ENERGY CONSERVATION

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HEARINGS

BEFORE THE

SUBCOMMITTEE ON ENERGY

OF THE

JOINT ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

NINETY-FOURTH CONGRESS

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FEBRUARY 2, 3, AND 24, AND APRIL 13, 1976

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ENERGY CONSERVATION

MONDAY, FEBRUARY 2, 1976

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON ENERGY
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:45 a.m., in room 1318, Dirksen Senate Office Building, Hon. Edward M. Kennedy (chairman of the subcommittee) presiding.

Present: Senators Kennedy and Percy.

Also present: William A. Cox, professional staff member; George D. Krumbhaar, Jr., minority professional staff member; and John G. Stewart, subcommittee professional staff member.

OPENING STATEMENT OF CHAIRMAN KENNEDY

Chairman KENNEDY. This is the first of 3 days of hearings before the Subcommittee on Energy of the Joint Economic Committee to explore the proposition that a serious national commitment to energy conservation is the essential next step in fashioning a workable and effective national energy policy for the United States. The subcommittee will meet again tomorrow, February 3, and on Tuesday, February 24.

Many Senators and Members of the House have been vitally concerned about energy conservation. A number of important conservation provisions were included in the compromise of the Energy Policy and Conservation Act that President Ford finally signed into law last December and there are presently pending in Congress other bills that reflect this congressional interest in the more efficient use of our energy resources.

Nonetheless, it is also fair to observe that energy conservation has not been generally perceived by the mass media or the public as occupying a priority position on the Nation's energy agenda. Nor has the executive branch accorded energy conservation much priority in its agency budgets or in its research and development expenditures.

Energy conservation has been in the curious position of being something that just about everyone favors, except that we, as a nation, have made only limited progress in putting these good intentions to work.

This lack of progress can be explained, in part, by the circumstances of the oil embargo in 1973 when energy conservation became linked in the public mind with energy curtailment, the arbitrary cutting back of energy use that almost always means reduced economic output and loss of jobs. But there is another dimension to energy conservation—the one we intend to pursue in these hearings—and that is the way to use energy more efficiently.

The heart of our energy problem is the economic burden that rising energy prices place on the American people. The more efficient use of energy is primarily a way to reduce or eliminate this economic burden. It is a way to avoid suffering any significant decline in our standard of living in the face of growing energy scarcity and higher energy prices, whether due to natural forces or to artificial production cutbacks administered by the OPEC cartel.

It is primarily from this economic perspective that a larger national commitment to energy conservation makes sense. Conservation for its own sake is not the point. We are talking about those conservation actions that make economic sense on the basis of hardnosed cost-benefit calculations.

The reasons for moving forward with an active national program of energy conservation are persuasive:

Individual citizens, businesses, and industry will realize substantial net savings through more efficient energy consumption. This means lower fuel bills for the average family and lower costs for energy-dependent industries.

The United States will serve notice on OPEC that we are controlling our nearly open-ended reliance on imported oil by reducing the energy that is needlessly wasted. About one-third of total U.S. energy demand presently falls into this category.

The efficient use of energy is generally the least expensive, most environmentally safe, and quickest way to increase the energy supply.

In other words, the potential benefits of greater energy efficiency—whether viewed from the perspective of the average family, the small business owner, or from the corporate board room—merit a much more concerted national effort than has been made to date.

In these hearings, we hope to explore in some detail the ways that this potential can be realized in this session of Congress.

As I travel in Massachusetts, the subject of high energy costs is brought to my attention more than any other issue. Those of us who have grappled with the energy issue for the past several years know that no responsible public figures can promise significantly lower prices in the foreseeable future. To me this simply means that we must take every possible step to reduce the amount of energy we use, and we must do it in a way that does not rely on arbitrary curtailment. Finally, we must do it as quickly as possible.

These, then, are the questions we hope to answer in these hearings:

What role should energy conservation play in a balanced national energy program?

What are the most promising energy conservation actions in terms of short-term payoffs? What about midterm and longer term possibilities?

What are the most cost-effective energy conservation opportunities available to us?

Why has energy conservation played such a relatively minor role to date in U.S. energy planning? Why have our citizens been relatively slow to take advantage of the opportunity to save money by using energy more efficiently?

What is the proper role for the Federal Government to play in promoting energy efficiency? What about State and local governments?

If we can answer these questions, I am confident that Congress will respond quickly. There is not a single Member of Congress who fails to appreciate the urgency of stopping the needless waste of energy in the United States.

There is some background to these hearings that should be noted. Last November, this subcommittee conducted a day of hearings in Waltham, Mass., on the subject of energy conservation. We heard from many experts who spoke knowledgeably about ways to save energy and who testified to the remarkable results that were possible.

I recall a witness from the Honeywell Corp. who described how they had reduced energy consumption by fully 45 percent in their Waltham plant. We heard the mayor of Waltham, Arthur Clark, describe the sensible steps to save energy that were underway in the city government. We heard the president of the Thermo-Electron Corp. in Waltham describe the extraordinary potential for industrial energy conservation. And we heard Roger Sant, the Assistant Administrator for Conservation and Environment in the Federal Energy Administration describe the cost-effectiveness of energy conservation compared to developing new sources of production from natural resources.

These witnesses convinced me that Congress had the clear obligation to take energy conservation seriously. We had the duty to invest as much time and energy in developing a national energy conservation program as we were prepared to spend in developing ways to expand energy production.

But one witness in Waltham last November spoke about the need for greater energy conservation with a clarity and sincerity that surpassed all of the experts. She was not an expert on energy conservation by most standards since she lacked advanced degrees in economics or engineering. She held no elective office. All she could tell us was what high fuel and utility costs had meant to her day-to-day existence and how she looked to her Government for some answers.

Her story is one that millions of Americans could also relate if they had the chance. I thought she should have the opportunity to speak for these millions of her fellow Americans.

Mrs. Florence Leyland of Waltham has come to Washington for the first time in her life to tell us why energy conservation should be the No. 1 energy priority of this session of Congress. She will testify later in the morning.

But I am delighted to welcome our first witness, Thomas Salmon, who is the distinguished Governor of the State of Vermont and who knows what the high fuel costs are doing to the population of his State. He has described to me how many Vermonters now face winter fuel bills of about $1,000 per year.

Governor Salmon is the chairman of the Committee on Natural Resources and Environmental Management of the National Governors' Conference. Governor Salmon is among the best qualified of the Gov-

ernors, to help us find answers to these questions. We look forward to his testimony. But before we hear from the Governor, I ask Senator Percy if he would like to say a word?

Opening Statement of Senator Percy

Senator Percy. Governor Salmon, I want to again publicly apologize to you for not being able to stay for your testimony, but I did want to pick up a copy of your prepared statement, and study it and indicate personally my appreciation to you, and also to Mr. John Eberhard, for coming to testify this morning.

Energy conservation is a subject of tremendous importance and I think your testimony can be invaluable. We have little credibility in the world today as far as energy conservation measures are concerned. We have talked a lot about it, but we have done virtually nothing. We are the biggest wasters and squanderers of energy on this Earth.

I put one bill into this body to cut down the speed limit on the highways to 55 miles an hour. Senator Randolph tucked it into his legislation. It is the only piece of legislation we passed in 2 years to mandate conservation, but we don't even observe that. It is being broken every day of the week. I think we ought to deprive States of highway trust funds if they don't enforce that law.

The Energy Policy and Conservation Act was nearly vetoed. I recall I was having dinner with Edward Kizer when I received an emergency call from the White House to come over and join the President in the Cabinet Room. I witnessed every single Republican conferee and members of the Republican leadership advising the President to veto that bill. I could see then why I was called over. Frank Zarb had apparently sent the distress signal out. He wanted to have at least one Republican tell the President that although EPCA is not the best bill in the world, it is all we've got—and all we are going to get—and that he'd better sign it, because if he did not we would have no conservation policy at all.

This is a really topsy-turvy world. We still have public utilities that offer special incentives if you use more energy. That was designed back in the days when we were trying to develop energy and find new customers. In contrast with such incentives is the fact that you can't open up a home here within the confines of this city or Virginia and get gas for it.

We are dealing in scarce commodities, and as a nation we need to address ourselves to it. It is for that reason I think your testimony will be very valuable this morning. I am going to read your prepared statement with great interest and the transcript as well. I am very grateful that you are here.

Thank you, Mr. Chairman.

Chairman Kennedy. We want to thank Senator Percy very much for those comments. I think the Governor and all of us in New England understand that the top issue last year was on the question of pricing, which had such enormous kinds of important consequences on New England. Obviously, in terms of the scarcity of materials, it had importance, but also on pricing, and there is no part of the country that is facing a more difficult time in the terms of our economy than those areas which are petroleum consuming.

But, it seems to me that this area of conservation can be the most meaningful in terms of lower energy costs and in terms of our national interest in conserving. We are hopeful we will develop, as a result of this, the kind of meaningful legislation that is going to be able to deal effectively with this problem; working with the States in a very important way, to achieve what I think all of us recognize as an important national and international responsibility. Of course, it means so much to the homeowner.

But, I want to thank Senator Percy for his comments and for his interest in this issue.

Governor, we look forward to your testimony.

STATEMENT OF HON. THOMAS P. SALMON, GOVERNOR, STATE OF VERMONT, AND CHAIRMAN, NATIONAL GOVERNORS' CONFERENCE COMMITTEE ON NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT, ACCOMPANIED BY EDWARD ROVNER, DIRECTOR, ENERGY PROJECT, NGC

Governor SALMON. Thank you very much, Mr. Chairman. To my right is Edward Rovner, director of the energy project at the National Governors' Conference here in Washington.

My remarks may bear slight resemblance to the prepared statement that is before the subcommittee, Mr. Chairman, but I thought I would come down and speak briefly and informally on perhaps the most critical issue in this country; that is, on the issue of energy and energy conservation in our times. When I became Governor 3 years-plus ago there was no national energy policy in this country, and there was no national energy conservation policy. It is only in recent years that an energy conservation policy has surfaced. And the one, as articulated by our national administration, is that the price mechanism solely and exclusively should serve to bring supply and demand together; should raise the price of energy in all forms sufficiently; and should eventually result in some people dropping out of the marketplace and then we will reduce consumer demand and meet our objectives.

Well, times are changing. I come to Washington today to suggest that in my view from the perspective of life as I see it, that energy conservation is an idea whose time has now finally come.

As we begin this dialog, I think a few central facts of life should be reviewed. We are in these United States the most gluttonous Nation on Earth in terms of our use and abuse of energy. And unless we modify our ways, in the foreseeable future we are not going to have it. We are not going to have either enough capital or enough resources to meet our projected demands.

We use more than double, as you know, Senator, the energy per capita, as do the people of West Germany today. I think it is critically important to point out that there is no realistic expansion in supply, on the supply side, in the next few years, with the notable exception of the Alaskan Pipeline, which will help. I think it is important to point out that national Canadian energy policy has dramatically changed over the past several years and there has been a significant reduction in exports of petroleum under their energy policy evoked by Prime Minister Trudeau.

I think it is important, Senator, to note that the cartel, of course, has been the trigger mechanism in the malaise of inflation in this country today. It has rigged and set the world price of oil. And the success of the cartel and the success of the cartel's policies is inextricably wedded to the proposition that the United States of America will continue to require large-scale imports.

Most of us who labor in the vineyard of public life today know that the era of cheap energy is over, but too few Americans are willing to believe this. The most notable story of all, the Mrs. Leyland story, the lady who will be with you here today, shows spiraling prices of oil, which has taken a fearful toll amongst middle Americans and the poor in this country.

Amory Loving once said that most solutions today, which increase supply, are in certain technologies, slow, costly, risky and of short-term benefits, where most solutions which reduce demand are easily obtainable, quick, economical in the long-run, safe, lasting and do not contain the risk of unsure development.

This subcommittee posed two central questions to me in the invitation to come down here: In what ways can we perceive the greatest potention of energy and economic savings through conservation? And my suggestion is that this can be achieved only through a variety of strategems. This country has spent $10 billion in the development of nuclear energy thus far and has only added 8 percent to the Nation's total electrical supply by so doing. The Ford Foundation, in a recent report, as found that very significant investment in conservation in the industrial sector could save millions of barrels of oil a day by the year 2000, and that industries' investment in this initiative could be repaid in as early as 7 years.

If the United States of America would shift completely to returnable containers, as we have done in Vermont and as we have done in Oregon, employment could rise significantly and annual consumer savings would exceed $1 billion a year and, of course, there would be significant savings in barrels of oil per day.

One of the most crying needs in this country, as it relates to this issue of energy conservation, in my view, is the absolute indispensable necessity of programmatic national growth policies. And if we will put some money into projects such as land use planning for the Federal, State, regional and local governments, significant results, in my view, including energy efficiency, will follow.

We made some progress, Senator, in the State of Vermont in terms of concern about our environment, because we believe very strongly you can't build a strong economic base unless you build first a strong environmental base. And our experience with a series of progressive rules over the course of the past 6 years particularly suggest this. You just can't simply spread people all around willy-nilly and then expect to provide public services to them.

I read recently HUD surveys which said planned, high-density communities use significantly less energy, less water and generate considerably less air pollution than a community of low-density sprawl. Now, this is the wave of the future that must be incorporated in our national growth policy initiatives. We are going to have to have substantially altered policies: We are going to have to substantially alter our throwaway habits in this country. We are going to have to fix it

instead of junk it. We are going to need, of course, more recycling and a full-scale war on waste in all fields.

That brings us to the bill that is emerging before this subcommittee, an excellent bill, in my view, and a pragmatic bill. It goes to the very heart of the most significant problem; namely, the average American, the average small businessman in America faces this problem when he wants to do something signicant about achieving optimum energy savings, Senator, and that is his availability to find the money to do the job.

We looked at some numbers in the State of Vermont. As everyone in this country should know, Senator, and as you know, unemployment up our way is 25 percnt above the national average. We pay almost 30 percent more for energy in all forms than any other sector of the country, and we are experiencing a moderately severe depression, compared to the general malaise of the national recession as viewed in some parts of this country. But, we have taken a look at some numbers, Senator. For instance, looking at the Community Services Administration standards calling for 12 inches of attic insulation in an average Vermont home, that results in about 1,500 square feet of insulation, and this would mean a minimal investment of $700 to get the job done. And the fact of the matter is that most of my constituents, and I sense most of my constituents in New England as a whole, don't have that $700 to get that job done. And it seems to me that this bill very directly, very immediately relates to this critical and essential fact of life.

I think it is less important what final administrative strategems are agreed upon to complete the job in the final analysis, than it is to make a long-term commitment that will pay off in due course to give Joe Smith, who is a homeowner, the capacity to make a significant individual contribution to energy conservation in our times.

Chairman KENNEDY. Let me ask you on that point, Governor, if this makes so much sense in terms of the investment for the homeowner now, why aren't more people just doing it? If it could be shown to make a great saving, why don't they get a repayable loan at the present time and pay it off over 2 or 3 years in terms of saving their fuel and oil bills? Why aren't more people in Vermont willing to do that at the present time?

Governor SALMON. They don't have the money. They can't pay the interest rates, which are too high. Those are two reasons. Third, a program such as this, which has a significant potential, can be the linchpin in my view of a composite strategy toward significant energy usage reduction with a goal, perhaps, out there conceivably of as much as 10 percent in terms of what we currently use, if we put it all together. But, it isn't going to happen unless somebody leads the band. Under our system it should be led from Washington, D.C., in terms of giving the Governors the capacity at home to follow suit. It is going to have to be a strong public education program, and the Governors are going to have to be heavily involved. We are going to have to put on line strategies that actually reach the people and make them aware of the program and that the program exists. Today, they just don't understand.

Chairman KENNEDY. If the local homeowner is having difficulty in making ends meet, which I know they are certainly in my State and I am sure in yours, then why can't the States themselves develop this

kind of sort of a revolving fund or provide this? What is your situation? I can tell you what it is in my own State of Massachusetts. With the kind of recessionary pressures that we are under, we have had a very substantial cutback in terms of human services; and I consider this to be the net result of fundamental mismanagement of the economy.

Now, how do you reach the question about, "Well, why don't the States do it?" How do you answer the question, "Why does the Federal Government have to get involved?"

Governor SALMON. The States can't do it, Senator, because we are working with double-digit inflation. What a lot of people in this country don't understand is that in hard times a lot of good people, a lot of poor people, but also a lot of people that normally would prefer to work for a living come to Government as the place of last resort. In hard times they come in droves. If we don't take care of them, there is nobody else out there that is going to do it.

In our little State, we don't have as severe problems as does the Commonwealth of Massachusetts and not nearly so severe as the problems in New York City. But we are facing a situation in our revenue base where we are receiving approximately the same number of dollars this year as last year. We've got to swallow inflation and try to maintain a full commitment to a wide range of programs, including human services programs on less money, in other words. And with the strong antitax feeling that abounds in this land today, we are doing very well just to keep this thing alive, as it is.

Chairman KENNEDY. And so to think about a major new program in the State, just to think about it is really unrealistic, in spite of its importance and the consequences that could occur in terms of the people up there. I suppose there is an additional responsibility in that this is a national program. There is more Federal responsibility. And therefore, there ought to be some kind of response of trying to work with the States and local communities in fashioning some response to this, is that not so?

Governor SALMON. Our office here in Washington called the States, Senator, and we were able to reach 46 energy offices and we posed this question: Are there serious money constraints in terms of your desire and capacity to move forward aggressively in an energy program and in a conservation program? And 44 States responded and said, "Yes." And so the problems that I cite in terms of my State are fairly endemic to the Nation in terms of the pragmatic capacity to find resources to do this job at home.

Chairman KENNEDY. Governor, are you going to talk a little bit now about how the States could develop a program if funds were available at the Federal level in terms of some sort of guaranteed loans. It seems to me that if the States are able to deal, as they were, in terms of the allocation program, which was enormously complex and difficult, that they ought to be able to deal effectively with this, but will you develop that either now or a little later in your testimony?

Governor SALMON. Yes; I will develop that right now, Senator, or attempt to develop it. You cite a good case in point. The postembargo situation in this country after October 1973 was traumatic to say the least. A fair assessment of the Federal Energy Administration regulations on the allocation side was that it was a veritable blizzard of

words that ultimately led to a "Catch 22" situation. But, somehow, we survived. The FPC analysis of that significant period in our history suggests States and State energy offices carried us out of the wilderness.

I see a real challenge to the Governors, frankly, Senator, in looking at the working draft of your bill in terms of how the program might best be implemented. I sense that the regions of this country, that the individual States of this country are so diverse, have administrative structures in places so different, that a different mousetrap in different States may well be indicated.

Just speaking off the top of my head, although I haven't done a staff review on this situation, in our State we have just a handful of utilities who provide fundamental electric services to virtually all of our people. It might very well be appropriate to utilize these resources, their mailing lists, their outreach capacity in terms of helping to spell out the message of what is available under appropriate circumstances. It might well be that we could develop a structure wherein the cost of insulating a home for solid reasons could be welded into the utility bill over a period of time and ultimately reaching a real savings.

I would have to give a great deal of thought to the specific administrative structures, but that is one that might be appropriate for us.

In any event, in small, rural States, such as ours, the people feel very close to their Government. They complain about it a lot. But, we have a toll-free action line in my office, and they jam it with calls every day. So they do communicate. I sense that if the program is left with us to implement under broad Federal guidelines—certification requirements or whatever is needed in terms of utilization of funds—that we can run it quite adequately.

Chairman KENNEDY. Well, it would certainly seem to me that that could be the kind of a structure that would make a good deal of sense and this is certainly the approach that I think justifies support.

Could you comment a little bit about the sense of priority that this program has in terms of our national goals? We see now the administration officials talking about $100 billion in a guarantee program in the area of energy independence. We see a $6 billion program in terms of development of synthetic fuels. I am just wondering about your own sense of priorities and speaking as a Governor and responsible public official, Governor Salmon, where does a conservation program fit into this kind of allocation of sizable resources and national commitment of say approximately $10 billion over a 4-year period? Is this a raid on the Treasury? From your point of view, is this a raid, or is it something which in terms of equity and fairness is really long overdue in terms of the homeowner? What can really make the greatest difference in terms of that family that is trying to balance the budget and facing increasing problems with inflation and uncertainty? Is it this program?

Governor SALMON. Well, the latter, I would say the fundamental difference between the Nation's Governors and the national administration—and this is the Nation's Governors both Democratic and Republican, although I guess we have one Independent up in the State of Maine who I can't speak for—but the Nation's Governors' view is the development of quantifiable energy conservation goals as the linchpin of any conscious national energy strategy. Whereas, up until fairly recently, the national administration has been overwhelmed

with the price mechanism; the decontrol aspects of their programing in the modified forms recently enacted into law. So, it is my view that this legislation will be vigorously supported by the Governors of this country on a bipartisan basis.

Of course, one must be mindful of the notion that in our view, Senator—and I haven't spoken to the supply side at all during these remarks—that we sense also a case can be made for a $6 billion program for synthetic fuels, for instance, and for other specific supply issues.

Chairman KENNEDY. Yes.

Governor SALMON. Just another word or two in my formal remarks. A very good question, I suppose, Senator, is do the American people really hear? Can voluntary conservation programs—and this is another voluntary conservation program because you don't have to sign up for insulation and you don't have to participate in this program, because it is a voluntary program—but can they work? Do we, as an American people, have the collective capacity to really do something about this?

There are a couple of examples recent history shows that I think are suggestive that the answer may be yes. After the embargo in New England and under a strong call of six Governors, and under a strong public education campaign, we were able to achieve energy conservation initiatives that aggregated about 20 percent in terms of reduced usage over the preembargo year. That is very significant, because the national average during that time frame was something like 4 percent. In 1974, they had a drought out in the Pacific Northwest. As you know, about 90 percent of the electrical power generated in that region of the country comes from hydroelectrical sources. It was absolutely necessary that the people of the States of Washington and Oregon conserve electricity. Governor Evans of Washington and Governor Tom McCall of Oregon led the public relations campaign on the energy conservation side. Through their collective efforts and the cooperation of the people, they exceeded everyone's anticipation in terms of the quantum of energy that could be saved through a conscious effort. So, I think that those two recent examples in two different regions of our country are suggestive of the notion that if the American people get their heads made up to do something about this problem, indeed it is within the realm of accomplishment.

Chairman KENNEDY. Could you talk about the impact this could have on employment in Vermont, that is, with an important conservation program?

Governor SALMON. We, in Vermont, feel that unemployment is the No. 1 problem in this country, Senator, even as compared to inflation and regrettably, the national administration does not agree. Any program designed to put the unemployed, the able-bodied unemployed to work in my view and in the view of all the Governors, Senator, is a good program. This program, with a $10 billion loan guarantee of potential and other specific initiatives would obviously be designed to put people to work.

I can see true, creative utilization of our CETA programs, if they continue, with the training of additional people to install insulation, for instance, and so on. I see a very positive implication here, if the program indeed gets off the ground.

Chairman KENNEDY. Would you share with us, Governor, a little bit in terms of the human situation, in terms of what these escalation of fuel bills have really done to the people of Vermont and to the homeowners? What sort of stories are you hearing up there? How dramatic has the cost increase been and what has it meant in terms of the human situation?

Governor SALMON. Well, it has meant several things. It has meant this. It has meant that Yankee ingenuity in New England has come to the fore. We have any number of people in our State creatively using wood as a replenishable resource to supplement or, in some instance, to replace existing heating systems. The State of Vermont has a program wherein we let people come into the State parks, the State forests and cut cordwood for $2 a cord. And that is a good deal on anybody's standard. You see pickup trucks all over the place loaded with it. People are burning wood as a hedge against inflation, as a hedge against energy costs.

What is happening to the categorical poor in our State—and those are the tens of thousands of unfortunate people who have no chance and who have no constituency—is this. They are being required to consciously make a choice between adequate heat or adequate food. I hope that fact of life is reflected when the final decisions on the President's budget are made, as they relate to the human services side.

In a sense, without a great deal of complaint, Senator, people are making do under very, very harsh circumstances. But, the implication of energy costs is a profound one in the region which you and I live in. Thank you.

Chairman KENNEDY. Thank you, Governor Salmon.

[The prepared statement of Governor Salmon follows:]

PREPARED STATEMENT OF HON. THOMAS P. SALMON

Mr. Chairman and distinguished Members of the Subcommittee, my name is Thomas P. Salmon. I am the Governor of the State of Vermont. I also serve as Chairman of the National Governors' Conference Committee on Natural Resources and Environmental Management, the Committee with jurisdiction in the field of energy. I appear here today in my latter capacity although I am no less concerned about the welfare of the people of the Green Mountain State. I am grateful for the opportunity to share with you some of the judgments and insights I have developed from work in the energy field.

The nation's Governors have a long record of action with regard to America's problems of energy supply and demand. Long before the Arab Embargo, the Governors called for formulation of a national energy policy. Before the Embargo, the Governors created an energy program at the National Governors' Conference. Before the Embargo we named a key advisor on energy problems and established ways and means to handle the acute energy problem. We did this in order to make sure that lines of communication were opened to our constituents; industry, to the federal government and to each other in the State Houses across the country.

When the Embargo took hold, the Governors were in a position to play a crucial role in the struggle to maintain America's integrity and the vitality of our own society. The Federal Trade Commission conducted a review of the petroleum allocation program and found that it was the States that kept the program "afloat."

The Governors have always been concerned about expanding America's energy supply. Many adopted innovative power plant siting programs to bring orderly development out of what threatened to become chaos. The Governors not only called for prompt development of the mineral resources of the Outer Continental Shelf but produced innovative suggestions to the federal Administration on how to achieve this goal in the most effective manner, minimizing

both waste and adverse impact on the abutting shores—impacts that produce opposition to such development. Our Committee is even now working through a series of multi-state subcommittees to produce new initiatives that could expand our nation's use of its most abundant fuel—coal.

Many States are spending money from their own treasuries to do research and development not only for coal but also for better use of traditional fuels, for introduction of newer fuel supplies and for better ways to use what we have. The National Governors' Conference maintains a catalogue of state-sponsored research which is available to be shared by all States and serves to reduce duplication of effort amongst the States. We have begun a series of meetings between federal and state researchers, primarily with ERDA.

I come before you today not to speak of how to expand supply, but rather to solicit your help in finding ways to reduce the energy we use to produce our goods and services and to meet our other activities. The balance of supply and demand requires attention to both sides of the equation. A few salient facts will indicate why the nation's Governors have concluded that an aggressive and expansive program of energy conservation is of the highest order.

Current U.S. imports, about six million barrels of oil a day, are mainly from insecure sources and impose a yearly cost of twenty-four billion dollars.

There is no expansion of supply possible in the next few years except for completion of the Alaskan pipeline which could materially increase domestic production. You should know, however, that a portion of the production from the Alaskan pipeline will merely replace current Canadian imports. This time constraint applies to synthetic fuels; expansion of coal mining; secondary and tertiary oil and gas recovery programs; or, an acceleration of leasing of tracts in the Outer Continental Shelf.

Per capita energy used in the U.S. is more than double that of West Germany, an industrial nation with which we compete in the World's markets.

A significant contributor to the inflation which plagues our nation since 1973 has been the escalation of the world market price of oil. The cartel which rigs (and which threatens our power to make international decisions on their intrinsic merits) depends on a large-scale import program by the United States to maintain a world shortage.

The era of cheap energy is over and too few Americans can accept this fact.

Spiraling prices of petroleum have taken a fearful toll among the poor and middle income families and businesses.

The recent legislation passed by the Congress and signed by the President will help reduce energy waste in America. Improved efficiency in our automobiles; encouragement of building codes which can make new or renovated buildings more energy efficient; and, more efficient appliances will all make their contribution. Very importantly, we hope the federal government will fully fund the program to help States to devise and to implement their own energy conservation programs. We hope, too, that the Congress will make the program of refitting the homes of lower income families more effective. Finally, we hope that you will pass legislation which mandates national building efficiency standards for new or renovated buildings.

All of these measure will make their own contributions. However, they do not go far enough. We know that tax incentives will help some home owners and small businessmen who understand the value of refitting their buildings and upgrading the efficiency of their processes to do so. In my own State of Vermont, the average family that heats its home with oil has seen the cost of heating go up by $250 a year since 1973. The cost of driving to work, to the store and to the doctor has nearly doubled in that time period. For those with very modest earnings and small savings, the opportunity to save money by adding insulation to their homes mocks them because they don't have the necessary financial resources to meet the front end cost. In the State of Vermont, insulation standards recommended by the Community Services Administration call for twelve inches of attic insulation. Current costs indicate that to meet this standard in Vermont means a minimum investment of about $700 for an average 1500 square foot home. And, this cost reflects only one element that needs to be taken into account to improve the heating qualities of our homes.

The small business person who has attended seminars sponsored by many of the States comprehends the savings he, or she might achieve by modifying the processes or by adding insulation to the building. However, loans for these purposes too often carry an interest rate of ten percent and the banks are reluctant to extend additional credit to small business.

If, as we all hope, America is back on the road to an expansion of our economy, we can anticipate that investment money may become tight again. If housing rebounds from two bad years, mortgage money will compete for funds with industrial expansion. The President's budget calls for tax incentives for industrial investment in areas of high unemployment and this, too, would place some stress on the availability and price of capital. All this is by way of saying that those who seek to invest in energy conservation measures may find themselves shut out of the money market or paying interest rates that they cannot readily afford.

The States are prepared—and are anxious—to play their role in a national effort. Every State has an energy office and most Governors have at least one prime advisor on energy on their personal staff. A survey we conducted last month asked the question of each State: Do you have any energy conservation plans which are frustrated for lack of funds? of the 46 States that replied to the questionnaire, 44 replied in the affirmative. They are ready to act but have no money.

States have established mechanisms to bring the conservation message to their citizens. The Governors have credibility with their fellow citizens. What they seek are the resources, within the States, and in the economy generally, to get the job done.

We reject the notion that energy conservation implies a decrease in the quality of life. A person is as comfortable in a well insulated house as he or she may be in a poorly insulated one. A factory works as well with insulated steam pipes as with poorly insulated conductors. A laundry gets clothes as clean with recycled hot water as when it wastes water. All of these measures do not even affect life style and each of them presents an opportunity to reduce energy waste. Modest changes in life style can also play a useful role without reducing the quality of life. Workers can get to and from work as comfortably and reliably in a car pool as in a series of autos each bearing only the driver. Modestly lit stores can provide equal shopping convenience as when they are overlit but the conversion may involve initial investment.

In State after State, the Governors briefed business people about the good sense that energy conservation can mean for them. Lower fuel bills can reduce mounting increases in unit costs and make a producer more competitive. Conservation can ease the threat of natural gas curtailments. But, the missing piece in this effort is to advise the business people not only of the opportunity but also to be able to direct them to reasonable sources of funds to capitalize on opportunity.

We can alert homeowners to the excellent cost-benefits of upgrading insulation and adding storm windows. Many investments in home improvements pay for themselves in a short time and then the annual savings in fuel are all gravy. An excellent federal publication, "In the Bank or Up The Chimney" advises the reader that typical do-it-yourself attic insulation that might cost about $290 can save $120 a year—a payback in less than three years. Even if there is nobody in the household who can do it themselves and a contractor is used, the payback is only a few years longer.

The problem is the availability of the initial investment for the homeowner. For state government this is a huge obstacle. If we had a good line of easy credit, we could induce utilities and oil dealers and lending institutions to undertake imaginative and easily understood programs which could be popularized by the Governors and the Mayors.

A number of us who have labored long in the vineyards of rational energy policy see conservation as an idea whose time has come. It is free of the stigma of doing without. It appeals to those who are trapped by higher prices and know that this is no temporary bulge in prices. It is time to repair the crack in the picture window, to caulk around its edges and maybe even to put storm windows over it.

The proposal to put up six billion dollars to accelerate U. S. production of synthetic fuels was supported by many Governors. The scale of the challenge requires massive resource commitment. This must be as true for eliminating waste as it is for expanding energy supplies.

The imaginative blending of the efforts and the resources of all levels of government can make a major contribution. A national effort includes, but is not limited to, the federal government. I can assure you that the Governors are ready and anxious to make their contribution.

Chairman KENNEDY. Governor, I was wondering if you could remain with us and then I was going to see if we could have John Eberhard of the American Institute of Archictects Research Corp., which is a nonprofit public benefit corporation concerned with developing more energy efficient and environmentally accepted architectural approaches, whether he would be good enough to come on up now and talk with us, then we will get to the other questions and come back to you.

I want to thank you very much for coming up here, Mr. Eberhard, and being with us. We have had some weather problems on the east coast this morning. So, we have been closed out from Boston. David White, who is the director of the Massachusetts Institute of Technology Energy Laboratory, who was scheduled to appear on this panel, has not been able to come, and also Lola Redford, president of Consumer Action Now, who has been slowed up in New York. So we will try to reschedule both of those witnesses. But, we will be glad to hear from you, Mr. Eberhard. We welcome you here.

STATEMENT OF JOHN P. EBERHARD, PRESIDENT, AMERICAN INSTITUTE OF ARCHITECTS RESEARCH CORP.

Mr. EBERHARD. Senator Kennedy, if you would prefer, I would like to submit my prepared statement for the record and then just speak extemporaneously.

Chairman KENNEDY. Yes, that will be fine.

Mr. EBERHARD. I certainly support everything you have said this morning and that Senator Percy and Governor Salmon said. I would like specifically to speak to the question of energy in buildings, since that is our area of expertise and make a slightly different point, perhaps, than has been made so far about the question of energy conservation.

Buildings use something like 30 percent of the energy budget in the Nation. This includes housing, schools, hospitals, churches, office buildings, and so forth; our total inventory of buildings.

Buildings, other than housing, which were built in the last 20 years particularly, have become swollen with mechanical and electrical equipment that use large amounts of oil and gas. Twenty-five years ago, mechanical and electrical systems represented 20 percent of the buildings' costs. Today, it is not unusual to have a hospital have 65 percent of its costs vested in mechanical and electrical systems, not just because they have gotten more expensive, but because they have gotten more elaborate and more complex.

There is a misconception in a lot of the discussion here in Washington about the energy issue with respect to buildings. That misconception is that buildings use energy because they have this mechanical and electrical equipment. And I think what Governor Salmon was pointing out a moment ago is the correct question; that is: Why do buildings have mechanical and electrical equipment in them? The answer to that question is because people use buildings. Because people require some measure of comfort, if they are going to hold hearings in a congressional chamber, for instance; or if they are going to work in an office building; if they are going to go to school; if they are going to be in a hospital. In severe climates like Vermont, Senator, and

like Washington, D.C., this morning, we need to provide some measure of comfort for these activities.

However, when the problem is stated that way, we see it has been an architectural problem for some 3,000 years. That is, we always have to try to design buildings to accommodate people's requirements under changing climatic conditions. It has only been in my lifetime—and I had my 49th birthday last Thursday, so it has only been in the last 40 or 50 years—that we have come to depend on fossil fuels, on oil and gas and their equivalents in electricity, to provide us with a very narrow range of comfort conditions.

We don't have to maintain 70 degrees in our houses every hour of the day in every part of the house. The house itself requires no heat. It is those of us who use the house or building that require heat or, in Washington, D.C., in the summertime, we would prefer to have air-conditioning.

The concept which I would like to suggest, and which we are talking about in the American Institute of Architects these days, Senator, is what we call energy conscious design. That is not conservation in the sense that we would cut back from the fairly gluttonous set of present conditions, or it is not just dealing with how you increase the supply to continue to feed those gluttonous conditions; but what can we do, particularly with respect to designing buildings, to be conscious of the fact energy is now a precious commodity—and really always has been—and that we should be more careful about how we use it. We believe that we should approach the design of buildings with that in mind.

We believe if we do that, if we do some sensible things which we probably should have been doing as architects all the way along, but which for the last 25 or 30 years we have neglected to do, that we will see a vast improvement in energy use.

Energy conscious design begins with thhe simple procedure of first talking with the client, whether the client is a government agency or school board or even a private client for a home, and being sure that the space requirements that the client believes that they need to solve their functional activities are so modest as would be warranted. A school building, a hospital, a governmental office building. for example, which would be twice as large as is needed in order to accommodate some activity, is obviously going to use a lot more energy than it should.

A second step is to talk with a client about what their design requirements are in terms of temperature and humidity and light within the building and seeing if we aren't in a position to make some adjustments to what we have come to expect in the way of comfort conditions.

The third thing to do, and this is where architects see it as an opportunity and a new challenge, is to do those kinds of sensible things about the design of the buildings that would adapt the buildings to climactic conditions those things which we used to do and that we have tended to forget. For instance, how do you adjust a building to take advantage of natural ventilation; what do you do to protect a building in the southern part of the United States from sun exposure in the hot part of the day or the hot part of year; what do we do to take advantage of landscape design?

In the last 20 years, for example, it has been possible to build a glass box for an office building that ignores the climatic factors and then by brute force, to put in mechanical equipment that would compensate for what obviously in that case is a bad design from an energy conservation standpoint.

We are also realizing increasingly that things like solar energy and wind energy and renewable resources of energy, are going to give us new and exciting opportunities for designing buildings. For example, I was in a home last January in Albuquerque, N. Mex.—his name is Steve Bear—whose total utility bill for the year was $7. That was for the little bit of electricity he uses for light. He has solar energy that provides the complete heat for his building. He cooks—rather his wife prefers to cook, because they are adapted to the environment, on a wood-burning stove. They have not gone back in history to a lifestyle of earlier days, but what they have done is gone forward to a new and exciting time of using renewable sources of energy to enhance their lifestyle. That is the message I am trying to convey here, both in my prepared statement and in what I am discussing with you.

I think that the Congress should look at those kinds of opportunities that would underwrite and sensitize people to the adaptation and changes in lifestyles that are already beginning to emerge in our society out of a consciousness of energy, out of a consciousness of adapting to the environment, and out of a consciousness of not being gluttonous with our use of energy, as we have been in the past, that that is the recommendation I would bring.

There are two kinds of ground rules that this suggests: One is that we don't overlegislate and as a result tend to freeze the present state of the art. There was a tendency, I am afraid, in earlier legislation before Congress for energy standards to be prepared as prescriptive standards that would freeze the state of the art. I am glad to see that Congress is now moving toward performance standards, which is what we advocate.

The second ground rule is that there are few indications that increasing the supply system is going to help. If we provide some tax relief or underwriting for encouraging an increase in the supply side, my belief is that we are going to be mortgaging our future. We may provide some short-term responses for increasing the supply, but we will be mortgaging the future in terms of the decline in the availability of those resources in the future.

There are sectors in our population, Senator, not just people on fixed incomes and not just people with low incomes, but there are universities, which I am sure Governor Salmon is aware of—and I am aware of, since my son goes to the University of Vermont and I know the problems in Vermont—and there are hospitals, and there are schools, and there are institutions who cannot passthrough in any form their increasing costs of fuel. Those institutions are going to need some capital from somewhere to make the redesign and readjustment of their buildings for energy conservation purposes. Congress could, and I hope will, provide the means of their getting access to capital.

Now, that does not mean that those people, who are in a position to passthrough the cost of capital by the fact that they are in businesses which would allow it, will necessarily have to have incentives.

Next, I think you suggested earlier, Senator, that the rising price of fossil fuels will create an economic situation such that if we approach the design of buildings or the redesign of existing buildings from a consciousness standpoint, that the marketplace is going to be able to take care of a large part of the needed investment. The part that cannot be taken care of, though, is going to need some encouragement from Congress for capital development.

Finally, I support the notion that a much more balanced research budget is needed by the Federal Government. The amount of research funds we spend on increasing the supply—for example, the funds we spend on nuclear energy—are disproportionate to the funds that we have spent so far, in areas like solar energy, wind energy, and energy conservation. I would hope that you would support legislation in the future that would provide a better balance in those research expenditures.

Thank you.

Chairman KENNEDY. Thank you very much, Mr. Eberhard.

[The prepared statement of Mr. Eberhard follows:]

PREPARED STATEMENT OF JOHN P. EBERHARD

Mr. Chairman, my name is John P. Eberhard. I am President of the AIA Research Corporation, not-for-profit public benefit corporation established by the American Institute of Architects. I come before you as a professional experienced in energy matters, but not today as a spokesman for the American Institute of Architects.

There should be little doubt about that a more concerted national commitment to energy conservation is not only required but possible. There may be some disagreement about how large our reserves of oil and gas are, but it seems clear that these reserves are not adequate to take us into the 21st century—especially if we continue to use these fossil fuels at an ever expanding rate. Policies which seek to temporarily increase the supply of these resources, whether through deregulation of price controls or special tax advantages, can only provide a temporary semblance of relief for the present by mortgaging the future. The result of short-term efforts to increase by economic incentives the supply of fossil fuels is most likely to bring sharp increases in costs to the consumer.

A reduction in our dependence on fossil fuels has so far been focused on two major strategies. One is to "conserve" the remaining reserves by cutting back on our present patterns of use. Driving our automobiles at a maximum of 55 miles per hour, or turning down the thermostats on our furnaces in the winter are examples of this strategy. A second strategy is to introduce alternatives to fossil fuels. Nuclear energy is getting the lion's share of this action, but solar energy, wind and geothermal alternatives are coming into greater prominence each day.

There is a fundamentally different approach to reducing our dependence on fossil fuels that I would like to propose. I can illustrate this strategy most easily by discussing the use of energy in houses and in public and private buildings. Most of the buildings we have built in the United States during the past twenty years have been swollen with expensive mechanical and electrical systems that require gluttonous amounts of oil or gas to keep them going. Thirty years ago, these mechanical and electrical systems for heating, cooling, ventilating, and lighting buildings were less than 25 percent of the building cost. Today, they are often in excess of 60 percent of the building budget—not just because they are more expensive versions of the earlier systems, but because they are larger and more complex. Architects have helped to bring about these conditions by designing the basic building (often as little more than glass boxes) without due regard to the climatic conditions and then compensating for such energy inefficiencies by putting in still larger heating and air conditioning plants. To begin a program of energy conservation by cutting back from these over-designed conditions is like allowing yourself to become excessively heavy and then trying to go on a diet. How much better it would be to be sensible about our demands in the first place.

The AIA Research Corporation, for which I am responsible, has begun a major

program of experimentation with ways to help architects understand what we can do about "energy conscious design". The Federal Energy Administration is supporting our efforts to move from a well-intended, but often misunderstood program for the conservation of energy in buildings (with all of the negative connotations of being forced by circumstances to cut back) to one of energy conscious design as a positive approach to meeting human requirements in buildings. The Energy Conservation Program of the Energy Research and Development Administration has supported our work in evaluating the educational and informational needs of various sectors in the industry of building. The General Services Administration has used our services in the preparation of Guidelines for Energy Conservation in the design of Federal Buildings. The National Bureau of Standards and the Department of Housing and Urban Development have utilized our services in establishing the architectural issue that relate solar energy to residential design, and the National Science Foundation has given us a grant to determine the constraints and/or incentives to the introduction of solar energy. I recite this long list of cooperation with Federal agencies to underscore our experience in the field of energy and perhaps to lend credence to the recommendations I shall propose.

I believe it is important to all of us, but especially to architects to understand that we are moving rapidly toward a new accommodation to nature by the man-made environment—a renewed discipline to challenge our architectural creativity. A positive and welcome opportunity to provide spaces for human use that are more humane in their response to an ethic of worldwide conservation and more stimulating in their use of renewable sources of energy which are non-polluting. The energy of the sun, of the wind, of the oceans' thermal gradients, are there for us to think about in new ways. The use of natural sites, of water, wind and trees challenge us again, as they have in the past, to capture their delights for all to use. It's too bad that it took an "energy crisis" to awaken us to this challenge, but it's going to be exciting to be thinking again about design in creative terms.

To respond to this new—or renewed—opportunity, we first must get past a major misconception. Most people, including most architects, believe that buildings use energy because they have heating, air conditioning and ventilating systems, and because we use electricity for lights, elevators, and other appliances. This misconception lingers on because we often fail to ask the more fundamental question—why do we use such energy-consuming equipment in our buildings? The question poses its own answer—because buildings are designed to shelter some human activity and because such human activities are best conducted when we are comfortable.

In a large country like the United States, we have widely divergent climates and often large fluctuations in the climatic conditions for different seasons of the year. For thousands of years, architects have been challenged to provide a measure of protection from climatic conditions by designing buildings that recognized the need for human comfort inside the building by the provisions of design features that ameliorated these climatic variables. Only in the recent past have we had the luxury of mechanical equipment to fine-tune the interior comfort conditions within a narrow range of temperature and humidity boundaries. Consequently, it has been only in the past few decades that we could ignore the sensible things we have always had to do to make our buildings first and foremost the accommodating instruments of human comfort under fluctuating climatic conditions.

If we accept the challenge of energy conscious design, then we will design new buildings or redesign existing buildings by taking the following steps:

(1) We will work with our clients to make sure that their space requirements are reasonably related to their needs. Excessive spaces pose environmental comfort loads which may be excessive.

(2) We will work with our clients to make sure that their design requirements for comfortable conditions are reasonably related to human needs. Humans are capable of fairly wide fluctuations in temperature, humidity, and light.

(3) Next we should do all of those things we once did to make our buildings the instruments of adjustment to climate. Orient the building to the prevailing breezes; protect the openings or glass areas from excessive heat with shading devices; provide natural light where it is needed; screen the building from raw north winds with earth berms or planting; increase the mass of the walls and roofs to act as a buffer against excessive heat or cold, etc.

(4) Having done all of the sensible things we can in designing the building itself, we should then turn to the use of renewable sources of energy such as

solar energy or wind energy to increase the means of comfort conditioning. New concepts of using the sun's energy and wind will be developed in large numbers over the next few years, and we should make an effort to know about these new concepts, understand them, and use them.

(5) Finally, we will turn to mechanical systems for the supplemental conditioning that is required if all of the above still leaves us with unmet human requirements. But we will do this sparingly and with a delicate touch, not with the brute force systems of the recent past. Mechanical equipment for heating and cooling, and artificial light will be treated as supplements to natural solutions, not as primary solutions.

We can, and we should, take these steps in designing or redesigning buildings as wise and sensible procedures. But we can go beyond these sensible steps to provide that quality of design that Vitruvius called "delight". To infuse our designs with those attributes that make architecturally designed solutions more than suitable and adequate—to provide aesthetic qualities that generate in the observer a response that is emotional.

The question now remains as to what Congress might do to encourage such an energy conscious design approach to buildings. My first suggestion is to be careful not to move too quickly to legislate where legislation may not be needed or may even produce results that are counterproductive. As the price of fossil fuels rise and as the prospect for reasonable use of alternatives such as solar energy increases, many people will vote in the market place by making private investments. Legislation which was introduced last year proposed to issue Federal prescriptive standards for energy conservation in the design of buildings. This would have been a mistake. Fortunately, the Congress is now moving towards the adoption of wiser, and in the long term, more beneficial performance standards for this purpose. It remains then a major challenge to the research community to frame such performance standards in terms of human requirements.

There are, however, sectors of our society that will find it difficult to make the adjustments needed in their buildings because of economic constraints. This includes schools, colleges, and hospitals who are not in a position to pass on the rising costs of energy to their users. Congress should provide economic assistance that will enable such institutions to raise the capital required for redesigning and modifying their buildings. Persons whose incomes are low, or elderly people on fixed incomes, will find it increasingly difficult to bear the burden of increased energy costs and they will lack the resources to invest in building modifications that would reduce their dependence on fossil fuels. Congress should provide for their assistance, but not in a simplistic manner. Simply to add insulation to a house may sound like a good investment, but it may do no more good than putting a fur coat on a fat man who is cold and hungry. More fundamental adjustment to the "metabolism" is called for, and that will require more complex legislation and long debate about the proper role of government in helping people to adjust to new life styles.

Finally, there is a need for more research to inform our judgments, create new concepts and bring about new developments. There are a large number of government agencies involved in energy research. Most of the money is being spent on finding new ways to increase supplies of scarce fuels or speed up the development of nuclear energy. A bettter balance will be needed in the future between research expenditures in those areas and the research that supports programs for energy conservation (or as I prefer, energy conscious design) and other alternatives.

Chairman KENNEDY. Mr. Eberhard, you have raised some very important points here and ones which I think we are going to have to deal with in a responsible way. I am interested in hearing you elaborate on some of them.

One is, do you think that we ought to be passing standards for the building and the construction of buildings now in terms of energy efficiency? Do you think the Federal level ought to be working with the States to expect them to develop such standards? I mean, can such standards be developed now? Is the nature of the art such that you can say that these energy conscious designs can actually go forward?

Mr. EBERHARD. The bill which is before Congress—there has been a House version of it and a Senate version—called for a 3-year lead-time before standards would be issued. In my judgment, 3 years should be adequate to develop a workable performance standard. In the short term, I think it would even be possible for a Federal posture to advocate energy budgets for buildings, such as the one we helped develop for the GSA in Federal office buildings.

Chairman KENNEDY. What about in private homes?

Mr. EBERHARD. In private homes, the situation, I think, is not as clear as it is in other buildings. The marketplace for many of us is going to be the initiative, that is, as our fuel prices go up, we will make corrections to the extent that the knowledge is provided for us about the things that we can do. By the way, I think the simplistic notion of providing insulation alone is like putting a fur coat on somebody who is cold and shivering—it will help, but we have to look at the more fundamental reasons why the person is cold or why the house uses energy. So, for people who are on low incomes or fixed incomes, as Governor Salmon suggested a moment ago, some form of Federal support or governmental support would seem to be in order. It is not clear, though, to me exactly how Congress can legislate changes in lifestyles or whether they should do so. It is the change in the lifestyle, Senator, it seems to me, that is imminent. So far, in our history, most of the people in the United States, when faced with the reality of the opportunity or the need to change lifestyles, have responded to those changes.

Congress sometimes can get in the way of that process, if they try to legislate too rapidly, or try to legislate too narrowly factors that are bringing about those kinds of changes.

Chairman KENNEDY. Is it more expensive or less expensive to have these kinds of energy-conscious design included either in a public or private home?

Mr. EBERHARD. To do energy-conscious design, Senator, which I will continue to hammer on, would be less expensive.

Chairman KENNEDY. In just the building and construction of it?

Mr. EBERHARD. No; for new buildings. That is, if buildings were designed in a way that recognized energy-conscious design, all the evidence is that they would cost less than it is now costing us to build normal buildings. I say "normal buildings" in quotes because normal buildings today are overdesigned with respect to mechanical and electrical equipment in order to provide very narrow ranges of temperature and humidity controls and with no adjustment being made for the natural climatic conditions, like natural ventilation.

For example, I can't open the windows in my office building. There are many times in Washington, D.C., as you well know, when it is a beautiful day and rather than depending on air-conditioning or a heating system for mechanical ventilation, Senator, I would like to be able to open the windows in my office. We have designed too many buildings that way in the last 20 years. We depend on the mechanical equipment, and that costs money.

Chairman KENNEDY. Well, the JFK building, where my office is in Boston, is about the same. You can open them, but you have to get the building superintendent. There isn't a person in my office who can open them without getting him. You have to call downstairs and

get the building superintendent to come upstairs, because it is so complex to get them open. Obviously, that discourages people from doing it.

How can you stop the fast-buck artist? You have expressed some concerns about what can be done in existing situations for conservation. But how can you prevent a fast-buck artist from taking advantage of people who want to get into doing some rather basic and fundamental conservation in terms of insulation and storm windows and other types of things? Is that a problem?

Mr. EBERHARD. That is a complicated question. It happens to be one I have done a good deal of work on in other areas. There was for a long time, and still is, I think, legislation that was enacted for building code enforcement, with the notion that cities would enforce their building codes in low- and middle-income neighborhoods in order to improve the housing. This program ended up being of special interest to the fast-buck artist. Too often governmental programs have good intentions, but end up being the circumstance that enables customers to be preyed upon by the fast-buck artist. It is very difficult for Federal largess to be organized, to be legislated, and to be made available to private citizens without that phenomena occurring. For most of us, therefore, my judgment is that I would let the marketplace conditions be the one that provides us with motivation. For those people who are not able to respond, either because of their income or because of their circumstances to marketplace mechanisms, some form of governmental program seems to be in order, and the safeguards to protect them against the rip-off artists or the fast-buck artists are going to have to be designed. But they are very difficult to put into such a program, Senator.

Local control is probably one of the best mechanisms for that, rather than trying to control from the Federal level.

Chairman KENNEDY. What is your timeframe for how long it will take for energy-conscious design, as you put it, to be an accepted approach for the design of new buildings?

Mr. EBERHARD. Well, it is already——

Chairman KENNEDY. Can you give us any idea about what kind of savings you could realize with such standards?

Mr. EBERHARD. It is already happening on a small level. We just made a study, for example, which was sponsored by the National Science Foundation, of a number of buildings around the country that are already using solar energy. We identified some 400 projects that architects around the country had investigated for solar energy and some 120, which have been built. We did case studies of 80 of those; and what we established in those case studies I think is important to your question:

Where the client and the architect had tried to design a building utilizing solar energy without making any modifications to the normal way of designing a building, they were not successful. If what they did was to go through an energy-conscious design to reduce the demand that they were going to place on energy in the first place—from the very beginning of the design of the building—and then introduced solar energy, it made much more economic sense and was much more technically successful.

Therefore, at that small scale, in that small number of cases, it is already happening.

The timeframe for energy-conscious design to be a dominate mode of activity in the United States is very, very difficult to estimate. I think it is going to depend on several factors. It is going to depend on what, in fact, happens to the cost of fossil fuel energy over the next several years; it is going to depend on the nature and intelligence Congress is able to put into legislation in the next few years; and then it is going to depend on a very broad program of education for all sorts of persons in the building industry. This is not just architects, but everyone who is involved in the building industry, to get their thinking geared in this direction.

Chairman KENNEDY. Does GSA require an energy-conscious design?

Mr. EBERHARD. Yes; in their new buildings. We helped develop 2 years ago for them an energy budget of 55,000 Btu's per square foot per year, which is a very tight budget, when you consider some of our buildings that are all glass and that have lighting on 24 hours a day, et cetera, use 400,000 Btu's per square foot per year. That means we are talking about a considerable reduction in the size of the budget for energy. GSA also has a set of guidelines which they provide to architects and engineers to go about designing buildings to achieve those budgets. Not every building can be designed to those specifications or to that budget. Therefore, GSA has a policy in which they review proposed designs. If there is justifiable reason why the budget will have to be higher than 55,000, they allow them. But, they are doing it, yes.

Chairman KENNEDY. What are the States doing as far as that? Do you know?

Mr. EBERHARD. Well, different States have different policies. I am not sure what Vermont is doing. In Florida, for example, there is a State policy now, backed by a State procedure for the design of State buildings. Many States have legislation in one form or another which they are exploring. Maybe Governor Salmon would like to answer that.

Governor SALMON. Life is so tough up North that we essentially consider our buildings in relationship to our debt service and general fund requirements.

But, we have on line energy efficient standards in determining the structure of any new buildings.

Mr. EBERHARD. The big opportunity, Senator, I think, for all of us, and I particularly pointed out this to my fellow architects, is to go back and redesign the existing buildings, because, particularly the buildings built in the last 20 years, have been overdesigned with respect to energy use. There is an enormous opportunity for everyone to go back and redesign those buildings and reduce their dependence on energy. That is going to require capital, though, in an area in which capital is not readily available. To raise capital for the redesign of buildings is going to be even more difficult than to raise new capital for building new buildings. Congressional incentives and economic incentives from Congress to help in that purpose, I would think, would produce very large results.

Chairman KENNEDY. How widespread is the acceptance of the concept of energy-conscious design amongst architects generally in this country?

Mr. EBERHARD. I would say it is growing every day. If I were honest with you. I would say it is not widespread, though. I have in the last year talked to architectural groups all across the country. Most architects, like most citizens, do not believe there is an energy problem. They think it is either something Washington has dreamed up, or it is something that the utilities and oil and gas companies have been able to impose on Congress as a problem.

That used to be the case 1 year ago, much more than it is today. Each month that goes by has changed architects' thinking and I think the citizens' view of this. Just last May, the American Institute of Architects, in their national convention, voted energy as the No. 1 priority before the profession, even in the face of the economic situation, which is a very difficult problem for architects today.

Chairman KENNEDY. Do you have any suggestions of what ought to be done to make it more widespread or more acceptable?

Mr. EBERHARD. Well, I am pleased to say that the Federal Energy Administration and the Energy Research and Development Administration are both supporting the AIA Research Corp. with funds. We just began, in the first of January, a major program of education and informational dissemination for the design professions to raise their consciousness. They realize now that it is something that not only will serve energy purposes, but also represents a business opportunity for them. They became very enthusiastic about it at that point.

Chairman KENNEDY. Just as a final observation, how do you place the whole priority of energy conservation, as you study this particular problem? I gathered that you feel that with an energy-conscious design in buildings, both public and private, it can make a really significant impact in terms of national energy priorities. I wonder if you would speak to that?

Mr. EBERHARD. At the risk of sounding even more idealistic than I have so far, Senator, let me answer this way. We recently completed a study for the United Nations Habitat Conference on the implications for each nation in the world of providing and operating the housing that is going to be needed between now and the end-of-the century in terms of energy. One of the things that was made clear by that study is that the United States, with one-sixteenth of the world's population, now consumers more than 30 percent of the world's energy. I think we cannot continue to assume that either that will be tolerable or certainly that that is humane for us to be as gluttonous in terms of the world energy resources as we have been in the past. Therefore, energy conservation is not only an economic issue, as this subcommittee is considering it; but I think it is an issue of our humanity in our dealing with the rest of the nations of the world.

Most importantly, for us as architects, Senator, I think it represents a new kind of opportunity. It is a new design challenge. It is a way of relating our buildings, our homes, to national interests and to environmental conditions in a much more positive way than we have been doing when we have depended on artificial sources. So, in considera-

tion of all of those reasons, Senator, I think that energy conservation or energy-conscious design—and that is what I prefer to call it—should be much higher on the Nation's agenda than it is at the moment.

I would hope in the future that you would support it.

Chairman KENNEDY. Well, I think that has been very, very helpful testimony that you have given, Mr. Eberhard. I suppose one of the real problems that Governor Salmon is faced with, and I think that our own State of Massachusetts is faced with, along with many other communities in other sectors of the country, is how we are going to deal effectively, both with existing buildings and existing homes, which are owned by people with extremely modest incomes. I think that is what Governor Salmon is very much concerned with and we are all concerned about.

Those homes in Boston and in Waltham and in Lawrence and in Bedford, et cetera, that are not now energy efficient have to somehow be made energy efficient. Of course, in these areas, we are not gettting the big buildings that are going up as much as they are in other parts of the country. The real question is how we are going to try and deal effectively with this problem of people of extremely modest incomes redesigning their homes.

We will certainly not be able to resolve the whole energy crisis, because of its enormity; but how you can even take some meaningful steps on it is a great concern.

I think you have outlined very convincingly what can be done in terms of new construction in the area of public buildings and private buildings and new homes. I don't know if there is anything in addition you would like to say about what can be done about the homes that are already in existence and that have been in existence 35 or 50 or 70 years. These homes are basically housing the great majority of the people in the New England area.

Mr. EBERHARD. If you would like, Senator, I would like to talk about one extreme situation—realizing it is an extreme situation—but I think it represents an example. At one point in my life, in about 1960, I lived in Marblehead, Mass. I rented a summer home that belonged to a millionaire. The home had seven bedrooms, five bathrooms, a formal dining room, and an informal dining room, an eating place in the kitchen, a living room and a ballroom.

Chairman KENNEDY. It sounds like Marblehead.

Mr. EBERHARD. They rented that house to us for a very modest price, like $150 a month in 1960. I found out the reason in January of that year, because our fuel bill in January was $175. I am sure at today's prices for oil in Massachusetts, our fuel bill would be $600. The adjustments to that house, in order to reduce the fuel, involved not just turning the thermostat down. The adjustments to that house are deciding which parts of the house you are going to spend most of your time in. As far as that house was concerned, the ballroom, for example, had no need for heat because the only time that was used was for a New Year's Eve party. We had one bedroom, which the children were allowed to use when they were sick, because it was nice, and we had another bedroom in which the children had their train. Of course, that is very, very affluent living. It is possible to reduce, obviously, the demand on that house so that we could have lived in the living room alone. Of course, we needed no air-conditioning in Marblehead in the summertime, because we just opened up the house for the natural breezes.

The amount of energy which we would have required to live and live perfectly adequately and happily, Senator, having done all that, would have been considerably less.

So, it is those kinds of adjustments I think all of us can think through.

The house I live in in Maryland now is considerably smaller, but adjustments of various kinds can still be made in how we use the house.

Chairman KENNEDY. How many children do you have?

Mr. EBERHARD. I had four children.

Chairman KENNEDY. How many in 1960 did you have living in the house?

Mr. EBERHARD. In 1960, I had three children living with me.

Chairman KENNEDY. I suppose the problem I am talking about is about a three-bedroom house, where you've got about six or seven children there.

Mr. EBERHARD. Well——

Chairman KENNEDY. In Vermont, you don't have the ability to close down the ballroom or the other rooms, because you've got two or three kids, for example, who are living in there.

Mr. EBERHARD. It is possible to make adjustments in how all kinds of housing is used. It would be possible in any house to reduce the demand that bedrooms need; for example, for heat, if the heating system were designed to make that possible. So that is part of the difficulty. That is part of why redesign is necessary. Heating systems do not have that flexibility in most houses today. We also take less advantage of things like sunshine and sunlight and the heat that comes from them, than we could. We take less advantage in the summertime of natural breezes and ventilation. So everyone has that opportunity. Most of the rest of the world has had to make that adjustment and I think we are going to have to face up to it, all of us, whether our incomes are large or small, over the next 15 to 20 years. I think we are going to have to make some of those adjustments. They are not necessarily negative, either.

Chairman KENNEDY. Well, fine. Thank you very much. Thank you, Governor. I want to thank you very much for your presence here. We look forward to working with the Governors' Conference and your committee on fashioning this legislation which can help deal with some of these problems. I am very, very appreciative of your presence here and your leadership that you are providing in this area, which is of central importance to the country. We want to express our appreciation to you for your willingness to come down and share your experience with us. The problems you have are national problems. I think you are speaking for the people of Massachusetts and New England and many other parts of the country, as well. We are very appreciative of your appearance.

In the course of our field hearings last November, as I mentioned earlier, we had a number of experts who spoke, but none of them were more convincing or more eloquent, I think, than the statements and comments that were made by a Mrs. Florence Leyland of Waltham. She has come to Washington to share with us the impact of high-energy costs on her, and I think she is speaking for hundreds of thousands or millions of homeowners, not only in my State, but generally throughout the country. It is her first time in Washington, I

understand, and we very much appreciate your willingness to come down here and share with us your story.

Mrs. LELAND. It is the first time, Senator. I was honored and pleased to come.

Chairman KENNEDY. Well, we appreciate very much your being here, and I am going to also ask Mr. Garry Blum, who is president of the Tarrant Rendering Co. of Fort Worth, Tex., to join our panel. He is going to join you at the table here. He is a small business owner who operates a highly energy intensive business and has been hard pressed to make ends meet because of the high energy prices. We will start with you, Mrs. Leyland. We would like very much for you to tell us your story. I am very interested in finding out a little bit about your history.

As I understand, you are a widow, and you are living on social security. Your husband died and his pension has stopped?

TESTIMONY OF FLORENCE LEYLAND, RESIDENT, WALTHAM, MASS.

Mrs. LEYLAND. Yes.

Chairman KENNEDY. We are interested in your story about what energy costs have meant to you and the way that you live and whatever else you can tell us about it.

Mrs. LEYLAND. Now, Senator, first of all, would you like to have me tell you about the period of time from 1970 to 1975, what the different prices of oil have been?

Chairman KENNEDY. Yes; would you?

Mrs. LEYLAND. Yes.

Chairman KENNEDY. I think that would be very helpful. Maybe you would tell us ultimately a little bit first about the size of your home.

Mrs. LEYLAND. Well, you mean the size of the foundation?

Chairman KENNEDY. Well, just a little bit about the size of the house you live in.

Mrs. LEYLAND. You see, the foundation is 35 by 40 feet, and I have a living room, dining room, kitchen, and three bedrooms.

Chairman KENNEDY. I suppose you would describe it as a little bungalow?

Mrs. LEYLAND. Yes; it is a bungalow, all on one floor.

Chairman KENNEDY. All on one floor?

Mrs. LEYLAND. Yes.

Chairman KENNEDY. It is 35 by 40 feet?

Mrs. LEYLAND. Yes, 35 feet wide and 40 feet deep.

Chairman KENNEDY. Fine.

Mrs. LEYLAND. I have the old-fashioned storm windows. I haven't the modern windows. The attic is not insulated or the sidewalls are not. So I presume I lose a certain degree of my heat and it costs me more to heat my house than it would if it was insulated.

Now, I will tell you about the price of oil. In 1970, it was 18.9 cents a gallon; in 1972, 19.9; in 1974, 38.9; same in 1975, but the last of 1975, it was 41.9. It is 41.9 now.

The gas was, in 1970, $5.07; in 1974, it was $6.61; in 1975, it is $8.22.

Chairman KENNEDY. So, how is your heating bill and your utility bills—so how have they gone up during the period of the last 5 years?

Mrs. LEYLAND. The price now of my oil bill has more than doubled, because it was 18.9 a gallon for oil and now 41.9.

The bill from September 1974 to September 1975 was $550 for the heating alone.

Chairman KENNEDY. Has your social security gone up? Has it gone up enough to help take care of that?

Mrs. LEYLAND. You see my social security averages weekly, when I figure 52 weeks in the year, $62 a week to live on and pay all my expenses as best I can. I receive $3,223.20 yearly from my social security.

Chairman KENNEDY. Right.

Mrs. LEYLAND. Then I figure I have the real estate tax on my house and I have insurance and water bills and oil and gas and the Edison bill. I have Blue Cross-Blue Shield that went up from $28 to $40 quarterly.

Chairman KENNEDY. After you pay all of your utilities, and after you pay these other expenses, what do you figure that you have?

Mrs. LEYLAND. I have, you know, all that I told you; the taxes, the insurance, the water bill, the oil bill, the gas, the Edison, the Blue Cross-Blue Shield, and it totals up to $2,259.72. That leaves me only $963.59 to live on, or less than $1,000 to live on for the whole year.

Chairman KENNEDY. What does that come to in a week?

Mrs. LEYLAND. $18.52.

Chairman KENNEDY. For what?

Mrs. LEYLAND. To live on weekly.

Chairman KENNEDY. What do you have to buy with that $18 a week?

Mrs. LEYLAND. You have to buy your soap, your soap powders, your food that you eat, both your bread and your pastries; your vegetables; your eggs; your milk, just everything; and meats, including cheap hamburger.

Chairman KENNEDY. With your $18 a week, you have to buy all of that; is that correct?

Mrs. LEYLAND. Yes.

Chairman KENNEDY. How are you able to do it? Can you give us some idea?

Mrs. LEYLAND. Well, I tell you, I do as much as I can and then when I haven't got any more, I ask my son if he can give me some money to buy the rest, because I can't make it alone. I can't do it. You have to buy toilet tissue and even a box of Kleenex. The Kleenex used to be two for a quarter, but now they are 43 cents a box today. Toilet tissue has gone up. Everything has gone up. A little bar of Ivory soap went up from 5 cents to 14 cents a bar. The tiniest bar of Ivory soap is 14 cents.

Chairman KENNEDY. You have to watch every one of these pennies you have?

Mrs. LEYLAND. You keep looking until you can hardly look any longer and you look until you have a good headache and wonder what are you going to do next. Just what?

Chairman KENNEDY. How do you save on the bread and pastries?

Mrs. LEYLAND. Well, you know it was funny. In Waltham, I told you that Saturday night the leftovers, they were half price. The next Saturday night I went it was one-third.

You see, Saturday night our stores mark down all the breads and pastries. They mark down bread and pastries that are outdated. So you used to get them for half price, but now they only give you one-third off, and then you've got what you want for the week. So you

don't have to run out and pay the full price of a loaf of bread or whatever you get.

Chairman KENNEDY. So you make a point of going down Saturday evenings and buying this?

Mrs. LEYLAND. Every Saturday night, I go to get what I want for the week, so that way I save. I have to. There is no other way out.

When I have but so much money, I can't—no matter what I do—I can't make it go any further, because there is no more money to go any further.

Chairman KENNEDY. Do you find that other elderly people or people on pensions are doing the same thing?

Mrs. LEYLAND. You would be surprised at all the young mothers and fathers, you know, the wives and husbands that are up there waiting until they get ready to reduce the prices at 8:30. They are standing around with families and children just waiting there for them to mark down those pastries. So, it isn't just elderly alone; it is young couples; it is everybody waiting there to see if they can't get the markdowns.

Chairman KENNEDY. The biggest element of your budget that has increased over the period of this last few years has been your fuel bills and other utilities?

Mrs. LEYLAND. You see, when I used to pay only $200 for my oil bill and then it went up to $550, it is almost hard to visualize that there could be such an increase, but that is the biggest jump there is and that is something you can't do without. You've got to have heat. Even at that price, I don't have the top heat. During the day, I figure if I put on some extra clothes that are woolen, why I turn it down to between 65 and 68 when I am working around. Then at night, I put it down to 65.

Chairman KENNEDY. Is this good for you? I mean, are you bothered by arthritis at all?

Mrs. LEYLAND. You see, I have arthritis and a little bronchial trouble. Sometimes, when you just get out of bed from under the covers and you step out, there is a chill in the air. Sometimes it makes me feel very cold. My nose starts to run and I just shiver. The change, I know, isn't good, but what else can I do? What can I do?

Chairman KENNEDY. One of the things that I imagine could be done is to have some insulation in your attic. Probably that would mean some saving of energy and translate into savings from your fuel bill as well. It would be awfully difficult, I imagine, for you to afford, given your type of budget, to go out and try and borrow a couple of hundred dollars, try to borrow $200 or $300, perhaps, to get such insulation: would it not?

Mrs. LEYLAND. You see, I would like to do it, because it would save me 20 percent of $550. That would be $110. I would save that each year for the bill. But, if I go to the bank and I state my predicament, and I haven't got anything to take as a guarantee that I have got extra money to pay that back, probably they would turn me down for a loan. I haven't asked, but probably they would. I don't know. Of course, I could try, but I don't know what they would do.

Chairman KENNEDY. Certainly.

Mrs. LEYLAND. If I could get the material, I know my son would insulate. He would put it up in the attic. I know he would do it.

Chairman KENNEDY. But the real problem is getting the sort of front-end money, so to speak?

Mrs. LEYLAND. Yes; that is right.

Chairman KENNEDY. It is awfully difficult, I expect?

Mrs. LEYLAND. Yes; it is.

Chairman KENNEDY. But it would be something you would be interested in?

Mrs. LEYLAND. Oh, definitely, because look what it would save me. It would save me $110 a year, which would be quite a little bit of money. Maybe it might even save more; it might go up to 25 percent. If it did, then it would be more than $110.

Now, next year, fuel oil is going to be at 41.9 cents a gallon. I know this is figured $550 at 38.9 a gallon. It isn't figured at 41.9.

Now, it is up to 41.9, so that means it is going to get over $600.

Chairman KENNEDY. Are you actually using less fuel oil than you were a few years ago?

Mrs. LEYLAND. Yes; I am using less because I cut it down. At one time, I didn't have to cut it down; when the oil bill was only $200. But now I am older and I have to do that, because I can't let it go any higher than that.

Chairman KENNEDY. All right, do you find this is pretty common among some of your friends, among some of the older people who have retired, as well? Are they faced with this?

Mrs. LEYLAND. They all have to go through it. They all have to do it. They have a shawl or a sweater on and I don't know how many things on because they say that with the prices of everything, they've got to do it to pay their bills.

Chairman KENNEDY. You've got some of your files there, some of your bills, don't you?

Mrs. LEYLAND. I have some of the fuel bills here, but I haven't the early ones here, but I just have some that are different dates. I have them here to give to you, to show that the price I am telling you is the price that it is. It sows here 18.9 and 19.9 and 38.9 and all the others. Then I made a statement of those that I thought maybe you would want to have. You see, I have all of these.

Each bill for each year I didn't bring.

Chairman KENNEDY. How about some of the other economies that you have to do, besides sort of buying marked-down bread and pastries? Do you find that your ability to purchase some of the vegetables that you used to be able to purchase is not there? Do you find that that is more difficult now?

Mrs. LEYLAND. You see, the Star Market in Waltham, there are two of them, they take and on Saturday night or on different days during the week, and if they have food or if they have vegetables like lettuce and tomatoes and different things, so instead of holding it over another day, if it is slightly bruised or something like that, they will mark it down. Probably they take off, oh, a quarter or one-third. In that way, you can buy it, you see? I buy the cheapest hamburger; it sometimes is 79 cents a pound; 85, 89, or 99 cents a pound.

And then I don't buy regular milk. I buy powdered milk and I buy the 20-quart size, because that is more economical than the smaller. But, now, from about 18 months ago, you see, 20 quarts of milk was $1.79. But now, Carnation has gone up so that 20 quarts is $5.25. The

Stop & Shop and A. & P. sells it for $5.05. So, that is the jump. You go out and you want to shop and you look around and you say "What next?" You say that because you don't know what to do.

Little did I ever think that these 20 quarts would jump so much. That is over $3 that they have jumped from $1.79 to $5.25 for Carnation. So they have jumped over $3 in price. At Stop & Shop, it is $3.21 on each box that you buy. So things aren't going down. They are going up and up and up.

Chairman KENNEDY. Everything is going up and up, except your social security?

Mrs. LEYLAND. That is right. You know, it seems as though you go around every day and you lay awake at night and you say to yourself, "What am I going to do if this keeps going on? What can I do?"

Right now, I can hardly exist. What am I going to do if this keeps on? What? Where am I going to go? Where am I going to turn? I don't know. I just don't know.

Chairman KENNEDY. We will come back to you in a moment. I am going to ask Mr. Blum if he would be kind enough to tell us a little bit about his experience.

STATEMENT OF GARRY BLUM, PRESIDENT, TARRANT RENDERING CO., FORT WORTH, TEX.

Mr. BLUM. Senator Kenedy, I have been a rendering plant manager now for 10 years. The rendering industry—well, I guess I'd better explain a little bit about it, first, so we understand what we are saying.

We recycle animal byproducts. Most of your cattle and poultry byproducts, well, 40 percent of it is consumed by the public and 60 percent of this is recycled in the rendering industry. We take these products and put them back in the process in order to get the protein for feeds and our tallow goes into soap, feeds, and other processes.

The main support of the rendering industry is the public health; it is to keep these byproducts. In other words, you can't bury them or anything. The only way you can do it is recycle them, which takes a tremendous amount of heat in our recycling business. Most of your rendering plants are independent renderers. They are small businessmen. Most of them employ under 100 employees. They are usually one-plant operations and each little individual town around the countryside has these.

Our rising cost of doing business lately is getting tremendous. Our operating costs, our electricity, gas, oil and labor has doubled, and our gas has quadrupled since 1971.

The requirements of city, State, and Federal standards, of air and water pollution standards, and so on, have caused a big burden on our industry. Also, since we are in a high-energy intensive industry, our fuel for steam generation, for our boilers, is an important part of our process. We have to have the steam to convert this material, to dehydrate it for our products.

Our transportation costs of raw and finished material has gone up. The cost for diesel fuel or fuel oil has gone from 18 cents to 41 cents.

Our alternatives on our boiler fuel to go to, say, coal, which is cheaper, but the changeover from gas and oil to coal is to talk about an ex-

change of five times normal equipment. In our business, our standard oil and gas type boilers cost in the neighborhood of $30,000 to $35,000. To go to coal-fired boilers, we are talking about spending in the neighborhood of $200,000 just in one little plant, which is almost one-third the cost of the total plant.

Small businessmen in general are suffering all over in my industry, and in all industries. We do not have the expertise or the money to develop new methods. The only thing we have to do is rely on our trade associations and equipment manufacturers. Our trade associations have come up with manuals on energy conservation. They have come up with manuals like these.

But these manuals, to follow each suggestion we are talking about spending thousands of dollars in our industry alone.

Our figures on fuel for the boilers and trucks and electricity and water usage and building with better insulation, all of these different types of fuel we have to conserve on are in these manuals.

We are not conserving on the money; we are trying to conserve on the usage or consumption. The main thing is to cut our consumption down, because eventually we realize the only way we can overcome this is to try to achieve consumption improvements.

Now, small businesses need capital to operate. Small businesses already have a heavy financial burden, as I say, from the EPA and also from our normal, everyday business activities. Can small business stand the strain of changing over to these other fuels? We need a program in order to do so, and in order to do so successfully. We need cooperation from all parts of the Government.

The technology for new equipment and methods, well, this is something we need to have stress on, and have research for other types of fuel, like solar and nuclear and synthetic gas and oil shale oil. With research and technology, Senator, I believe we can overcome these, but it takes capital to do all this.

We, the small businessmen, need relief now so that we can improve our operations and conserve energy with the present technology.

I also believe we can cut down our expenditures in our operations from anywhere from 10 to 15 percent just in better equipment and in better type insulation. I am talking about consumption rates. I feel like this is a very important part of small business; that is, to do everything possible to stay in business.

I wish small business had the technology that big business does and the staff of scientists on hand to do research in different types of fuel. But, as I say, we cannot afford these types of expertize. We have to do it all on our own. We have to experiment on our own.

So that I feel that some day the technology will finally prevail and take over so we can really do something about this.

I thank you very much for your time.

Chairman KENNEDY. Do you think your situation is replicated throughout Texas?

Mr. BLUM. Yes.

Chairman KENNEDY. In small business?

Mr. BLUM. Very much so. I have been in contact with other plants in Texas. In one plant their fuel bill was running around something like $3,500 or $4,000 a month. That bill, in 3 months' time, went to

$17,000 a month. I don't know what the percentage was, but it is about four times. It went just that quickly.

Chairman KENNEDY. You would be interested in a program to help provide some front-end capital for energy conservation and some expertise at the State level to try and help and assist you and I suppose other small businesses to deal effectively with this problem?

Mr. BLUM. Yes; I imagine we all have the same problem in our building designs as Mr. Eberhard was talking about a moment ago. They were never improved with the type of insulation they could have been. They could be, but this all takes expenditure; this all takes capital to put these improvements in.

Chairman KENNEDY. The interesting point in terms of the hearing is that you really have very much the same interest, as a small businessman in Texas, as a homeowner who depends on social security in my own State of Massachusetts. You have a very, very similar kind of concern. You are both interested in conservation, but you both need some additional kind of front-end assistance in order to be able to deal effectively with it. I think that this is the underlying need all over the country; that there are small businessmen and homeowners who are very interested in conservation, but, as Mrs. Leyland's testimony points out, how can you expect the great majority of Americans who are hard pressed in terms of meeting their financial responsibilities, how can you expect them to be able to have the capital to move into the area of conservation? Mrs. Leyland has indicated that were such a program available, that she would be the first to take advantage of it. This could have real meaningful savings to her over a period of time, and would increase, I expect, the value of her home as well, and be an important national priority and objective; namely, that of conservation of energy, which is extremely important from a national point of view. The real challenge is how do we fashion some kind of a program that can offer the hand of cooperation and help and assistance to the small homeowner and to the small businessman in different parts of the country, who are very much interested and concerned about the same issue; namely, a desire to save energy, which is a national interest, and to reduce fuel bills, which can have an important impact on savings for a particular family.

This testimony today indicates a willingness to do something about it, but there just isn't the mechanism or system to try and help and assist in this area. That is what I am hopeful that we can deal with in the development of some legislation, which I will be very shortly introducing. I think that is what we are very hopeful of being able to achieve.

Mrs. Leyland, in all of the expenditures which you have, has the fuel been the one that has increased the most?

Mrs. LEYLAND. That has been the one. You see, the gas has gone from what it was at $5 and it has gone up to $8.22. I just have Edison's bill here. Edison's was $20 and that has gone to $34; but the oil bill has gone from $200 to $550. It has gone from about $200 to $550 in 1975. That has taken the greatest jump.

Chairman KENNEDY. You can lower your thermostat just so far, but you can't lower it any more.

Mrs. LEYLAND. When you sit and you are really not comfortable, you just have to stand it, because what else can you do? You've either got to make it warm and the next day you won't have any oil and freeze, or you go along with it at 65° at night and 68° during the day. If you are working around, sometimes you can set it back to 65° during the day, if you have a sweater on and you have a pair of pants on. You can then set it back to around 65, if you are moving all the time. But the minute you relax a bit, you can't sit at 65°, because that is anything but comfortable.

Chairman KENNEDY. I suppose faced with these kinds of choices, I imagine particularly for older people, that this is an extremely difficult choice? I mean, for people who have rheumatism or arthritis.

Mrs. LEYLAND. Yes; it is. You see you don't have the proper circulation at my age. When the room isn't warm, it is quite uncomfortable. Pain forms in the joints.

Chairman KENNEDY. How do you make these kinds of choices? In other words, you are really having to make the choice between the sort of food you eat and the temparture of your house. Are you faced with that kind of a circumstance these days?

Mrs. LEYLAND. That is right. You've only got so much money. You can't stretch it. There is nothing you can do. You just have to survive the best way you can with what you've got. You've just got to do it. I never thought I would ever see this day, but I see it now, and I've got to face up to it somehow, someway. If it goes up any more, I don't know how. I just don't know.

Chairman KENNEDY. OK. Well, I want to thank you very much, Mrs. Leyland, and you, Mr. Blum.

The subcommittee stands in recess.

[Whereupon, at 12 noon, the subcommittee recessed, to reconvene at 10 a.m., Tuesday, February 3, 1976.]

ENERGY CONSERVATION

TUESDAY, FEBRUARY 3, 1976

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON ENERGY
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to recess at 10 a.m., in room 1202, Dirksen Senate Office Building, Hon. Edward M. Kennedy (chairman of the subcommittee) presiding.

Present: Senators Kennedy, Javits, Percy, and Fannin.

Also present: John G. Stewart, subcommittee professional staff member, and George D. Krumbhaar, Jr., minority professional staff member.

OPENING STATEMENT OF CHAIRMAN KENNEDY

Chairman KENNEDY. We will come to order. The Honorable Frank Zarb, Administrator, Federal Energy Administration, is our first witness, and he is in a meeting in the House of Representatives on an important issue, so we look forward to seeing him, and it is my understanding that he is on his way.

And I want to make a statement, and Senator Fannin, if you would like to make any remarks, and then we will start with the panel. It is my understanding now that Mr. Zarb has arrived, and we will ask the people to stand aside so we can hear from him.

This is the second of 3 days of hearings before the Subcommittee on Energy dealing with the subject of energy conservation. The final day of the hearings is scheduled for Tuesday, February 24, 1976, at 9:30 a.m.

These hearings are being held to explore the proposition that the United States is failing to take advantage of the significant economic and energy savings that would be achieved through a serious national program of energy conservation.

This proposition received significant support over the weekend through the release of an FEA-supported study on energy conservation conducted by Worldwatch Institute. In essence the study suggested that Americans could cut their energy use in half without lowering their standards of living and that the energy savings would be significant for the United States to meet all its new energy needs for the remainder of this century.

This is not the place to examine the details of this study but I ask unanimous consent of the introduction of the Worldwatch Institute's study on energy conservation be printed as an appendix to this hearing record.

The energy problem is something akin to three-dimensional jigsaw puzzle: Many different pieces must be identified and matched; many different actions, some large, some small, must be taken; many levels of government, as well as the private sector must play a role.

This means that energy conservation, by itself, is not an answer to all of our energy problems. But it also means that it would be equally wrong just to concentrate our time, effort, and money in attempting to expand production on energy from natural resources. It is my view that this balance between conservation and production has not been achieved in our efforts to date. We have tended to ignore, to our detriment, the significant contribution that greater energy efficiency can make in solving our energy problems, both in short and long run.

Of course, we have some important beginnings in the recently passed Energy Policy and Conservation Act of 1975; now it is our job to see how we can build on that new foundation.

We are privileged to have before us this morning some of the country's best informed persons to perform the role that energy conservation should play in our national image program. The opening witness is Frank G. Zarb, the Administrator of the Federal Energy Administration. Mr. Zarb is accompanied by the FEA's Deputy Administrator, John Hill, and by the Assistant Administrator for Conservation and Environment, Roger Sant.

Following the testimony of FEA, we have a panel of witnesses that include Robert C. Lind, professor of business and administration at Cornell University; Richard L. Aspenson, manager of mechanical utilities and energy conservation of Minnesota Mining & Manufacturing Co.; Robert W. Hubner, senior vice president of the International Business Machines Corp., and Lola Redford, president of Consumer Action Now.

We look forward to a most interesting and productive morning from their testimony.

Mr. Zarb, we are just opening, and subsequent to that, how did you happen to hop over from the House?

Are you ready to make introduction?

STATEMENT OF HON. FRANK G. ZARB, ADMINISTRATOR, FEDERAL ENERGY ADMINISTRATION, ACCOMPANIED BY JOHN A. HILL, DEPUTY ADMINISTRATOR; AND ROGER W. SANT, ASSISTANT ADMINISTRATOR FOR CONSERVATION AND ENVIRONMENT

Mr. ZARB. Mr. Chairman, I would like to say that I am sorry to be late by some 10 minutes. I left as soon as possible in order to come here to read my testimony.

Chairman KENNEDY. Let me ask you at the outset, before having had a chance to examine the testimony, I would like to ask you to go through it. I think that would be very helpful to the subcommittee.

Mr. ZARB. Mr. Chairman, as I go through the testimony, please feel free to stop me from time to time to ask questions.

The enactment of the Energy Policy and Conservation Act last December represented a small step toward the establishment of an effective national energy policy.

The compromise oil pricing provisions, while far from perfect, at least signaled an end to the long and often frustrating debate that we witnessed during the past year.

The act also incorporates other provisions that can contribute to the eventual realization of energy independence, including the establishment of a strategic oil reserve, conversion of oil and gas fired plants to coal, and emergency standby authorities. It also provides for mandatory automobile fuel economy standards, mandatory energy efficiency reporting by the 10 most energy-consumptive industries, energy labeling and efficiency targets for major home appliances and a technical and financial assistance program to aid the States in developing and implementing energy conservation at the State level.

Although the passage of this law does indicate that we have made progress, we should not be lulled into believing that it alone can solve the Nation's energy problems. There remain several pieces of pending legislation which must be enacted to effectively complete the energy program, building upon groundwork laid by the Energy Policy and Conservation Act. These hearings on energy conservation are a welcome indication that Congress also sees the need for further action.

During the last few years there has been much discussion of the need for energy conservation.

However, despite the fact that conservation has been the subject of considerable public debate, several widely held misconceptions somehow still remain. These have not only delayed the enactment of important legislation but have also engendered confusion among the general public. I would like, therefore, to begin my testimony by identiying, and hopefully dispelling some of these myths.

First, and perhaps most widespread, is the myth that intelligent conservation of energy will hinder economic growth, increase unemployment or lower our standard of living. There is no question that the dramatic increases in the price of imported oil instituted by the OPEC nations during the past few years pose a threat to our economy. Because of this threat, it is absolutely necessary that individuals and businesses take steps to use energy more efficiently. Contrary to the myth, conservation is vital to our efforts to sustain our high standard of living and rekindle economic growth. Moreover, several recent analyses have shown that reducing the inefficient use of energy would not result in an employment penalty and may, in fact, create more jobs.

A second is the myth that energy conservation is only an environmental concern and that conserving energy is not an economic proposition. While energy conservation would result in a cleaner enviroment, the key motivation behind virtually all efforts to conserve energy is and should be economics. Saving energy is synonymous with saving dollars and can, in fact, be considered as one of the most inexpensive energy supplies this Nation has.

Chairman KENNEDY. And I think that is really the nub of the whole issue for conservation. It's really the cheapest energy that we have. Your testimony seems to be pointing at the significant savings that can be made in the area of conservation. And we in Congress ought to be addressing these conservation opportunities in an important way, and I just want to emphasize this for the record.

Mr. ZARB. Mr. Chairman, in addition to that, until we take advantage and continue to take advantage of new sources of energy, and until we enact a bill that will permit us to burn coal in an environmentally acceptable way and make it economical to use, energy conservation alone will not solve the problem. Higher energy prices will encourage

greater energy conservation. Since the dramatic rise in oil prices at the end of 1973, petroleum demand has declined markedly. Of the decrease, over a third, or about 1 million barrels per day, is attributable to increased awareness and response to higher prices. Thus, as energy prices climb higher, saving energy becomes more attractive for both businesses and individuals. That energy prices do not have an impact on demand is the third myth. We have found time and time again that it is not correct. By comparing actual energy demand in 1976 to the levels we anticipated in 1973, we have determined that there has been a savings of approximately 3 million barrels per day of oil equivalent. Although much of this reduction can be attributed to the effects of the economic recession and warmer weather, we estimate that at least one-third was the result of higher energy prices alone. With higher prices, saving energy becomes more attractive for both business and individuals.

A fourth myth is that conservation is only a stopgap measure and can't really make a significant contribution to the resolution of our longer term needs. We estimate that anticipated increases in energy prices along with Government initiatives will result in the adoption of conservation measures that will reduce energy demand, including oil, gas, coal, nuclear power, and other energy sources, by about 14 percent from levels anticipated before the embargo—or the equivalent of more than 7 million barrels per day of oil—by 1985. This reduction is just slightly less than our current rate of production of domestic crude oil. Although a large part of these savings are likely to occur in response to higher energy prices alone, the full amount would not be achieved without Government involvement to accelerate the adoption of conservation measures. A good example of a desirabble conservation measure that would result in long-term savings, if adopted, is the updating of standards for new residential and commercial buildings.

I should like also to try to dispel several myths, some of which I've already cited, which are often engendered by many. I think on the whole this is necessary to obtain a balanced understanding of the conservation issue.

One is the myth that energy conservation alone, or in combination with the development of solar and other inexhaustible energy resources can solve our energy problems. Even when we achieve our estimate of reduced energy demand, which I cited earlier, we would still require the energy equivalent of approximately 44 million barrels per day of oil to meet the needs of our economy in 1985.

This is 24 percent more than what we use today. Even the most optimistic projection of the contribution to our national energy needs that could be made by solar and other inexhaustible energy resources is far below this figure. Obviously, unless we reverse the trend of rapidly declining domestic oil and gas production, we will be forced to rely even more heavily on imported energy.

A second myth is that the Federal Government, by enacting a law or issuing regulations, can swiftly and painlessly insure that energy is conserved. As this past year has clearly indicated, there are no such simple solutions. In fact, encouraging greater energy conservation is, in many respects, a more complex and difficult task than encouraging increased domestic energy production. While only several thousand companies produce and/or distribute our domestic energy supplies,

literally millions of businesses, institutions and individuals consume energy. While increased energy prices have stimulated conservation actions, in a few circumstances the President and the Congress have taken a mandatory approach. It will be no simple task to manage these complex programs; great care must be exercised to avoid the large bureaucracies and economic distortions that often are the result of Government regulations.

Finally, there is the myth that energy conservation is free or nearly free. While it is true that significant energy savings can be realized for little or no cost, it is also true that many measures that could result in large energy savings require significant investment. The installation of storm windows, heat pumps, heat recovery systems, and power recovery turbines have a cost, just like measures to increase energy supplies. The choice between whether or not to adopt any specific conservation measure must be made by the individual or firm concerned on the basis of hardnosed economic analysis. Currently, our best estimate is that over $200 billion will be required for energy conserving investments over the next 10 years if we are to achieve the savings I have cited earlier.

Chairman KENNEDY. I will just have to interrupt you for a moment. The points that you are making are very significant, and the figures in the area on which we have been talking are in the hundreds of billions of dollars. For the $200 billion to be used over the next 10 years, could you clarify for us how that may be broken down? I believe that would be of interest to the public and industries as well as others.

Mr. SANT. Mr. Chairman, the estimate was calculated on the basis of the amount of savings achieved through investments in the long run, and one way it can be estimated is to take a continuing 10 quads of aggregate energy savings of $2 per million Btu's, which is an estimate, and, at a 10-percent rate of discount it yields a rough figure of $200 billion.

These figures really need to be refined. As we go along, we will get better figures.

Chairman KENNEDY. Well, I would like for you to try to show me what should be done on the residential part. You have previously outlined four sectoral areas which use energy, including transportation. And I am especially interested in homes, since there is a problem in many different parts of the country, not only in the rural areas, and throughout the colder States, but also in the Southern mountain regions.

So, that's a ballpark figure that you are thinking about?

Senator FANNIN. And it means the total capital?

Mr. SANT. Yes, sir. I don't have the detailed figures with me.

Mr. ZARB. And would you want me to review our presentation whereby we attempted a year ago to indicate where the problem was?

Chairman KENNEDY. Well, what we are talking about is millions, a few million dollars, compared to many billions of dollars in terms of what could be done in our residential areas. This is one of the important things that we are talking about.

Mr. ZARB. There are many knowledgeable individuals who are interested in this and who recognize it totally a $1 billion issue, while the individual has available maybe just a few one hundred dollars which is used for repairs in a relatively short period of time. All of these fi-

nancial issues have to be worked out. Indeed, one of them would already be resolved if a year ago, when the Members of the House picked up on the issue of an insulation tax credit, the Senate had acted on it.

I was talking to Chairman Long within the last few weeks, and he asked me to try again on that kind of legislation. I have also talked about building standards for the residential sector and that was in the President's Omnibus Energy Act, and I must say, Mr. Chairman, if you are going to call a spade a spade there was also a program proposed to help poor people with Government grants for weatherization. So that could clear the way for the Federal Government to give some aid to ordinary homeowners. Again, a tax credit on up to $1,000 of insulation has been proposed and there has not been any decision by the Congress.

Chairman KENNEDY. Well, Mr. Zarb, if we are going to call it a program to provide, say, $55 million for the people——

Senator FANNIN. Per year?

Chairman KENNEDY. Per year. That could be used just in Roxbury, Mass. But we really don't want to go into this at this hearing; yet I wish that program was acted on and that we had made it large enough to do a decent job for poor homes. But, that would probably have meant a veto. I know we are going to try to find funds and a way to deal with a tentative program for the $55 million.

That is what the President proposed in his state of the Union address, but I am going to make sure that someone points out the limitations of that program, and where, in many instances, another answer is needed. Obviously, we have to try to continue in this for there are different types of residents; some who are fortunate enough to live in homes, but who still need to be able to obtain loans on a guaranteed basis. Such a Federal program is in our approach and you may have given some thought to it.

Mr. ZARB. We have, Mr. Chairman, and certainly that's one potential vehicle. I guess our main thinking thus far has been that there are essentially two categories of families, and then, of course there are some in between. There are those who can see the economic benefits to themselves of reducing energy use but need some incentive to go ahead and make that investment beyond simply the economic incentive of saving energy downstream. We would propose a tax credit to provide that incentive, but perhaps a loan guarantee might be considered for those instances where a homeowner could not get a loan and needs a guarantee to get one. However, we don't find that to be too prevalent among those families that could take advantage of an investment tax credit.

On the other hand, there are some families which, even if you give them a 20-percent tax credit, can't afford the first $80. It is for these families that we have proposed the weatherization program. And, Mr. Chairman, I simply must point out that if we had gotten started with that $55 million program—which is quite a bit of burden to put on the system for starters—I would be most happy to talk about the rest of the price. Just so long as we can get going with something. We should have gotten going before the winter and perhaps done some good.

Senator FANNIN. Mr. Chairman, I would like to commend the FEA for some of the programs they have been looking into, and advocating. The one that recommends getting electric pilots for water, for gas water heaters and for gas furnaces and even cookstoves. One of the programs talked about is the strategic placement of rooms and windows from the standpoint of taking advantage of sun, even in medium latitudes—as high as Massachusetts or in warmer Arizona—there can be great advantage in what is done in new construction, such as double-pane glass and things of that nature. I think it lends itself more to conservation than many people realize. We all think of conservation in putting in more insulation and changing wall structure and things like that. I think it goes beyond that and I am very pleased that FEA is looking into that.

Chairman KENNEDY. I want to thank Senator Fannin for his presence here this morning and his comments.

Senator FANNIN. I have a matter on the floor I must attend to——

Senator KENNEDY. Fine, thanks very much.

Mr. ZARB. Mr. Chairman, if you prefer I could submit the entire testimony for the record.

Senator KENNEDY. If we could just move through, we are about halfway—we are making good progress.

Mr. ZARB. All right, sir.

If conservation is so attractive from an economic standpoint, why hasn't more been done? We know, for example, that at least 18 million homes are inadequately insulated—and it's probably more like 30 million—yet the insulation industry is operating with sufficient excess capacity to supply insulation for an additional 2 million homes per year. We also know that, on a per dollar of product basis, manufacturing paper in West Germany requires only 37 percent of the energy used in U.S. papermills and that the German chemicals industry uses only 57 percent of the energy required, per dollar of product, in the United States. The list is almost endless.

We don't have the final answer, but we do know some of the reasons why more is not being accomplished.

First and foremost, the price of energy in the United States has been artificially low because of regulated natural gas and oil, and because the external costs of our dependence on foreign oil supplies have not been reflected in the prices paid by consumers.

As a result, the economic incentives for conservation have been lacking. Furthermore, basing the rates charged for electric utility service on total kilowatt-hour usage rather than on the consumer's contribution to peak demand, encourages the inefficient use of our electric generating capacity.

Also, some conservation actions take time. We simply can't afford to renovate the entire capital plant of our economy instantaneously. Our existing buildings and industry were constructed in a time of plentiful and inexpensive energy supplies, and it will take decades to fully implement the changes that are now warranted by higher energy prices. Similarly, each of us was brought up believing that low-cost energy could be taken for granted. It is difficult to change such ingrained perceptions. Sticking to these old patterns may be more comfortable but it will also be expensive.

A lack of reliable information on the costs and benefits of specific conservation measures has also prevented consumers from being as responsive as they might be. This is true for both the homeowner who doesn't know how much he'll save if he installs insulation and the businessman who isn't aware of the steps he can take to improve the energy efficiency of his plant.

Chairman KENNEDY. What do you think can really be done in that area?

Mr. ZARB. In the industrial sector, Mr. Chairman, we are seeing a lot done already. There are associations representing various categories of industries that are meeting and working with us to develop techniques for improving the energy efficiency of their industries. We have had a number of successes in that praticular area, and it is my view that if we continue to work on that basis with those industries—working with them so that their members can understand what steps they can take—we can get the word out. For example, even laundry and drycleaning stores can save energy, and we hope to be working with their associations in the near future.

Insofar as the homeowner is concerned, we are working, as you know, on a project conserve program which would have the Federal Government assist in disseminating information enabling homeowners to make wise choices with respect to conservation measures they may take right within their homes.

To some extent the private sector is helping in this area as well. Insulation manufacturers, storm window manufacturers, and other responsible groups of people are making information available to consumers so they can better understand what needs to be done.

Chairman KENNEDY. Massachusetts is one of the pilot States for which we are very grateful.

What about our brothers and sisters up in Vermont and New Hampshire and Maine? How are we going to make sure that they are going to get assistance? How are we going to make sure they are going to get this kind of information?

Is it going to be a nationwide program?

Mr. ZARB. I would think, Mr. Chairman, if the program is successful in Massachusetts, we ought to expand that program to be effective in other States. Our experience in Massachusetts should help us learn more about which techniques are useful.

As you know, we are working with State Governors. The energy bill provides a program to work one on one with each State Governor in developing a conservation program for that particular State. This is important because conditions are different in New England than they are in the Southwest. So we are on our way.

But, based on the experiences we have had to date, and what we expect to learn from the pilot programs, we will have to go further and see that the program is expanded.

Chairman KENNEDY. How many States do you have that in?

Mr. SANT. Two, New Mexico and Massachusetts.

Mr. ZARB. Two pilot States, Mr. Chairman.

In addition to insufficient information, there are a number of other factors which often discourage the adoption of energy conservation measures.

The undue emphasis placed upon reducing the initial cost of energy using products is one of these barriers to conservation. The energy efficiency of new appliances, automobiles, and buildings can be improved substantially. But such improvements often result in higher initial costs. Even though these costs would be recouped, with interest, in lower fuel bills within a few years, consumers continue to purchase the less efficient and lower priced alternatives. One reason for this emphasis is that banks and other lending institutions often do not take into account enegry-operating costs in determining the conditions under which homeowners and businessmen can obtain a loan.

Chairman KENNEDY. Is there anything that can be done on that? I think that is an excellent point.

Mr. ZARB. I think we should be working with banks, as we fully intend to, so they better understand the economics of those transactions.

Another factor is that consumers rarely are given information on energy efficiency or operating costs before they purchase a product. The Energy Policy and Conservation Act will move us in the right direction in that category by requiring that appliances be labeled for energy efficiency, as well as automobiles.

Uncertainty about future energy prices also discourages the adoption of conservation measures—particularly those which require large capital investments.

But where an industry has been convinced that higher energy prices are here to stay, programs have often been established to increase the effiicency of energy use. The Monsanto Corp. is a good example of what industry can do when it becomes committed to conservation. I recently presented FEA's Energy Conservation Award to Monsanto for an employee conservation program they established in early 1975.

Monsanto provided on incentive for their employees to conserve energy both on-and-off the job by offering a $500 check to those employees who submitted the best suggestions for improving energy efficiency. As a result of this program, Monsanto was able to identify numerous opportunities for saving energy in its plants as well as in the homes of its employees.

A final factor slowing conservation efforts, however, is that individual benefits realized through the adoption of certain conservation measures, such as improved furnace maintenance, may just be too small in many cases to arouse much enthusiasm by the consumer. On a national scale, however, the significance of all of these small individual savings is immense.

In that particular sector, Mr. Chairman, we have met from time to time with a number of the oil fuel maintenance organizations which I think will be very helpful in improving efficiency in this area.

In face of these various barriers to conservation, the Federal Government needs to take action to encourage energy conservation.

During the past year, there were many who advocated that the Federal Government should force individuals and businesses to reduce consumption by instituting import quotas, allocating supplies or even by rationing. Fortunately, these arbitrary curtailment measures were eventually rejected. With the enactment of the Energy Policy and Con-

servation Act, more constructive alternatives for Federal action have been put into place.

These include oil price deregulation, auto fuel economy standards, appliance labeling, and federally sponsored information or goal-oriented programs to encourage and assist energy users to conserve.

Congress, however, has been slow to enact other vital pieces of energy conservation legislation. Four of the conservation measures initially proposed by the President 1 year ago are still pending. They are the deregulation of new natural gas supplies, the Building Energy Conservation Standards Act, the Weatherization Assistance Act, and the insulation tax credit for homeowners. Each of these measures had cleared the House or Senate

Another major energy initiative awaiting congressional action is the Energy Independence Authority proposed by the President last October. This proposal, if enacted, would authorize Federal support, in the form of loan guarantees, not only for major energy supply ventures, but also for conservation projects unable to obtain private financing.

Chairman KENNEDY. What would be your rough estimate again as to the amount that would be used for conservation in that program?

Do you have any idea, either a percentage or whole numbers?

Mr. ZARB. It was a substanial number, Mr. Chairman. I will provide it for the record, but I don't have it with me today.

Quick action on these measures would go a long way toward the establishment of a comprehensive national program for energy conservation.

Although the enactment of these proposals would give a major boost to our conservation efforts, they would still not insure that the full potential for conservation is realized. There are a number of areas that cannot easily be affected by Federal legislation. For example, the wide range of energy consuming processes and equipment in the industrial sector would make it impossible to design and implement effective energy efficiency standards. However, because industry is responsive to measures which lower costs and improve productivity, a Federal program to promote the adoption of cost-effective conservation techniques could result in major energy savings. The Federal Energy Administration, together with the Department of Commerce, has established such a program and we will be expanding these efforts under the provisions of the Energy Policy and Conservation Act.

I would point out also, Mr. Chairman, that industry has been awfully cooperative and willing to participate in these programs. They have taken substanial leadership in this effort, and their associations have worked very, very hard, particularly to put out information. We have been very pleased with the response we have gotten in that sector.

You have requested that I include in my testimony an assessment of what priority the administration, and particularly FEA, has given to energy conservation efforts. I think the fact that our conservation appropriations request for fiscal year 1976 increased more than sixfold over the fiscal year 1975 level is a good indication that conservation has been given high priority.

Chairman KENNEDY. Of course, that is still a pretty small figure, is is not? What do you go up to, about $85 or $86 million now? You had

a figure last year about $10 to maybe $15 million, so even though percentagewise it is a pretty big percentage, when you look at it in terms of the total energy——

Mr. ZARB. Mr. Chairman, I would just point out the Appropriations Committee cut us by about 50 percent in that sector.

Chairman KENNEDY. Well, you mean from——

Mr. ZARB. From about $87 million to, as I recall, $46 million.

Chairman KENNEDY. Last year?

Mr. ZARB. Yes, sir.

Chairman KENNEDY. Out of a total budget of how much on energy?

Mr. ZARB. Our total budget request for FEA during fiscal year 1976 was $205 million; this includes the proposed $87 million budget for the conservation programs, which was cut almost in half. As a result, our current total budget for fiscal year 1976 is only about $143 million.

Chairman KENNEDY. Well, even under the proposal, if you have $85 million in requests for conservation activities out of a total request on energy, by the administration last year, which was——

Mr. ZARB. $2 billion in total; but that is deceiving because we also had other conservation programs of some considerable size. I don't have the amounts in front of me. I am told that about $75 million is in the ERDA budget as well and, of course, NASA and HUD, as well as other agencies, have some of their budgets in energy conservation. We have given you a warmup number, Mr. Chairman. But——

Chairman KENNEDY. Well, this year, as I understand, it is an $11 million request in the President's budget. Am I correct in that?

Mr. ZARB. It is $11 million. This was before the energy bill was passed and signed by the President, Mr. Chairman. As I testified before, that budget was established when we did not know where we were going; what kind of energy bill we were going to have; and, indeed, whether we were going to continue to have an FEA. So, we will be requesting a supplemental to insure that we meet our responsibilities under the Energy Policy and Conservation Act.

Chairman KENNEDY. I mean earlier we were talking about approximately $200 billion of investments for energy conservation and we have gotten the request now, I guess, of about $11 million for FEA next year. You expect it to go up to what by the end of the year with the supplemental now? As I understand it is up to about $48 million.

Mr. ZARB. We are still in discussions with OMB on that issue, Mr. Chairman. I don't have a final number. But the $200 billion number that we put forward earlier represents needed capital investment by the private sector. Surely Government isn't going to have to spend $200 billion to get that job done.

What we should be spending is sufficient amounts to do whatever we can properly accomplish.

Chairman KENNEDY. Well, as I understand it, under the 1976 budget there is $1,749 million in terms of energy supply activities, and approximately $88 million on conservation. Those are figures that were derived from the 1976 budget and even though that represents a sizable increase over last year, it is still, when you are putting it in some kind of proportion or relationship, virtually diminimis in terms of its relationship to expenditures for energy supply.

Mr. ZARB. Mr. Chairman, to put this in perspective and to identify the areas where we need action, I would like to make two points.

First, your figure does not include the $55 million for weatherization which clearly is a conservation measure, so you could add $55 million to that number as soon as the Congress acted.

Secondly, I would again point out that last year we were cut in half by the Congress in our attempts to increase our conservation funding.

Chairman KENNEDY. Well, I don't know what justification you were able to give in terms of those particular measures, but it is still an extremely small amount, the ERDA proposal for 1976—and I am reading from the budget—was, 1976 total is $1.4 billion, and in the conservation is $56 million, and in fiscal year 1977 it is going to go up to $91 million, which is going to represent a 63-percent increase, but it is starting at a pretty small base.

The point is that when you are talking in the ERDA budget for 1977 of approximately $2 billion, you are talking here about the request for conservation of $91 million. And it does seem to me that if you want to talk about weatherization or the $55 million for that, you are still talking about very, very modest figures. I would agree with you that it ought to be dramatically more, whether through direct expenditures, loan guarantees, interest rate subsidies, or whatever. I think you have given a sense of urgency about it in your statement. You have talked about the relationship with the States in terms of the States assuming some important responsibilities in these areas. We are very hopeful that we can try and develop some kind of legislative vehicle which can maximize these opportunities. These ideas which you have commented on during your testimony can provide some basis for some very important and meaningful action.

Mr. ZARB. Mr. Chairman, I would like to go back to calling a spade a spade for a moment. The ERDA conservation budget is up substantially. We gave some numbers, but we will have to check those out.

Chairman KENNEDY. Well, I don't know who can do better than the Executive Office of the President, and page 52 of the budget where they talk about it. I mean if there is another——

Mr. ZARB. There may be another category. In regard to the R. & D. elements of conservation, I would just point out that the Energy Independence Authority Act, which was proposed last October, did have a conservation element. We are prepared to talk about the extent to which conversation would be funded through that vehicle. We put no limits on it. We are still prepared to do it and yet we haven't had a set of hearings. We are all committed to moving in this direction, but there obviously will be disagreements as to the forms, vehicles, and the funding of such conservation efforts. For example, we have had a building standards bill up here for a year, which would simply set a very narrow range of standards on new building in this country, that we consider very, very important. Such standards would have dramatic effects on future energy use. That bill has passed the House and is waiting for action in the Senate.

If we can get the EIA program enacted, it would establish conservation programs that could have real payoffs in the industrial sector, as well as other areas, by providing loan guarantees.

Chairman KENNEDY. Well, the importance I think at least from my point of view is to capture the sense of urgency that you feel about the questions of conservation in terms of providing an additional source of less expensive fuel. Of course, there are also extremely important environmental considerations and it seems to me that we all have a responsibility to try and find out the best way to deal with it.

Mr. ZARB. Mr. Chairman, I would just like to compliment you, if I could take a minute. This is the first time I have had an opportunity in the year I have been in office to get into conservation in any meaningful way at hearings.

Chairman KENNEDY. Well, we appreciate it, and we want to work with the FEA. We have got to, and we appreciate very much the testimony of Mr. Sant at our earlier subcommittee hearings that we had up in Massachusetts. We are going to try and work with the Agency on a legislative approach which we intend to introduce—Senator Hollings and myself—on Thursday, and which has developed some interesting and strong support within a number of the members of the Interior and Commerce Committees and also with Senator Pearson, who is the ranking Republican member of Commerce.

We are extremely hopeful in working with the States so that we can use the expertise and information that's been developed in that area, primarily focused on the homeowner who has difficulty in taking advantage of a tax deduction for insulation. I have strong personal reservations about using the tax system in creating additional kinds of tax expenditures, even in this very worthwhile area, but we will have to hammer that out from a legislative point of view.

But, we are very hopeful to be able to get your review of that particular proposal when it goes in and hopefully we can work with you in trying to see if we can't achieve a good bill, as well as move on the other pieces of legislation that have been pointed out here today.

Mr. SANT. Mr. Chairman, could I just make a short comment on that?

Chairman KENNEDY. Yes.

Mr. SANT. I think you have characterized it well. We have identified a potential for reducing energy demand by about 16 percent by 1985 from currently projected levels and clearly all of us know the potential is higher than that. I think what we need now is some searching thought by all of us to identify additional policies that we might pursue. I think the ones that have passed or are about to pass represent the most important policies that have been proposed by both partisan as well as nonpartisan persons who are committed to conservation.

I think clearly we are faced with a task of developing some new initiatives, creative initiatives, and we are delighted to work with you on the one that you have mentioned.

Chairman KENNEDY. Well, thank you very much. And we will be working with you.

I would like to, if I could, on just another area, Mr. Zarb, just on a situation that was raised with me yesterday, I would like to hear any comments you might have now, or if you want to respond later.

This was in my own State of Massachusetts. We had a few years ago approximately 3,500 branded independents and perhaps 30 direct major oil company operated stations, and some 800 nonbranded independents and jobber-run stations. The basic change we have seen is that perhaps 600 or so of those branded independents have disappeared, and the 30 direct, major oil cooperated stations now have reached approximately 450.

And what is more, virtually everyone is of the self-service nature. And most of the change has taken place recently. And there are now some 150 more applications from the majors at the State fire marshall's

office and I am told they are for additional self-service stations, most of which involve conversion from operations leased to dealers to operations run directly by the majors.

From the public point of view, this means less service. It means fewer places where you can get your car inspected and fewer places where you have mechanics, and, ultimately, it means less competition perhaps and higher prices. In the short run it may be slightly lower prices, but in the long run it means the major oil companies are driving out the independent dealer, at least for some 30 years or so.

And once they do that, they will turn on the jobber, at least that is my concern, and on the nonbranded independent, and I am just wondering if this matter had come to the attention of the FEA and whether you have any reaction to it.

Mr. ZARB. It has, Mr. Chairman.

I haven't focused on the numbers in your particular State. We keep an eye on the total share of the market held by independents as compared to the nonindependent sector.

As a matter of policy we have considered the independent sector to be a vital element to the petroleum industry at all levels, from production and refining on to marketing. So, we have been concerned.

The changes that have occurred seem to have occurred differently in different parts of the country; different companies operating with different kinds of marketing plans.

The gas-and-go variety that you just described seemed to have, in some sectors, achieved consumer acceptance. Consumers are actually asking for the 2 cents or so discount that comes from pumping your own gas. As a result self-service stations have taken off in popularity at the consumer level, even without providing the service elements. I expect that when consumers demand additional services the industry will respond by providing the necessary full-service stations.

We continue to worry about the independent sector of the whole marketplace.

There are two good arguments, one on each side of this issue. One of the benefits is that the consumer will be able to pump gas himself and get a cheaper price. On the other hand, there are the problems related to the overall independent arm at the retail marketing level. We have certain authorities and responsibilities under the act which we intend to carry out, but beyond that there is a much bigger question.

Chairman KENNEDY. Well, if I could, in my hand I have a series of letters that are both from independent fuel dealers, these are just about all December of this past year, December 16, 1975, a Gulf lease-dealer since 1957 says:

It is now apparent the year 1975 will be the last year of my dealership if it continues a monthly increase of 81 percent in my rent, and this is a forceful eviction on the part of Gulf.

This is just his reaction to it.

Here's Gulf Oil Co. to a gentleman. Gulf will not renew its lease.

The reason Gulf is taking this action in not renewing your lease and other agreements with dealers is it is economically unsound for Gulf to continue on a lease basis at this service location.

Here is from Citgo to another gentleman.

You are hereby notified that Citgo Service Oil Co. elects not to renew any of the aforementioned agreements.

That's December 30, 1975.

Here's another December 30, 1975, from Citgo.

You are hereby notified that City Service Oil Co. will not renew your lease.

The first one was in Lynn and the other was on the North Shore.

Another one, December 30, from City Service in Newton, Mass., same message, and here's one from Gulf Oil Corp.

We represent Gulf Oil Corp. We have been instructed to take court action to evict you from the premises now occupied in Sandwich, Mass.

Rice Oil Co. On December 30.

And when the gentlemen came in yesterday afternoon I said, well, I want some figures on this, I don't want your general impressions, and these letters or copies were just received overnight.

And then another point that they mention is that under the Clean Air Act, phase 1, takes effect March 1, and all of the stations in Massachusetts have to install evaporation recovery equipment on the gasoline tanks. Those underground tanks are owned by the majors and the majors are not putting that equipment in. The dealers, even if they would, could not afford it and could not tamper with the tanks. As of March 1 they cannot receive any new supplies, and the majors say "Sorry," they don't renew the lease or they will, you know, buy them out.

If we could I would like to send you a note later on in the day on this point.

Mr. ZARB. All right, sir.

Chairman KENNEDY. And then what I would like to do, if you could, is have your people look into it in the next few days. I am going to be up in Massachusetts during the recess, and if it is convenient next Tuesday morning, your region 1 director could meet with us. I will see what his reactions to these particular points might be.

I would appreciate it.

Mr. ZARB. Would you send me copies of these letters as well?

Chairman KENNEDY. I will give you copies of these letters and give you a brief note to summarize what these gentlemen said to me yesterday. I will get that over to your office later in the afternoon or have it delivered.

Mr. ZARB. We will look at each and every one of them.

Chairman KENNEDY. I would like them, to the extent they can, to look into them individually. I am interested in learning what is happening in those areas, what your people are doing and what these considerations are, to the extent they can. I don't expect they are going to be able to resolve all of these problems by next week, but I wish, though, they would get into these particular issues and tell us what their own oversight has revealed.

Mr. ZARB. In fairness, Mr. Chairman, we have looked at a number of these cases before. This has historically been a relatively high turnover sector of the business. While occasionally there are situations that bear your attention, oftentimes they are routine business contract situations which develop in any industry of that kind.

But we will give you a summary of what we have found.

Chairman KENNEDY. We welcome Senator Javits here to the hearings, an active member of the full committee as well as our energy subcommittee.

Senator JAVITS. Mr. Chairman, if I may, I came because I have felt that this was the area in which we were weakest in the national energy policy and I have often discussed it with Mr. Zarb. And he is, I know, very sympathetic to that view and I simply came to lend my support to your efforts and those of the Administrator, consistent with six other committees this morning. Thank you, Mr. Chairman.

Chairman KENNEDY. Well, I want to thank Senator Javits for his interest. I think you can see, Mr. Zarb, that there is some very great interest in trying to both support the administration's effort and also to be able to create some initiatives in this area. We are very hopeful that we can work together to try and meet the particular challenge which exists in the area of conservation.

And I dare say that we haven't done the job properly in the Congress or within the administration in giving energy conservation the kind of priority it deserves, and which I think your testimony has spoken to this morning. We would just like to welcome the opportunity to work with you and your people and see what can be done.

Mr. ZARB. Mr. Chairman, in my prepared statement there are several summary charts which list all of the programs either in place or proposed and pending before the Congress and their value to this country in barrels of oil saved both by 1978 and by 1985.

Chairman KENNEDY. Are you going to include the gasoline mileage?

Mr. ZARB. Yes, sir, it is a total set.

I would be negligent if I didn't comment on the natural gas regulation provision that passed the Senate.

In our calculations, that's worth 2 million barrels of oil a day by 1985 in reduced imports and that's the reason we are so strenuously hoping the House will adopt a bill similar to the one passed by the Senate.

Chairman KENNEDY. Just a couple of other issues.

Are you troubled that most of the new investment now that has taken place, even with these enormous increases in costs, have basically been overseas by the major oil companies? Has this been the recent trend?

Mr. ZARB. Yes.

Chairman KENNEDY. I should have mentioned this before. I am just interested.

Mr. ZARB. There has been some of that. I am troubled to the extent that there are no opportunities for production in this country or the Outer Continental Shelf or the Alaskan frontiers, as well as enhancing recovery domestically. I am hopeful now that we are finished with the price debate that we can begin to provide the necessary means that would insure that the maximum amount of investment occurs in this country, which I think will be the case.

Natural gas is a good example of exactly what we are talking about.

Chairman KENNEDY. I want to welcome Senator Percy who was at the opening of our hearings yesterday in the area of conservation. We have had very good testimony from Mr. Zarb indicating the support of the administration in the areas of conservation, and pointing up some areas where we hope they will get some congressional action.

We have asked him about some areas where we hope we can get some support from the administration for some legislative action

which we will be introducing and which will be considered by the Congress at this session.

So, I don't know, Senator, if you had anything. We have gone over most of the ground.

Senator JAVITS. I have a question.

Mr. Zarb, one of the things that worries me about our situation is the relationship, the trade-off, as it were, between the conservation attitude respecting the environment and the development of the conservation concept including the utilization of fuels like coal, and what I consider to be catastrophic dropoff in the onstream operations for atomic power.

Now, has any study been made as to precisely what those legal actions and other activities are costing us as compared to what they are gaining, even in terms of environmental security. I, for example, am not aware of what the trade-off is costing us and what it is getting us, except for the assertion of many of my friends that we are being very, very badly damaged and that that is probably the biggest area for improvement in terms of this situation.

Now, do you have any views or any studies that have been made on that subject?

Mr. ZARB. We have, Senator, and we can provide you information by sector. We have recently contracted with the University of Texas to do an analysis for us of the nuclear debate in California and what a moratorium would cost in sociological and economic impacts.

The simple facts are these: If we really intend to become self-sufficient by 1985 or around that point, we have to fully develop our coal capability and that means mining, transporting, and burning it in environmentally acceptable ways. We have to do the same in nuclear. We have to be able to get to the Outer Continental Shelf; we have to be able to get to the frontiers of Alaska; and we have to have the ability to build the pipelines necessary to deliver that product in the Lower 48 States.

To the extent that we fall short on oil, gas, coal, nuclear, and the Outer Continental Shelf or Alaska, we are not going to be self-sufficient. It simply gets down to that. When we withdraw one fuel we have to replace it with another, and there are none to replace it with during this period of time. So I am as concerned as you are because every single area I just mentioned has a constituent group opposed to the development of that particular resource area.

Conservation is probably the least of the controversies, although it has its share as well. But until we are able to develop all of our resources and at the same time maximize everything we have talked about today in the way of conservation—do all of those all out—we will not be self-sufficient by 1985. There is the tradeoff.

Senator JAVITS. Well, the thing I wanted to do was sharpen it on the figures so the public gets a comprehension of what the tradeoff really means in terms of what it is giving up in optimum conservation practices relating to the environment.

Mr. ZARB. We have that.

Senator JAVITS. I think the courts read the newspapers, too, as has been very frequently said, and allegedly one of our big problems has been in the courts, and the speed of decisions, and in the speed of consideration of cases. And maybe by legislation we can help that.

But I think a pinpointing of where we are and what we are paying for what we are getting, having both is critically important to the public. And if you deputize this study to the university, as you say, great. If you haven't, I would hope very much that you will, because I believe that the public debate is very long on sentiment and short on facts.

Mr. ZARB. We have some material already developed, Senator. We will send it to you and provide it for the record.

Senator JAVITS. Well, I ask unanimous consent that that may be included. And also, could we have the specifications of the University of Texas proposal?

Chairman KENNEDY. The material will be made a part of the record.

Mr. ZARB. Thank you, sir.

Senator JAVITS. So you can judge and we can judge whether it will really produce the full array of facts which are needed.

Mr. ZARB. Yes, sir.

Senator JAVITS. Thank you, Mr. Zarb.

Thank you, Mr. Chairman.

Senator PERCY. I am very sorry to have missed some of this morning's discussion, I wanted particularly to be here to hear your testimony, but our plane was late coming in from Prime Minister Rabin's talk in Chicago last night.

I would like to know whether you feel that the extension of FEA for several more years is, in your judgment, necessary to keep the pressure on energy conservation as a national policy.

Mr. ZARB. Yes, sir.

As I have said earlier, we are going to have to keep maximum pressure on all four legs of this stool or we are going to have it knocked out from under us, and that means all of the areas I mentioned for energy development over the next 10 years as well as maximum conservation.

And with respect to FEA's extension, the Energy Policy and Conservation Act does provide for an extension of controls over a 40-month period, and we would propose that FEA, as an institution, be extended to accommodate that particular bill.

Senator PERCY. Over the last 2 years, starting from the energy crisis in October 1973, the only piece of legislation the Congress adopted for conservation was the 55-mile-per-hour speed limit, a bill I put in and Jennings Randolph helped me get passed. But we are not enforcing it, or certainly not uniformly.

Is there any way the Federal Government can enforce the law? For example, is there any way we can withhold highway trust funds?

Mr. ZARB. The Secretary of Transportation and I have had a number of discussions on that point and he is examining all of the alternatives. It is going to be very difficult for him to follow that particular approach because you have really got to prove that they are not enforcing the law as compared to something. Oftentimes that's just looking at arrest records or what have you and you are not able, on that basis, to make a calculation which then becomes enforceable.

The Secretary has this on his mind and I am convinced he will do whatever can be done within his administrative capabilities.

Senator PERCY. I have put in a bill, to abolish the highway trust fund. Henry Ford and Leonard Woodcock testified in favor of that principle, and when yo uhave got those two on the same side of the

issue it is either awfully bad or awfully good. I am not sure which.

We are gradually moving in the direction of invading the highway trust fund for all kinds of things now, and we are going to keep it up. It is the only place you have really got money, and it makes no sense whatsoever in a country that's trying to wean itself away from Arab oil to continue to have all of this money set aside to construct highways when we have finished 99 percent of our Highway Interstate System.

Do you have a particular position on this? Do you see a chance for us to move in the direction of a balanced transportation trust fund so that we can get a balanced system rather than just continuing to pave over America and make it easier and easier for people to drive and less and less attractive for them to take the mass transit that we are trying to build?

Mr. ZARB. Well, of course, we have encouraged transportation policies which would support our conservation goals, and are continuing to work with the Department of Transportation on their execution of the current laws.

I would say that we ought to take a careful look at mass transit systems as proposed, and their real contribution to energy conservation. I don't believe we have finished that debate quite yet, and there is some evidence that is being developed that tends to indicate while, under certain circumstances, mass transit looks good, when it is completed it does not save the energy it was proposed to save.

So, if we are going to support these notions on an energy basis we are going to have to examine actual cases to make sure we are achieving the energy savings.

In certain cases highway constructions actually help in terms of bypassing cities, thus avoiding stop-and-go travel.

We have not taken a position on the highway trust fund and it is one I didn't realize was an initiative that was being pursued, but we will certainly take a look at it and be back to you.

Senator PERCY. Thank you very much.

Mr. ZARB. I want to point out one thing that I didn't get to in my testimony that I want to.

The automobile industry in this Nation has begun to turn in what I think are very, very favorable results. We have improved our miles per gallon in the new car fleets during 1974 and 1975 by about 26 percent. In 1976, it will be 26 percent over 1974. And the projections that we see indicate even more substantial improvements by the 1980's—really substantial improvements. I think from time to time we ought to stop and tip our hat to those in the private sector that have responded to consumer demand in this particular area where it has been very meaningful.

Senator PERCY. We have a system of pricing energy by the utilities that goes back many, many years to the time when they were trying to encourage new customers and get more business.

Today the situation is radically different, and yet we still have volume discounts. What is your position on continuing quantity discounts when we ought to be charging higher prices for higher consumption?

Mr. ZARB. It is hard to make a generalization in all cases, but in general we have been supporting peakload pricing as the basis for electric rates charged by utilities in various States.

As you know, we have no authority in that sector. The States have full authority. But we have undertaken to fund a number of systems demonstrations, which we initiated last year and will continue this year, so that we can induce some of these utilities to attempt to get consumers to change their usage patterns. In our view, that's a conservation technique and should be encouraged.

Senator PERCY. Before asking my last question, I would like to extend appreciation to Senator Kennedy for calling these hearings. I think they are extraordinarily important, and serve the interest of the public in the very best way. I commented in Illinois that I thought we probably ought to have dollar gasoline if we are ever to have real conservation and if we are ever really to develop mass transit systems. I wasn't tarred and feathered for this suggestion even in downstate Illinois, even though I was tarred and feathered there when I came out for gun control.

But the suggestion of a dollar gasoline didn't shock people, even in parts of the State that are heavily dependent on the automobile. So, I put a bill in for a 30-cent Federal tax on gasoline.

I didn't get a single cosponsor. I reduced it to 20 cents, and I still didn't get a cosponsor. Do you think higher priced gasoline will discourage driving?

Mr. ZARB. There is no question that demand is elastic with respect to the price of all petroleum products, and I think we ought to address it on the basis of all petroleum products simultaneously. Gasoline is only 40 percent of the crude barrel and we ought to take care of the other 60 percent. I pointed out earlier, Senator, that the 3-million-barrels-a-day savings that we have achieved compared to projections for 1975, at least a third, and possibly more is directly attributable to the higher prices of energy.

But we face this question right now in the natural gas situation in those sectors where we have natural gas priced way below its real value. That's hardly the way to induce conservation.

Senator PERCY. Senator Kennedy ought to try out in his office what I did in mine. I asked my staff if they intended to use Metro when it is finished. I couldn't find a single potential user; they all said it is going to be too expensive. It is cheaper to drive a car at 61 cents for gasoline than to use Metro. That's why I think the price of gasoline has got to go up.

I wonder if FEA could undertake an analysis for various tax levels on gasoline which would get it up a little over a dollar. How much saving would we get if we increased the price that much?

How much favorable effect on the budget would it have even if we exempted 500 gallons for every driver? What effect would such a tax have on the economy?

If we could have that analysis at least it would give us a basis for helping us legislate more effectively. Even though such a tax does not stand a chance of being considered in this election year, at least we have to start laying the groundwork this year for what is absolutely right in 1977. I hope I will have the guts to be for a stiff gasoline tax in 1978 when I am up to reelection.

Thank you very much indeed for your testimony this morning.

Mr. ZARB. Thank you, sir.

Chairman KENNEDY. Just two very brief areas.

I have felt for some period of time that we ought to find out what oil and gas exists offshore in the State of Massachusetts on the George's Bank. There has been a deferral of leasing arrangements that have been announced recently in the last 3 weeks or so. I would just urge that we complete the baseline studies which have not yet been done during this period of time. Many of us have been urging this course of action for a long time. There have been many excuses why these studies could not be done. We have the time now, and I would really urge that it be done, and it should be done.

And I wish you would, in your role as the Energy Czar for the administration, in consideration for those of us who are also concerned about environmental considerations but who also recognize the responsibility to try and find out what energy resources are there, that we get this kind of baseline material developed.

Mr. ZARB. I will, Mr. Chairman. I have and Secretary Kleppe has as well. We surely ought to develop all of the information required to insure acceptable environmental risks as we develop the Outer Continental Shelf.

I must point out to you, however, that all too typically in each of these sectors the requests are made for more than is essential at any given moment in the process. Sometimes that's done in order to simply delay the program, and in some cases perhaps with the intent that the program may go away and never have to be developed. We ought to have all of the information necessary for each stage of the leasing, exploration, development, and delivery systems on the Outer Continental Shelf, but we should approach that whole equation with some degree of reason and not be stopped for months and sometimes years at each stage by requiring more information than is required to develop that next stage.

Chairman KENNEDY. Well, I just will mention that in 1971 a group of New Englanders met with Secretary Morton to ask him to do such a study in the Academy of Science. It took 3 years to get it done, and then they defined it and refined it in such a way as not to include even what is generally accepted on the baseline study today.

And it seems to me, now that the decision is made in the administration to defer action, that we should move ahead and use this time to good advantage and get the baseline material prepared.

If you would be kind enough to let us know what reaction you are getting either through the Secretary of Interior or through others, and any reasons that these studies can't be done, I would appreciate it.

One other point. At the present time, as I understand, the major oil companies permit as a tax deduction both their advertisements for new utilizations of resources and their communications with their membership in terms of supporting or opposing various pieces of legislation.

And yet it is prohibited for any individual to make a tax deduction to any public interest energy firm, who are interested in doing the same kind of communication for or lobbying or whatever you want to call it. And I just wondered whether that one makes any sense at all, for us to be permitting a tax deduction for major oil companies to be able to both take out advertisements and communicate all of the pros and cons of various legislation, but people are prohibited from making contributions to public interest firms and deducting them?

Mr. ZARB. I just don't know the answer to your question, Mr. Chairman. To the extent that we would have the responsibility we will be happy to look into it. I would expect that perhaps more information from the FTC and IRS ought to be forthcoming in this regard.

Chairman KENNEDY. Sure.

Well, I am not asking you as the Commissioner of Internal Revenue, but I am asking you as a public policy question. It is not so much a question of eliminating it from the major oil companies, but whether those who are interested in public interest questions shouldn't have the same advantage?

Mr. ZARB. Well, I am sure in favor of fairness, Mr. Chairman, but this is a question that I have not addressed before, and I would like to look at it some before I respond to it.

Chairman KENNEDY. Fine. Thank you very much. We appreciate it. We got into some of these other areas, but we appreciate your willingness to respond and we want to thank you very much.

Mr. ZARB. Thank you, sir.

Chairman KENNEDY. Thank you, Mr. Administrator, we hope you go directly back to your office now and not go back to the House of Representatives on the natural gas bill. [Applause.]

Your prepared statement will be included in the hearing record.

[The prepared statement of Mr. Zarb follows:]

PREPARED STATEMENT OF HON. FRANK G. ZARB

Mr. Chairman and Members of the Subcommittee, I welcome this opportunity to discuss with you the current status and the future direction of our efforts to encourage the conservation of energy.

As I hope you will agree, the enactment of the Energy Policy and Conservation Act last month represented a small step toward the establishment of an effective national energy policy.

The compromise oil pricing provisions, while far from perfect, at least signaled an end to the long and often frustrating debate that we witnessed during the past year. The Act also incorporates other provisions that can contribute to the eventual realization of energy independence, including the establishment of a strategic oil reserve, conversion of oil and gas fired plants to coal, and emergency standby authorities. It also provides for mandatory automobile fuel economy standards, mandatory energy efficiency reporting by the ten most energy consumptive industries, energy labeling and efficiency targets for major home appliances and a technical and financial assistance program to aid the States in developing and implementing energy conservation programs.

Although the passage of this law does indicate that we have made progress, we should not be lulled into believing that it alone can resolve the Nation's energy problems. There remain several pieces of pending legislation which must be enacted to effectively complete the energy program, building upon groundwork laid by the Energy Policy and Conservation Act. These hearings on energy conservation are a welcome indication that Congress also sees the need for further action.

During the past two years there has been much discussion of the need for energy conservation. However, despite the fact that conservation has been the subject of considerable public debate, several widely held misconceptions somehow still remain. These have not only delayed the enactment of important legislation but have also engendered confusion among the general public. I would like, therefore, to begin my testimony today by identifying, and hopefully dispelling, some of these myths.

First, and perhaps most widespread, is the myth that intelligent conservation of energy will hinder economic growth, increase unemployment or lower our high standard of living. There is no question that the dramatic increases in the price of imported oil instituted by the OPEC Nations during the past two years pose a threat to our economy. Because of this threat, it is absolutely necessary that individuals and businesses take steps to use energy more efficiently. Contrary to the myth, conservation is vital to our efforts to sustain our high standard of living

and rekindle economic growth. Moreover, several recent analyses have shown that reducing the inefficient use of energy would not result in an employment penalty and may, in fact, create more jobs.

A second is the myth that energy conservation is only an environmental concern and that conserving energy is not an economic proposition. While energy conservation would result in a cleaner environment, the key motivation behind virtually all efforts to conserve energy is and should be economics. Saving energy is synonymous with saving dollars and can, in fact, be considered as one of the least expensive energy supplies this Nation has.

A third myth is that higher energy prices will not induce greater energy conservation. Since the dramatic rise in oil prices at the end of 1973, petroleum demand has declined markedly. In comparison to pre-embargo forecasts, 1975 petroleum demand declined by approximately 14 percent or 2.7 million barrels per day. Of that 2.7 million barrels per day, over a third or about one million barrels per day is attributable to increased awareness and respone to higher prices. Thus, as energy prices climb higher, saving energy becomes more attractive—for both businesses and individuals.

A fourth myth is that conservation is only a stop-gap measure and can't really make a significant contribution to the resolution of our longer term energy needs. We estimate that anticipated increases in energy prices along with Government initiatives will result in the adoption of conservation measures that will reduce energy demand, including oil, gas, coal, nuclear power and other energy sources, by about 14 percent from levels anticipated before the embargo—or the equivalent of more than 7 million barrels per day of oil—by 1985. The reduction is just slightly less than our current rate of production of domestic crude oil. Although a large part of these savings are likely to occur in response to higher energy prices alone, the full amount would not be achieved without Government involvement to accelerate the adoption of conservation measures. A good example of a desirable conservation measure that would result in long-term savings, if adopted, is the updating of standards for new residential and commercial buildings.

I should like also to try to dispel several myths which are often engendered by many advocates of energy conservation. This is necessary to obtain a balanced understanding of the conservation issue.

One is the myth that energy conservation alone—or in combination with the development of solar and other inexhaustible energy resources—can solve our energy problems. Even when we achieve our estimate of reduced energy demand, which I cited earlier, we would still require the energy equivalent of approximately 44 million barrels per day of oil to meet the needs of our economy in 1985. This is 24 percent more than what we use today. Even the most optimistic projection of the contribution to our national energy needs that could be made by solar and other inexhautible energy resources is far below this figure. Obviously, unless we reverse the trend of rapidly declining domestic oil and gas production, we will be forced to rely even more heavily on imported energy.

A second myth is that the Federal Government, by enacting a law or issuing regulations, can swiftly and painlessly ensure that energy is conserved. As this past year has clearly indicated, there are no such simple solutions. In fact, encouraging greater energy conservation is, in many respects, a more complex and difficult task than encouraging increased domestic energy production. While only several thousand companies produce and/or distribute our domestic energy supplies, literally millions of diverse businesses, institutions and individuals consume energy. While increased energy prices have stimulated conservation actions, in a few circumstances the President and the Congress have taken a mandatory approach. It will be no simple task to manage these complex programs; great care must be exercised to avoid the large bureaucracies and economic distortions that often are the result of Government regulation.

Finally, there is the myth that energy conservation is free—or nearly free. While it is true that significant energy savings can be realized for little or no cost, it is also true that many measures that could result in large energy savings require significant investment. The installation of storm windows, heat pumps, heat recovery systems, and power recovery turbines has a cost, just like measures to increase energy supplies. The choice between whether or not to adopt any specific conservation measure must be made by the individual or firm concerned, on the basis of hardnosed economic analysis. Currently, our best estimate is that over $200 billion will be required for energy conserving investments over the next ten years if we are to achieve the savings I cited earlier. We are pursuing

further studies to refine our understanding of the specific capital costs that can be anticipated.

Energy is only a means to economic well being, not the end product. If a fuel becomes overly expensive, or unavailable, then common business sense dictates that the thing to do is replace it with the lowest cost substitute. Let's consider a simple example of a consumer faced with rising fuel oil prices. The consumer has available several alternative responses. First, he could simply continue to pay the higher heating bills. Second, he might consider switching from fuel oil to some other source of heat—such as natural gas, electricity, or possibly solar energy. Another alternative, however, would be to reduce his use of fuel oil by installing insulation. How does he choose among the alternatives?

Continuing to pay the higher bills for fuel oil would cost more than $17 for each barrel of oil used. If the homeowner were able to switch to natural gas, then he would be paying only around $9 for the energy equivalent of that barrel of fuel oil. (Natural gas is still a "bargain" because it is regulated at unrealistically low prices. However, many areas, including Washington, D.C., have moratoria on new gas hook-ups. Consequently, the natural gas alternative is increasingly unlikely to be available.) If the homeowner lived in Massachusetts and chose to heat his home electrically by installing baseboard or some other form of resistance heating, he would be paying more than $30 for the equivalent of that barrel oil. However, if this homeowner chose to install ceiling insulation to improve his home's thermal efficiency, he could effectively save a barrel of oil or $17 for every $5 that he spent on insulation. Thus, conservation turns out to be, in this case, the most economically attractive alternative.

We've performed similar analyses of several other conservation measures and we have received some actual case histories through contacts with industry leaders. Installing storm windows can range in cost from $8 to $13 or more for every barrel of oil saved, depending on the characteristics of the home. In most northern regions of the country, the cost would be less than $9 for each barrel saved.

Industrial examples include the installation of an air pre-heater on a boiler for $11 per barrel and addition of power recovery turbine, also costing $11 for each barrel saved. Naturally, in every sector conservation measures range in cost from virtually zero for "housekeeping" actions to more than the cost of simply purchasing more fuel.

The point of such examples is that conservation measures are not only viable alternatives, but generally they represent some of the most cost-effective ways we have of dealing with energy problems. Therefore, conservation, as I view it, is not only a means to help achieve our national energy objectives; it is also in the economic self-interest of consumers and businessmen.

If conservation is so attractive from an economic standpoint, why hasn't more been done? We know, for example, that at least 18 million homes are inadequately insulated—and it's probably more like 30 million—yet the insulation industry is operating with sufficient excess capacity to supply insulation for an additional two million homes per year. We also know that, on a per dollar of product basis, manufacturing paper in West Germany requires only 37 percent of the energy used in U.S. paper mills and that the German chemicals industry uses only 57 percent of the energy required, per dollar of product, in the United States. The list is almost endless.

We don't have the final answer, but we do know some of the reasons why more is not being accomplished.

First and foremost, the price of energy in the United States has been artifically low because of regulated natural gas and oil and because the external costs of our dependence on foreign oil supplies have not been reflected in the prices paid by consumers. *As a result, the economic incentives for conservation have been lacking.* Furthermore, basing the rates charged for electric utility service on total kilowatt hour usage rather than on the consumers contribution to peak demand encourages the inefficient use of our electric generating capacity.

Also, some conservation actions take time. We simply can't afford to renovate the entire capital plant of our economy instantaneously. Our existing buildings and industry were constructed in a time of plentiful and inexpensive energy supplies, and it will take decades to fully implement the changes that are now warranted by higher energy prices. Similarly, each of us was brought up believing that low cost energy could be taken for granted. It is difficult to change such

ingrained perceptions. Sticking to old patterns may be more comfortable but it will also be expensive.

A lack of reliable information on the costs and benefits of specific conservation measures has also prevented consumers from being as responsive as they might be. This is true for both the homeowner who doesn't know how much he'll save if he installs insulation and the businessman who isn't aware of the steps he can take to improve the energy efficiency of his plant. Most energy users are aware of the need for conservation, but the detailed information necessary to make home and business investment decisions is all too often not available.

Another factor that has compounded this problem is that unlike energy supply, energy conservation has not had enough advocates in the business sector. As a result, while we have regularly been bombarded with advertisements urging energy use, we have not, until recently, seen business advertisements for products which conserve energy. And, because the businesses that would benefit from increased sales of energy conserving materials and equipment are generally small and diverse, we face the difficult task of increasing awareness of energy conservation measures.

Where a combination of clear price signals and credible, easily understood information on comparative energy savings does exist, manufacturers and consumers have moved toward more energy efficient products. An excellent case study exists in the automobile industry. First, the embargo with its attendant gasoline shortages and then the substantially increased prices convinced consumers—and Detroit—that miles per gallon was a very important part of buying a new car. Moreover, as a result of the Clean Air Act emission certification procedures, this information was widely available through the EPA/FEA Gas Mileage Guide. In the 1974 model year (pre-embargo), the new car fleet averaged fourteen miles per gallon. By 1976, only two years later, that same average reflected increased fuel efficiency of 26.6 percent (to 17.6 miles per gallon) as the industry responded to market pressure.

In addition to insufficient information, there are a number of other factors which often discourage the adoption of energy conservation measures.

The undue emphasis placed upon reducing the initial cost of energy using products is one of these barriers to conservation. The energy efficiency of new appliances, automobiles, and buildings can be improved substantially. But such improvements often result in higher initial costs. Even though these costs would be recouped, with interest, in lower fuel bills within a few years, consumers continue to purchase the less efficient and lower priced alternatives. One reason for this emphasis is that banks and other lending institutions often do not take into account energy operating costs in determining the conditions under which homeowners and businessmen can obtain a loan. Another factor is that consumers rarely are given information on energy efficiency or operating costs before they purchase a product.

Uncertainty about future energy prices also discourages the adoption of conservation measures—particularly those which require large capital investments.

But where an industry has been convinced that higher energy prices are here to stay, programs have often been established to increase the efficiency of energy use. The Monsanto Corporation is a good example of what industry can do when it becomes committed to conservation. I recently presented FEA's Energy Conservation Award to Monsanto for an employee conservation program they established in early 1975. Monsanto provided an incentive for their employees to conserve energy both on and off the job by offering a $500 check to those employees who submitted the best suggestions for improving energy efficiency. As a result of this program, Monsanto was able to identify numerous opportunities for saving energy in its plants as well as in the homes of its employees.

A final factor slowing conservation efforts, however, is that the individual benefits realized through the adoption of certain conservation measures, such as improved furnace maintenance, may just be too small in many cases to arouse much enthusiasm by the consumer. On a national scale, however, the significance of all of these small individual savings is immense.

In face of these various barriers to conservation, the Federal Government needs to take action to encourage energy conservation. During the past year, there were many who advocated that the Federal Government should force individuals and businesses to reduce consumption by instituting import quotas,

allocating supplies or even by rationing. Fortunately, these arbitrary curtailment measures were eventually rejected. With the enactment of the Energy Policy and Conservation Act, more constructive alternatives for Federal action have been put into place. These include oil price deregulation, auto fuel economy standards, appliance labeling, and federally sponsored information or goal oriented programs to encourage and assist energy users to conserve.

Congress, however, has been slow to enact other vital pieces of energy conservation legislation. Four of the conservation measures initially proposed by the Administration one year ago are still pending. They are the deregulation of new natural gas supplies, the Building Energy Conservation Standards Act, the Weatherization Assistance Act, and the insulation tax credit for homeowners. Each of these measures has cleared either the House or Senate.

Another major energy initiative awaiting Congressional action is the Energy Independence Authority proposed by the President last October. This proposal, if enacted, would authorize Federal support, in the form of loan guarantees, not only for major energy supply ventures, but also for conservation projects unable to obtain private financing.

Quick action on these measures would go a long way toward the establishment of a comprehensive national program for energy conservation.

Although the enactment of these proposals would give a major boost to our conservation efforts, they would still not ensure that the full potential for conservation is realized. There are a number of areas that cannot easily be affected by Federal legislation. For example; the wide range of energy consuming processes and equipment in the industrial sector would make it impossible to design and implement effective energy efficiency standards. However, because industry is responsive to measures which lower costs and improve productivity, a Federal program to promote the adoption of cost-effective conservation techniques could result in major energy savings. The Federal Energy Administration, together with the Department of Commerce, has established such a program and we will be expanding these efforts under the provisions of the Energy Policy and Conservation Act.

This is just one of many FEA programs directed at encouraging and assisting homeowners, building managers, businessmen, and all other energy users to conserve. These programs don't require new laws or regulations. They won't burden the Treasury with large revenue losses or cause disruptions in the economy. And, we believe, they have already shown themselves to be effective.

You have requested that I include in my testimony an assessment of what priority the Administration, and particularly FEA, has given to energy conservation efforts. I think the fact that our conservation appropriations request for Fiscal Year 1976 increased more than six-fold over the Fiscal Year 1975 level is a good indication that conservation has been given high priority.

Another area in which the Administration has been rapidly expanding its commitment is the research and development of more energy efficient technologies. I will defer to Dr. Seamans, who I understand is testifying before you later this month, for a detailed discussion of these efforts.

Having said that, I should reemphasize that there are no simple solutions. An effective conservation program must necessarily have many different components. Our programs are directed at saving energy in transportation, industry, residential and commercial buildings, utilities as well as the Federal Government. Some of these programs are now being expanded in response to the enactment of the Energy Policy and Conservation Act. I am submitting for the record a listing of FEA's current programs, together with preliminary estimates of the energy savings that will result. These estimates clearly indicate that the savings resulting from such programs far outweigh the cost to the Government of funding them.

Much still remains to be accomplished. Now that we have succeeded in resolving some of the more difficult issues, we must not ignore the other measures necessary to achieve our national energy goals. I believe that by continuing to emphasize that conservation is not only vital to the national welfare but also in the economic self-interest of most individuals and businesses, we are making an important contribution to the realization of these goals.

I would be happy to answer any questions.

FEDERAL PROGRAMS FOR ENERGY CONSERVATION

[Thousand barrels per day]

	1978		1985	
	Total[1] savings	Import[1] reduction	Total[1] savings	Import[1] reduction
I. BUILDINGS (RESIDENTIAL AND COMMERCIAL)				
Legislative programs:				
Building energy conservation standards—Presidential proposal (House passed as voluntary—Senate markup in December): Would establish mandatory thermal efficiency standards for all new buildings			350	315
Weatherization Assistance Act—Presidential proposal (passed House—Senate markup in December): Would provide winterization assistance to low income and elderly	25	25	25	25
Retrofit tax credit—Presidential proposal (passed House—awaiting action in Senate): Would provide tax credit for 30 percent of costs to insulate existing homes up to maximum $150	130	110	130	110
Administrative programs:				
Project Conserve: Provides specific energy conserving actions that can be taken by homeowner	42	35	70	58
Lighting and thermal operations: Commercial building owners are asked to adopt the FEA lighting and thermal guidelines and take other actions to reduce energy use; 50,000 buildings by fiscal year 1978; 75,000 buildings by fiscal year 1980	67	27	100	40
II. APPLIANCES				
Legislative programs:				
Consumer product energy conservation program (Energy Policy and Conservation Act): Would require energy labeling of major appliances and 20-percent improvement in energy efficiency by 1980 over 1972 levels	35	10	760	220
III. INDUSTRY				
Legislative programs:				
Industry energy efficiency (Energy Policy and Conservation Act): Energy efficiency targets would be set for 10 most energy-intensive industries, with annual reporting, for maximum improvement by 1980. Also, energy intensive industries participate in voluntary program which assesses potential, establishes programs and goals, and provides a reporting mechanism. (Continues previous administrative program.)	375	174	280	107
Waste oil utilization program: Designed to increase utilization of waste oil by creating market demand, assisting re-refining industries, and increasing awareness of potential	16	16	35	35
IV. TRANSPORTATION				
Legislative programs:				
Fuel economy performance standards (Energy Policy and Conservation Act): Standards are established for model year 1978 and beyond (autos and light-duty vehicles). Also includes mandatory labeling program. (Includes results of administrative program.)	100	100	1,000	1,000
Administrative programs:				
Improve CAB load factor	40	40	120	120
Vanpool program: Demonstration effort to encourage use of employer-sponsored vans for carrying employees to and from work	20	20	110	110
Voluntary fuel economy program for trucks and buses: Aims to reduce energy use in this sector by applying new fuel efficiency technologies and adopting improved operating practices	35	35	125	125

See footnotes at end of table.

FEDERAL PROGRAMS FOR ENERGY CONSERVATION—Continued

[Thousand barrels per day]

	1978		1985	
	Total[1] savings	Import[1] reduction	Total[1] savings	Import[1] reduction
V. UTILITIES				
Administrative programs:				
Utilities conservation action now (UCAN): FEA works cooperatively with electric and gas utilities, regulatory agencies, consumers and environmentalists to develop action plans to conserve energy. FEA provides technological assistance, monitors programs and provides national coordination. (See demonstration program and buildings programs.)				
Electric Utility Demonstration Projects:[2] FEA is funding demonstrations of innovative electric rate structures and load management techniques to assess consumer response to new rate structures, show effectiveness of load management practices and technologies and promote electricity conservation. (20 demonstrations in addition to 10 original, fiscal year 1976.)		50		300
Federal intervention in State regulatory hearings: FEA intervenes, by invitation, in State regulatory hearings to promote increased efficiency in generation, transmission, distribution and end-use of electricity and natural gas				
VI. INTERGOVERNMENTAL				
Legislative programs:				
State energy conservation programs[2] (Energy Policy and Conservation Act): Federal technical and financial assistance to States in developing and administering energy conservation programs. Programs will have a target of 5-percent reduction in energy consumption by 1980	370	245	850	640
Federal energy conservation program (Energy Policy and Conservation Act): Provides for a 10-yr program for Federal agencies. Savings from President's program included	255	225	305	260
Total energy savings	1,510	1,112	4,260	3,465

[1] All savings estimates contained in these tables are based upon reductions from FEA baseline demand projections using a $13/bbl world petroleum price.
[2] Preliminary numbers.

[A brief recess was taken.]

Chairman KENNEDY. We will come to order. We are delighted to have as our panel, as I mentioned earlier, Mr. Aspenson who is the manager of mechanical utilities and energy conservation of Minnesota Mining & Manufacturing Co.; Mr. Robert Hubner, Sr., is vice president of IBM; and Mrs. Lola Redford is director of Consumer Action Now.

Since all of you witnesses have been waiting and have been most patient this morning, perhaps the one we ought to start with is the one who has been waiting the longest, Lola Redford, who was supposed to testify yesterday, but who got snowed in up in New York. We will start off with Mrs. Redford. It is a pleasure to have you with us this morning.

STATEMENT OF LOLA REDFORD, DIRECTOR, CONSUMER ACTION NOW (CAN), NEW YORK, N.Y.

Mrs. REDFORD. Thank you, Mr. Chairman, for having me today. I am sorry I wasn't able to get out of the terrible blizzard in New York yesterday to get down here.

My name is Lola Redford. I am director of Consumer Action Now. CAN is an organization with headquarters in New York City. CAN

was formed 6 years ago as the result of our concern for environmental quality and specifically how consumer behavior affects our environment. This point of view has given CAN a wide scope of interests, from air pollution and toy safety, to over-the-counter drugs and no-fault insurance. However, of the many topics which have concerned us, energy problems and solutions have now become our major focus. Along with other environmental organizations, we were alarmed about the energy crisis long before it became a national issue. We began to realize the enormous importance of conserving our dwindling supply of fossil fuels and developing clean and renewable energy sources.

By renewable energy sources we mean energy that emanates directly or indirectly from the Sun's radiation, such as: Solar-thermal power, bioconversion, ocean-thermal gradients, and wind power. These are solutions to the energy crisis that respect the vulnerability of our life sustaining resources—the air, water, and the good Earth.

By conservation, we do not mean rationing, but the encouragement of investments that will enable us to use energy more efficiently and the development of lifestyles in which it is the quality of life not the quantity of things that is most important.

We need to conserve the fossil fuels that are available because they are very limited. Our main sources of energy today are oil and natural gas. Recent studies reveal that petroleum production may have already reached a peak and that U.S. sources will probably be exhausted in 15 to 30 years—within the life span of most Americans living today.

Even though this country's coal reserves are plentiful compared to petroleum, they too are finite. Moreover, coal has serious drawbacks. It is difficult to mine and exacts high health and environmental costs during the mining; it is expensive to transport; and it is difficult to burn coal in a manner that preserves air quality. Coal is an important energy resource that must serve as a bridge between our present liquid and gaseous fossil fuels, and the day we can rely on cleaner, renewable energy sources.

Some might argue that conservation annd renewable energy development is not critical because nuclear energy will be available as fossil fuels are depleted. While it may be foolish to suggest that nuclear energy has no place in meeting the energy goals of this Nation, its problems are awesome.

They include its ever-increasing costs, its unreliability, its questionable safety, its waste disposal problems, and its vulnerability to sabotage. To proceed primarily down the nuclear track would be at the least, shortsighted, perhaps foolhardy and possibly catastrophic. Compared to nuclear powers, a policy of energy conservation coupled with the development of renewable energy sources is certainly far safer and more compatible with environmental goals, and may be more economical.

I have a request with regard to Administrator Zarb's comments about the myths that many of us who preach solar energy and energy conservation should correct. He said that we proponents have said that solar energy and conservation can solve our energy needs by 1985. I would like you to ask him, what person, what advocate of solar energy, or energy conservation, or group has ever used a figure 1985 as a date that we believe energy conservation or solar can meet our energy needs.

I think by making such a statement he tends to undermine the credibility of those of us who preach energy conservation and solar energy.

For these reasons, Consumer Action Now is committed to doing what it can to implement conservation and to insure that renewable energy is developed and becomes a basic element in this Nation's energy picture within the next decade and beyond.

Out of this commitment, we have undertaken several projects designed to increase public awareness of both conservation and solar energy. I would like to relate our experience with one of these projects.

In the fall of 1975 we decided to implement a solar hot water demonstration project. We wanted to do so for the following reasons:

One, to show that in an urban setting and a Northern city it would be possible to save money and fuel through the use of a solar hot water system.

Two, to focus public attention on the viability of solar energy.

Three, to finance this project through conventional financing channels.

Four, to promote awareness of the necessary partnership between conservation and solar energy.

Five, to assess what the possible legal impediments or other impediments might be.

We wanted our demonstration building to be located in a middle income, high density, stable neighborhood. We also wanted a cooperative building, for we felt that, since cost savings would go directly to the tenant/owners, each resident would have a vested interest in this project's success. Since there had never been a solar water heating system in a building over four floors we hoped that we could locate a building of at least 12 stories.

The other main requirements for evaluation for possible buildings included:

One, minimal shading of roof by other buildings.

Two, minimal equipment on roof which could interfere with collectors, that is, water towers, skylights, and penthouses.

Three, space for a large storage tank near the boiler room.

Four, ratio of collector area to roof area of approximately 1:2 or less.

Five, orientation of building toward the South.

After reviewing the data gathered on visits to several buildings we felt the best candidate for a solar water heater system was a building located on Manhattan's Upper West Side, 924 West End Avenue.

Working with a solar architect we did preliminary financial assessments and arived at some very rough installation figures and projected energy savings. Armed with these figures we then approached three banks to see if there would be any possibility of financing this project. Needless to say in November, the financial situation in New York was hardly optimistic. It was clear a loan or mortgage would be hard to obtain but not necessarily impossible. We did find that the bank

which held the first mortgage would be the most likely source for additional funding.

At the same time we also investigated other means of assisting the funding of this project. We looked into the possibilities of Federal, State, or city tax incentives.

We discovered there was an existing city bill which allowed for tax abatement on real estate taxes for certain buildings that had made specific improvements including some energy conservation measures. This bill was up for renewal and included an amendment which would allow for qualified cooperatively owned buildings to participate. This abatement bill would provide a return in 11 years of 90 percent of the initial cost. Convinced that this would make our solar project viable, CAN lobbied for passage of this bill and testified on its behalf.

With this preliminary information we then met with the board of directors of the building. In this initial meeting they expressed enthusiasm for the entire project. They were excited about the notion of becoming the first major apartment house to use a solar hot water system, and the possibility more importantly of cutting their fuel costs. Like most middle income cooperatives, financing is their major concern. CAN agreed to obtain more complete data. We contacted Dubin-Mindell-Bloome, a firm of consulting engineers with experience in both energy conservation and solar applications. Their first assessment included the following—and I will just briefly go through this since you have all of the written things here.

Based on 20 gallons of hot water per day per person for 260 people, and calculations from similar projects, the 924 west end building would require about 5,200 square feet of collector. The initial cost of the entire system, including collector panels, support structure, storage tanks, piping, water conserving shower heads, a new domestic water heater, miscellaneous equipment, installation and engineering fees, would be in the order of $140,000 to $150,000. The annual savings for the system would be about $10,000 per year based on the present oil cost of 40 cents per gallon. However, over the next 10 years Dubin felt only prices would rise at 10 percent or more per year. Therefore, the average savings would be $15,000 per year or more, making the simple payback of the solar system in 10 years.

One of the key elements in the proposed solar water heater system is a new storage type, domestic water heater. Old boilers in buildings such as this, generate domestic hot water very inefficiently, especially in the summer. Over half of the energy savings previously mentioned are attributable to this energy conservation measure alone.

We once again met with the board to give them this information. We needed an indication of their interest in this project before we could justify the expenditure of $2,000 for a complete engineering study of the building. After a serious consideration of these facts, the board reluctantly decided not to go forward with the solar installation. They did not believe they could obtain the initial capital. How-

ever, they were astounded with the energy savings the building could realize with the installation of a new domestic water heater. This equipment would cost $15,000, a sum which at the present price of fuel could be recovered in only 2 years based on fuel cost savings. We strongly urged this energy saving step, and are delighted that they are taking our recommendation.

While CAN was disappointed that this particular building would not be our solar water heating demonstration project, we feel that what we have learned and the experience we have gained are extremely valuable. With regard to energy conservation we have made the following conclusions: People are uninformed about energy conservation techniques; they have no concept of the enormous cost savings that can result from implementing conservation measures.

Once people do understand our experience suggests they are eager to make the investment if they can obtain the initial capital at reasonable terms. It is the lack of reliable cost saving information and access to capital that is holding people back.

We need a program at the grassroots level that will make reliable information about conservation and solar energy available to consumers. Such conservation programs need to include:

One, energy audits by competent, reliable people independent of the companies who would benefit from such audits.

Two, reliable information about companies that can supply and install conservation equipment.

Three, access to capital on reasonable terms.

Four, government programs at the grassroots level to assure that the information and investment capital is readily available to consumers.

Five, energy cooperatives to make it more feasible for consumers to insulate or solarize their homes by pooling their purchasing power, expertise, and information.

In closing let me say that our experience convinces us that Government officials driving in large limousines must pay more than lip-service to energy conservation. We have managed to squander in just a few decades the precious fuels it took millions of years to create, and each year we are without an ambitious energy program for conservation shortens the time available for shaping an energy system and way of life that can endure.

We hope that the Joint Economic Committee and this subcommittee will address the fundamental issue of developing patterns of economic growth for this Nation that are less polluting, less energy intensive, and which make better use of the creative talents of people. Perhaps these hearings will help move us down that road.

Thank you very much for the opportunity to present the views of Consumer Action Now on this very important subject. I would be happy to try to answer any question that you might have.

Chairman KENNEDY. Thank you, Mrs. Redford; we will come back to the questions later. Let's hear from the panel first.

Mr. Hubner, please.

STATEMENT OF ROBERT W. HUBNER, SENIOR VICE PRESIDENT, INTERNATIONAL BUSINESS MACHINES CORP., ACCOMPANIED BY ROBERT H. HOWE, PRESIDENT, REAL ESTATE AND CONSTRUCTION DIVISION

Mr. HUBNER. Thank you, Mr. Chairman.

My name is Robert Hubner and I am a senior vice president of IBM. With me this morning is Mr. Robert H. Howe, president of our real estate and construction division.

I would like to thank the subcommittee for the opportunity to discuss IBM's energy conservation programs and the results we have achieved.

Energy conservation is the most effective short-range answer to the energy crisis and will remain an important element even after new energy supplies and alternative energy sources can be developed. By sharing with you some of IBM's experiences with industrial energy conservation, I hope to be of some assistance as you explore this very complex and important subject.

My testimony today will principally cover IBM as a user and conservor of energy and the techniques and programs IBM uses to conserve energy. Secondarily, I will cover the energy conservation features of our products; and the role of employee communications and participation.

IBM's principal business is the developing, manufacturing, and marketing of data-processing and office products equipment and services. Although we are an international company, my testimony today will focus on energy conservation in the United States.

From an energy conservation standpoint, I should note that IBM is not a manufacturer of heavy goods, and therefore, not energy intensive.

There are enormous differences in the types of energy usage and the amounts of energy consumption among businesses. Reductions in specific forms of energy usage may be achieved easily in one company or industry, but with difficulty in another.

The rapid rise in energy costs has created a strong incentive for conservation and makes it a business necessity. It has been our experience that the cost of energy conservation projects in existing buildings and of energy-saving features in new buildings can be justified by reductions in energy cost. Conservation is simply sound business management, as Mr. Zarb pointed out.

Our program is an example of what voluntary efforts can accomplish, and I will outline it for you.

IBM's domestic energy conservation program started in 1973, before the oil embargo, and was stimulated by our concerns about rising costs and interruptions of supply. At that time, we set a goal of reducing our energy usage by 10 percent. With the advent of the oil embargo, our efforts were intensified, and we set new reduction goals of 20 percent for fuel and 10 percent for electricity. These goals were quickly met to our surprise, and exceeded during the early stages of the program. Conservation goals, consistent with local conditions, were also set for our overseas subsidiaries.

IBM's U.S. results for the year 1974, covering 34 major plant, laboratory, and headquarter locations—approximately 28 million square feet—were fuel savings of 32 percent and electricity savings of 23 percent from preconservation levels. In 1975, the annual rate of savings from the same preconservation levels increased to 35 percent for fuel and 27 percent for electricity.

The fact that our first round of savings came quite easily has made it obvious to us that our prior usage had been something less than frugal. By the same token, future savings will be less dramatic and more difficult to achieve.

The value of these savings in 1974 was approximately $13 million and in 1975 around $20 million. If we had not had a conservation program, the $48 million energy bill for the 34 locations in 1975 would have been approximately 42 percent higher.

Energy costs, however, as shown in appendix 1, have risen even faster than we have been able to conserve. For example, the aggregate energy cost per square foot in 1972 was approximately 99 cents and by 1975 had risen to $1.70. Without conservation the cost for 1975 would have been $2.41. Needless to say, this provides a powerful incentive to conserve.

To implement our conservation policy, we established an energy committee of senior executives, which I chair, to insure management focus on the broader aspects of energy resources. Suporting the committee are people from appropriate functions of the business, with staff responsibility residing in our real estate and construction division. It should be stressed that the responsibility for meeting energy conservation objectives rests with the line management at each of our plant, laboratory, headquarters, and field locations.

The principal management tool used to follow our progress is an energy data bank covering the energy cost and usage of our major U.S. locations. In addition, the data this tool provides, as shown in appendix 2, helps to establish energy goals for new facilities.

As different companies vary one to the other, so do our individual locations. I have included, on appendix 3, samples of conservation results from IBM facilities of different types and in different parts of the country with this report.

I would like to mention some examples of specific energy reductions from preconservation levels.

In Rochester, Minn., our plant and laboratory achieved an energy savings of 40 percent. Our new high rise office building in Chicago

achieved a saving of 42 percent and our headquarters building and laboratory at Gaithersburg, Md. achieved a saving of 46 percent.

I would like to point out that approximately two-thirds of our initial savings were made with little capital investment. They were achieved by making operational savings in lighting, heating, air-conditioning and system and equipment operation. Very simply, we lowered the thermostats and turned off some lights. To achieve further savings, we are now making capital expenditures in such areas as computer control, heating and cooling system modifications, and combustion improvements. As one example, where lighting had been centrally controlled, we installed light switches in offices and encouraged employees to turn lights off when leaving.

Like other manufacturers in the computer industry, we have been applying our own products to the energy problem. Sensor-based computers, which monitor the changing environment, can improve the energy efficiency of a building. As a result, we have installed computers for energy management purposes in 14 of our locations. In the next 18 months this number will double. These computers are fully cost justified and the payback varies, depending on location and application. It is projected that an average of 10–15 percent further energy savings will result at the locations where computers are installed.

Many other companies are also using computers to reduce two major factors in energy bills—total energy consumed and peak demand. We have worked with 400 such users, who have reported savings of up to 25 percent or more on their electric energy bills. In the aggregate, this amounts to more than 1.4 billion kilowatt hours annually and is enough to offset the total residential electrical needs of the State of Wyoming.

I would also like to discuss the role of building design in conservation. While there is a limit to the changes which can be made to existing buildings to facilitate energy efficiency, there is significantly more latitude to incorporate energy conservation features in new building design. We are trying to reduce the energy usage of new office buildings by 30–40 percent over 1970 designs. To do this we are revising energy design standards and using computer techniques to evaluate architectural and energy tradeoffs.

Based on life cycle costs, there should be no cost penalty for constructing more energy efficient buildings, and the initial cost premium is minimal.

To put this into perspective for you, let me start with the example of our Chicago office building which was designed in 1968. Using a combination of energy-saving features in the original design, such as the use of a heat pump, computer energy management techniques, and other conservation measures, we achieved the relatively low annual energy consumption of 125,000 Btu's per square foot per year.

For our new building in Pittsburgh, still under construction, we expect an annual usage of 71,000 Btu's per square foot per year.

And for a building still in the design stage, planned for Southfield, Mich., we anticipate an annual usage of 51,000 Btu's per square foot per year.

These dramatic reductions are being made possible by changing design standards and by the use of computer analysis and simulation techniques. These techniques permit architects and engineers to simulate the effects of changes in a building's architectural, mechanical, and electrical systems on its energy consumption. This allows the selection of building features that will reduce energy usage.

Not only are we concerned about the energy efficiency of our operations, but also that of our products, The stress we have placed on reducing the cost-per-computation for our customers has led to increased energy efficiency with each new computer generation. In fact, the energy use per computation has been reduced by a factor of 6 over the 10 years from the 1400 series of computers to our current system/370 line. We expect further improvements in the energy efficiency of future products.

Finally, I would like to tell you how important it is to have the cooperation and commitment of all employees. We have kept our people fully informed of our objectives and achievements through articles in company newspapers, and through other means of internal communications. We are also preparing a film on this subject.

Mr. Chairman, my purpose today has been to show this subcommittee how one company has attempted to conserve energy. I would like to stress five key points:

First, in the past, abundant and low-cost energy supplies did not make conservation a key management concern, and so initial energy conservation measures yield large savings without capital investment.

Second, the methods of achieving these initial savings are not very technical or profound. They amount to turning off lights, changing temperatures, shutting down equipment when not needed, fine tuning building systems and other similar techniques.

Third, since these initial savings are relatively simple to achieve, and are so dramatic, we cannot expect additional savings to come so easily. It takes capital investments to further increase our energy efficiency.

Fourth, energy conservation is good business management, and the savings provide all businesses with a compelling economic incentive to conserve.

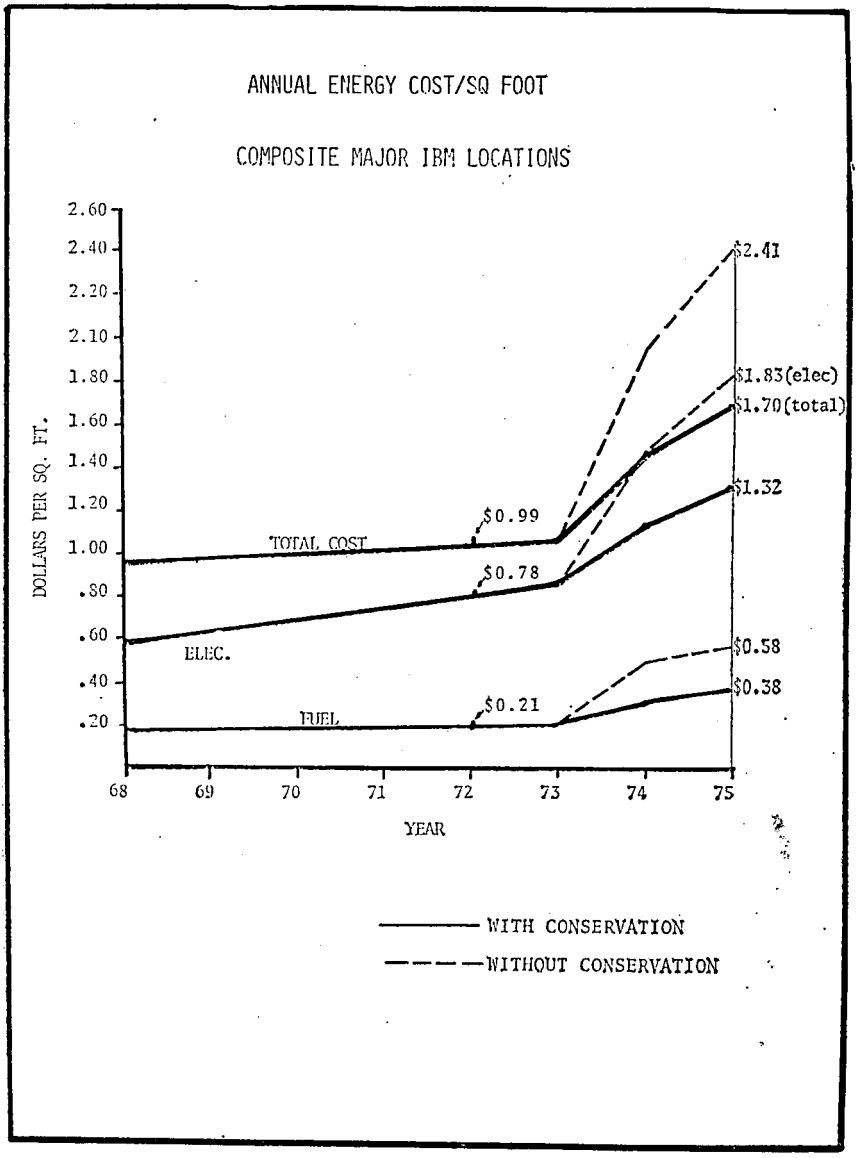
Fifth, and finally, it is critical for every business and institution to have the full cooperation and commitment of its people to realize the full potential of energy conservation.

I hope this subcommittee will find my testimony helpful as you consider this important item. Thank you.

Chairman KENNEDY. Thank you, Mr. Hubner, the appendix material you referred to will be included in the record.

[Appendixes 1, 2, and 3 to Mr. Hubner's statement follow:]

APPENDIX 1


ANNUAL ENERGY COST/SQ FOOT
COMPOSITE MAJOR IBM LOCATIONS
DOLLARS PER SQ. FT.
2.60
2.40
2.20
2.10
1.80
1.60
1.40
1.20
1.00
.80
.60
.40
.20
TOTAL COST
ELEC.
FUEL
$0.99
$0.78
$0.21
$2.41
$1.83(elec)
$1.70(total)
$1.32
$0.58
$0.38
68
69
70
71
72
73
74
75
YEAR
WITH CONSERVATION
WITHOUT CONSERVATION

APPENDIX 2

IBM ENERGY RESOURCE MANAGEMENT, ROCHESTER, N.Y., 1975 (PRECONSERVATION, ADJUSTED)

Category	January	February	March	April	May	June	July	August	September	October	November	December	Year to date
Electricity (kilowatthours):													
Base (in thousands)	4,799	5,353	4,857	5,361	4,857	5,470	5,262	5,544	5,344	5,314	5,269	5,024	62,454
Actual (in thousands)	3,283	3,730	3,600	3,369	3,477	3,550	3,341	3,859	3,701	3,729	4,010	3,434	43,083
Variance (in thousands)	−1,516	−1,623	−1,257	−1,992	−1,380	−1,920	−1,921	−1,685	−1,643	−1,585	−1,259	−1,590	−19,371
Variance (percent)	−31.59	−30.32	−25.88	−37.16	−28.41	−35.10	−36.51	−30.39	−30.74	−29.83	−23.89	−31.65	−31.02
Cost of actual	$82,083	$93,427	$99,108	$82,061	$83,203	$82,725	$74,119	$78,575	$70,855	$73,525	$87,545	$88,894	$991,120
Cost per unit	$.0250	$.0250	$.0275	$.0244	$.0239	$.0233	$.0222	$.0204	$.0191	$.0197	$.0218	$.0259	$.0231
Cost of variance (in thousands)	−$37.9	−$40.7	−$34.6	−$48.5	−$33.0	−$44.7	−$42.6	−$34.3	−$31.5	−$31.3	−$27.5	−$41.2	−$447.7
kWh per square foot	2.46	2.79	2.69	2.52	2.60	2.57	2.42	2.79	2.68	2.70	2.90	2.48	31.16
Gas (cubic foot):													
Base (in thousands)	11,900	19,200	30,700	43,500	44,700	47,689	56,135	58,298	47,380	44,290	30,694	21,733	456,219
Actual (in thousands)	28,760	28,894	26,355	28,826	25,371	26,578	29,541	30,030	25,566	26,342	28,369	28,709	333,341
Variance (in thousands)	16,860	9,694	−4,345	−14,674	−19,329	−21,111	−26,594	−28,268	−21,814	−17,948	−2,325	6,976	−122,878
Variance (percent)	141.68	50.49	−14.15	−33.73	−43.24	−44.27	−47.38	−48.49	−46.04	−40.52	−7.57	32.10	−26.93
Cost of actual	$23,570	$23,658	$21,923	$23,612	$21,251	$22,075	$24,100	$24,434	$21,381	$21,914	$26,609	$23,709	$278,236
Cost per unit	$.00082	$.00082	$.00083	$.00082	$.00084	$.00083	$.00082	$.00081	$.00084	$.00083	$.00094	$.00083	$.00083
Cost of variance (in thousands)	$13.8	$7.9	−$3.6	−$12.0	−$16.2	−$17.5	−$21.7	−$23.0	−$18.2	−$14.9	−$2.2	$5.8	−$101.9
Oil (gallons):													
Base (in thousands)	340	240	100	0	0	0	0	0	72	0	216	278	1,246
Actual (in thousands)	61	48	11	9	0	0	0	0	0	1	9	43	186
Variance (in thousands)	−278	−191	−88	9	0	0	0	0	−71	1	−206	−234	−1,060
Variance (percent)	−81.82	−79.67	−88.10						−99.50		−95.49	−84.36	−85.06
Cost of actual	$12,174	$16,982	$4,141	$3,131	$0	$0	$0	$0	$165	$365	$2,576	$11,483	$50,981
Cost per unit	$.197	$.348	$.348	$.348					$.348	$.348	$.264	$.264	$.274
Cost of variance (in thousands)	−$54.8	−$66.5	−$30.7	$3.1	$0	$0	$0	$0	−$25.0	$.4	−$54.5	−$61.9	−$289.9

Steam (pounds):													
Base (in thousands)	0	0	0	0	0	0	0	0	0	0	0	0	0
Actual (in thousands)	0	0	0	0	0	0	0	0	0	0	0	0	0
Variance (in thousands)	0	0	0	0	0	0	0	0	0	0	0	0	0
Variance (percent)													
Cost of actual	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cost per unit													
Cost of variance	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fuel totals:													
Equivalent gallons—base (in thousands)	425	371	310	297	319	326	384	399	398	303	426	426	4, 389
Equivalent gallons—actual (in thousands)	267	246	192	206	181	132	202	205	176	181	204	240	2, 486
Equivalent gallons—variance (in thousands	−157	−124	−117	−91	−138	−144	−182	−193	−221	−121	−222	−186	−1, 903
Equivalent gallons variance (percent)	−37. 12	−33. 59	−37. 99	−30. 71	−43. 24	−44. 27	−47. 38	−48. 49	−55. 72	−40. 18	−52. 16	−43. 76	−43. 36
Equivalent gallons normal (in thousands)	−148	−130	−145	−118	−117	−137	−182	−193	−240	−102	−189	−167	−1, 872
Equivalent gallons variance normal (percent)	−34. 93	−35. 15	−46. 92	−39. 82	−36. 67	−41. 96	−47. 38	−48. 49	−60. 48	−33. 68	−44. 39	−39. 21	−42. 67
B.t.u./square feet	28, 002	26, 960	21, 027	22, 559	18, 990	19, 231	21, 375	21, 729	18, 629	19, 171	21, 558	25, 369	264, 605
B.t.u.'s/square feet normal	28, 616	26, 541	19, 148	20, 505	20, 238	19, 675	21, 375	21, 729	17, 743	20, 416	23, 233	26, 521	265, 746
Location totals:													
B.t.u.'s/square feet normal	37, 001	36, 067	28, 342	29, 109	29, 118	28, 439	29, 624	31, 256	26, 880	29, 623	33, 133	34, 999	373, 597
Cost of variance (in thousands)	−$78. 9	−$99. 3	−$68. 9	−$57. 4	−$49. 2	−$62. 3	−$64. 3	−$57. 3	−$74. 7	−$45. 8	−$84. 2	−$97. 3	−$839. 5
Energy cost (in thousands)	$117. 8	$134. 1	$125. 2	$108. 8	$104. 5	$104. 8	$98. 2	$103. 0	$92. 4	$95. 8	$116. 7	$124. 1	$1, 325. 3
Savings (dollars per square foot)	−. 059	−0. 74	−. 052	−. 043	−. 037	−. 045	−. 047	−. 041	−. 054	−. 033	−. 061	−. 070	−. 616
Total energy (dollars per square foot)	.088	.100	.094	0. 81	.078	.076	.071	.075	.067	.069	.084	.090	.974
Local conditions:													
Building area (thousands of square feet)	1, 336. 0	1, 336. 0	1, 336. 0	1, 336. 0	1, 336. 0	1, 382. 0	1, 382. 0	1, 382. 0	1, 382. 0	1, 382. 0	1, 382. 0	1, 382. 0	1, 362. 8
Base temp index	1, 615. 0	1, 347. 0	1, 153. 0	615. 0	292. 0	78. 0	21. 0	35. 0	185. 0	485. 0	972. 0	1, 429. 0	8, 227. 0
Actual local temp index	1, 556. 0	1, 385. 0	1, 359. 0	755. 0	196. 0	60. 0	19. 0	7. 0	273. 0	380. 0	821. 0	1, 311. 0	8, 122. 0
Building factor	.600	.550	.500	.400	.200	.100	0	0	.100	.300	.500	.550	.317
Normalizing factor	.022	.016	.089	−. 091	−. 066	.023	0	0	−. 048	−. 065	−. 078	−. 045	−. 005
Electric demand	8, 352	8, 352	8, 208	8, 496	8, 208	8, 352	8, 280	8, 928	8, 496	8, 496	7, 776	7, 488	8, 928

APPENDIX 3

EXAMPLES OF IBM ENERGY CONSERVATION RESULTS, 1975 COMPARED TO PRECONSERVATION LEVELS

Location	Size square feet (thousands)	Type	Energy savings, fuel and electric combined (percent)
Campbell, Calif	65	Plant	53
Gaithersburg, Md	523	Headquarters	46
Armonk, N.Y	420	do	43
Chicago, Ill	1,836	High rise office	42
Franklin Lakes, N.J	350	Headquarters	42
Rochester, Minn	1,382	Plant	40
Raleigh, N.C	1,065	do	39
Glendale, N.Y	600	Laboratory	38
Poughkeepsie, N.Y	2,690	Plant	37
Lexington, Ky	1,884	do	35
Sterling Forest, N.Y	249	DP center	32
San Jose, Calif	2,069	Plant	28
Yorktown, N.Y	503	Laboratory	28
Boca Raton, Fla	769	Plant	26
Burlington, Vt	1,330	do	19

Senator KENNEDY. Mr. Aspenson, please proceed.

STATEMENT OF RICHARD L. ASPENSON, MANAGER, MECHANICAL UTILITIES AND ENERGY CONSERVATION, MINNESOTA MINING & MANUFACTURING CO., ST. PAUL, MINN.

Mr. ASPENSON. Mr. Chairman, I am Richard L. Aspenson, manager of energy conservation for the 3M Co., a worldwide enterprise with sales of $3.1 billion last year.

I appreciate being here today to give you an engineer's insight into the energy challenge with special emphasis on the time remaining between now and 1980, and what can be accomplished in the industrial and commercial sector.

My purpose is quite simple—to argue as strongly and persuasively as I can for vigorous programs of energy conservation in all of our economy and society, with special emphasis on the commercial-industrial sectors. My purpose is not to downgrade efforts for the increased supply of conventional energy sources—such as oil and coal—or to suggest that we should relax our efforts to develop the technologies for new energy sources, such as solar and nuclear fusion. I think that we must continue to progress in those areas and that we must try even harder to succeed.

Looking at the energy situation between now and 1980, however, I do not think that we can develop enough conventional energy sources or get enough of the new technologies on stream to keep our economy healthy and provide jobs for the more than 1.5 million people who will be entering the work force each year.

There are three fundamental reasons why we cannot increase supply to meet demand in this time frame in this country.

First, take a look at the huge size of our national energy production and consumption system and realize the tremendous effort it would take to enlarge it even a little bit. Visualize, for example, a railroad train with standard coal cars, 50 feet in length, each holding 50 tons of coal. If this train were to represent just 1 percent of national energy

consumption, it would stretch more than 5,150 miles—from the city of Washington, our Nation's Capital, to Los Angeles and back.

Second, consider the fact that we already know how long it takes to build conventional energy facilities. For example, we know that it takes a minimum of 9 to 10 years to build a nuclear power plant, 3 to 10 years to develop oil from new oil fields, and 5 to 8 years to build a coal-fired powerplant. Given the amount of time remaining before 1980, there just is no way we can build enough of these things to meet our demand—even if we were willing and able to make all the environmental tradeoffs. It would require the construction of 27 1,000 megawatt powerplants to equal just 1 percent of present U.S. energy consumption.

Third, looking at the new technologies, we and others have made estimates on how long it will take to, say, derive high Btu gas from coal in the amounts necessary to have an effect on our huge energy system. We define "effectiveness" as equal to about 3 or 4 percent of our total energy needs. Research shows that we cannot expect high Btu gas from coal for 10 to 15 years, solar-electric for 20 to 30 years, and efficient and direct solar heat for 5 to 25 years.

I know that some will say that we can use solar energy to heat homes right now. That's true, but we are some distance away from developing solar technology that is as cost-effective as other energy sources.

Permit me to illustrate graphically the efficiency of present solar systems as well as how large an undertaking it would be for us to substitute present solar technology for 10 percent of U.S. energy consumption. Visualize, if you will, how many flat plate collectors would be required. We have calculated that 10 percent of U.S. energy consumption could be produced by a solar energy system for which the flat plates alone would take up an area equal to the size of all New England except the State of Maine.

Thus far, we have confined our remarks to energy consumption and supply. There also is the matter of cost, and, by referring to cost, I am not just referring to money. I point to the political costs of energy dependency as well as emphasizing the human costs that will be extracted here at home if we do not conserve energy.

Our 3M purchasing people forecast that energy costs will increase by 85 percent between now and 1980. This is not out of line with some government forecasts which estimate that energy costs will double between 1975 and 1980 and triple by at least 1985.

I point out that those are only the direct costs—the gas bill, the electric bill, and the like. 3M is not energy intensive; our direct energy costs are only about 2 percent of sales. We calculate, however, our indirect costs are larger by a factor of nine over our direct costs. So when we add in all the energy input that goes into raw materials or commodities or semifinished goods that we buy in order to make products, our energy costs may be 18 or even 20 percent of sales.

3M started an energy program in 1970. Energy was relatively cheap at the time. Yet, after looking at some of the forecasts, we foresaw that there could be trouble ahead. We did not expect that it would come as soon as it did with an oil embargo. 3M was looking merely at the longer term supply and demand problems.

Fortunately, we had a large in-house engineering capability that we could put to work. We had an energy shortage contingency plan

drawn up and ready to go by June 1972. When the embargo took place nearly 1½ years later, we were ready to press the button to initiate a worldwide program of energy conservation.

Since starting our program we have obtained energy savings of at least 15 percent in the United States alone. In the beginning, we organized our people to do the simple things that cost little or no meney—like turning down the thermostats and turning off the lights. We now are halfway through a detailed natural gas survey of every major U.S. plant—some 50 of them. In our total survey of all energy usage by 3M, we have about 100 people involved in a 3-year undertaking. Our purpose is to learn precisely how our energy is being used and to make recommendations for capital expenditures. We then will modify our manufacturing precesses to make them more energy efficient.

We also have developed engineering standards for new plant and equipment so that we will not have to go back and redo our new office buildings and plants to make them energy efficient. Thus far, we have shared these standards with more than 4,000 businesses, hospitals, schools and governmental agencies. We have developed a close working relationship with many people in FEA, ERDA, GSA and the State energy agencies. As a result of our input from them and our operating experience, we know, to a large extent, what any business can do to achieve energy savings. We calculate, for example, that the entire U.S. commercial industrial sector can achieve energy savings of 10–15 percent with little or no expenditure. We also believe that another savings of 15 percent—for a total of 25 to 30 percent—can be achieved if businesses had the money and were motivated to spend it for this purpose.

Chairman KENNEDY. How much does that save totally, nationwide with these projections, have you figured that out?

Mr. ASPENSON. If we were to do this?

Chairman KENNEDY. Yes.

Mr. ASPENSON. If we, say, save 25 percent in the commercial and industrial sectors, that would be close to 12 or 13 percent of total U.S. energy, I believe.

Chairman KENNEDY. That would be a little over 2 million barrels, is what you are talking about, approximately 2 million barrels if you figure we are anywhere from——

Mr. ASPENSON. Mr. Chairman, it would be more than that. It would be 12 percent of 35 to 40 or—I will do a little homework here.

Chairman KENNEDY. We will get our computer out, Mr. Hubner.

Mr. ASPENSON. Sixteen percent of our total energy use is imported oil. If we were to save 12 percent totally, by achieving a 25-percent reduction in the commercial, industrial sector, it would be equivalent to three-quarters of our present imports.

Is that correct, Mr. Hubner?

Mr. HUBNER. Sounds pretty close to me.

Mr. ASPENSON. Did I answer the question?

Chairman KENNEDY. Yes.

Well, I guess it comes to, as our little computers up here figure, that's approximately 5 million, it is the equivalent of 5 million barrels a day.

Mr. ASPENSON. That's right, because presently imports, I believe, are somewhere between 6 to 7 million barrels per day.

Chairman KENNEDY. OK, let's continue then.

Mr. ASPENSON. Last summer, at the suggestion of the Minnesota Energy Agency, we were asked to make recommendations for legislative programs that would further the cause of energy conservation.

So we examined our engineering data carefully to see where the greatest results could be achieved and how people could be motivated to get the job done quickly.

Before long, we were part of a large, but informal coalition of people in agriculture, business and labor who were all concerned about energy conservation in Minnesota. The result is a dialog which produced "The Minnesota Plan."

It is based upon the assumption that the carrot as well as the stick can be employed to encourage energy conservation.

In brief, it involves a tax credit of 25 percent for expenditures on plant and equipment related to achieving energy efficiency, plus a same year writeoff.

It is, in effect, a loan with a 5-year cutoff point. Here is how it would work.

If an engineer could certify on a tax return that $4 of expenditure would result in $1 of energy savings annually, a given project would be eligible for the tax credit.

The "break even" point for large and small corporations would range between 2 to 2.7 years. The Government also would "break even" by taxing the savings that would show up in corporate profits. The Government, thus, would recover its costs for the program in 6 to 8.2 years. What would be the effect on governmental revenues? Frankly, we do not know. Our estimates range from $0.5 billion to $6 billion in the peak year of the 5-year program. We are hopeful that the subcommittee might look into this aspect further, using economic models and the computer technology at its disposal.

However, most of us feel it will be relatively easy to administer under the Internal Revenue Code with protection against fraud and confidentiality.

However, most of us feel that we should also look at the economic costs of not undertaking this or a similar program aimed at the same objectives.

We calculate, for example, based upon a National Academy of Engineering study that the cost of building new energy producing facilities to make up for a lack of conservation would total at least $110 billion, and that calculation was made on the basis of what money cost in 1973. A comparable amount of money spent on conservation would be $60 billion.

As one member of that "Minnesota Plan" coalition, I appreciate the fact that the concept of tax credits may not be popular at the moment. Yet we must point out how this proposal differs from others. Namely, it aims like a rifle shot at the specific objective of energy conservation.

It has anti-inflationary aspects inasmuch as it will decrease demand and hold down prices.

It has a favorable impact on balance of payments.

It will motivate particularly the small businessman who does not have in-house engineering capability, to go in search of it.

It will produce jobs for those who will participate in retrofitting America's plants equipment and buildings.

We do not think that this concept will be applicable to the Nation's entire energy conservation needs. We see it as being particularly appropriate for the manufacturing process where the four-in-one formula will work well in achieving substantial results.

Commercial buildings such as apartments and retail stores need another kind of solution. In these instances, for example, double glazing of windows could not be justified under the formula.

Likewise, energy conservation in the residential sector requires solutions.

So what may be in order for those kinds of situations may be tax credits or loans based upon ASHRAE standards. ASHRAE is the American Society of Heating, Refrigeration and Airconditioning Engineers. This professional society has developed standards for new construction which, I believe, have been adopted by at least five states and now are before the legislatures of others. Using either credits or loans, these same standards could be applied to the "retrofit" of the commercial-residential sectors.

The American people, if given the facts, will respond to leadership. So what we need is a greater public understanding—education—followed by the will to take the steps necessary. We also need a coherent national energy policy that places a high priority on energy conservation in the years leading up to 1980.

Your subcommittee should be commended on your efforts to bring this vital issue—one which is very highly complex—into sharper focus. In so doing, you are helping prove that our political system is not merely reacting to immediate crisis, but that you and others are anticipating problems and trying to solve them while there still is time.

Thank you very much for inviting me here today.

Senator KENNEDY. Fine, thank you vey much Mr. Aspenson. The text of "The Minnesota Plan" that you furnished the subcommittee will be placed in the hearing record, if there is no objection.

[The material referred to follows:]

"THE MINNESOTA PLAN"

An energy-conservation concept that Minnesotans in business, government, and labor believe should be closely examined by Congressional leaders and Administrative policy-makers in Washington.

It is being suggested in a spirit of non-partisanship because increasing energy costs and the threat of short supplies have created a commonality of interest among those who would maintain production and jobs as well as those who fear adverse inflationary and environmental impact.

CONTENTS

SUMMARY OF PROPOSAL

The problem:

New energy supplies cannot be developed quickly enough in the next 10 years to meet rising demand. Therefore, energy conservation must be prime national goal if commercial and industrial businesses are to operate at high enough levels to keep people employed.

ALSO:

- Energy has led the way in creating inflation. Real costs of energy are expected to triple by 1985. If the inflationary impact of rising energy costs is to be ameliorated, it is necessary to hold down demand for energy supplies (i.e. conserve).
- If energy is not conserved, new energy facilities must be built. Because of adverse environmental impact, it is undesirable to increase energy supplies without making a real effort to reduce energy demand.
- Substantial energy conservation can be accomplished in the commercial-industrial sector. Raising the price of energy, however, cannot be the sole approach to cutting consumption. Capital must be invested to modify existing commercial buildings, plants, and equipment so that energy efficiency is achieved. Therefore, there must be economic incentives to use capital for energy conservation purposes, particularly in an atmosphere of capital shortage.

The objective:

Reduce energy consumption in the commercial-industrial sector by at least 30 per cent below levels that otherwise would be achieved without an energy conservation incentive program.

The solution:

Tax credit of 25 per cent for expenditures related to energy conservation as well as same year write-off.

The mechanism:

The program, as explained on the following pages, contains these features: a program that is easy to administer, has built in protection against abuse, and does not continue beyond five years.

Who benefits:

Job holders, because large numbers of people can be employed by businesses to carry out the objectives of the program.

- Consumers, the effects of the program are anti-inflationary.
- Small as well as large businesses. Figures document the incentives provided for both to get the job done quickly.

- Energy intensive industries which often have the most difficulty in raising capital.

- Agriculture which requires energy in substantial amounts for a variety of tasks, including crop drying and quick freezing. A recent U.S. Department of Agriculture study points out how much more rural Americans are dependent upon propane and gasoline than their urban counterparts. About 75 per cent of propane is derived from natural gas, the energy source that is least available.

- Those who are concerned about the environment. Less energy consumption means less adverse environmental impact.

Costs: Both business and government recover the costs of the program. Business cuts energy expenses and realizes additional profits. The government taxes the energy savings. After "break even" points are reached, both profit in every succeeding year.

On the following pages, the program is fully explained with special emphasis on economic and environment impact and the effects on governmental revenue.

"THE MINNESOTA PLAN"

COMMERCIAL-INDUSTRIAL ENERGY CONSERVATION INCENTIVE PROGRAM

THE PROBLEM:

Among those who have examined the energy supply-demand problem for both the U.S. and the world community, there is near unanimity in defining the problem and even a large amount of agreement in identifying solutions. They commonly agree, for example, that:

— Development of new technologies will not take place in the near future. Supplies of "new" energy sources, such as solar and nuclear fusion, will not be available in quantity to have substantial impact before 1985, if then.

— In the immediate (1975-76) and short-term periods (before 1985), energy conservation should be a primary goal of national and international energy policies. In this period, the demands of larger populations and the desire to achieve economic growth will put increasing pressures on existing energy supplies. Therefore, in view of the economic and environmental costs for energy, our rate of consumption must be reduced.

— Given the dimensions of the problem, energy conservation must be achieved by all users, including the homeowner and the commercial-industrial user, in a short time frame (probably within no more than three to five years). This proposal addresses itself to the commercial-industrial effort.

PRIME OBJECTIVE:

TO PROVIDE ECONOMIC INCENTIVES FOR THE COMMERCIAL-INDUSTRIAL SECTOR TO MAKE ENERGY-SAVING CAPITAL EXPENDITURES OF SUFFICIENT SIZE TO REDUCE CONSUMPTION BY AT LEAST 30 PER CENT.

DISCUSSION OF OBJECTIVE:

Many energy saving measures can be adopted with little or no capital expenditures. Because of the significant rise in energy costs in the last two years, many of these already have been taken by industry and commercial businesses. However, there are many other energy-saving measures that could or would be taken if there were additional economic incentives. These require capital expenditures for which funds often are not available, given the competing demands that are being placed upon increasingly scarce capital resources.

(Various kinds of industries and businesses require differing amounts of energy supplies and have varying potentials for achieving energy conservation. On the basis of engineering experience, it is estimated that average energy savings of 15 per cent can be achieved with little or no expenditures and that perhaps savings of 30 per cent can be achieved if sufficient additional capital outlays were made.)

PARAMETERS OF COMMERCIAL-INDUSTRIAL ENERGY CONSERVATION INCENTIVE PROGRAM

In developing such a program, certain assumptions were made:

1) The program must not significantly decrease governmental revenues.

2) The incentive should be provided at the federal level. (The taxation systems of the various states vary greatly and probably could not be employed to achieve a nation-wide result. Corporate income taxes at the federal level are much higher than in the states, hence have greater potential to promote energy saving incentives.)

3) Small corporations must be motivated as well as the larger ones through a tax incentive program. Indeed there are greater potential energy savings to be achieved in small business, given its aggregate affect on total energy usage. Smaller business also frequently needs outside help through consulting firms to identify and achieve energy savings. Funds, particularly in a recession, are lacking for this activity in many smaller businesses. Larger firms may have "in house" personnel capabilities but still lack the capital to achieve the desired results on the scale necessary. This particularly is true of industries which are energy-intensive, such as the chemical, steel and aluminum industries.

4) The program initially must achieve significant results in existing structures and production facilities, many of which are energy wasters. Attention must be given to "retrofit," because most facilities, even in five years, will still have been constructed before 1975.

5) "Pay back" to both the government and business must be short-term, given the urgency of the energy problem and other factors relating to the general economic health of the nation.

THE PROPOSAL

A) AN ENERGY CONSERVATION TAX CREDIT ALLOWED AT 25 PER CENT OF THE TOTAL INVESTMENT.

B) WRITE-OFF FOR DEPRECIATION PURPOSES IN THE YEAR OF INSTALLATION FOR ENERGY CONSERVATION EXPENDITURES.

The tax policy of the United States can be used to accomplish this purpose without continuing cost to industry or to the government. Beyond a short time, industry benefits from continuing energy cost savings and government from continuing increased revenue by taxing the energy savings.

Here is how the program would work.

The present tax structure for corporations includes a maximum federal income tax rate of 48 per cent, commonly a state tax of 2 per cent (for total corporate income tax of 50 per cent), a 10 per cent federal investment credit, and depreciation over 18 years. Thus, for example, if a corporation invests $100,000 for energy-saving purposes, its net cash outlay is $40,000, as shown below:

Capital outlay	$100,000
Less tax recovery on capital costs (50%)	50,000
	$ 50,000
Less 10% investment credit	10,000
	$ 40,000

Under the proposed Commercial-Industrial Energy Conservation Incentive Program, a tax credit would be allowed at 25 per cent of the total investment for qualifying energy conservation facilities and equipment. Thus, a $100,000 capital investment would result in a net cash outlay of $25,000.

Capital outlay	$100,000
Less tax recovery on capital costs (50%)	50,000
	$ 50,000
Less 25% energy conservation tax credit	25,000
	$ 25,000

Table I, below, compares present taxation with proposed method (25 per cent energy conservation tax credit and same year write-off) on a large corporation (50 per cent state and federal tax rate bracket) which spends $10 million of capital on qualifying energy saving facilities and/or equipment. As Table II demonstrates, we obtained essentially the same result on a hypothetical "small" corporation (22 per cent federal, 2 per cent state tax rate bracket) which spent $10,000 for energy conservation purposes.

TABLE I
EXAMPLE: CORPORATIONS IN 50% TAX BRACKET
(48% federal, 2% state)

		(In millions of dollars) Present tax system	Proposed for energy program
1.	CAPITAL EXPENDITURE	$10.0	$10.0
2.	Less recovery through tax credit	-1.0	-2.5
3.	NET FIRST YEAR OUTLAY	$ 9.0	$ 7.5
4.	Less tax recovery of capital costs (federal tax rate 48% state tax rate 2%)	-5.0 (over 18 years)	-5.0 (over 1 year)
5.	Add adjustment to line 4 for present value @ 4% after taxes	+1.2	0.0*
6.	NET CASH OUTLAY	$ 5.2	$ 2.5

*no adjustment because of first-year write-off.

Based upon 3M's experience, an expenditure of $4 for energy conservation purposes yields an energy cost savings of $1. Thus, continuing our example of a 50 per cent bracket corporation spending $10 million for energy conservation purposes, we find that this corporation saves $2.5 million. As the chart below shows, we also deduct the taxes paid and we find that the corporation has an Annual Net Energy Savings of $1.25 million.

1.	Energy Savings	$ 2.5 million
2.	Less taxes paid (50% rate)	-1.25 "
3.	ANNUAL NET ENERGY SAVINGS	$ 1.25 "

To determine the "number of years to recover capital investment," it requires separate calculations for the present tax system, which includes depreciation, and the proposed energy program which contains same year write-off.

Using the double declining method of depreciating, it is calculated that the number of years to recover capital investment is 5.3 years under the present system for a corporation in the 50% tax bracket.

Number of years to recover the capital investment under the proposed energy program is calculated by dividing the Net Cash Outlay by the Annual Net Energy Savings, as shown below:

		(In millions of dollars)
1.	NET CASH OUTLAY	$ 2.5
2.	Divided by ANNUAL NET ENERGY SAVINGS	$ 1.25
3.	Equals TIME TO RECOVER INVESTMENT	2 years

CONCLUSION: A corporation in the federal-state 50 per cent tax bracket would recover its investment under the energy conservation plan in two years rather than 5.3 years under the present system.

TABLE II
EXAMPLE: CORPORATIONS IN 24% TAX BRACKET
(22% federal, 2% state)

		Present tax system	Proposed for energy program
1.	CAPITAL EXPENDITURE	$10,000	$10,000
2.	Less recovery through tax credit	-1,000	-2,500
3.	NET FIRST YEAR OUTLAY	$ 9,000	$ 7,500
4.	Less tax recovery of capital costs (federal tax rate 22%; state tax rate 2%)	-2,400 (over 18 years)	-2,400 (over 1 year)
5.	Add adjustment to line 4 for present value @ 4% after taxes	+600	0*
6.	NET CASH OUTLAY	$ 7,200	$ 5,100

*no adjustment because of first-year write-off.

Again, as pointed out in the $4-$1 energy expenditure-savings ratio in Table I, based upon 3M's experience, an expenditure of $10,000 yields an energy cost savings of $2,500. Thus, as the chart below shows, upon deducting the taxes paid (24% or $600), we find that the small corporation in this example has an Annual Net Energy Savings of $1,900.

1.	Energy Savings	$ 2,500
2.	Less taxes paid @ 24% rate	-600
3.	ANNUAL NET ENERGY SAVINGS	$ 1,900

To determine the "number of years to recover capital investment," it requires separate calculations for the present tax system, which includes depreciation, and the proposed energy program which contains same year write-off.

Using the double declining method of depreciating, it is calculated that the number of years to recover capital investment is 4.25 years under the present system for a corporation in the 24% tax bracket.

Number of years to recover the capital investment under the proposed energy program is calculated by dividing the Net Cash Outlay by the Annual Net Energy Savings, as shown below:

		(In dollars)
1.	NET CASH OUTLAY	$ 5,100
2.	Divided by ANNUAL NET ENERGY SAVINGS	$ 1,900
3.	Equals TIME TO RECOVER INVESTMENT	2.7 years

CONCLUSION: A corporation in the federal-state 24 per cent tax bracket would recover its investment under the energy conservation plan in 2.7 years rather than 4.25 years under the present system.

What would be the effect of such an energy conservation incentive program on governmental revenues?

The government initially would lose revenue because of the 25% tax credit, but it would make up this loss very quickly by taxation of the energy savings in future years. Using the figures in Tables I and II, we calculate that the break even point for the government is 6.0 to 8.2 years.

. . . CONTINUING OUR EXAMPLES OF CORPORATIONS IN:

		50% bracket	24% bracket
1.	Taxes not collected by government because of Energy Conservation Tax Credit	$ 2.5 million	$ 2,500
2.	Tax loss due to first year write-off	$ 5.0 million	$ 2,400
3.	TOTAL COST TO GOVERNMENT	$ 7.5 million	$ 4,900
4.	Divided by amount government recovers each year in taxes on energy savings	$ 1.25 million	$ 600
5.	Equals time in which federal government recovers lost revenue due to energy conservation program	6.0 years	8.2 years
6.	Rate of return to government	15.4 per cent	10.1 per cent

After the break even points for corporations and the government are reached, there would be annual savings for all thereafter. The economic impact would be much greater, however, because there would be less dependence on non-U.S. energy sources and consequently an improved trade account and balance of payments. Monies that might have been destined to leave the U.S. will circulate within the U.S. economy. Jobs would be produced for those who could participate in the "retrofit" of existing plant and equipment. In a short time, the over-all effect of this program would be anti-inflationary — a program that would benefit the consumer.

We feel that the above break even points would provide sufficient incentive for large, energy-intensive companies and industries to spend monies on energy-conservation-related facilities and equipment and the smaller users also would have economic incentive to conserve valuable resources. We appreciate the fact that these expenditures must be competitive, in terms of return on investment, with others that these companies must make if they are to improve productivity and produce new products.

A question that might be asked: how much of the energy conservation activity would have been accomplished under the present 10% tax credit, assuming no new program. That question is not easy to answer precisely. However, it can be assumed that some of it would have, but not enough energy conservation activity would have been achieved as quickly. The incentive for business would be to complete the energy conservation "retrofit" programs quickly because this program would expire in five years. Another related question: what would be the result of such a program, if 30% savings were realized in the industrial commercial sector. We calculate that U.S. usage totals the equivalent of 44 million barrels per day. If the industrial-commercial sector were to reach the goal of 30% savings, there would be conservation of the equivalent of 5.5 million barrels of oil per day.

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FACT SHEET — THE MINNESOTA PLAN

On Commercial-Industrial Conservation Incentive Program

PROBLEM:

If the Commercial-Industrial sector of the economy were to realize 30 per cent savings in energy consumption, the equivalent of about 5.5 million barrels of oil per day would be conserved. The cost of importing this oil at current prices ($13.50 per barrel) is $74.25 million per day. On an annual basis, this oil costs the U.S. payments account about $27 billion — about the same amount of money that the federal government will spend on health in fiscal 1976.

BASIC ASSUMPTIONS:

1) the increased cost of energy already has provided significant incentives to industry and commercial businesses to conserve energy. On the basis of our engineering data as well as other input from public and private sources, we calculate that this sector can conserve 15 per cent of its energy consumption by spending little or no money.

2) to reach total savings of 30 per cent (another 15 per cent, in other words), capital expenditures must be made to alter present plant and equipment for energy conservation purposes. These may total as much as $60 billion. (There are 40 billion square feet of commercial-industrial space in the U.S.; we estimate that it will cost on the average of $1.50 per square foot to alter existing space for energy conservation purposes.)

FUNDAMENTAL ECONOMIC TRADE-OFFS IN A FIVE YEAR PROGRAM

1) assuming 100 per cent participation in the program, total costs would be $60 billion. Energy cost savings using current figures would total $67.75 billion in five years ($13.55 billion times five). From the standpoint of practicality, no program, of course, will receive 100 per cent participation. The important points to remember in examining such figures: A) The maximum cost of such a program does not exceed $60 billion over five years; B) The energy cost savings exceed the total cost of the program in five years. After that, energy cost savings will be a plus in every succeeding year.

2) if no capital expenditures were to be made to achieve the additional 15 per cent conservation goal (for a total of 30 per cent savings in the commercial-industrial sector), we make the assumption that additional energy would have to be produced domestically in order to reach the goal of energy independence. This would amount to developing domestic resources that could produce the equivalent of 2.75 million barrels of oil per day. According to a National Academy of Engineering study, this would require a capital investment of about $110 billion if it were to be accomplished by 1985.

This figure, expressed in 1973-74 dollars, does not include money required for working capital, dividend, debt service, or other financial needs. To that enlarged sum it also is necessary to add the cost of importing oil over the 10 years while the nation is striving to reach that goal. THUS, A MAXIMUM EXPENDITURE OF $60 BILLION ON ENERGY CONSERVATION ELIMINATES THE NEED TO SPEND A MINIMUM OF $110 BILLION ON NEW ENERGY FACILITIES. Not only are results achieved more quickly by spending the $60 billion, but the economic benefits will be distributed more widely and adverse environmental impact is eliminated by avoiding the construction of such energy producers as oil refineries, coal mines, and nuclear power plants.

THE PROPOSAL

a) an energy conservation tax credit at 25 per cent of investment on energy saving facilities and equipment.
b) write-off for depreciation in the year of installation.

OBJECTIVE

To encourage capital expenditures for energy conservation purposes within five years so that commercial-industrial sector achieves energy savings of 30 per cent.

WHAT WOULD BE ACCOMPLISHED?

a) industry would accomplish energy savings very quickly. Break even point for expenditures would be 2 to 2.7 years. Annual cost savings every year thereafter.
b) government would experience improved balance of payments position because there would be less need for foreign oil. In 6.0 to 8.2 years government would recover costs by taxing energy savings.
c) the consumer would benefit because the program is anti-inflationary in as much as it would reduce energy costs.
d) labor would benefit from jobs created by the capital expenditures.

WHAT WOULD BE THE LENGTH OF THE PROGRAM?

Five years.

WHO WOULD QUALIFY FOR PROGRAM?

Commercial and industrial businesses could participate provided a professional or practicing engineer certified that specific projects would yield at least $1 of energy savings for $4 of expenditure. The data for these calculations are readily available and can be easily employed by professionals.

WHAT WOULD GUARD AGAINST ABUSE?

The fraud sections of the internal revenue codes.

WHAT WOULD BE THE MECHANISM TO GUARD AGAINST ABUSE?

Internal Revenue Service audits which routinely are done in most big businesses. In smaller businesses, there would be "spot" audits.

LEGISLATIVE BACKGROUND TO "THE MINNESOTA PLAN"

Related Bills Introduced in 94th Congress

1) H. R. 793	introduced by George M. O'Brien (R., Illinois) on January 14, 1975, to provide for an income tax deduction for expenditures made for effective insulation and heating equipment in residential structures.
2) H. R. 2002	introduced by J. Kenneth Robinson (R., Virginia) on January 23, 1975, to provide a special tax allowance for depreciation with respect to certain by-product and waste energy conversion facilities.
3) H. R. 2066	introduced by Charles A. Vanik (D., Ohio) and 24 co-sponsors, to allow an income tax credit for certain expenditures of a taxpayer relating to thermal design of the taxpayer's residence. Introduced on January 23, 1975, along with similar bills, H. R. 2067, 2068, 2482, 2648, 3064, and 4728.
4) H. R. 2981	introduced by William S. Cohen (D., Maine) to allow individuals an income tax credit for 25% of amounts incurred for the installation of insulation and heating equipment in existing residential structures. Introduced on February 6, 1975.
5) H. R. 3004	introduced by Barry Goldwater Jr., (R., Calif.) to provide for a refundable tax credit for certain building insulation and heating improvements. Introduced on February 6, 1975. Similar bills include H. R. 5003.
6) H. R. 6860	introduced by Al Ullman (D., Oregon) on May 9, 1975, to: 1) impose oil quotas; 2) establish import licensing system; 3) set duties on imported oil; 4) increase gasoline tax; 5) increase tax on special motor fuels; 6) provide for tax credits to offset higher fuel costs; 7) impose an auto fuel efficiency tax; 8) repeal excise tax on intercity buses; 9) repeal excise tax on radial tires; 10) provide a tax credit for home solar energy equipment expenditures; 11) establish an energy conservation and conversion trust fund; 12) set up an excise tax on business use of oil and natural gas;

13) allow five-year amortization of energy-related property;
14) allow investment credits for nondepletable energy sources but deny them for energy consuming devices;
15) provide a tax credit for recycling solid waste materials.

This amended bill passed the House with major provisions intact. Senate Finance completed hearings. Now awaiting "mark up."

7) S. 28 — introduced by Senators Moss (D., Utah) and Cranston (D., California) to provide an income tax deduction or credit for energy conserving residential expenditures. Introduced on January 15, 1975.

8) S. 897 — introduced by Charles Mathias (R., Md.) on February 28, 1975, to provide tax incentives for energy conservation.

9) S. 1195 — introduced by Hugh Scott (R., Pennsylvania) to provide income tax credits for expenditures by an individual to conserve energy used in heating and cooling a home. Introduced March 17, 1975.

10) H. R. 7014 — introduced by John Dingell (D., Michigan) to:
1) establish, contingent on Congressional approval, standby energy authority with respect to energy conservation plans, rationing, international oil allocation, and international energy exchanges;
2) authorize a national civilian strategic petroleum reserve;
3) de-control (in conjunction with a windfall profits tax) the price of domestic old oil;
4) set up a voluntary conservation program for industrial energy users;
5) impose an auto efficiency tax;
6) allow the Administration to require energy efficiency labels for appliances;
7) allow FEA to require more major fuel-burning installations to burn fuels other than oil or natural gas.

Reported to House with amendments on July 9, 1975, passed September 22, 1975. Some "emergency" aspects of this Bill passed Senate in S.622. Now in conference.

11) H. R. 8650 — introduced by William Barrett (D., Pennsylvania) on July 15, 1975, to authorize funds for state and local government programs for insulating the homes of low-income persons and to encourage state and local governments to include energy conservation standards in their building codes. Passed the House with amends on September 5, 1975, referred to Senate Commerce on September 8, 1975.

12) Other energy conservation bills of particular interest to Commercial-Industrial Sector

S. 680 introduced by Richard Stone (D., Florida) to encourage and protect investments in research, exploration, development and production of energy resources. Introduced February 13, 1975.

S. 594 introduced by Hugh Scott (R., Pennsylvania), an omnibus bill that also provides for national energy conservation standards for new residential and commercial buildings. Proposal is being considered by 11 committees. H. R. 2633 is companion bill which was introduced by Harley Staggers (D., Virginia) and Samuel Devine (R., Ohio). Hearings were held in House on March 10, 1975, and in Senate on February 13, 1975.

"THE MINNESOTA PLAN"

COMMERCIAL INDUSTRIAL ENERGY CONSERVATION INCENTIVE ACT OF 1975

ACT SEC. 1 CREDIT FOR ENERGY CONSERVATION EXPENDITURES. —

Act Sec. 1 (a) Allowance of Credit. — Subpart A of part IV of subchapter A of chapter 1 (relating to credits allowed) is amended by inserting after section 40 the following new section:

[Code Sec. 40 A]

"SEC. 40 A. ENERGY CONSERVATION EXPENDITURES.

"(a) General Rule. — There shall be allowed, as a credit against the tax imposed by this chapter, an amount equal to 25 percent of the energy conservation expenditures (as defined in subsection (g)) paid or incurred in such taxable year.

"(b) In Lieu of Section 38 Credit. — The credit allowed by this section shall be in lieu of any credit allowable under section 38 for said expenditures.

"(c) Limitation. — Notwithstanding subsection (a), the credit allowed by this section for the taxable year shall not exceed 100 percent of the liability for tax for the taxable year.

"(d) Liability For Tax. — For purposes of subsection (c), the liability for tax for the taxable year shall be the tax imposed by this chapter for such year, reduced by the sum of the credits allowable under —

(A) section 33 (relating to foreign tax credit),

(B) section 35 (relating to partially tax exempt interest),

(C) section 37 (relating to retirement income),

(D) section 38 (relating to investment in certain depreciable property),

(E) section 40 (relating to expenses of work incentive programs), and

(F) section 41 (relating to contributions to candidates for public office).

"For purposes of this subsection, any tax imposed for the taxable year by section 56 (relating to minimum tax for tax preferences), section 72(m)(5)(B) (relating to 10 percent tax on premature distributions to owner-employees), section 408(e) [f] (relating to additional tax on income from certain retirement accounts), section 402(e) (relating to tax on lump sum distributions), section 531 (relating to accumulated earnings tax), section 541 (relating to personal holding company tax), or section 1378 (relating to tax on certain capital gains of subchapter S corporations), and any additional tax imposed for the taxable year by section 1351(d)(1) (relating to recoveries of foreign expropriation losses), shall not be considered tax imposed by this chapter for such year.

"(e) Carryback and Carryover of Unused Credit. —

"(1) Allowance of Credit. — If the amount of the credit determined under subsection (a) for any taxable year exceeds the limitation provided by subsection (c) for such taxable year (hereinafter in this subsection referred to as "unused credit year"), such excess shall be —

"(A) an energy conservation credit carryback to each of the 3 taxable years preceding the unused credit year, and

"(B) an energy conservation credit carryover to each of the 7 taxable years following the unused credit year

and shall be added to the amount allowable as a credit by section 40 A for such years. The entire amount of the unused credit for an unused credit year shall be carried to the earliest of the 10 taxable years to which (by reason of subparagraphs (A) and (B) such credit may be carried, and then to each of the other 9 taxable years to the extent that, because of the limitation contained in paragraph (2), such unused credit may not be added for a prior taxable year to which such unused credit may be carried.

"(2) Limitation — The amount of the unused credit which may be added under paragraph (1) for any preceding or succeeding taxable year shall not exceed the amount by which the limitation provided by subsection (c) for such taxable year exceeds the sum of —

"(A) the credit allowable under subsection (a) for such taxable year, and

"(B) the amounts which, by reason of this subsection, are added to the amount allowable for such taxable year and attributable to taxable years preceding the unused credit year.

"(f) Recapture. —

"(1) In General. — If during any taxable year the taxpayer disposes of property with respect to which a credit was allowed under subsection (a) at any time within 24 months after the date on which he paid or incurred an energy conservation expenditure, then the tax under this chapter for said taxable year shall be increased by an amount equal to the credits allowed under this section for such taxable year and all prior taxable years.

"(2) Carrybacks and Carryovers Adjusted. — In the case of any disposition described in paragraph (1), the carrybacks and carryovers under subsection (e) shall be properly adjusted.

"(3) Section Not To Apply In Certain Cases. — Subsection (f) shall not apply to —

"(A) a transfer by reason of death, or

"(B) a transaction to which section 381(a) applies.

"(4) Special Rule. — Any increase in tax under paragraph (1) shall not be treated as tax imposed by this chapter for purposes of determining the amount of any credit allowable under subpart A.

"(g) Definitions; Special Rules. —

"(1) For purposes of this section, the term "energy conservation expenditures" means amounts paid or incurred by the taxpayer for the retrofit of plant, equipment and other business facilities utilized in the taxpayer's trade or business on October 1, 1975, provided that each dollar of retrofit expenditure results in an energy savings of 25 cents in the taxpayer's trade or business.

"(2) No item shall be taken into account under paragraph (1) unless the 25 percent energy savings required thereunder is certified by a licensed or practicing engineer and a certification by the engineer in accordance with regulations prescribed by the Secretary or his delegate is attached to the return of tax on which the credit is claimed.

"(3) No item shall be taken into account under paragraph (1) to the extent that the expenditure is made for the retrofit of residential property.

"(4) Subchapter S Corporations. — In case of an electing small business corporation (as defined in section 1371)

"(1) the energy conservation expenditures for each taxable year shall be apportioned pro rata among the persons who are shareholders of such corporation on the last day of such taxable year, and

"(2) any person to whom any expenditures have been apportioned under paragraph (1) shall be treated (for purposes of this subpart) as the taxpayer with respect to such expenditures.

"(5) Estates and Trusts. — In the case of an estate or trust —

"(1) the energy conservation expenditures for any taxable year shall be apportioned between the estate or trust and the beneficiaries on the basis of income of the estate or trust allocable to each,

"(2) any beneficiary to whom any expenditures have been apportioned under paragraph (1) shall be treated (for purposes of this subpart) as the taxpayer with respect to such expenditures.

"(6) Limitations With Respect To Certain Persons. — In the case of —

"(1) an organization to which section 593 applies,

"(2) a regulated investment company or a real estate investment trust subject to taxation under subchapter M (section 851 and following), and

"(3) a cooperative organization described in section 1381(a),

rules similar to the rules provided in section 46(d) shall apply under regulations prescribed by the Secretary or his delegate.

"(7) Cross Reference. —

For application of this subpart to certain acquiring corporations, see section 381(c)(25). Act. Sec. 1(b) Technical and Clerical Amendments. —

Act. Sec. 1(b) (1) The table of sections for such subpart is amended by inserting after section 40 the following:

"Sec. 40 A. Energy conservation expenditures."

Act Sec. 1(b) (2) Section 56(a)(2) (relating to imposition of minimum tax) is amended by redesignating clauses (v), (vi) and (vii) as clauses (vi), (vii) and (viii) and by inserting after clause (iv) the following new clause:

"(v) section 40 A (relating to energy conservation expenditures)".

Act Sec. 1(b) (3) Section 56(c)(1) (relating to tax carryovers) is amended by redesignating subparagraphs (E), (F) and (G) as subparagraphs (F), (G) and (H) and by inserting after subparagraph (D) the following new subparagraph:

"(E) section 40 A (relating to energy conservation expenditures)".

Act Sec. 1(b) (4) Section 381(c) (relating to certain acquiring corporations) is amended by inserting after paragraph (24) the following new paragraph:

"(25) Credit Under Section 40 A for Energy Conservation Expenditures. — The acquiring corporation shall take into account (to the extent proper to carry out the purposes of this section and section 40 A, and under such regulations as may be prescribed by the Secretary or his delegate) the items required to be taken into account for purposes of section 40 A in respect of the distributor or transferor corporation.

Act Sec. 1(b) (5) Section 6096(b) (relating to designation of income tax payments to Presidential Election Campaign Fund) is amended by inserting after section number 40 the following new section number:

"40 A"

ACT SEC. 2. DEDUCTION FOR ENERGY CONSERVATION EXPENDITURES. —

Act. Sec. 2(a) Allowance of Deduction. — Part VI of subchapter B of chapter 1 (relating to itemized deductions for individuals and corporations) is amended by adding thereto the following new section:

[Code. Sec. 189]

"Sec. 189. Energy Conservation Expenditures.

"(a) In General. — A taxpayer may treat energy conservation expenditures which are paid or incurred by him during the taxable year in connection with his trade or business as expenses which are not chargeable to capital account. The expenditures so treated shall be allowed as a deduction.

"(b) Definitions. — For purposes of subsection (a) the term "energy conservation expenditures" shall have the same meaning and be subject to the same restrictions as are set forth in subsection (g)(1), (2) and (3) of section 40 A (relating to the credit for energy conservation expenditures).

"(c) When Method May Be Adopted. —

"(1) Without Consent. — A taxpayer may, without the consent of the Secretary or his delegate, adopt the method provided in this section for his first taxable year —

"(A) which begins after December 31, 1975, and ends after the date on which this title is enacted, and

"(B) for which expenditures described in subsection (a) are paid or incurred.

"(2) With Consent. — A taxpayer may, with the consent of the Secretary or his delegate, adopt at any time the method provided in this section.

"(d) Scope. — The method adopted under this section shall apply to all expenditures described in subsection (a). The method adopted shall be adhered to in computing taxable income for the taxable year and for all subsequent taxable years unless, with the approval of the Secretary or his delegate, a change to a different method is authorized with respect to part or all of such expenditures.

Act Sec. 2(b) Technical and Clerical Amendments. — The table of sections for such part is amended by adding at the end thereof the following new section:

"Sec. 189. Energy conservation expenditures."

ACT SEC. 3 EFFECTIVE DATES; TERMINATION PROVISION. —

Act Sec. 3 (a) Sections 1 and 2. — Except as provided in paragraph (b), the amendments made by sections 1 and 2 shall apply to amounts paid or incurred after December 31, 1975, in taxable years ending after December 31, 1975.

Act Sec. 3 (b) Sections 1 and 2. — The amendments made by sections 1 and 2 shall not apply to amounts paid or incurred after December 31, 1980.

Chairman KENNEDY. I would be interested in what your general observations have been with regard to the business community generally in moving in the areas which you and Mr. Hubner have testified on to achieve that approximately 20- or 25-percent savings? How active is the business community generally just under the existing structure and system; what can we expect?

Have you got any sort of ballpark figures based upon your own knowledge of other major companies and corporations? How much progress are we really making?

Mr. ASPENSON. Mr. Chairman, are you asking me for a percentage of energy reduction?

Chairman KENNEDY. I was just wondering what you could tell us about, if you can, a percentage or give us whatever comment you would have or general reaction. You must be in touch with many of the leaders of companies and corporations who must be giving a good deal of thought to this. You talked about what it could mean if you get a 20- or 25-percent savings generally among American industry and I am just wondering how rapidly other companies and corporations are moving in that direction?

Mr. Hubner, do you want to take that?

Mr. ASPENSON. There are a number of companies that are active. They are primarily the ones that have captive engineering groups within their corporation. Very few companies have probably gone out and hired professional people to make energy conservation analysis.

I wish I could say that the majority of American business has responded to the problem and have shown similar results, but in my opinion this is not the case. Many of them have reduced energy use. I think they are all aware and concerned with the problem, but the conviction in many cases to get the job done is not there.

Chairman KENNEDY. Mr. Hubner.

Mr. HUBNER. I believe most corporations have given energy conservation a good college try. It is pretty hard to guess at the number, but if I were to guess I would say 10- or 15-percent savings might have been made over all. Some companies have not saved as much as that because they are much more energy intensive, so the potential for savings simply isn't there.

So, I do think constant pushing in this entire area on the part of the Government can produce some quite dramatic results.

Chairman KENNEDY. How are we going to get the smaller industries and business which don't have "the engineering techniques", and backup that both of your companies have. How can we get them to move ahead in these areas?

Mr. HUBNER. Well, I think there are at least two areas. One would be communication leadership, promulgation of ideas and exchange of information. The other is to acknowledge that some smaller businesses simply can't afford the capital expenditures and that it might be necessary to help them. If something like the "Minnesota plan" would help, then that would be a worthwhile consideration.

Mr. ASPENSON. Tax incentive legislation would certainly do that. In other cases, the emphasis has to be put on the educational process. Not just for the commercial sector, but also for the small business, the industrial, and certainly the residential sectors. People won't respond until they really understand the energy facts. And we are going to have to, through Washington, do the job of educating all sectors of society to the real facts of the energy problem.

Chairman KENNEDY. Through the States, I would think so.

Mr. ASPENSON. No question. The States working with the Federal Government.

Chairman KENNEDY. What about it, Mrs. Redford, how about the other great sector of our Nation, the residential sector, the homeowner. Why haven't we been able to as a society get them more interested and more concerned and more involved in trying to do something in these areas.

Mrs. REDFORD. I think basically it is exactly the same issues you are addressing in industry and business, and which is first of all information, and second, the capital to make those kinds of improvements.

Information which is accurate is a problem throughout the entire society. Much of the information that comes out is misinformation, and some of the information that comes out of some of the Federal agencies, I think, tends to be written in bureaucratese and is difficult for people to understand. Conservation has not yet become an issue that people have been able to internalize.

Chairman KENNEDY. If the savings are as dramatic as mentioned in terms of the companies or corporations millions and millions of dollars, and if the savings are perhaps in the hundreds of dollars for the homeowner, what else beyond the dissemination of information ought to be done in terms of getting the homeowner interested.

If you are able to show them what can actually be achieved in terms of savings, it seems to me that this in itself should be an incentive for them to take the kind of steps in areas of conservation which would be self-evident. Have we been that bad or has the leadership been that poor in terms of the whole conservation issue, where the public just doesn't believe that those savings can be realized, or is it because we are in a world or an atmosphere of such cynicism and skepticism that they just don't really believe that they are going to be able to have these kinds of savings?

What do you think, Mrs. Redford?

Mrs. REDFORD. I think so. I think today there is an atmosphere that most of our lives are pretty well out of our own hands. Most of the processes we live by today are not within the boundaries of our own control.

The notion of a person being self-sufficient is a notion of a day gone by. We can't be. We rely on many things for just the daily process of living, and so perhaps the consumer begins to abdicate his responsibility for his own self-determinations. Looking toward trying to stimulate interest in doing things for ourself has to be coupled with the possibility that a mechanism exists to do so. That is some sort of financial assistance where the consumer can control some financial decisions. Yes, I do think there is a lot of cynicism.

Chairman KENNEDY. What is your reaction, Mr. Aspenson, and Mr. Hubner, to setting some requirements or standards in the construction of various structures today? Should we be thinking in those terms or should we be encouraging the States to do so, or, to meet the kinds of energy needs that your companies have been doing? Do you have any feeling about that?

Mr. ASPENSON. Mr. Chairman, I think it is absolutely essential that all energy use structures be designed energy efficiently. Whether it is ASHRAE 90–75 or whether it is individual State efficiency standards,

even if they are mandatory, this is the one way to accomplish this objective. It has to be done. Certainly in the area of retrofit, if other things are done, this can be kept on a voluntary basis. We will get active response by all sectors and we can make energy reduction achievements.

Our key problem lies between now and 1980. There is no other approach that I can see to help solve the energy problem in this time frame other than energy conservation. With our increased need for growth in GNP, I just don't see how we can continue throwing out the billions of dollars per year to other countries.

The $25 billion for oil imports has to stay at $25 billion or be decreased. We can't let it approach 50.

Chairman KENNEDY. Mr. Hubner.

Mr. HUBNER. I would certainly agree generally with that. I believe that the guidelines that have been established are impressive and there are more conservation results you can get by cutting down the areas of glass in new buildings, and increasing insulation.

Mrs. REDFORD. Could I say something, Mr. Chairman?

Chairman KENNEDY. Yes.

Mrs. REDFORD. I think part of the problem is that we don't have qualified people to help to have a homeowner-consumer make some of these determinations. You know, in some rural areas, the county agent was enormously helpful to the local farmer in giving him the kind of pragmatic helpful information that the farmer needed. We need the same kind of approach in our cities and throughout the country, someone that people can turn to for this kind of information. For example, some are telling him what it will save if you put in storm doors, what it will save you if you caulk your windows. There needs to be a grassroots approach to information. I believe thinking in terms of something like the county agent approach might be helpful.

Chairman KENNEDY. Just a brief final question.

Would you think that if the Congress has some reservations about the tax credit approach, I mean that may fly and it may not, that loan guarantees would be another option that should be considered by the Congress in terms of permitting either homeowners or perhaps small industries, the ability to move into this area with the idea of payback types of provisions.

Do any of you have any reactions on that?

Mr. HUBNER. I think it certainly is a consideration, Mr. Chairman, because obviously many elderly people and low-income people, people on fixed incomes as well as small businesses simply cannot afford the front-end money that is required to get savings over the life of the improvement.

So, I think it is a possibility.

Chairman KENNEDY. Just finally, Mr. Hubner, how does your building design that you have done in Michigan compare, which only uses 50,000 Btu's, differ from the ones you have which use 200–400,000 Btu?

Mr. HUBNER. It has double glassing and more insulation all throughout. It also has much lower lighting levels. You provide the right amount of light to do a given job, and you don't provide a lot of light throughout the rest of the building where it is not needed.

Chairman KENNEDY. Like we do here?

Mr. HUBNER. That was unintentional. And we have reduced considerably the amount of glass used.

Chairman KENNEDY. Senator Percy.

Senator PERCY. Mr. Chairman, I would like to point out that when I came into this room the thermostat was set at 92°. We have subsequently turned this down to 67° and the room is still 73°.

Two weeks ago I worked for 3 hours in an unemployment compensation office in Chicago to see why it took so long to process applications. It was a fairly cold day outside and people were heavily clothed. There was no place for them to hang their coats. They had to either hold them in their arms or just keep them on. The average waiting time was 2½ hours and that room was 90°.

We have got to stop talking about this and do something about it. I hope Chairman Kennedy will join me in writing a letter to the Superintendent of the Senate Buildings about wasting energy in these buildings, particularly in hearing rooms where the glare of television cameras adds to the heat. I literally leave hearings ready to go take a shower, and the same sort of thing happens all over this country.

Shoppers who are heavily clothed go into stores and they are absolutely baked when they get inside. I know we overheat them in the winter, and then we freeze them in the summer. They come in from the high temperatures outside, and they are frozen inside.

The whole mood of this country has to change. And I don't know any better way to do it than have it cost a lot. IBM has to be cost conscious and recognizes that as I used to say in business, you don't make money, you save money many times. Every company in this country ought to realize that they are throwing money down the drain if they don't do exactly what IBM is doing.

I wonder how many companies are as energy conscious as 3M and IBM. Do you have any idea whether it is a fairly widespread practice, or are you unique?

Mr. HUBNER. Well, Senator Percy, I believe that major companies are really trying to conserve, simply out of business necessity. The costs just simply drive them to it. And as I did mention earlier, I think smaller businesses can use some help.

Senator PERCY. Well, I would like to insert your testimony in the Congressional Record, all three of you, because I would like industry to know what two great companies are doing, and the leadership they are exerting. I also think it would be desirable for industry to learn a little bit more about CAN, because it appears to be a nonprofit group really dedicating itself to doing something about energy conservation.

If any of you have mailing lists you would like me to send the testimony out to, I would be glad to put a little preliminary statement in and will ask Chairman Kennedy to join me. I think the return on this investment will be very high for the modest costs that it would involve.

What you have been talking about may look a little exotic and not too practical, but practical people are coming in and saying this is good business. We are going to have to do this sort of thing in the future.

I would like to ask first about ERDA because I managed a related bill for the Republican side and for the Energy Research and Development Administration. ERDA is the principal instrument for the

Government acting as a capitalist in this field, and I wonder whether you feel the rate of expenditures are proportioned properly or whether you would like to take a look with us at it. They have a forecast in the new budget for 1977 of $1.4 billion for nuclear research and development against $900 million for nonnuclear energy research and development.

Already the research money for the future is going very heavily into the nuclear area.

You may want to jot these figures down. We actually spent $15 million for solar energy development in 1975. This is to be increased to $110 million in 1977. In the area of geothermal energy development, we spent $19.9 million in 1975, while $44 million is projected for 1977.

In your judgment are these ratios right, or should we question them, and in the future move much more rapidly in the nonnuclear area?

Mrs. REDFORD. We must move as rapidly as possible in the nonnuclear area. We must now start long-term planning. I would like to think we are going to be around 100 years from now, and if we are going to be around without lethally endangering our atmosphere and environment, we simply must look toward renewable energy resources. We had better start doing that right now by recognizing the fact that renewable energy resources are the only sources of energy which don't add heat to our atmosphere. If we continue to produce energy which adds heat to the atmosphere, we are going to disrupt the entire cycle of this Earth.

Senator PERCY. In your testimony, Mrs. Redford, you indicate it is difficult to burn coal and preserve air quality. This is certainly true today.

Do you think research and development will be able to make coal more burnable under present quality standards if we emphasize those standards in research for the coal resource program?

Mrs. REDFORD. I guess if the ultimate use of coal is going to be to burn it, perhaps it is.

I believe that when we think in terms of long-term use of coal, once again we will have to consider the fact that if our petroleum and natural gas is gone, we may have to use coal for synthetics, certain drugs and chemicals, or petrochemicals. I am not sure burning coal or trying to develop a process that burns coal better is the only use of coal we must consider. I think we have to give that some very, very serious thought.

Senator PERCY. You also mention that while it may be foolish to suggest that nuclear energy has no place in meeting the energy goals of this Nation, its problems are awesome. I would say that's almost an understatement.

Mrs. REDFORD. I tried to be kind—I tried to be reasonable.

Senator PERCY. I would recommend to you, for study by your group, the complete set of hearings—I will see that you get them when they are published—that we have been holding in the Government Operations Committee on the proliferation of nuclear plants. Dr. Leibenthal testified in those hearings that he was happy he was as old as he was because he wouldn't want to be the age of his children for fear of what he sees ahead. When that comes from the Director of the Atomic Energy Commission, it's a rather startling statement—just one of many startling statements by eminent scientists.

I am not surprised that three executives of a prominent nuclear manufacturer resigned yesterday. They are going to sign up as volunteers with you, and devote themselves to your kind of work because we are in a very dangerous period. There is no stopping the development of nuclear power now, but we can certainly look and listen as we did in South Carolina. In that case we stopped the production of that plant which would have been extraordinarily dangerous, I think.

I think your testimony is very practical and sound and hardheaded.

Mrs. REDFORD. May I just say something as far as nuclear energy is concerned. The reason that we are trying to promote the use of conservation, and the use of solar technology and renewable energy sources is because of our fear of going down the nuclear path. We feel it is very important, however, when you are an opponent of a specific energy resource, that you have an alternative to suggest.

We don't feel it would be constructive just to be antinuclear without saying here are some energy options, and that's the reason I have worded it the way I have.

Mr. ASPENSON. Senator Percy, could I say something on one of your previous questions?

Senator PERCY. Yes, sir.

Mr. ASPENSON. In respect to priorities, I hope you could tell from my statement today that there is no question in my mind that the priorities are not proper, that they are misplaced. When we look at the administration's budget for ERDA of $2.4 billion—$709 million for fission, $282 million for nuclear fuel, $116 million for solar, and energy conservation of only $91 million. FEA's budget request was for $259 million. But they were appropriated $142.9 million. Most of the dollars that have been left out were in the educational area for promoting the need for energy conservation. I hope I made my point today that I felt was so necessary. To actually give more people the opportunity to do more things for reducing energy use. Certainly continued efforts have to be made in all of the other areas requiring new technologies, but the priorities are wrong if we are going to accomplish what I have outlined.

Our dollars and efforts have to be put into energy conservation.

Senator PERCY. And the public has to made conscious of it.

Mr ASPENSON. Yes, sir.

Senator PERCY. I think that's the purpose of public hearings on this subject, and that's why I am as anxious to get as many people to read your testimony as possible.

Mrs. Redford.

Mrs. REDFORD. I just have one additional comment, and that's the problem of cost. You mentioned the fact if cost goes up we will conserve. I think we have to consider the fact that the people who are generally hurt most by cost increases are poor people in our society. If we tend to think in that direction we better be thinking about how the poor are going to be able to handle it.

Senator PERCY. OK.

Just a couple of clarification points, Mr. Hubner. In your new high-rise building in Chicago, which we are happy to have, you achieved 42-percent rate of improvement in energy efficiency. On your chart I noticed that in Campbell, Calif., you had 53 percent improvement, but you have another plant in California that only had a 28-percent.

And down in Burlington, Vt., only 19 percent. Why this disparity? Do you think it is the management or was is something else?

Mr. HUBNER. Well, the difference is in conditions, and not in the intention of the management. The plant at Campbell, Calif., is a very small operation that prints tabulating cards. The plant in Burlington is a much newer plant and would have taken advantage of later design techniques. Therefore, the opportunities for savings at Campbell simply weren't as much.

Senator PERCY. I do have further questions. You probably know that there was a lot of opposition to the President signing the omnibus energy bill. In fact, I was called into a Cabinet meeting one night about it and every Republican in there, many members of the party leadership, were telling him to veto the bill. I had to be the one adviser—and it wasn't unusual among Republicans for me to differ—to tell him I thought he had to sign that bill. Your actions and testimony are an indication that you, too, are trying to reduce the energy consumption on computers and so forth. Do you think the Labeling Act, to at least let consumer know which appliance consumes the most or least amount of energy, is a good provision in that it serves as another way to try to make people conscious of energy consumption?

Mr. ASPENSON. I do, yes, sir.

Mr. HUBNER. I do, too.

Senator PERCY. I want to thank you very much, indeed, all three of you. You have presented an extraordinarily good set of testimony, and we are most grateful to you.

Chairman KENNEDY. Thank you.

We may pose additional written questions to the witnesses to complete the hearing record.

The hearing will recess until February 24, 1976.

[Whereupon, at 12:55 p.m., the subcommittee recessed, to reconvene at 10 a.m., on February 24, 1976.]

[The following questions and answers were subsequently supplied for the record:]

RESPONSE OF HON. FRANK G. ZARB TO ADDITIONAL WRITTEN QUESTIONS POSED BY CHAIRMAN KENNEDY

Question 1. What is a rough estimate of the percentage of the guarantees issued under the Energy Independence Authority that would be used for energy conservation?

Answer. The proposed Energy Independence Authority Act does not prescribe the percentage of guarantees to be issued for any of the various types of projects which would qualify for support under the bill. That decision is reserved to the five voting members of the Board of Directors, who are thus enabled to vary relative financial allocations in accordance with the changing relative needs of the qualifying project categories. However, in view of the emphasis given to the national need for energy conservation in the Findings and Purposes sections of the bill—and in view of the specific authority given to support conservation technologies, processes, or techniques not in widespread use at the time of the Authority's commitment of financial assistance—there is little doubt that a significant percentage of guarantees issued by the Board of Directors would be allocated to projects involving energy conservation.

Question 2. Has any study been made to determine the total cost of the legal actions which are delaying the construction of nuclear power plants? What are the trade-offs, particularly in terms of environmental impacts?

Answer. To our knowledge, no study has been done specifically to assess the costs of delay to nuclear power plants caused by legal actions. However, FEA has made other analyses which bear on this question.

The Presidential Task Force on Power Plant Acceleration, an inter-agency group which is administered within FEA's Office of Energy Resource Development, has recently completed a survey of problems delaying the construction of signficant power plants around the country. By interpreting "legal actions" as legal intervention plus regulatory delay stemming from state or federal legal requirements, the Task Force has found that construction of *28* nuclear generating units has been delayed during the past year by legal actions. The average delay in projected on-line schedules was *one year*. To measure the cost of nuclear plant delays, the Task Force uses a figure of $10,000,000 per month (or $120,000,000 per year) per 1000 MW, taking into consideration rising capital costs due to inflation and the cost of replacement energy. At that figure, an average one year delay to 28 generating units would equal a total cost of $3,360,000,000.

In a study done for the FEA in June 1975, on "Energy Facility Siting Delays—the Economic Impact of Delays in Construction Starts," the Institute for Energy Analysis at Oak Ridge, Tennessee, estimated the cost of a one-year delay to an LWR nuclear plant at $160,000,000. Using that figure, the delay cost for the 28 units would be $4,480,000,000.

Question 3. Would you provide the specifications for the University of Texas study?

Answer. Attached is the "Contract Schedule" for the University of Texas study referenced in the question (Attachment 3). It includes a detailed statement of work which describes the objectives of the study. Also attached, for your information, is a copy of the Executive Summary of the study as issued in April, 1976 (Attachment 4).

The study first established three basic growth rates for electric demand based on assumed rates of population and economic growth, various own and cross elasticities and various degrees of non-price motivated conservation. A series of scenarios was investigated for meeting the projected demand through the most economic forms of generation, first with no constraints and then with a nuclear constrained scenario emphasizing, in turn, oil, coal and a mix of coal and oil.

The environmental, economic, and social impacts of the nuclear constrained scenarios were then compared to those produced through the unconstrained, "Business as Usual", cases. The results were stated in the final report with no recommendations as to which course should be taken. The most critical assumption underlying the entire study was that any shortfall in electric energy from nuclear sources would be offset by increased coal or oil generation.

In addition, the recent decision by the Nuclear Regulatory Commission to postpone construction permits for 7 generating units and operatng permits for another 4 units will delay those units by at least 3 to 6 months. Also in question is whether to revoke the operating permits for 2 other nuclear plants which are the subject of the law suits filed against the NRC. At the $10,000,000 per month figure, the construction delays alone equal another $210,000,000 to $420,000,000.

Threatening to cause inestimable additional delays to nuclear plant construction are nuclear moratorium initiatives pending in 32 of the 50 states. FEA did an informal study on the numbers and types of these initiatives and found that 117,217 MW of capacity not yet under construction and 113,109 MW of capacity now existing or under construction could be cancelled or otherwise affected by these initiatives.

As to environmental trade-offs, most federal and state regulatory bodies now have stringent environmental standards for new power plants. Therefore, if one considers these existing standards adequate for the protection of the environment, the main trade-off for legal actions is economic impact on the consumer of electricity who eventually will have to pay the bills for these delays.

We have attached copies of an interim Task Force report (Attachment 1) along with a list of those major projects currently being planned or constructed (Attachment 2).

Question 4. How much energy savings would result if the price of gasoline were to be increased by 10, 20, 30, and 40 cents per gallon taxes, respectively? How much additional revenue would such taxes raise? What if the first 500 gallons for each driver is exempted? What effect would these taxes have on the economy?

Answer. The amount of fuel savings that a gasoline tax may generate depends on the level of the tax, the price elasticity of demand for gasoline and the price elasticity of demand for more efficient automobiles relative to the change in

the price of gasoline. The price elasticity of gasoline is the most important element in determining the fuel savings resulting from an increase in gasoline prices. Unfortunately, there is a great deal of uncertainty associated with estimating gasoline price elasticity. Short term elasticity estimates range from —0.06 to —0.43. Long run estimates are even more uncertain. As a consequence of this uncertainty, it is very difficult to quantify fuel savings from a specific change in the price of gasoline. Notwithstanding the above uncertainty, we have estimated that a 20 to 25 cent gasoline tax would reduce gasoline consumption by about 400 thousand barrels per day (MB/D) in the short run and by about 1,000 MB/D in the long run.

The revenue generated from a gasoline tax would be substantial. For example, over 100 billion gallons of gasoline were sold last year. Thus, a 20 cent tax would generate something over 20 billion dollars in revenue. The economic effect of a gasoline tax would depend on the level of the tax and whether other actions are taken to mitigate its impacts. For example, if a tax were established at a high rate (i.e., 20–40 cents per gallon) it would have significant adverse economic effects—resulting from the increase in vehicle operating cost and the associated depression of the automobile related industry. Automobile sales would be adversely affected; an estimate of the short run elasticity of automobile demand with respect to gasoline is —0.6 (i.e., a 40 cent tax would reduce sales by 30 percent). Additionally, a gasoline tax is regressive, placing greater burdens on the low and middle income families.

Other measures such as rebates, exempting a prescribed amount of gasoline purchase from the tax, and loans or loan guarantees to distressed industries could mitigate the adverse impacts of high gasoline taxes. However, such measures may be administratively burdensome and potentially inequitable.

Attachments.

ATTACHMENT 1

REVIEW AND EVALUATION: PRESIDENTIAL TASK FORCE ON POWER PLANT ACCELERATION

I. INTRODUCTION AND PURPOSE OF REPORT

This report is a review and evaluation of the activities of the Presidential Task Force on Power Plant Acceleration, a group established on an interim basis by direction of the President to deal with site-specific problems of power plant construction. The report is one of four reviews and summaries prepared during the life of the Task Force. Summaries of Task Force activities were sent to the Executive Committee on December 31, 1975 and April 19, 1976, and a "Review of Task Force Operations" was issued on March 16, 1976.

In brief, the recommendation of this report is that the Task Force mechanism be continued in substantially the same form as has developed, for another six months.

The contents of this report are as follows:

II. BACKGROUND

In June 1975, the President's Labor-Management Committee responded to growing concern over a rash of deferrals and cancellations of new electricity generating facilities by recommending to President Ford that a special inter-federal agency task force be set up "to discover the impediments to the completion of electric utility plants and to take steps to relieve the particular situation wherever possible." The President endorsed this recommendation and instructed Frank Zarb, as Executive Director of the Energy Resources Council and head of the Federal Energy Administration, to implement the recommendation.

To establish a data base for the Task Force, the Federal Energy Administration in July 1975, conducted a brief in-person survey of utilities reporting delays in construction of power plants. The survey, which covered 133 plants in planning or construction by 72 utilities, revealed that the average delay at that time was 23 months, caused primarily by (1) financing difficulties (2) uncertainties surrounding future demand and (3) federal and state regulatory policies.

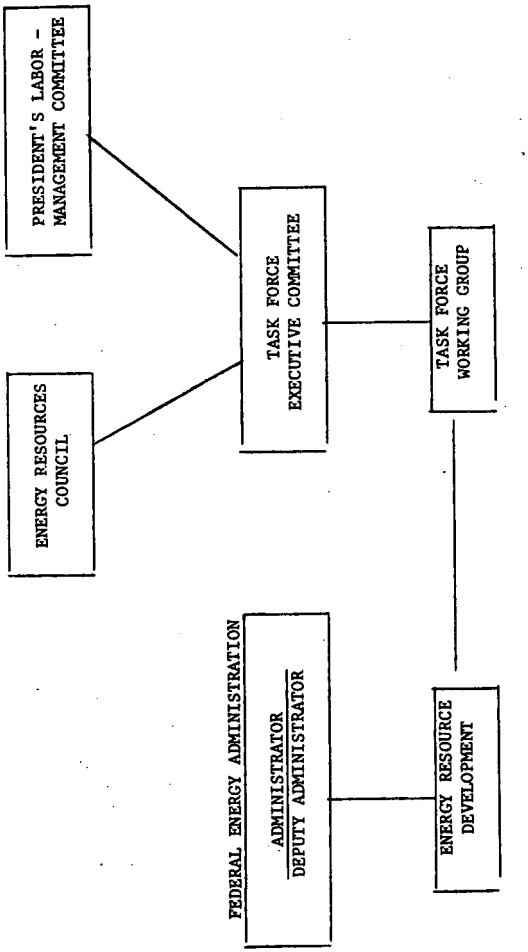
Following the survey, the Presidential Task Force on Power Plant Acceleration was organized to pursue the mandate of the President's directive. Comprised of a small working group of Federal Energy Administration personnel directed by an Executive Committee of senior officials of nine energy-related federal agencies, the Task Force began operations in November 1975. The group viewed its role as that of trouble-shooter and problem solver and adopted as its mission the identification, investigation and resolution of plant-specific problems delaying the construction of power plant projects in order to expedite the decision-making and construction process.

III. ORGANIZATION

A. TASK FORCE EXECUTIVE COMMITTEE

Chairman:	John Hill, Deputy Administrator Federal Energy Administration
Vice Chairman:	William Rosenberg Assistant Administrator Federal Energy Administration
	Gerald Parsky, Assistant Secretary Department of the Treasury
	James G. Watt, Commissioner Federal Power Commission
	Richard W. Roberts Assistant Administrator Energy Research and Development Administration
	Alvin L. Alm Assistant Administrator Environmental Protection Agency
	John Mumford, Consultant to The Secretary of Labor
	Department of Commerce: Member to be named
	Department of the Interior: Member to be named
Participating Observer:	William Dircks, Assistant Director for Operations Nuclear Regulatory Commission
Executive Director:	Michael Kutsch Federal Energy Administration (formerly Ronald Naples)

B. ORGANIZATION CHART



IV. CONCEPT OF TASK FORCE APPROACH

The Presidential Task Force on Power Plant Acceleration was established to provide a group which could function as a trouble-shooter and problem-solver. This meant in its approach the group had to be prepared to effectively address problems in an interagency setting, to understand, focus and leverage the activities of all involved agencies and to be able to evaluate power plant construction problems as well as to design and propose solutions.

Generally, the approach of the Task Force was to seek to play an active role in expediting the construction process where the need for power was certified, where the utility desired to expedite the project, and where the difficulties were such that the Task Force could be usefully and productively involved. Essentially, in seeking to achieve short-term, demonstrable results in accelerating the construction of specific power plant projects, the Task Force acted as an expediter to promote responsible solutions to problems rather than as an advocate for any particular point of view.

The courses of action available to the Task Force in order to accomplish its mission were diverse. Taking advantage of its inter-agency nature, the Task Force acted as a coordinating body and a communications channel, mediated disputes, focused attention on critical issues and long-range implications, mobilized resources and suggested alternative or compromise solutions. Generally, the Task Force played its most important role by providing a forum in which problems, uncertainties and misconceptions could be addressed openly.

V. RESULTS AND OUTPUT

The results which the Task Force has achieved over the past eight months should be viewed both objectively and subjectively. The objective results which follow focus on the quantitative, on results estimable in terms of numbers. The discussion of subjective perceptions is an attempt to measure the subtle, unquantifiable impacts of the actions of the group. While the objective achievements are more immediate in their returns, the less measurable dimensions of subjective perceptions and credibility may have a more telling effect on the possible future role of a group such as the Task Force.

A. OBJECTIVE RESULTS

1. INVENTORY AND MONITORING SYSTEM

The Task Force has developed an inventory of all significant* power plant projects in planning or construction. This inventory has been developed through personal contact with each utility, initially by mail and subsequently by phone.

This inventory provides information relating to size, fuel type, on-line date (original and current), and the reason for delay if slippage has occurred. Files have been established on each plant containing this information as well as the name and individual designated by a senior official as a future contact point for Task Force inquiries or utility-initiated requests for assistance. (Inventory available upon request to Power Plant Task Force, Federal Energy Administration.)

* Defined as 200MW or larger and planned to come on-line prior to 1990 and primarily non-petroleum-fueled unless in plans of utility with other non-petroleum projects.

2. PROJECT INVOLVEMENT

Utilizing the inventory of all significant power plant projects in planning or construction, the Task Force has identified as delayed and become actively involved in 12 plants totaling 18,414 mw's. The following is a review of project involvement to date, identifying specific projects, the situation and actions taken and an estimate of the effect, measured in terms of time and dollars, of Task Force intervention.

Plant, Company	Description	Estimated Savings
Pleasant Prairie 1&2 Wisconsin Electric Power Co. Coal, 580 M.W. each	Focused attention of Department of Wisconsin Natural Resources Board on implications of ozone resolution which the Board was to vote upon. Initiated submissions of "expert" testimony by EPA & FEA on the validity and substance of issues addressed in resolution. Actions resulted in approval of modified resolution which eliminated likely two-year delay in lead time for project. T.F. wrote Corps of Engineers to ask them to accelerate their environmental review and issuance of permits and Corps responded that they will cooperate with State of Wisconsin in a joint environmental review. Region V testified at Wisconsin PSC hearings on application for emergency construction authorization. PSC granted authorization.	Time - 2 years Dollars - $72 Million

Plant, Company	Description	Estimated Savings
St. Lucie #2 Florida Power & Light Co. Nuclear, 890 M.W.	Focused the attention of the Florida Governor and Cabinet and regulatory bodies on the possible delay effects of its decision on state radiological review. Promoted the adoption of a compacted procedural schedule for radiological review by Florida Dept. of Environmental Regulation which was eventually adopted. Arranged and coordinated NRC support to Florida Department of Environmental Regulation with resultant effect of reducing the initially planned one year review to six months. Have urged Florida and the NRC to integrate their respective radiological reviews of nuclear plants. Upcoming plant in late summer expected to be first beneficiary of this integrated review.	Time - 6 months Dollars - $60 Million
Geysers 12-15 Pacific Gas & Electric Co. Geothermal, 400 M.W.	Cleared uncertainties and misconceptions between company, PUC and local authorities on status of environmental review, role of Air Pollution Control District and relation of relevant permitting jurisdictions. Initiated and arranged testimony by FEA Regional Office before Local Zoning Board in hearings on a Sierra Club challenge to a land use permit issued for project.	Results Unquantifiable

Plant, Company	Description	Estimated Savings
Helms Creek Pacific Gas & Electric Co. Pump Storage, 1125 M.W.	Resolved uncertainties between company and US Forest Service on negotiations concerning project cost-sharing. Encouraged speedy review of delayed EIS by: Communicating with FPC to cause early review of project submission so as to enable timely construction start; FPC issued license in April. Writing California PUC to expedite issuance of construction permit; PUC issued construction permit on June 2.	Time - 1 year Dollars - $12 Million
Shoreham Long Island Lighting Co. Nuclear, 849 M.W.	Initiated contacts through the Labor Department with local labor unions to negotiate a special labor agreement which provided for an additional shift at the plant for less than the established double-time premium, resulting in increased employment and earlier on-line date for a previously delayed plant.	Time - 1-2 months Dollars - $10-20 Million
Gerald Gentleman #1 Nebraska Public Power District Coal, 650 M.W.	Communicated concerns to Federal Power Commission and developed various procedural compromises with FPC which sketched out alternative courses of action for the company. Endorsed FPC interim decision resulting in the granting of an exception to begin construction prior to final reviews. This early decision allowed construction to begin on company schedule three to six months earlier than initial FPC estimate.	Time - 3-6 months Dollars - $9-18 Million

Plant, Company	Description	Estimated Savings
Pilgrim #2 Boston Edison Co. Nuclear, 1180 M.W.	A series of meetings and communications have been held to discuss and resolve several outstanding issues. The output of this involvement has been: Arranged and coordinated FEA testimony presented on "need for power" before the NRC's Atomic Safety and Licensing Board hearings and Massachusetts Energy Policy Office hearings dealing with "need." Mobilized EPA (Federal) resources to assist the new Massachusetts Department of Environmental Quality and Engineering in the establishment of their general procedures and subsequently in the specific review and report on Pilgrim #2. This assistance was to assure the timely completion of the state review within the framework of the company's current critical path. Involvement in discussions with the NRC/USGS promoting a timely decision on the appropriate seismic design criteria for Pilgrim #2 with careful consideration of the ramifications of the decision. Ultimate NRC decision will require additional 1 year delay to conduct further seismic studies.	Prior to adverse NRC decision, 3 months Dollars - $30 Million

Plant, Company	Description	Estimated Savings
Jamesport 1&2 Long Island Lighting Co. Nuclear, 1150 M.W. each	Held meetings with the NYPSC to identify the outstanding issues delaying the state siting review of the plant and received a commitment that they would attempt to expedite the review. Expressed the TF's general concern with the NYPSC failure to license a plant over the past four years.	Time - 1 month Dollars - $20 Million
Pioneer 1&2 Idaho Power Co. Coal, 500 M.W. each	Met with the State Public Utilities Commission. Introduced the idea of Federal assistance in the development of new "expertise" at the state level capable of reviewing a coal plant. Emphasized the importance of coal-fired power plants in achieving national energy objectives. PUC decision regarding the state siting approval as yet not reached.	Results Unquantifiable
Naughton 4&5 Utah Power and Light Co. Coal, 415 M.W. each	Met with BLM and learned that Naughton will probably be included in Interior regional EIS which will not be finished until 1978. Initiated meeting between Assistant Administrator of FEA and Assistant Secretary of Interior to discuss effects of regional EIS's on power projects in the West.	Results Unquantifiable

Plant, Company	Description	Estimated Savings
Alma 6 Dairyland Power Coop Coal, 350 M.W.	Task Force and FEA Region V wrote Secretary of Wisconsin Department of Natural Resources urging him to make prompt decision regarding the construction of a coal delivery rail loop for Alma 6. DNR responded that review will be expedited.	Results Unquantifiable
Perkins 1-3 Duke Power Co. Nuclear, 1280 M.W. each	Provided assistance to N.C. Utilities Commission to enable them to finish load forecast which, by law, must precede issuance of permits for individual plants in N.C., such as Perkins. NCUC has submitted revised schedule, which will allow completion of review process for Perkins by February 1977 when permit is needed.	(1) Time - 2-3 months Dollars - $250 Million (1) Delay in construction start for Perkins beyond Feb. '77 would disrupt construction schedule for entire "Duke six-pack" (Perkins 1-3 and Cherokee 1-3), causing a loss of $250 million.

Additional facilities for which the Task Force has provided limited or partial assistance:

Plant, Company	Description	Estimated Savings
Seabrook Public Service of New Hampshire Nuclear, 1150 M.W. each	Promoted the submission of testimony by FEA on behalf of project similar to testimony initiated on behalf of Pilgrim II.	Results Unquantifiable
Arkansas Nuclear One #2 Arkansas Power & Light Nuclear, 950 M.W.	Eased labor uncertainties by confirming, through the Labor Department, the efforts of the union International on behalf of local needs.	Results Unquantifiable
Sterling Nuclear Rochester Gas & Electric Nuclear, 1100 M.W.	Encouraged EPA Region II to expedite review of water discharge permit, which they readily agreed to do.	Time - 1 month Dollars - $10 Million
New York Utility Companies	Task Force met with New York Public Service Commission on behalf of the Electric Utilities of New York to urge that the existing New York siting process be reviewed.	Results Unquantifiable
M.T.A. Power Authority of the State of New York Coal/Refuse, 700 M.W.	Involved EPA Region II in a debate between PASNY and the NYPSC regarding appropriate water discharge standards which had been delaying the docketing of the State siting application.	Results Unquantifiable

3. STATISTICAL TOTALS

Power Plants	Type	Capacity (MW)	Time	Dollars
9	Nuclear	16,099	1-1 1/2 yrs	200-400 Million
6	Coal	3,610	2-2 1/2 yrs	80-100 Million
2	Pumped Storage	2,125	1-1	12-12 Million
1	Geothermal	400	1	-
18		22,234 MW	4-5 years	292-512 Million

* Totals are approximations and do not necessarily agree with individual project breakdown data.

It should be noted that the above time and dollar savings are estimated only for projects for which the results of the Task Force role were reasonably clear. The Task Force impact on several listed projects is not currently measurable, and no attempt was made to include estimated savings for these projects in the statistical totals. It seems clear, however, that the total time and dollar savings of the Task Force effort will ultimately far exceed those indicated above when the final result from all projects becomes identifiable.

The Task Force calculations of approximate dollar savings include estimates of interest expense, escalation of construction costs, and fuel cost differentials between planned facilities and oil or gas alternatives. In some cases, direct input from the respective utility companies on the financial consequences of specific delays has been incorporated into the calculations.

B. SUBJECTIVE OBSERVATIONS

The foregoing discussion of objective results and tangible actions provides some measure of the success of Task Force operations and the usefulness of the Task Force concept. Just as important, however, is the matter of intangible perceptions and credibility. The experience of the Task Force thus far has indicated an impact beyond the specific actions taken in its expediter role.

In almost every case which the Task Force identified for active involvement, after initial contact by the Task Force, the company involved not only accepted Task Force proposals for assistance, but initiated ongoing contacts and raised new issues to be addressed. Even in projects which initially appeared unpromising for Task Force involvement, the companies frequently contacted the Task Force later on their own initiative to air problems. As a result, in every case listed previously, the Task Force has taken some action which has had positive and constructive results. In no case has the Task Force received any unfavorable reaction or criticism of its role or its actions.

Generally, through its ability to move quickly and decisively and as evidenced by its reception among those with which it has dealt, we feel that the Task Force has conveyed impressions of competence and action-orientation and the capability to achieve results.

VI. EVALUATION

In evaluating the worth of the Task Force effort, two basic questions arise. One, was there a demand for the kind of role which the group sought to play? And two, if there was such a market, was the inter-agency task force concept the appropriate vehicle to serve the market?

When the group began its work, it became clear that there was a tremendous demand for a single point of contact within government with which various groups could deal in trying to pull together the diverse strands of government regulation and special interests which affect power plant development. The market for the Task Force function was clearly manifested by the continuing receptivity the group found among those with which it dealt, particularly the utility companies.

The organization of a non-institutional interagency group as the mechanism for pursuing the trouble-shooting role for power plant development proved an appropriate choice. The interagency nature of the group provided the ability to play the middleman role in specific disputes without serving any specific interest, and it prevented the group from being generally viewed in its dealings with other government agencies as a vehicle to promote specific institutional interests.

The Task Force concept allowed the group flexibility of action, quickness of response and the mobility to move in and out of situations in order to make optimal use of its limited resources in a way such as would have been greatly inhibited by a more traditional institutional setting. Further, the Presidential mandate of the group, and its concomitant Executive Committee, allowed access to Federal and State agencies, utilities and other involved groups at a policy level.

The matter of how well the group served its purpose is a question of objective and subjective results, as discussed above, in relation to available resources and of how well the Task Force laid the foundation for continuing contributions by its successor.

VII. RECOMMENDATION

In order to perform the problem-solving role assumed by the Task Force, an interagency outlook, high-level access and timely response are absolutely essential. Future conditions of demand and financial uncertainty, continuing lengthy regulatory review and

unresolved environmental and safety issues suggest that the trouble-shooting role is one that will continue to be necessary. Focusing this role at a central point within government has worked through the Task Force mechanism thus far and will continue to be an efficient mechanism for the future. For these reasons, it is recommended that:

1. The work of the Task Force be continued, and

2. The Task Force mechanism be continued in substantially the same form for another six months.

ATTACHMENT 2

STATUS:

SIGNIFICANT U.S. POWER PLANTS IN PLANNING OR CONSTRUCTION

PRESIDENTIAL TASK FORCE ON
POWER PLANT ACCELERATION
FEDERAL ENERGY ADMINISTRATION
WASHINGTON, D.C. 20461

JULY 1, 1976

The following information on the status of significant power plant projects in planning or construction was obtained through personal communication between senior executives of the respective electric utility companies and the Presidential Task Force on Power Plant Acceleration. The information was collected in an attempt to determine the "current" status of all "significant" U.S. electrical generating facilities in planning or construction in order that the Task Force's Presidential directive, "to discover the impediments to the completion of electric utility plants and to take steps to relieve the particular situation wherever possible," could be achieved.

This list is a compilation of the information collected by the Task Force over the past six months. It is not an attempt to portray all planned future electrical generating facilities at a particular point in time. Rather, it is the by-product of a dynamic process designed to identify the problems which currently delay significant projects and could usefully be addressed by the Task Force.

Comments or inquiries regarding this list should be directed to Ms. Elaine Smith, Presidential Task Force on Power Plant Acceleration, FEA Room 3344, Washington, D.C. 20461 (phone: 202-961-8553).

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GLOSSARY

"Significant Projects"	Defined as larger than 200 MW, originally planned to come on-line by 1990, and generally non-oil or -gas fired unless project planned by electric utility with other non-oil or -gas fired plants in planning or construction.
Company	Self explanatory
Project	Self explanatory
Fuel Type	Self explanatory
Size	Self explanatory
Current Status	Three general categories: "Early Planning" (EP) - prior to submission of licensing and certification applications "Licensing and Certification" (LC) - after filing for appropriate permission but prior to issuance of final constuction go-ahead "Construction" (C) - under construction - not yet operational
On-Line	
Original	Utility's original plan for the plant
Last Report	Most current information available from various sources prior to direct company contact
Current	Present expected date indicated by company in direct contact
Problem	If slippage between "last report" and "current" on-line dates, reason for slippage indicated in this section
Date of Inquiry	Date of latest contact with electric utility company

STATISTICAL SUMMARY

Utilities Contacted		110
Power Plants Surveyed		224
Nuclear	89	
Coal	104	
Hydro	15	
Other (oil, geothermal)	16	
	224	
Generating Units		437
Delayed Units		143
Delayed	101	
Deferred	34	
Cancelled	8	
	143	

Causes of Delay: (1) Regulatory problems (2) Demand and Finance (3) Other, such as environmental restrictions and labor problems

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Alabama Power Co.								
Barton - 1	Nuclear	1191MW	LC	1981	1983	Deferred	Finance	5/27/76
2	Nuclear	1208MW	LC	1982	1984	Deferred	Finance	5/27/76
3	Nuclear	1208MW	LC	1983	1985	Deferred	Finance	5/27/76
4	Nuclear	1208MW	LC	1984	1985	Deferred	Finance	5/27/76
Farley - 1	Nuclear	844MW	C	1976	1976	1977	Anti-trust	5/27/76
2	Nuclear	844MW	C	1977	1977	1978	Anti-trust	5/27/76
Miller - 1	Coal	683MW	C	1978	1978	1978	Finance	5/27/76
2	Coal	683MW	C	1979	1979	1981	Finance	5/27/76
3	Coal	683MW	C	1980	1980	1982	Finance	5/27/76
Allegheny Power System								
Davis Power Project	Pumped Storage	100MW	LC	1976	1980	1981	FPC permit	4/29/76
Pleasants - 1	Coal	660MW	C	1978	1979	Uncertain	Finance	4/29/76
2	Coal	660MW	C	1979	1980	Uncertain	Finance	4/29/76
Appalachian Power Co. (American Electric Power)								
Project 1301	Coal	1300MW	C	1977		1980	Demand & Finance	6/10/76
Blue Ridge - 1-5	Hydro	1025MW	LC	1980		1984	State opposition	6/10/76
Arizona Power Authority								
Montezuma	Pumped Storage	500MW	C	1977	1980	1982	Demand	4/28/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Arizona Public Service								
Cholla - 2	Coal	250MW	LC	1976	1977	1978	Demand	3/10/76
3	Coal	250MW	LC	1977	1978	1979	Demand	3/10/76
4	Coal	250MW	LC	1978	1979	1980	Demand	3/10/76
Palo Verde - 1	Nuclear	1238MW	LC	1981	1981	1982	Demand	3/10/76
2	Nuclear	1238MW	LC	1982	1982	1984	Demand	3/10/76
3	Nuclear	1238MW	LC	1984	1984	1986	Demand	3/10/76
Arkansas Power and Light								
Arkansas Nuclear One #2	Nuclear	950MW	C	1976	1977	1978	Labor shortage	2/20/76
White Bluffs - 1	Coal	800MW	LC	1978	1979	Indefinite	Finance	2/20/76
2	Coal	800MW	LC	1979	1981	Indefinite	Finance	2/20/76
3	Coal	800MW	LC	1980	1982	Indefinite	Finance	2/20/76
4	Coal	800MW	LC	1981	1983	Indefinite	Finance	2/20/76
Associated Electric Corp.								
New Madrid #2	Coal	600MW	C	1977	1977	1977	None	5/14/76
Thomas Hill 3	Coal	600MW	LC	1981	1981	1981	None	5/14/76
Baltimore Gas & Electric								
Brandon Shores - 1	Oil/Coal	600MW	EP	1980	1980	1980	None	3/4/76
2	Oil/Coal	600MW	EP	1981	1981	1982	Finance & Demand	3/4/76
Calvert Cliffs 2	Nuclear	800MW	C	1977	1977	1977	None	3/4/76
Basin Electric Power Corp								
Laramie River Station - 1	Coal	500MW	LC	1979	1979	1980	Permits and	3/29/76
2	Coal	500MW	LC	1979	1980	1980	Pollution	3/29/76
3	Coal	500MW	LC	1982	1982	1983	standards	3/29/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Black Hills Power & Light								
Wyodak 1	Coal	330MW	C	1977	1978	1976	None	5/19/76
Boston Edison Co.								
Pilgrim #2	Nuclear	1180MW	LC	1980	1982	1983	Seismic design criteria	4/15/76
Buckeye Power Inc.								
Cardinal 3	Coal	600MW	C	1976	1976	1977	Problems resolved	4/6/76
Cajun Electric Power Corp.								
Big Cajun - 1	Coal	540MW	C	1979	1979	1979	None	4/14/76
2	Coal	540MW	C	1980	1980	1980	None	4/14/76
Carolina Power & Light Co.								
Brunswick 1	Nuclear	821MW	C	1976	1976	1977	Closed cycle cooling	2/10/76
Harris - 1	Nuclear	900MW	LC	1977	1984	1984	None	2/18/76
2	Nuclear	900MW	LC	1978	1986	1986	None	2/18/76
3	Nuclear	900MW	LC	1979	1990	1990	None	2/18/76
4	Nuclear	900MW	LC	1980	1988	1988	None	2/18/76
Roxboro 4	Coal	720MW	LC	1981	1980	1980	None	2/10/76
Central Illinois Light Co.								
Duck Creek - 1	Coal	400MW	C	1976	1976	1976	Installation of scrubber	5/4/76
2	Coal	400MW	LC	1979	1981	1982	Finance & Demand	5/4/76
3	Coal	500MW	LC	1982	1984	1986	Finance & Demand	5/4/76
4	Coal	600MW	LC	1990	1990	1990	Finance & Demand	5/4/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Central Illinois Public Service								
Newton - 1	Coal	600MW	C	1977	1977	1977	None	4/20/76
2	Coal	600MW	C	1981	1981	1981	None	4/20/76
Central Louisiana Electric Co.								
Rodemacher 2	Coal	530MW	?	1979	1979	Unknown	No co. response	5/27/76
Central Maine Power								
Sears Island	Nuclear	1150MW	EP	1983	1984	1986	Demand	4/1/76
Wyman #4	Oil	600MW	LC	1977	1977	1978	Demand	4/1/76
Central Power & Light								
Caleto Creek 1	Coal	550MW	C	1979	1980	1980	None	5/4/76
Cincinnati Gas & Electric								
East Bend - 1	Coal	600MW	LC	1981	1982	Indefinite	Demand	4/2/76
2	Coal	600MW	LC	1979	1980	1980	None	4/2/76
Miami Forte 8	Coal	500MW	C	1977	1978	1978	None	4/2/76
Zimmer - 1	Nuclear	810MW	C	1975	1979	1979	None	4/2/76
2	Nuclear	1150MW	C	1982	1984	Indefinite	Demand	4/2/76
Cleveland Electric Illuminating								
Perry - 1	Nuclear	1205MW	LC	1979	1980	1980	None	4/15/76
2	Nuclear	1205MW	LC	1980	1982	1982	None	4/15/76
Colorado Ute Electric Assn.								
Craig Station - 1	Coal	447MW	C	1979	1979	1979	Possible problem: Environmental review by DOI	4/27/76
2	Coal	447MW	C	1978	1978	1978		4/27/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Columbus & Southern Ohio Electric Co.								
Conesville - 5	Coal	411MW	C	1976	1976	1976	None	5/4/76
6	Coal	411MW	C	1977	1978	1978	Finance	5/4/76
Posten - 5	Coal	413MW	C	1978	1981	1981	Finance	5/4/76
6	Coal	413MW	C	1979	1983	1983	Finance	5/4/76
Commonwealth Edison Co.								
Braidwood - 1	Nuclear	1120MW	LC	1977	1981	1981	Possible problem:	4/8/76
2	Nuclear	1120MW	LC	1980	1982	1982	permit	4/8/76
Byron - 1	Nuclear	1120MW	C	1978	1980	1980	Possible problem:	4/8/76
2	Nuclear	1120MW	C	1979	1982	1982	permit	4/8/76
Collins - 1 & 2	Oil	100MW each	C	1976	1976	1977	Possible problem:	4/8/76
3 & 4	Oil	100MW each	C	1977	1977	1978	permit	4/8/76
5		100MW	C	1978	1978	1979		4/8/76
Lasalle Station - 1	Nuclear	1078MW	C	1978	1978	1979	None	4/8/76
2	Nuclear	1078MW	C	1979	1979	1979	None	4/8/76
Consolidated Edison Co.								
Cornwall	Pumped Storage	2000MW	LC	1970	1985-86	Unknown	Legal delays	3/5/76
Consumers Power								
Campbell 3	Coal	770MW	C	1977	1980	1980	None	5/3/76
Karn 4	Oil	663MW	C	1975	1976	1977	None	5/3/76
Midland - 1	Nuclear	506MW	C	1981	1982	1982	None	5/3/76
2	Nuclear	855MW	C	1981	1981	198	None	5/3/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	 LAST REPORT	 CURRENT	PROBLEM	DATE OF INQUIRY
Dairyland Power Coop								
Alma 6	Coal	350MW	C/LC	1978	1979	1979	DNR,Corps permits	3/19-22/76
Lansing Transmission Line		161KV	LC	1977	1977	1977	Environmental review: Corps,FWS	3/19/76
Dayton Power & Light Co.								
Killen - 1	Coal	600MW	C	1979	1983	1983	None	6/24/76
2	Coal	600MW	C/LC	1980	1981	1981	Corps permits	
Delmarva Power & Light								
Indian River 4	Coal	400MW	C	1978	1979	1979	Demand	5/17/76
Summit - 1	Nuclear	770MW		1980	1981	Cancelled	Materials/Demand	5/17/76
2	Nuclear	770MW		1982	1984	Cancelled	Materials/Demand	5/17/76
Detroit Edison								
Belle River - 1	Coal	676MW	C	1979		Indefinite	Finance	4/29/76
2	Coal	676MW	C	1979		Indefinite	Finance	4/29/76
Fermi 2	Nuclear	1093MW	C	1974	Indefinite	Indefinite	Finance	4/29/76
Greenwood - 1	Nuclear	1205MW	C	1979	Indefinite	Indefinite	Finance	4/29/76
2	Nuclear	1205MW	C	1979	Indefinite	Indefinite	Finance	4/29/76
3	Nuclear	1205MW	C	1979	Indefinite	Indefinite	Finance	4/29/76
Duke Power								
Catawba - 1	Nuclear	1157MW	C	1979	1981	1981	None	5/3/76
2	Nuclear	1157MW	C	1980	1982	1982	None	5/3/76
Cherokee - 1	Nuclear	1280MW	LC	1981	1983	1984	Demand	5/3/76
2	Nuclear	1280MW	LC	1982	1985	1986	Demand	5/3/76
3	Nuclear	1280MW	LC	1983	1987	1988	Demand	5/3/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Duke Power (cont d)								
McGuire - 1	Nuclear	1180MW	C	1976	1978	1978	None	5/3/76
2	Nuclear	1180MW	C	1977	1979	1979	None	5/3/76
Perkins - 1	Nuclear	1280MW	LC	1981	1983	1985	State permits	5/3/76
2	Nuclear	1280MW	LC	1982	1985	1987	State permits	5/3/76
3	Nuclear	1280MW	LC	1983	1987	1989	State permits	5/3/76
Duquesne Light Co.								
Beaver Valley - 1	Nuclear	853MW	C	1975	1976	1976	None	4/15/76
2	Nuclear	853MW	C	1978	1981	1981	None	4/15/76
Florida Power Corp.								
Anclote 2	Oil	515MW	C	1975	Indefinite	1978	Deferred	4/14/76
Crystal River 3	Nuclear	825MW	C	1974	1976	1976	None	4/14/76
N/D - 1	Coal	600MW	EP	1982	1982	1982	None	4/14/76
2	Coal	600MW	EP	1984	1984	1984	None	4/14/76
Florida Power & Light								
Martin County - 1	Oil	431MW	C	1977	1979	1979	None	4/15/76
2	Oil	431MW	C	1978	1981	1981	None	4/15/76
St. Lucie 2	Nuclear	890MW	LC	1979	1981	1981	None	4/15/76
N/D	Nuclear	1140MW	EP	1984	1984	1984	None	4/15/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
General Public Utilities								
Coho #1	Coal	800MW	EP	1979	1987	1987	None	4/13/76
Forked River 1	Nuclear	1120MW	LC	1978	1982	1982	None	4/13/76
Gilbert #9	Coal	800MW	EP	1980	1990	1990	None	4/14/76
Mount Hope	Pumped Storage	800MW	LC	1985	1990	1992	Land ownership	4/13/76
Portland #5	Nuclear	1200MW	EP	1984	1994	1994	None	4/13/76
Scotsville #1	Coal	800MW	EP	1983	1991	1991	None	4/13/76
Seward #7	Coal	800MW	EP	1978	1984	1984	None	4/13/76
Stoney Creek	Pumped Storage	800MW	EP	1982	1989	1989	None	4/13/76
Three Mile Island	Nuclear	880MW	C	1977	1978	1978	None	4/13/76
Wehrum 1	Coal	800MW	EP	1986	1993	1993	None	4/13/76
Georgia Power Co.								
Hatch - 1	Nuclear	786MW	C	1975	1975	Commercial	None	3/31/76
2	Nuclear	786MW	C	1978	1979	1979	None	3/31/76
Rocky Mountain	Pumped Storage	675MW	LC	1983	1983	1983	None	3/31/76
Scherer - 1	Coal	825MW	EP	1981	1981	1981	None	3/31/76
2	Coal	825MW	EP	1982	1982	1982	None	3/31/76
3	Coal	825MW	EP	1984	1984	1984	None	3/31/76
4	Coal	825MW	EP	1985	1985	1985	None	3/31/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Georgia Power Co. (cont d.)								
Vogtle - 1	Nuclear	1100MW	LC	1980	Indefinite	1983	None	3/31/76
2	Nuclear	1100MW	LC	1981	Indefinite	1984	None	3/31/76
Wallace Dam	Pumped Storage	324MW	LC	1976	1979	1980	Demand	3/31/76
Wansly - 1	Coal	880MW	C	1976	1976	Start up	None	3/31/76
2	Coal	880MW	C	1977	1978	1978	None	3/31/76
Gulf States Utilities								
Blue Hills - 1	Nuclear	930MW	LC	1981	1985	1989	Demand	4/15/76
2	Nuclear	930MW	LC	1983	1987	1989	Demand	4/15/76
Nelson - 5	Coal	540MW	LC	1978	1979	1984	Demand	2/13/76
6	Coal	540MW	LC	1979	1984	1985	Demand	2/13/76
Riverbend - 1	Nuclear	940MW	C	1980	1981	1981	Labor	2/13/76
2	Nuclear	940MW	C	1980	1981	1983	Labor	2/13/76
Sabine 5	Oil/Gas	480MW	C	1976	1977	1979	Demand	2/13/76
Houston Lighting & Power Co.								
Allens Creek - 1	Nuclear	1200MW	LC	1980	1980	Indefinite	Demand/Finance	5/5/76
2	Nuclear	1200MW	LC	1982	1982	Indefinite	Demand/Finance	5/5/76
Parish - 5	Coal/Gas/Oil	660MW	C	1978	1979	1979	ICC Hearing	5/5/76
6	Coal/Gas/Oil	660MW	C	1980	1981	1981	pending	
South Texas - 1	Nuclear	1250MW	C	1980	1980	1980	None	5/5/76
2	Nuclear	1250MW	C	1982	1982	1982	None	5/5/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Idaho Power Co.								
Pioneer - 1	Coal	500MW	LC	1980	1981	Unknown	Siting Permit	4/15/76
2	Coal	500MW	LC	1981	1983	Unknown	Siting Permit	4/15/76
Illinois Power Co.								
Clinton - 1	Nuclear	950MW	C	1980	1981	1981	None	4/20/76
2	Nuclear	950MW	C	1983	1984	1984	None	4/20/76
Havana 6	Coal	450MW	C	1978	1978	1978	None	4/20/76
Indiana & Michigan Electric Co.								
Breed - 1	Coal	1300MW	LC	1979	1980's	Indefinite	Demand/Finance	5/3/76
2	Coal	1300MW	LC	1981	1980's	Indefinite	Demand/Finance	5/3/76
Cook 2	Nuclear	1060MW	C	1974	Indefinite	1978	None	5/3/76
Indianapolis Power & Light								
Petersburg - 3	Coal	600MW	C	1977	1977	1977	None	5/28/76
4	Coal	600MW	EP	1981	1981	1982	Demand (minor)	5/28/76
Interstate Power Co.								
Lansing 4	Coal	260MW	C		1977	1977	None	3/19/76
Iowa Power & Light								
Central Iowa	Nuclear	1200MW	LC	1984	1984	1985	NRC Review	5/14/76
Council Bluff 3	Coal	650MW	C	1979	1979	1978	None	5/14/76
Iowa Public Service Co.								
George Neal 4	Coal	576MW	C/LC	1979	1979	1979	Possible problem: delay in EPA EIS	4/7/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	 LAST REPORT	 CURRENT	PROBLEM	DATE OF INQUIRY
Iowa Southern Co.								
Ottumua I	Coal	675MW	LC	1981	1981	1981	None	5/14/76
Kansas City Board of Public Utilities								
Nearman Creek - 1	Coal	246MW	C	1978		1979	Permits: Corps,EPA	5/18,28/76
2	Coal	319MW	LC	1982		1982	Permits: Corps,EPA	5/18,28/76
Kansas City Power & Light								
Iatan 1	Coal	630MW	C	1979	1980	1980	None	5/25/76
La Cygne 2	Coal	630MW	C	1977	1977	1977	None	5/25/76
Kansas Power & Light								
Jeffrey Energy Center - 1	Coal	680MW	C	1978	1978	1978	None	5/18/76
2	Coal	680MW	LC	1979	1980	1980	None	5/18/76
3	Coal	680MW	LC	1980	1982	1982	None	5/18/76
4	Coal	680MW	LC	1982	1984	1984	None	5/18/76
Kansas Gas & Electric								
Wolf Creek 1	Nuclear	1150MW	LC	1980	1981	1982	Intervenors	2/13/76
Kentucky Utilities								
Ghent 2	Coal	500MW	C	1977	1977	1977	None	4/13/76
Long Island Lighting Co.								
Jamesport - 1	Nuclear	1150MW	LC	1981	1982	1983	State Permits	4/15/76
2	Nuclear	1150MW	LC	1981	1982	1983	State Permits	
Northport	Oil	380MW	C	1977	1977	1977	None	4/15/76
Shoreham 1	Nuclear	849MW	C	1975	1978	1978	None	4/15/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Los Angeles Dept. of Water & Power								
Castaic 2	Pumped Storage	625MW	C	1978	1978	1978	None	4/29/76
Intermountain - 1	Coal	750MW	EP	1983	1983	1983	None	4/29/76
2	Coal	750MW	EP	1984	1984	1984	None	4/29/76
3	Coal	750MW	EP	1985	1985	1985	None	4/29/76
4	Coal	750MW	EP	1986	1986	1986	None	4/29/76
San Joaquin - 1	Nuclear	1300MW	LC	1981	1983	1985	State Permits	4/29/76
2	Nuclear	1300MW	LC	1983	1985	1986	State Permits	4/29/76
3	Nuclear	1300MW	LC	1985	1986	1988	State Permits	4/29/76
4	Nuclear	1300MW	LC	1986	1988	1989	State Permits	4/29/76
Louisiana Power & Light								
St. Rosalie - 1	Nuclear	1150MW	EP	1984	1984	Cancelled	Demand & Finance	4/14/76
2	Nuclear	1150MW	EP	1984	1985	Cancelled	Demand & Finance	4/14/76
Waterford 3	Nuclear	1165MW	C	1977	1980	1980	None	4/14/76
Louisville Gas & Electric								
Mill Creek - 3	Coal	425MW	C	1977	1977	1977	None	4/13/76
4	Coal	495MW	C	1979	1979	1979	None	4/13/76
Trimble County - 1	Coal	500MW	LC	1981	1981	1981	None	4/13/76
2	Coal	500MW	LC	1984	1984	1984	None	4/13/76
3	Coal	675MW	EP	1986	1986	1986	None	4/13/76
4	Coal	675MW	EP	1988	1988	1988	None	4/13/76
Lower Colorado River Authority								
Fayette - 1	Coal	600MW	C	1979	1979	1979	None	5/6/76
2	Coal	600MW	LC	1980	1980	1980	None	5/6/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Minnesota Power & Light								
Clay Boswell #4	Coal	500MW	LC	1980	1980	1980(?)	Possible problem: state permits	5/17/76
Minnkota Power Coop								
Center 2	Lignite	435MW	C	1977	1977	1977	Possible problem: scrubbers	3/23/76
Mississippi Power Co.								
Jackson County - 1	Oil/Coal	500MW	C	1976	1977	1977	None	4/30/76
2	Oil/Coal	500MW	C	1978	1979	1980	New ownership/ Demand	4/30/76
Mississippi Power & Light								
Grand Gulf - 1	Nuclear	1250MW	LC	1979	1979	1979	Finance	2/17/76
2	Nuclear	1250MW	LC	1981	1983	1983	Finance	2/17/76
Montana Power Co.								
Colstrip - 2	Coal	330MW	C	1976	1976			
3	Coal	700MW	C	1978	1979			
4	Coal	700MW	C	1979	1980			
Nebraska Public Power District								
Gerald Gentleman 1	Coal	650MW	C	1977	1978	1978	None	4/15/76
Nevada Power Co.								
Harry Allen - 1	Coal	500MW	LC	1978	1980	1983	Finance	3/8/76
2	Coal	500MW	LC	1979	1981	1984	Finance	3/8/76
3	Coal	500MW	LC	1980	1982	1985	Finance	3/8/76
4	Coal	500MW	LC	1981	1983	1986	Finance	3/8/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Nevada Power Co. (cont'd)								
Warner Valley - 1	Coal	250MW	LC	1978	1979	1982	Finance	3/8/76
2	Coal	250MW	LC	1979	1980	1983	Finance	3/8/76
New England Electric								
Charlestown - 1	Nuclear	1200MW	LC		1983			
2	Nuclear	1200MW	LC		1985			
New York State Electric & Gas								
Cayuga	Coal	800MW	LC	1980	1979	1982	State permits	3/5/76
Homer City	Coal	600MW	C	1977	1977	1977	None	3/5/76
N/D - 1	Nuclear	1200MW	EP	1987	1987	1987	None	3/5/76
2	Nuclear	1200MW	EP	1987	1987	1987	None	3/5/76
Niagara Mohawk Co.								
Lake Erie - 1	Oil	850MW	LC	1985	1985	1985	None	3/5/76
2	Oil	850MW	LC	1987	1987	1987	None	3/5/76
Nine Mile Point #2	Nuclear	1100MW	C	1979	1982	1982	None	3/5/76
Oswego - 5	Oil	800MW	C	1976	1975	1976	Demand	3/5/76
6	Oil	800MW	C	1979	1978	1979	Demand	3/5/76
Northeast Utilities								
Millstone - 2	Nuclear	830MW		1975	1975	Operational		4/13/76
3	Nuclear	1150MW	C	1979	1979	1982	Finance	4/13/76
Montague - 1	Nuclear	1150MW	LC	1981	1986	1986	None	4/13/76
2	Nuclear	1150MW	LC	1983	1988	1988	None	4/13/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Northern Indiana Public Service								
Bailly Station Nuclear 1	Nuclear	660MW	LC	1974	1979	Unknown	Legal	2/17/76
Schaeffer - 14	Coal	535MW	C	1975	1976	1976	None	2/17/76
15	Coal	535MW	C		1979	1979	None	2/17/76
Northern States Power								
Sherburne - 1	Coal	680MW	C	1976	1976	1976	None	4/20/76
2	Coal	680MW	C	1977	1977	1977	None	4/20/76
3	Coal	800MW	LC	1982	1982	1981	State Permits	4/20/76
4	Coal	800MW	LC	1984	1984	1983	State Permits	4/20/76
Tyrone Energy Park 1	Nuclear	1100MW	LC	1985	1985	1985	None	4/20/76
Ohio Edison Co.								
Bruce Mansfield - 1	Coal	825MW	C	1975	1975	Unknown	Materials Shortage	2/17/76
2	Coal	825MW	C	1976	1977	1976	Materials Shortage	2/17/76
3	Coal	825MW	C	1978	1979	1978	Materials Shortage	2/17/76
Erie - 1	Nuclear	1200MW	LC	1982	1982	1984	Demand	2/17/76
2	Nuclear	1200MW	LC	1984	1984	1986	Demand	2/17/76
Oklahoma Gas & Electric								
Muskogee - 4	Coal	515MW	C	1977	1977	1977	None	3/31/76
5	Coal	515MW	C	1978	1978	1978	None	3/31/76
Sooner - 1	Coal	515MW	C	1979	1979	1979	None	3/31/76
2	Coal	515MW	C	1980	1980	1980	None	3/31/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Omaha Public Power District								
Fort Calhoun 2	Nuclear	1150MW	LC	1983	1983	1983	None	5/17/76
Nebraska City 1	Coal	575MW	LC	1979	1979	1979	None	5/17/76
Otter Tail Power Co.								
Coyote 1	Lignite	440MW	LC	1981	1981	1981	None	7/2/76
Pacific Gas & Electric								
Diablo Canyon - 1	Nuclear	1060MW	C	1975	1976	1976	None	3/2/76
2	Nuclear	1060MW	C	1976	1977	1977	None	3/2/76
East Stanislaus	Nuclear	1200MW	LC	1984	1985	1986	None	3/2/76
Geysers - 12	Geothermal	100MW	LC	1977	1977	1978	County permits	3/2/76
13	Geothermal	100MW	LC	1978	1978	1979	County permits	3/2/76
14	Geothermal	100MW	LC	1977	1979	1978	County permits	3/2/76
15	Geothermal	100MW	LC	1977	1978	1979	County permits	3/2/76
Helms Pumped Storage	Pumped Storage	1125MW	LC	1980	1982	1981	None	3/2/76
Pacific Power & Light								
Jim Bridger 4	Coal	500MW	C	1978	1979	1979	None	2/13/76
Pacific Nuclear 1	Nuclear	1200MW	EP	1985	1988	Indefinite	Demand	2/13/76
Wyodak	Coal	330MW	C	1977	1978	1978	None	2/13/76
Pennsylvania Power & Light								
Martins Creek 4	Oil	800MW	C	1977	1977	1977	None	2/12/76
Susquehanna - 1	Nuclear	1050MW	LC	1979	1980	1980	None	2/12/76
2	Nuclear	1050MW	LC	1981	1982	1982	None	2/12/76

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Philadelphia Electric Co.								
Fulton - 1	Nuclear	1160MW		1984	1984	Cancelled		4/17/76
2	Nuclear	1160MW		1986	1986	Cancelled		4/17/76
Limerick - 1	Nuclear	1055MW	C	1981	1981	1981	Financial	4/19/76
2	Nuclear	1055MW	C	1983	1983	1982	(minor)	4/19/76
Portland General Electric Co.								
Boardman	Coal	500MW	C	1979	1980	1980	None	3/8/76
Pebble Springs - 1	Nuclear	1260MW	LC	1980	1983	1985	Demand/Finance,	3/8/76
2	Nuclear	1260MW	LC	1982	1986	1988	Licensing, NRC Hearings	3/8/76
Potomac Electric Power Co.								
Chalk Point 4	Oil	630MW	C	1980	1980	1980	None	5/12/76
Dickerson 4	Coal	800MW	C	1982	1982	1982	None	5/12/76
Douglas Point - 1	Nuclear	1100MW	LC	1982	1982	1985	Demand	5/12/76
2	Nuclear	1100MW	LC	1985	1987	1987	Demand	5/12/76
Northern Site 1 - 4	Pumped Storage	1100MW	EP	1979	1982	Indefinite	Demand	5/12/76
Power Authority of New York								
Breakabeen 1 - 4	Pumped Storage	1000MW	LC	1979	1979	1981	Site Change	4/30/76
Green County	Nuclear	1200MW	LC	1983	1983	1983	None	4/30/76
Metropolitan Transit Authority	Coal/Refuse	700MW	LC	1980	1980	1982	State permits	4/30/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON LINE DATE ORIGINAL	ON LINE DATE LAST REPORT	ON LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Public Service Electric & Gas Co. (New Jersey)								
Hope Creek - 1	Nuclear	1100MW	C	1975	1982	1982	None	1/26/76
2	Nuclear	1100MW	LC	1977	1984	1984	None	1/26/76
Salem - 1	Nuclear	1090MW	C	1971	1976	1976	None	12/1/75
2	Nuclear	1115MW	C	1973	1979	1979	None	12/1/75
Atlantic - 1	Nuclear	1150MW	LC	1980	1985	1985	State permits	1/7/76
2	Nuclear	1150MW	LC	1981	1987	1987	State permits	1/7/76
3	Nuclear	1150MW	LC		1984	Indefinite	State permits	1/7/76
4	Nuclear	1150MW	LC		1986	Indefinite	State permits	1/7/76
Public Service of Colorado								
Pawnee - 1	Coal	500MW	LC	1978	1978	1979	Permits: PUC, EPA, Health Dept.	4/22/76
2	Coal	500MW	LC	1980	1980	1981		4/22/76
N/D - 1	Coal	500MW	EP	1983	1983	1983	None	4/20/76
2	Coal	500MW	EP	1985	1985	1985	None	4/20/76
Public Service of Indiana								
Gibson - 3	Coal	650MW	C	1978	1978	1978	None	5/5/76
4	Coal	650MW	C	1979	1979	1979	None	5/5/76
Marble Hill - 1	Nuclear	1150MW	LC	1982	1983	1982	None	5/5/76
2	Nuclear	1150MW	LC	1984	1984	1984	None	5/5/76
Public Service of New Hampshire								
Seabrook - 1	Nuclear	1150MW	LC	1979	1980	1981	Permits:Corps,EPA	3/3/76
2	Nuclear	1150MW	LC	1981	1982	1983	Permits:Corps,EPA	3/3/76

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Public Service of New Mexico								
San Juan - 1	Coal	330MW	C	1976	1976	1976	None	5/13/76
3	Coal	465MW	LC	1978	1978	1979	None	5/13/76
4	Coal	465MW	LC	1981	1981	1981	None	5/13/76
Public Service of Oklahoma								
Black Fox - 1	Nuclear	1150MW	LC	1982	1983	1983	None	5/4/76
2	Nuclear	1150MW	LC	1984	1985	1985	None	5/4/76
Northeastern - 3	Coal	450MW	C	1979	1979	1979	None	5/4/76
4	Coal	450MW	C	1980	1980	1980	None	5/4/76
Puget Sound Power & Light								
Skagit - 1	Nuclear	1280MW	LC	1982	1982	1983	Seismic design criteria .	5/3/76
2	Nuclear	1280MW	LC	1983	1985	1985		5/3/76
Rochester Gas & Electric Corp.								
Sterling - 1	Coal	600MW	LC	1977	Indefinite	Indefinite	Demand	2/17/76
2	Coal	600MW	LC	1977	Indefinite	Indefinite	Demand	2/17/76
Sterling Nuclear	Nuclear	1100MW	LC	1982	1984	1984	None	2/17/76
Sacramento Municipal Utility								
Rancho Seco 2	Nuclear	1100MW				Cancelled	Finance/Moratorium	4/19/76
Salt River Project								
Coronado - 1	Coal	350MW	LC	1978	1979	1979	Possible problems:	4/8/76
2	Coal	350MW	LC	1980	1980	1980	U.S.G.S. EIS,	4/8/76
3	Coal	350MW	LC	1982	Indefinite	Indefinite	BLM EIS	4/8/76
Hayden 2	Coal	250MW	C	1976	1976	1976	State Permits	4/8/76
Navajo 3	Coal	750MW	C	1976	1976	1976	None	4/8/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
San Antonio Public Service Board								
J. T. Deely - 1	Coal/Oil	436MW	C	1976	1977	1977	None	4/27/76
2	Coal/Oil	436MW	C	1976	1977	1977	None	4/27/76
San Diego Gas & Electric								
Sun Desert - 1	Nuclear	Unknown	EP	1985	1985	1985	None	4/19/76
2	Nuclear	Unknown	EP	1988	1988	1988	None	4/19/76
South Carolina Electric & Gas								
Fairfield	Pumped Storage	480MW	C	1978	1978	1977-78	None	2/4/76
Summer - 1	Nuclear	900MW	C	1979	1979	1979	None	2/4/76
2	Nuclear	900MW		1984	Cancelled	Cancelled	Demand	2/4/76
South Carolina Public Service								
Winyah #2	Coal	280MW	C	1977	1977	1977	None	4/19/76
South Texas Electric Coop								
Texas Coop - 1	Unknown	Unknown	Unknown				No Company	5/27/76
2	Unknown	Unknown	Unknown				Response	5/27/76
Southern California Edison								
Cool Water - 3	Oil	236MW	C	1975	1978	1978	None	5/27/76
4	Oil	236MW	C	1975	1978	1978	None	5/27/76
Long Beach 1 - 7	Oil	576MW	C	1975	1977	1977	None	5/27/76
Lucerne Valley 1 - 6	Oil	1385MW total	LC	1977	1985	1985	None	5/27/76
San Onofre - 2	Nuclear	1140MW	C	1979	1980	1980	None	5/27/76
3	Nuclear	1140MW	C	1980	1981	1981	None	5/27/76

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Southern Indiana Gas & Electric								
A. B. Brown - 1	Coal	255MW	C	1978	1979	1979	None	5/3/76
2	Coal	Unknown	EP	1982	1984	1983	None	5/3/76
Southwestern Electric Power Co.								
Flint Creek 1	Coal	528MW	C	1978	1978	1978	None	4/13/76
Welsh - 1	Coal	528MW	C	1977	1977	1977	None	4/13/76
2	Coal	528MW	C	1980	1980	1980	None	4/13/76
3	Coal	528MW	LC	1982	1982	1982	None	4/13/76
Southwestern Public Service Co.								
South Plains - 1	Coal/Gas	500MW	EP	1982	1980	1981	Demand	4/29/76
2	Coal/Gas	500MW	EP	1985	1982	1982	Demand	4/29/76
Harrington - 1	Coal/Gas	318MW	C	1976	1976	1976	None	4/29/76
2	Coal/Gas	318MW	C	1980	1978	1978	None	4/29/76
Tampa Electric Co.								
Big Bend 4	Coal	425MW	EP	1981	1981	1981	None	4/8/76
Tennessee Valley Authority								
Bellefonte - 1	Nuclear	1332MW	C	1977	1980	1980	None	5/5/76
2	Nuclear	1332MW	C	1978	1981	1981	None	5/5/76
Browns Ferry 3	Nuclear	1152MW	C	1972	1976	1979	None	5/5/76
Hartsville - 1	Nuclear	1300MW	C	1982	1984	1981	None	5/5/76
2	Nuclear	1300MW	C	1982	1984	1982	None	5/5/76
3	Nuclear	1300MW	C	1982	1984	1982	None	5/5/76
4	Nuclear	1300MW	C	1982	1984	1983	None	5/5/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Tennessee Valley Authority (cont d)								
Phipps Bend - 1	Nuclear	1287MW	LC	1983	1983	1983	None	5/5/76
2	Nuclear	1287MW	LC	1984	1984	1984	None	5/5/76
Raccoon Mountain 1 - 4	Pumped	1530MW	C	1975	1977	1977	None	5/5/76
Sequoyah - 1	Nuclear	1221MW	C	1974	1977	1977	None	5/5/76
2	Nuclear	1221MW	C	1977	1979	1978	None	5/5/76
Watts Bar - 1	Nuclear	1270MW	C	1976	1978	1978	None	5/5/76
2	Nuclear	1270MW	C	1977	1979	1979	None	5/5/76
Yellow Creek - 1	Nuclear	1407MW	EP	1983	1983	1983	None	5/5/76
2	Nuclear	1407MW	EP	1984	1984	1984	None	5/5/76
Texas Utilities Co.								
Comanche Peak - 1	Nuclear	1150MW	C	1980	1980	1980	None	4/27/76
2	Nuclear	1150MW	C	1982	1982	1982	None	4/27/76
Forest Grove	Lignite	750MW	C	1978	1979	1981	Demand	4/27/76
Handley - 4	Gas	425MW	C	1976	1976	1976	None	4/27/76
5	Gas	425MW	C	1977	1977	1977	None	4/27/76
Martin Lake - 1	Lignite	750MW	C	1977	1977	1977	None	4/27/76
2	Lignite	750MW	C	1978	1978	1978	None	4/27/76
3	Lignite	750MW	C	1979	1979	1979	None	4/27/76
4	Lignite	750MW	C	1980	1980	1981	None	4/27/76
Monticello 3	Lignite	750MW	C	1978	1978	1978	None	4/27/76
Twin Oak - 1	Lignite	750MW	EP	1982	1982	1982	None	4/27/76
2	Lignite	750MW	EP	1983	1983	1983	None	4/27/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Toledo Edison								
Davis Bessee - 1	Nuclear	900MW	C	1976	1976	1976	None	4/30/76
2	Nuclear	900MW	LC	1982	1983	1983	None	4/30/76
3	Nuclear	900MW	LC	1984	1985	1985	None	4/30/76
Union Electric Co.								
Callaway - 1	Nuclear	1150MW	C	1981	1981	1981	None	5/17/76
2	Nuclear	1150MW	LC	1983	1983	1983	None	5/17/76
Rush Island 2	Coal	590MW	C	1976	1976	1976/1977	None	5/17/76
Utah Power & Light								
Emery - 1	Coal	430MW	C	1978	1978	1979	Possible problem:	3/28/76
2	Coal	430MW	C	1980	1980	1981	BLM EIS	3/28/76
Huntington Canyon 2	Coal	400MW	C	1977	1977	1977	None	3/26/76
Naughton - 4	Coal	415MW	LC	1979	1982	1983	Possible problems:	3/26/76
5	Coal	415MW	LC	1981	Indefinite	1984	U.S.G.S. EIS, BLM EIS	3/26/76
Virginia Electric & Power								
Bath County 1 - 6	Pumped Storage	2100MW	LC	1980	1982	1983	FPC License	4/14,15/76
North Anna - 1	Nuclear	934MW	C	1975	1976	1977	None	4/14/76
2	Nuclear	934MW	C	1976	1977	1977	None	4/14/76
3	Nuclear	934MW	C	1978	1980	1980	None	4/14/76
4	Nuclear	934MW	C	1979	1981	1981	None	4/14/76
Surry - 3	Nuclear	900MW	C	1980	1983	1986	Demand	4/14/76
4	Nuclear	900MW	LC	1981	1984	1987	Demand	4/14/76

COMPANY PLANT	FUEL TYPE	SIZE	CURRENT STATUS	ON-LINE DATE ORIGINAL	ON-LINE DATE LAST REPORT	ON-LINE DATE CURRENT	PROBLEM	DATE OF INQUIRY
Washington Public Power Supply System								
WPPSS - 1	Nuclear	1250MW	LC	1980	1980	1981	Demand	4/13/76
2	Nuclear	1250MW	C	1977	1978	1979	Demand	4/13/76
3	Nuclear	1250MW	LC	1981	1981	1982	Demand	4/13/76
4	Nuclear	1250MW	LC	1982	1982	1982	Demand	4/13/76
5	Nuclear	1250MW	LC	1983	1983	1984	Demand	4/13/76
Wisconsin Electric Power Co.								
Koshkonong - 1	Nuclear	900MW	LC	1981	1982	1983	State Permits	2/24/76
2	Nuclear	900MW	LC	1983	1984	1984	State Permits	2/24/76
Pleasant Prairie - 1	Coal	580MW	LC	1979	1980	1980	State and Corps Permits	2/24/76
2	Coal	580MW	LC	1980	1983	1983		2/24/76
Wisconsin Power & Light								
Columbia 2	Coal	527MW	C	1978	1978	1978	None	5/18/76
Edgewater 5	Coal	400MW	LC	1982	1982	1982	Possible problem. state siting law	5/18/76
Wisconsin Public Service								
Weston 3	Coal	300MW	LC	1981		1981	Possible problem: state review	7/27/76

ATTACHMENT 3

CONTRACT SCHEDULE

ARTICLE I - STATEMENT OF WORK

Sec. 1.0 BACKGROUND

Much of the controversy between nuclear power proponents and opponents has revolved around issues of public health and safety. Far less in the way of detailed analysis has been done in the area of the economic, social, and environmental implications of limiting the development of nuclear power. In particular, attempts to quantify the impacts in these areas have been few.

The Administrator of the Federal Energy Administration (FEA) is specifically charged by law (P.L. 93-275) to accomplish, inter alia, the following:

(1) Assess the adequacy of energy required to meet demands in the immediate and longer range future for all sectors of the economy and for the general public.

(2) Develop plans and programs for dealing with energy production shortages.

(3) Assure that energy programs are designed and implemented in a fair and efficient manner so as to minimize hardship and inequity while assuring that the priority needs of the Nation are met.

(4) Collect, evaluate, assemble, and analyze energy information on reserves, production, demand and related economic data.

In line with these purposes, FEA has a responsibility to:

(1) Determine the effect on the rest of the Nation if California were to implement legislation that could limit the use of nuclear power in that state.

(2) Determine the effect on the Nation's energy posture if other states were to implement similar legislative initiatives.

(3) Evaluate the impacts of state energy actions on specific areas of the country.

Sec. 1.1 OBJECTIVE

This study is an initial step toward meeting FEA's responsibilities outlined above. Specifically, the study will analyze and quantify the following:

(1) The direct and indirect economic, social and environmental impacts on the State of California and its citizens of the passage of the "California Nuclear Safeguards Initiative," under a prescribed set of realistic alternatives.

(2) The indirect economic, social and environmental impacts on the appropriate neighboring states (e.g., Oregon, Nevada, Arizona, New Mexico, Texas, Utah, Idaho, Washington, Montana, Wyoming, and Colorado), and their citizens and the National energy supply and demand

picture, of the passage of the "California Nuclear Safeguards initiative."

The impacts are to be examined in the context of the short term (decade of the 80's), and the long term after 1990.

Sec. 1.2 GENERAL APPROACH

Two possible futures will be examined -- one in which the growth of nuclear power is constrained by legislation, and one in which the growth is not constrained by legislation. In the first case, the constraint shall be based on the assumption that the provisions of Section 67503 of the proposed California Nuclear Safeguards Initiative (Appendix 1) are not met and all operating nuclear plants and those under construction will not operate at more than 60% of rated power after one year and after five years shall be derated at a rate of ten percent per year. The second (unconstrained) case would occur if the initiative were not passed -- or if the initiative were passed and the requirements of Section 67503 were met. It is recognized that other futures intermediate between these two extremes are possible. In order to assure a manageable effort, however, this contract is intended only to bracket the possible futures and not look at intermediate cases.

TASK I. DETERMINATION OF DEMAND FOR ELECTRICITY

The contractor shall make a number of demand projections (both kwhr and kw) under several different conditions. The

demand scenarios shall include, but not be limited to, the following:

(1) A scenario where the rate of growth in demand for electricity is an "upper range" value in the range of realistic demand possibilities. This might result from the reduced availability of oil and natural gas to industry and to consumers, causing them to switch to electricity. The contractor should quantitatively assess the likelihood, timing, and magnitude of such switching. This case would assume that some conservation and load management efforts succeed but not to the extent desired.

(2) A scenario where the rate of growth in demand for electricity is a "middle range" value in the range of realistic demand possibilities. This case would assume a realistic savings from conservation and load management.

(3) A scenario where the rate of growth in demand for electricity is a "lower range" value in the range of realistic demand possibilities. This case would assume achievement of high levels of load management and conservation efforts on the part of industry and the consumer, such as might result from major increases in financial investment by consumers and industry aimed at reducing consumption of electrical energy.

5

The contractor shall submit to FEA for review and approval the contractor's recommended demand projection scenarios to be examined. This submittal of the contractor shall include a description of all demand projection scenarios considered, including the recommended scenarios, by the contractor in arriving at his recommendation. Further, this submittal of the contractor shall provide a description defining all the factors and assumptions that were used by the contractor in each of the demand projection scenarios considered. The contractor shall use an analytical model of his own choice to perform the supply-demand econometric study. FEA will make available the use of the Project Independence Evaluation System (PIES) Model for this effort, if the contractor so requests (see Appendix 2). If the contractor chooses to make use of the PIES Model, computer runs will be made on FEA facilities with the cost of such runs absorbed by FEA. If the contractor proposes to utilize a model other than PIES and therefore different computer facilities, cost of using such facilities shall be priced out separately in the cost breakdown.

TASK II. DETERMINATION OF SUPPLY

In the area of supply, the analysis shall consider two cases: (1) utilization of non-nuclear energy sources, and (2) utilization of all available energy sources, including nuclear energy (base case).

6

A. Non-Nuclear Sources

At least three basic alternatives to nuclear will be examined, one reflecting a preponderance of coal-fired generation, one reflecting a preponderance of oil-fired generation, and one reflecting some combination of the two (perhaps the "most likely" case). Each of these basic alternatives is to be analyzed in light of the demand projections.

B. Nuclear Sources Available (Base Case)

In this supply case the contractor shall assume that nuclear plants can continue to operate and be built and that some realistic combination of all sources available will be utilized.

NOTE - Analysis Assumptions

All of the supply scenarios will require certain assumptions to be made about industrial capability to construct new power plants (including licensing and regulatory constraints), availability of natural gas, hydroelectric, solar, and geothermal energy, and electricity imports. The contractor should make a realistic assessment of the contribution each particular source can make in both the short and long term and submit recommendations for FEA review and approval.

FEA reserves the right to approve all basic assumptions used in this contract effort including, but not limited to, basic input data to quantitative models.

7

TASK III. DETERMINATION OF ECONOMIC, SOCIAL, AND ENVIRONMENTAL IMPACTS.

Each of the supply cases in conjunction with the various demand projections will set the stage for the determination and analysis of the economic, social, and environmental impacts. This is the main objective of the study, and it is expected that the contractor will expend at least half of his resources on this task.

The impact analysis should begin with a complete evaluation of the impacts of the base case. This will provide the basis for a comparison with the impacts resulting from other supply-demand scenarios.

Some areas that are to be examined in light of the supply-demand scenarios should attempt to include, but not be limited to, the following to the extent that methodology can be agreed upon:

(1) Cost of electricity to the California consumer. (Cost/kwhr, avg. monthly bill increase, etc.).

(2) Quality of life and consumer lifestyles. (Including effect on reliability of electric service).

(3) Cost of living.

(4) Tax base, including real estate, income and other taxes.

(5) Real personel income.

(6) Purchasing power of wages.

(7) Employment levels.

(8) Detailed analysis of impacts on specific industries (production decisions, development, growth, etc.) including interstate competition for industry.

(9) Consumption of fuel by type (coal, oil, gas) and import implications.

(10) General health effects; occupational fatalities

(11) GNP.

(12) Balance-of-payment.

(13) Environment (i.e., water, air, land use, etc.). The impact assessment should address (1) possible violations of existing State and Federal environmental standards, (2) the elements of the environmental regulatory program that may be the subject for pressures for relaxation, and (3) long term impacts.

(14) Dependence upon other states and countries.

(15) The availability and impact of capital requirements of the various supply options.

(16) The impact of capital investments for conservation on industry (e.g., building design and construction and employment).

(17) The impacts of low demand scenarios (e.g., capital availability, effect on disposable incomes, employment, etc.).

Where appropriate, the above should be analyzed for both the State of California and the appropriate neighboring states (see Sec. 1.1).

ARTICLE II - REPORTS AND COMMUNICATIONS REQUIREMENTS

As part of the work to be performed pursuant to this contract, the contractor shall submit the following reports, and other documentation, in accordance with the schedule set forth in ARTICLE III - DELIVERY.

Sec. 2.1 WEEKLY REPORTS

The contractor shall supply to GTR, either in writing or by telecon, informal weekly progress reports covering progress to date and recommended approaches to facilitate successful completion of the project.

Sec. 2.2 REQUESTS FOR INFORMATION

The contractor shall from time to time provide the GTR with information requested by telephone that is within the scope of this contract.

ATTACHMENT 4

Direct and Indirect Economic, Social, and Environmental Impacts of the Passage of the California Nuclear Power Plants Initiative

EXECUTIVE SUMMARY

April 1976

VOL. 1 OF 4

FEDERAL ENERGY ADMINISTRATION

DIRECT AND INDIRECT ECONOMIC, SOCIAL, AND ENVIRONMENTAL IMPACTS OF THE PASSAGE OF THE CALIFORNIA NUCLEAR POWER PLANTS INITIATIVE

EXECUTIVE SUMMARY

April 1976

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies of the U.S. Government.

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PREFACE

The work upon which this report is based was performed under Federal Energy Administration Contract No. CO-05-60484-00 by a research team in the Center for Energy Studies of The University of Texas at Austin. As stated in the contract, the contents of the report are at the sole discretion of the research team.

During the course of the study the research team has received advice from an Oversight Committee composed of:

Roger Beers - National Resources Defense Council
Brant Calkin - Sierra Club
Donham Crawford - Edison Electric Institute
R. William Habel - Florida Public Service Commission
Kai Lee - Institute for Environmental Studies,
University of Washington
Floyd Lewis - Middle South Utilities
Marvin Lieberman - Illinois Commerce Commission
Sylvia Siegel - Towards Utility Rate Normalization "TURN"

Each member was afforded the opportunity of having a technical adviser. The members of the Committee served as individuals and the organizational affiliations are listed for information purposes only.

The committee members met with the research team in Austin, Texas, three times during the study on February 2 and 27 and on April 19, and the committee members have reviewed a draft of the report and made comments for the benefit of the research team. The committee members' comments are attached to the Executive Summary and to the complete report. These comments represent the views of the members of the oversight committee only.

On behalf of the research team we want to thank the members of the oversight committee, their technical advisers, and the FEA staff members who provided comments during the course of the study.

Martin L. Baughman
H.H. Woodson

I. PURPOSE OF THE STUDY

Under Federal Energy Administration Contract No. CO-05-60484-00 a research team in the Center for Energy Studies of The University of Texas at Austin has performed an independent analysis of the economic, social, and environmental impacts that could occur as consequences of passage or nonpassage of the California Nuclear Power Plants Initiative.

To facilitate the analysis we used a set of scenarios, each one describing a possible future. The set of scenarios was chosen with a range of alternative assumptions to bracket the most likely future, which the research team feels will be near the middle of the range. The scenarios contain projections of low, medium, and high electric energy demand growth rates in conjunction with a number of electric energy supply alternatives. The business-as-usual alternative includes the assumption that nuclear, coal, and oil generating capacity are available as competitive sources for electric energy supply. The other scenarios contain assumptions of some degree of curtailment of nuclear power in California which leads to a greater dependence on coal and oil for electric generation, with different mixes of these alternatives in different scenarios. Analytical models and assessments were used with the set of scenarios to determine impacts for the years 1977, 1985, and 1995. Study assumptions were based on best available information combined with professional judgment by the UT Center for Energy Studies staff.

Questions that were addressed in this study are:

1. What is the expected growth of electric energy demand

in California for different demand and supply alternatives?

2. What are the projected requirements for future electric generating capacity needed to serve California?
3. What mix and amount of alternative fuels would be required with and without nuclear power curtailment in California?
4. What uncertainties affect the availability of alternative fuels?
5. What are the implications for reliability of electricity supply in the several alternatives?
6. What are the effects on cost of electricity if substitutes for nuclear-based electrical energy are needed?
7. For the several alternatives, what are the requirements for capital investment and would it take place inside or outside California?
8. What would be the effects on the economy of the state if nuclear power development were constrained?
9. What are the environmental implications of the energy supply alternatives?
10. What are the sociocultural implications both inside and outside California of the energy supply alternatives?

Specifically not included in this study was an examination of the safety risks of nuclear power plants. That subject has been treated exhaustively by others.

To answer the questions asked, the study was carried out using the

following interacting components:

1. Conservation Assessment
2. Electrical Energy Demand/Supply/Production/Cost Analysis
3. Long-Run Economic Growth Analysis
4. California Input-Output Analysis
5. Energy Resource Assessment
6. Environmental and Health Impacts Assessment
7. Sociocultural Assessment

The body of the report of this study contains a large amount of data and results. In this executive summary we have condensed these results into a presentation of principal findings followed by discussions of these findings in terms of the impacts on key areas and the uncertainties associated with the alternatives. We emphasize that these results are for constraints placed on nuclear power development in California and only California, with energy supplies for the remainder of the country continuing to grow as currently planned. The analysis assumes other states will cooperate fully to supply California with whatever energy or resources it needs and at prices normally commensurate with production costs. Any prospect that this cooperation would not take place is addressed as an uncertainty.

II. PRINCIPAL FINDINGS

A. A Need for Additional Electric Energy Supply in California

The results of this study indicate that with continuing population and economic growth in California there will be a need for additional electric generating capacity and additional electric energy generation to serve loads in California between now and 1995. The rate of growth of new supply requirements, however, can vary widely. The principal factors which affect the range of this variation are: (1) population growth rate, (2) average economic growth rate, (3) extent of price-motivated conservation, and (4) potential for non-price-motivated conservation.

Table 1 shows the ranges of population and economic growth rates used in the study (see chapter 2 for further details).

Table 1

POPULATION AND ECONOMIC GROWTH RATES

	Low	Medium	High
Average population growth rate per year, 1975-1995	0.69%	1.36%	1.53%
Increase in population over twenty-year period	14.7 %	31.0 %	35.5 %
Average economic growth rate per year, 1975-1995	3.5 %	4.9 %	6.5 %
Increase in economic output over twenty-year period	98.9 %	160.3 %	252.4 %

These assumed population and economic growth rate parameters mean that the

alternative cases analyzed cover the following ranges:

1. California's population in 1985 would range from 22.8 to 24.7 million and in 1995 from 24.2 to 28.6 million compared to 21.1 million in 1975.
2. Economic output in the state in 1985 would range from $254 to $358 billion and in 1995 from $358 to $672 billion (all in 1975 dollars) compared to $170 billion in 1975.
3. Per capita income in the state in 1985 would range from $11,100 to $14,500 per person and in 1995 from $14,800 to $23,500 per person (all in 1975 dollars) compared to $8060 per person in 1975.

Effects of Conservation

Electrical energy consumption in these varying projected futures would be conditioned by both price-motivated and non-price-motivated conservation as well as by whether or not natural gas is readily available. With no constraints placed on nuclear power development in California and with only price-motivated conservation resulting from price elasticities of demand that decrease from a maximum in the low growth case to a minimum in the high growth case (see table 2-12 of chapter 2), the growth rates in kilowatt-hour demand would be as shown in figure 1.

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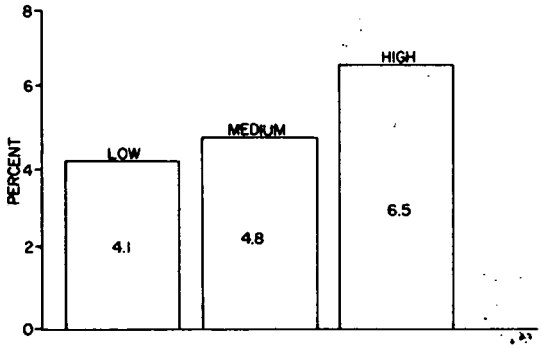
Figure 1

AVERAGE KILOWATT-HOUR DEMAND GROWTH RATE PER YEAR, 1975-1995, CONSIDERING ONLY PRICE-MOTIVATED CONSERVATION WITH NO CONSTRAINTS ON NUCLEAR POWER DEVELOPMENT

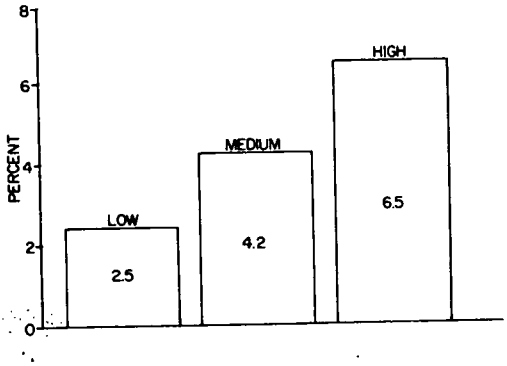


To highlight the possible effects of non-price-motivated conservation, the requirements upon residential and commercial building thermal insulation standards imposed in California up to January 1976 were added to the medium growth case, and additional conservation measures deemed possible were added to the low growth case (see table 1-10 and accompanying text). No non-price-motivated conservation was imposed on the high growth case. The net changes in kilowatt-hour demand growth rate that can be brought about by non-price-motivated conservation are about 0.6 percentage points reduction in the medium growth case and about 1.6 percentage points

reduction in the low growth case. The resulting kilowatt-hour demand growth rates are given in figure 2.

Figure 2

AVERAGE KILOWATT-HOUR DEMAND GROWTH RATE PER YEAR, 1975-1995, NON-PRICE-MOTIVATED CONSERVATION ADDED AND NO CONSTRAINTS ON NUCLEAR POWER DEVELOPMENT



These results show that conservation, both price-motivated and non-price-motivated, in combination with future economic and population growth rates substantially below historical trends and with the assumption of a readily available natural gas supply, can reduce substantially the expected electric energy demand growth but not eliminate it.

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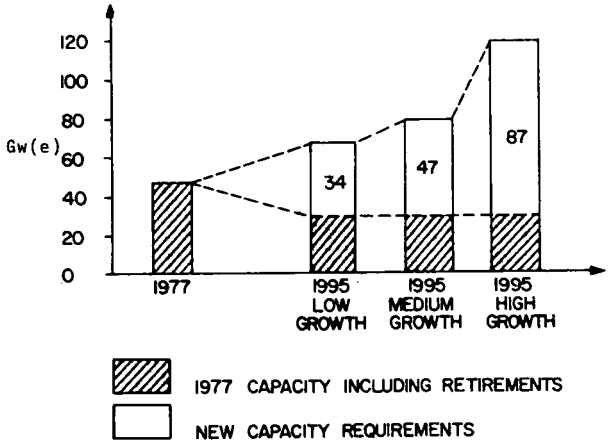
To meet the electrical energy demand growth rates given above, the required growth in electrical generating capacity needed to serve California with no constraints on nuclear power development but including non-price-motivated conservation is illustrated in figure 3. These amounts include the retirement of a portion of existing facilities after 1977.

Figure 3

ELECTRIC GENERATING CAPACITY REQUIREMENTS 1977-1995 WITH NON-PRICE-MOTIVATED CONSERVATION AND NO CONSTRAINTS ON NUCLEAR POWER DEVELOPMENT



Effects of Eliminating Nuclear Power in California

If nuclear power generation is eliminated in California and replacement capacity and fuels are available when needed and at normal prices, higher electric energy prices will result, leading to price-motivated reductions in electric energy consumption and a reduction in additional electric generating capacity needed. This reduction in electric energy use would be accompanied by greater direct consumption of oil and gas at the point of end use. The resulting average annual growth rates in electric energy demand and the additional generating capacity requirements when nuclear power is eliminated in California are illustrated in figures 4 and 5.

Figure 4

AVERAGE KILOWATT-HOUR DEMAND GROWTH RATE PER YEAR, 1977-1995, WITH NON-PRICE-MOTIVATED CONSERVATION ADDED AND NUCLEAR POWER PHASED OUT IN CALIFORNIA

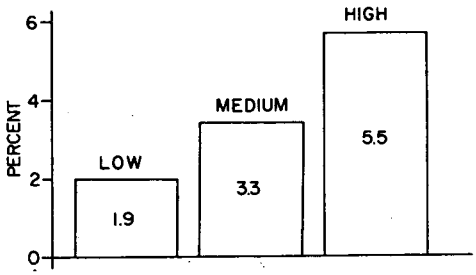


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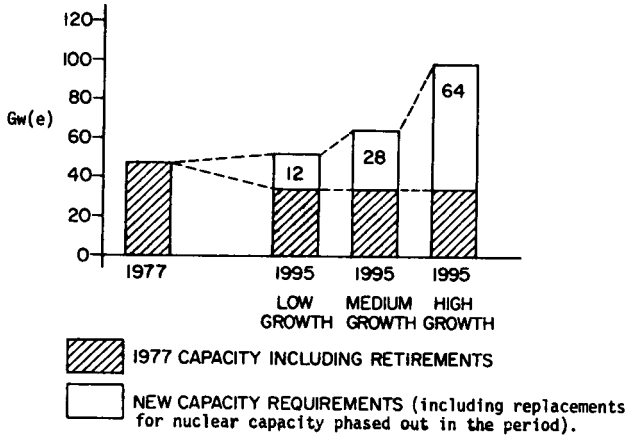
Figure 5

ELECTRIC GENERATING CAPACITY REQUIREMENTS 1977-1995

WITH NON-PRICE-MOTIVATED CONSERVATION ADDED

AND NUCLEAR POWER PHASED OUT IN CALIFORNIA



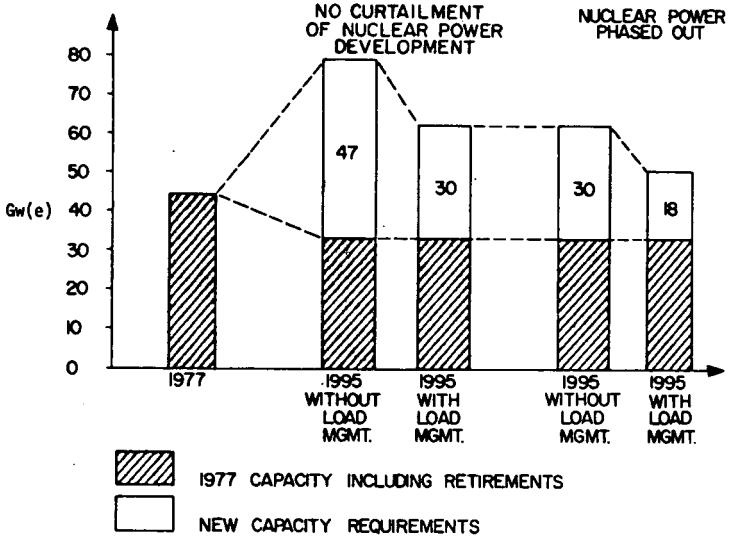
Effects of Improved Load Factor

Finally, the effects of improved load factor were explored by assuming successful load management efforts along with non-price-motivated conservation for the medium growth case with and without curtailment of nuclear power in California. The results are shown in figure 6.

Figure 6

GENERATING CAPACITY REQUIREMENTS 1977-1995

MEDIUM DEMAND GROWTH



Note: Improvement in load factor of 0.62% to 0.75% over 1977 to 1987 interval in load management cases. This is considered to be a high degree of improvement and may be difficult to accomplish.

These results show that improvement in load factor could reduce the need for additional generating capacity but not eliminate it for the medium growth case.

Summary

In summary, it appears from the results of this study that there is likely to be a need for additional electric generating capacity and additional electric energy generation in California for the period from now to 1995. The level of this need could vary widely depending on population and economic growth rates, relative success in non-price-motivated conservation efforts, relative success in improving load factors, and whether or not nuclear power is phased out in California.

The elimination of the need for additional electric generating capacity and electrical generation to serve California could only come about if there were:

1. A decline in the economic growth rate in California to well below the historical trend
2. A decline in the population growth rate in California to the equivalent of no further in-migration
3. Institution of active government programs to reduce growth in electric energy consumption in California
4. Institution of active load management programs to reduce peak electric loads in California

B. Sources of Electric Energy for California

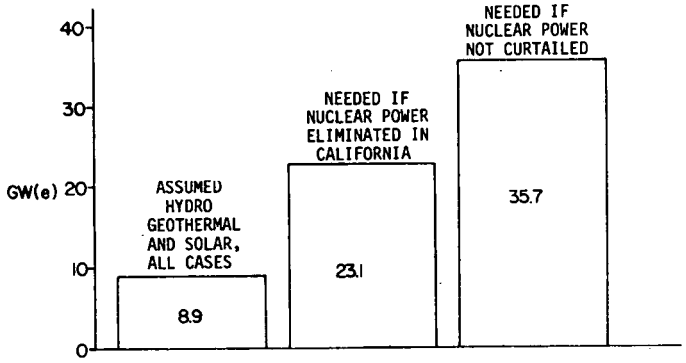
Although hydro, geothermal, and solar sources could supply some of the additional generation needed, their possible contribution during the time interval studied is much less than could be obtained from nuclear fission, coal, and oil based generation. Moreover, as discussed in

appendix 2C, the availability of the amount of geothermal and solar capacity additions assumed for this study is uncertain. In all but the lowest growth scenarios analyzed, there would be a need for additional, large-scale energy sources beyond the capability additions of hydro, geothermal, and solar assumed in the study (see figure 7).

Figure 7

ADDITIONAL CAPACITY, 1977-1995

MEDIUM DEMAND GROWTH



C. Characteristics of the Supply Alternatives

The use of each of the three sources--nuclear, coal, and oil--to supply additional electric energy needed by California through 1995 has risks, impacts, and benefits. The major features of each alternative are highlighted here and elaborated upon later.

The Business-as-Usual Alternative

The business-as-usual alternative is based upon expansion of the electric energy supply for California as currently planned. This means that electric generation capacity would come from a mix of nuclear, coal, and oil plants augmented as much as practical by hydro, geothermal, and solar sources. Based on economic considerations, nuclear would exhibit the most rapid growth, and coal would be used to the extent necessary and possible. Much of the existing oil capacity would be retired as the more economical nuclear and coal alternatives become available. Under this alternative, the three large-scale energy sources--nuclear, coal, and oil--are available. Hence, if difficulties are encountered in the siting, construction, or use of any one of the three sources, the other two are available.

The Constrained Nuclear Alternatives

If nuclear power were phased out in California, additional coal and/or oil capability would be required. The mix of the alternatives used would depend upon a number of considerations, including economic and environmental factors, federal and state pricing and regulatory policies, and possible reactions of other states to constraints on nuclear power in California. A range of possible alternatives is discussed in the report, bracketed by one alternative that assumes the predominant use of coal (high coal) to replace nuclear and another alternative that assumes the predominant use of oil (high oil) to replace nuclear. In these alternatives, without nuclear as a source, there are two large-scale energy sources,

coal and oil, available for use. Hence, if difficulties are encountered in the siting, construction, or use of coal or oil, only one source remains to supply the electric energy demand.

Some Representative Results

The major features of the business-as-usual (BAU), high coal (HC), and high oil (HO) alternatives are presented in the following charts. In the high coal alternative all coal-fired generating plants are assumed to be located outside California; whereas, in the high oil alternative, all oil-fired generating plants are assumed to be located in the state.

The results which follow (tables 2-3, figures 8-16) are given for the medium growth assumptions. The results for low and high demand growth assumptions exhibit similar trends through time and across alternatives, but precise values of numerical results change. The details of these alternatives are given in the body of the report with a summary in chapter 1.

Table 2

CONDITIONS UNDERLYING ANALYTICAL RESULTS OF EACH ALTERNATIVE

Conditions That Must be Fulfilled for Numerical Results of the Business-as-Usual (BAU) or Continued Use of Nuclear Option to Apply	Conditions That Must be Fulfilled For Numerical Results of the High Coal (HC) Use Option to Apply	Conditions That Must be Fulfilled For Numerical Results of the High Oil (HO) Option To Apply
1. Initiative fails, or if passed, no constraints are placed upon nuclear	1. Initiative passes and nuclear power is phased out	1. Initiative passes and nuclear power is phased out
2. In-state cooling water supplies are made available	2. The coal supply states cooperate fully with California to make additional supplies of coal available on an accelerated schedule	2. Coal expansion is constrained due to economic, environmental, regulatory, or political reasons
3. Long-run problems of fuel cycle closure and waste storage solved	3. The coal supply states make available the cooling water needed to operate the coal generating plants or alternate siting in California is possible	3. California utilities begin investment in the oil alternative immediately after passage of the initiative
4. Uranium shortages do not develop	4. California utilities begin investment in the coal alternative immediately after passage of the initiative	4. Federal action to force conversion of oil plants to coal burning is not taken as is possible under provisons of the Energy Supply and Environmental Coordination Act of 1974
	5. Air quality standards do not preclude the expansion of coal-burning capability, nor is undue delay experienced in the opening of new coal mines	5. No oil embargoes are experienced
	6. Accelerated demands are not placed upon the same sources of coal from other states	6. Existing air quality standards are relaxed in some areas of the state to make additional oil use permissible
	7. Federal coal leasing policy and mined land reclamation legislation does not impede coal development	7. In-state sites and cooling water supplies are made available

Figure 8

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CAPACITY REQUIREMENTS FOR ALTERNATIVE CASES

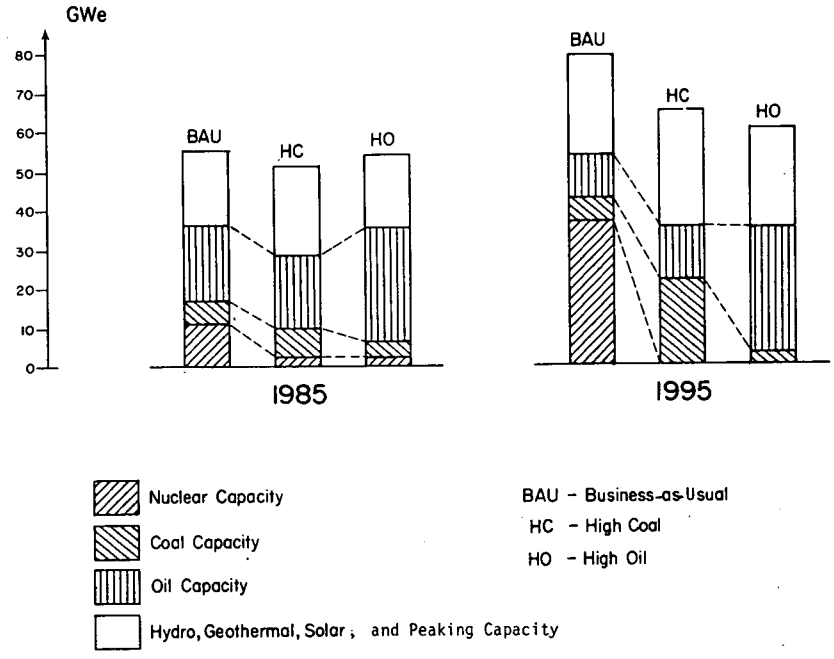

Figure 9

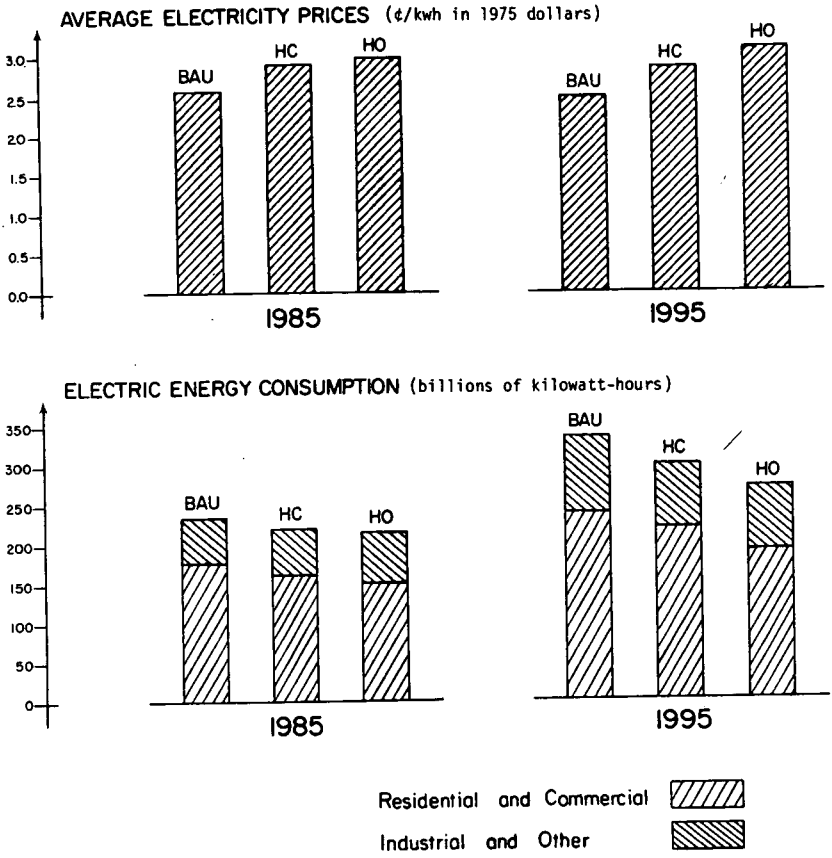
AVERAGE ELECTRICITY PRICES (¢/kwh in 1975 dollars)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
BAU
HC
HO
1985
1995
ELECTRIC ENERGY CONSUMPTION (billions of kilowatt-hours)
350
300
250
200
150
100
50
0
Residential and Commercial
Industrial and Other

Figure 10

EFFECTS ON TYPICAL ELECTRIC BILL

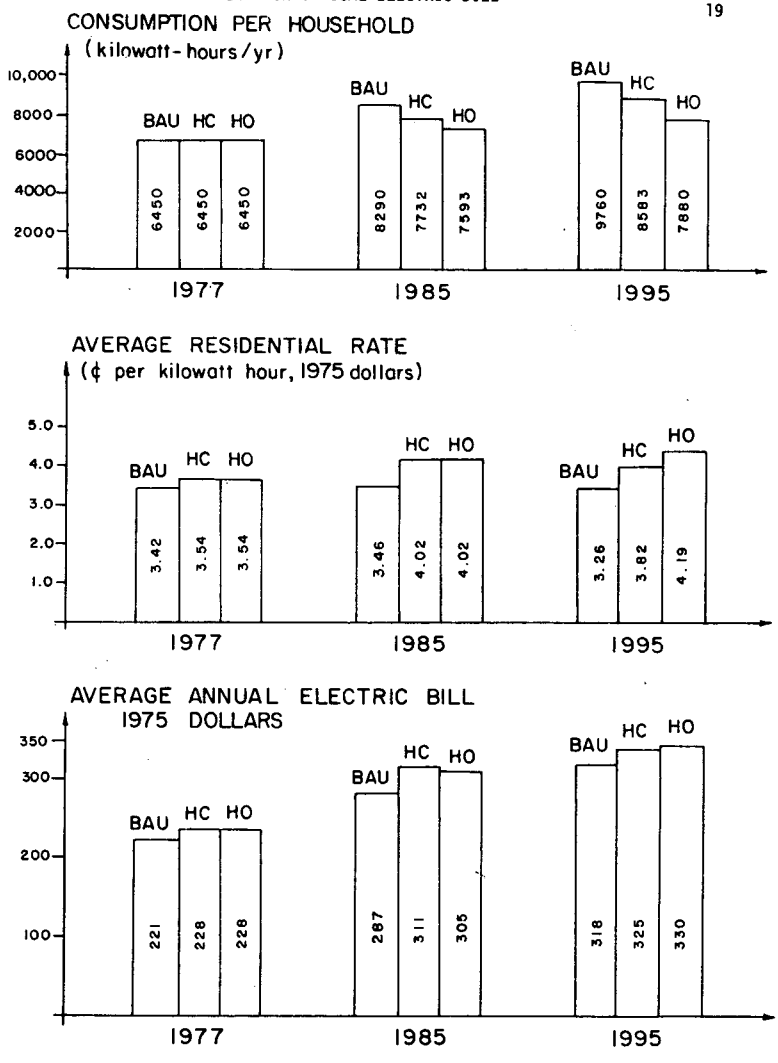

Figure 11

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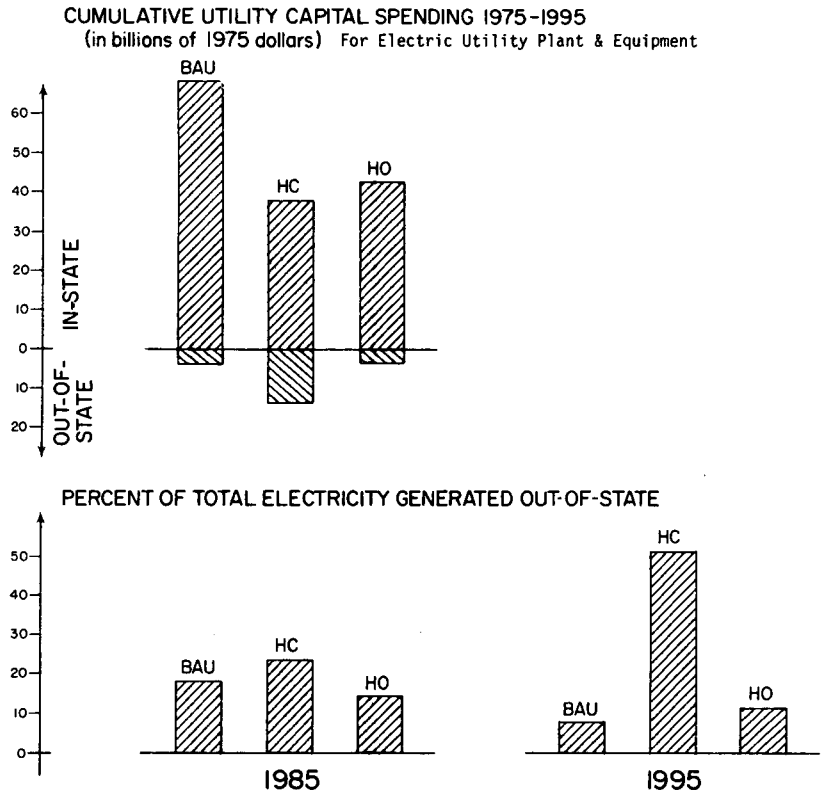

CUMULATIVE UTILITY CAPITAL SPENDING 1975-1995
(in billions of 1975 dollars) For Electric Utility Plant & Equipment
BAU
HC
HO
60
50
40
30
20
10
0
10
20
IN-STATE
OUT-OF-STATE
PERCENT OF TOTAL ELECTRICITY GENERATED OUT-OF-STATE
50
40
30
20
10
0
BAU
HC
HO
1985
BAU
HC
HO
1995

Figure 12

REQUIREMENTS OF AND RELEASES TO THE ENVIRONMENT

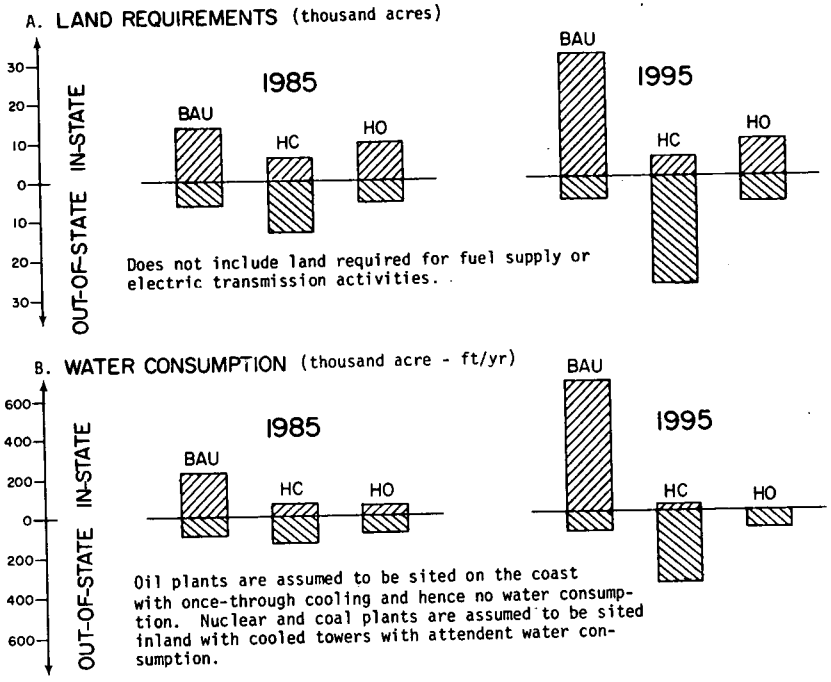
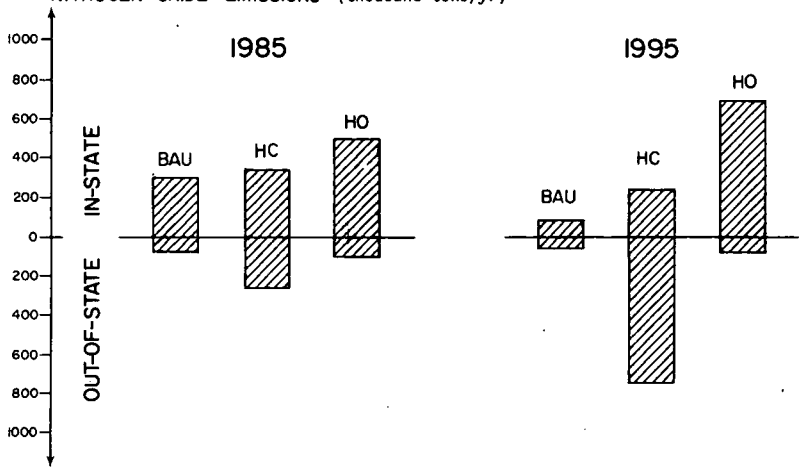
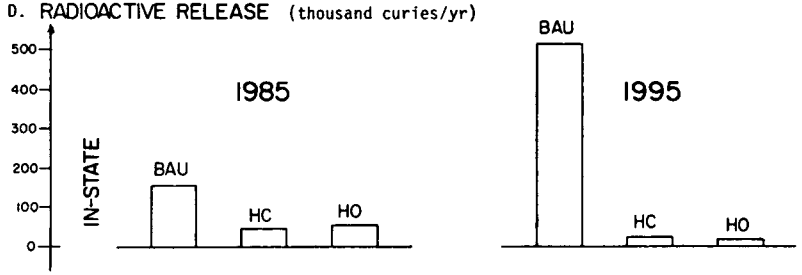


Figure 12 continued

C. NITROGEN OXIDE EMISSIONS (thousand tons/yr)



D. RADIOACTIVE RELEASE* (thousand curies/yr)



*There are radiation releases from coal burning. The amount is very uncertain due to lack of sufficient data on radioactive substances in coal in the Southwest. The radiation release from coal plants would be less than from nuclear plants, probably about a factor of ten less. In the high coal option most of the release would be out of state. In the BAU option, such releases amount to an increase of 1-3% of background radiation. In the high coal option, such releases amount to an increase of 0.1-0.2% of background radiation.

Figure 12 continued

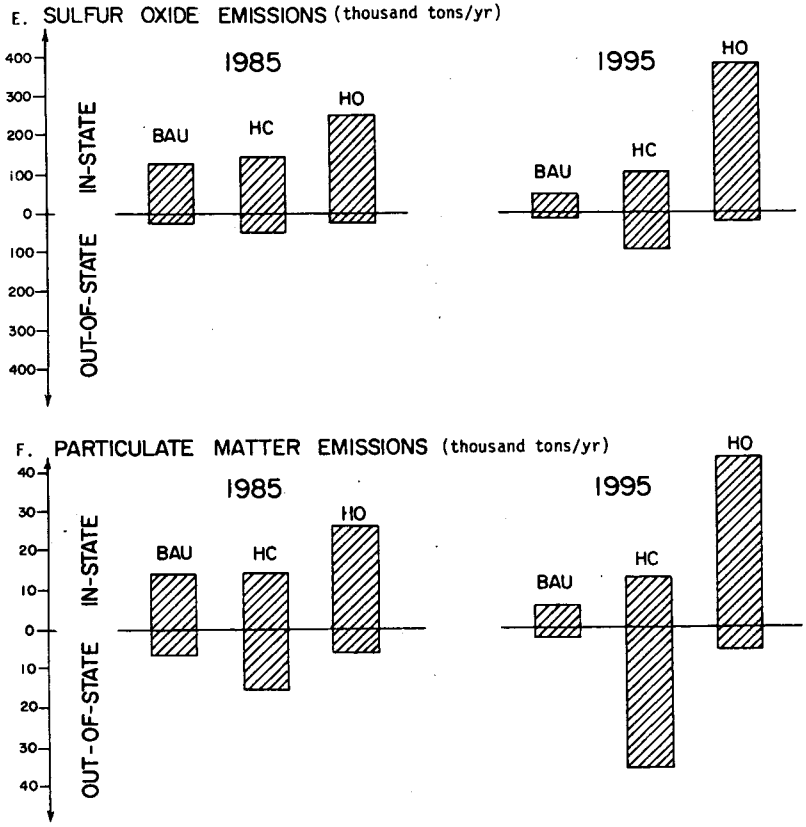
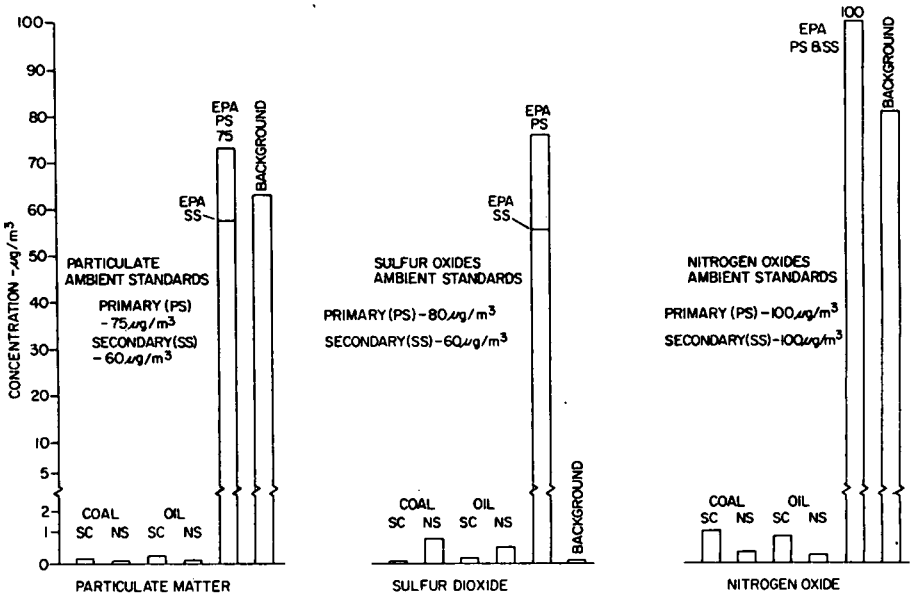


Figure 13

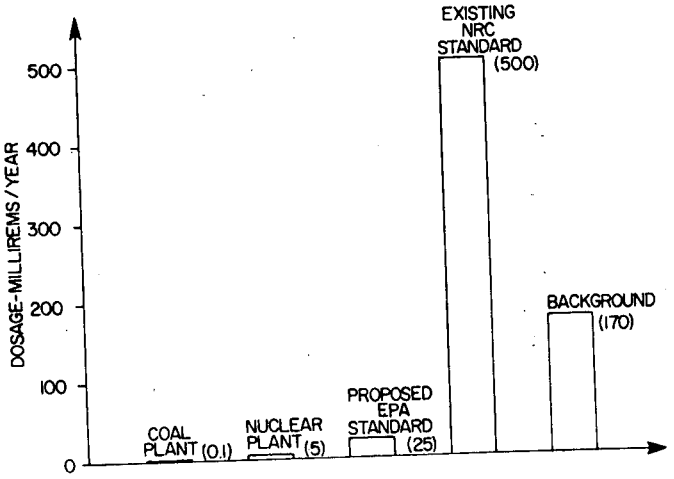
AMBIENT AIR QUALITY IMPACTS AND NATURAL BACKGROUND LEVELS
(micrograms per cubic meter)



Note: Calculations performed for a single 1000 Mw(e) plant with a single 400-foot stack. Meteorological conditions are based on Sacramento for coal- and oil-fired plant. SC denotes plant with a sulfur dioxide scrubber included while NS means no scrubber included. Increased ground level concentrations of particulate matter and nitrogen oxides with sulfur dioxide scrubbing result from reduced plume buoyancy at lower stack exit temperature.

Figure 14

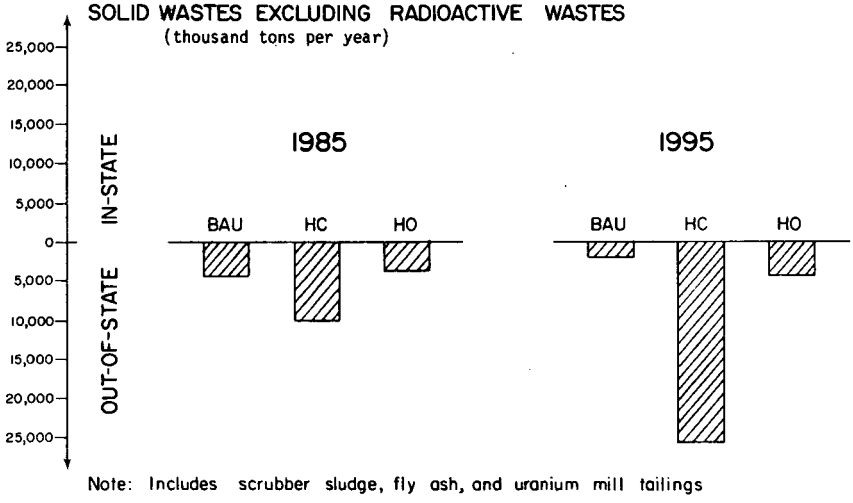
RADIATION DOSAGE LEVELS



Based upon a single 1000 Mw(e) coal and nuclear plant.

83-198 O - 77 - 13

Figure 15



Note: Includes scrubber sludge, fly ash, and uranium mill tailings

Figure 16

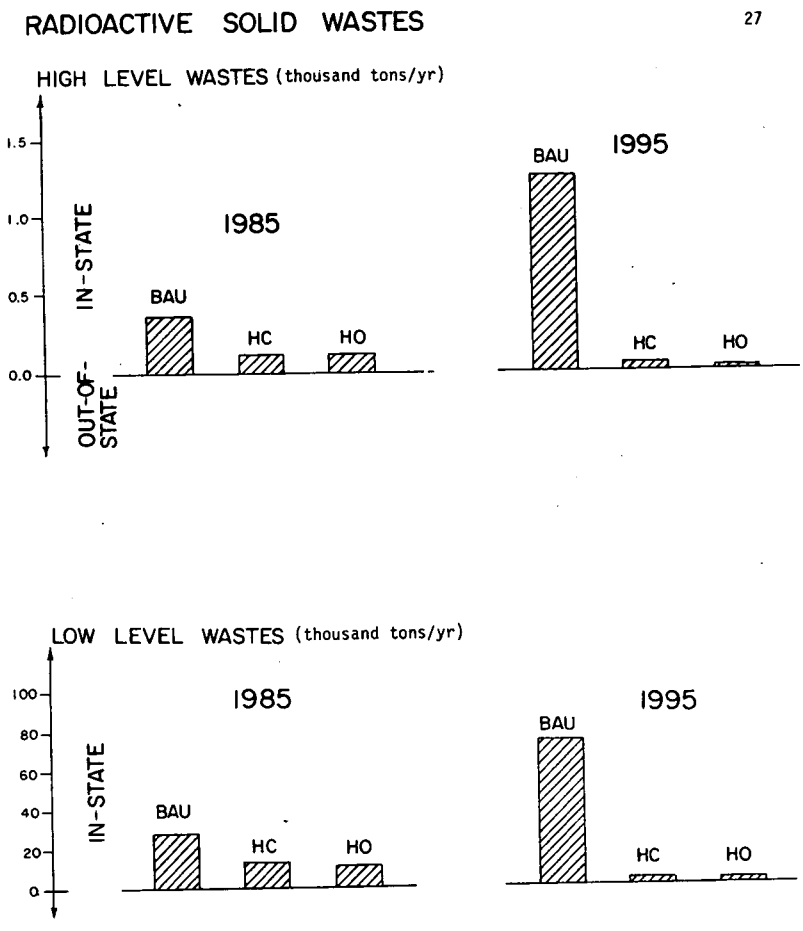

RADIOACTIVE SOLID WASTES
27
HIGH LEVEL WASTES (thousand tons/yr)
1.5
1.0
0.5
0.0
IN-STATE
OUT-OF-STATE
1985
BAU
HC
HO
1995
BAU
HC
HO
LOW LEVEL WASTES (thousand tons/yr)
100
80
60
40
20
0
IN-STATE
1985
BAU
HC
HO
1995
BAU
HC
HO

Table 3

POWER PLANT SITING CAPABILITIES BY REGION
(megawatts electric)

Geographical Region	Coal-Fired Generation Siting Capacity-Mw(e)			Nuclear Power Plants	
	Limiting Standard	Air Pollution Basis Mw(e)	Cooling Water Basis Mw(e)	Cooling Water Basis Mw(e)	Air Pollution Basis Mw(e)
California					
Sacramento Valley	NO_x - FSS	15,000	12,000-450,000	9,000-335,000	No Limit
San Joaquin Valley	PM,NO_x-FSS	0	12,000-45,000	9,000-35,000	5,000-15,000[a]
Northeast Plateau	PM[b]-FSS	12,000	10,000-28,000	7,500-20,000	No Limit
Mohave Desert	PM-FSS	10,000	12,000-14,000	8,000-10,000	No Limit
Colorado Desert	PM-FSS	0	15,000-50,000	10,000-35,000	No Limit
Utah	SO_2[c]-NSD	100,000	45,000-135,000	33,000-85,000	No Limit
Nevada	SO_2-NSD	85,000	25,000	18,000	No Limit
New Mexico	SO_2-NSD	65,000	55,000	40,000	No Limit
Arizona	SO_2-NSD	50,000	X	X	No Limit

Notes: FSS = Federal secondary standards
NSD = Proposed non-significant-deterioration standards
X - Depends on resolution of Indian Water Rights Issues

[a]Based on fog formation potential in San Joaquin Valley.

[b]Particulate matter siting projections are based on 99.5% efficiency controls.

[c]Sulfur oxides siting projections are based on 90.0% efficiency scrubbers.

D. Effects on the California Economy

Assuming that the alternative energy supplies are available to California when needed, at reasonable prices, and in the quantities required, there is little overall economic difference among the three alternatives BAU, HC, and HO for any one of the three demand growth rates studied. For example, the maximum impact on gross state product over the twenty-year period, 1975-1995, for medium growth cases was a decrease of 0.03 percent per year in the growth rate or a decrease in 1975 dollars of $18 billion out of a cumulative total of $5,500 billion. There would be some differences in electricity prices and consumption levels as presented earlier and there could be localized, short-term increases in unemployment if nuclear plant construction is suddenly stopped, but the overall long-term economic growth of California would be affected little by the alternative chosen provided electricity shortages do not develop.

E. Sociocultural Effects

Whether or not nuclear power is curtailed in California, the study shows little long-term change in the California economy provided the alternatives are available. Hence, few economically derived sociocultural impacts are expected in California except for transient effects such as possible unemployment among the relatively small number of specialists whose livelihoods are dependent on nuclear power plant construction or operation and perhaps a proportionate number of supporting workers.

Curtailment of nuclear power with a consequent increase in coal production required for replacement could have major sociocultural impacts

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on the states of Arizona, Colorado, New Mexico, and Utah where the coal is located. The coal deposits are in sparsely populated areas where expansion of coal production and the construction and operation of coal-fired power plants would entail rapid increases in population with attendant problems of expansion of housing, education, health care, police and fire protection, sanitary services, and so forth. These impacts are, for the most part, short-term consequences that are contingent on the extent, nature, and success of advance planning in those states. In the long term, the coal-bearing states would derive significant economic benefits from the development of their resources and would undergo a permanent change in character as a result of the development.

Particularly in the absence of clear economic impacts which could be analyzed for specific groups of California residents, it is important not to overlook the relationship of the initiative to more comprehensive and complex social trends in the state. California has developed into a highly urbanized, service-oriented system to the point where numerous students of social processes refer to it as a "post-industrial state." Continued population and economic growth near historical rates would probably continue these trends which include the desirable consequences of further development of service, or "technocratic," occupations with attendant higher income levels and better educational services, as well as the undesirable consequences of growth in population pressure, increase in organizational problems, and continued high rates of social pathologies such as crime.

The initiative movement may indicate a sentiment in the social constitution of California to slow the rate of technological innovation and technocratic development. If that is the case, a constrained nuclear

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situation could provide an impetus for slowed in-migration, or possible out-migration, of the technical professional population. Such a shift in population composition could mean, on the one hand, lowered income levels, loss of tax revenues, and, therefore, less expenditure on education and other services. Slowed population and economic growth, on the other hand, could also mean less pressure on services and possibly a slowed rate of growth in the social pathologies associated with urbanization and rapid social and economic development.

F. Environmental Effects

The possible passage of the California Nuclear Power Plants Initiative and subsequent phase-out of nuclear power in California would have significant environmental impacts on California and nearby states. These environmental impacts would be most important in terms of air pollution and health effects in California for the high oil case with restricted nuclear development, particularly in the south coast air basin of California. For the high coal case with restricted nuclear development, the environmental impacts would be greatest in terms of land-use requirements, solid-waste generation, and air pollution in the nearby western states where the coal mines and coal-fired generating plants were assumed for the analysis to be located. If, alternatively, the coal-fired power plants in the high coal case were located in California, there could be damage to agriculture in the Sacramento Valley from air pollution. The high coal scenario would result in the greatest consumption of inland fresh water in the Colorado basin and Utah with the coal-burning plants located outside California, or from the upper reaches of California rivers if the plants were located in California.

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The major potential environmental impacts of the business-as-usual case of unrestricted nuclear development would relate to increased water consumption at inland California locations and the greater potential of radiation releases. Much of the increased water consumption could be of agricultural wastewater, technology permitting; but, this could lead to increased water vapor releases in the San Joaquin Valley which could aggravate existing fogging problems during the winter months. Although the potential for greater radiation releases exists, the radiation levels near nuclear plants would be well below present permissible limits.

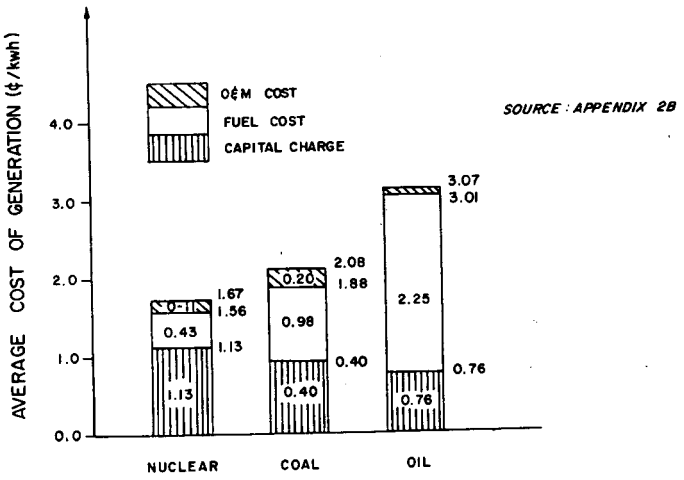
III. DISCUSSION OF FINDINGS

A. Summary Findings Relative to the Business-as-Usual Alternative

If nuclear power use is allowed and integrated with the existing system capabilities, it will have certain important effects upon the character of future electricity supply. California now derives about 55 percent of its electricity from oil- and gas-based generation; the rest comes from hydro, coal, nuclear, and geothermal sources. California has operational about 1500 megawatts electric of nuclear capacity and plans for an additional 7800 megawatts electric to be installed by 1984. The cost of energy from nuclear plants is less than that from new coal plants and lesser by an even greater margin compared to the cost of power from new oil plants (figure 17).

Figure 17

1985 AVERAGE COST OF GENERATION FOR NUCLEAR, COAL, AND OIL PLANTS
(In 1975 Dollars)



If nuclear is not constrained as a future option for production of electric power in California, it can be expected to exhibit the most rapid future growth of any generation alternative.

Several conditions must be met, however, for this to happen. These are:

1. The initiative fails, or if passed, no constraints are placed upon nuclear power
2. In-state cooling water supplies and sites are made available for the nuclear plants
3. The long-range problems of nuclear fuel cycle closure and radioactive waste storage are solved
4. Uranium supplies are available

If these conditions hold, nuclear could by 1995 provide as much as 45 to 50 percent (or 38,000 megawatts electric) of California's total installed generating capacity (expected to be about 80,000 megawatts electric) because of its economic advantage. This expansion, coupled with the expected growth in geothermal, solar, coal, and to some extent, hydro capability, is sufficient to meet the future electricity needs in California, and in addition, replace much of the existing high cost oil-based generation.

If such nuclear expansion occurs, the results of this study indicate that it would be accompanied by decreases in the real cost of electricity to California consumers. This declining trend in cost coupled with declining supplies of natural gas, the indicated potential of existing conservation programs, and existing trends in population and economic growth would lead to an average growth rate in electricity consumption of about 4.3 percent per year between now and 1995. This growth trend would not be

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evenly distributed through time; for the period 1977-1985 the growth in consumption would be about 5.3 percent per year, whereas between 1985-1995 it would drop to about 3.6 percent per year as many uses for electricity saturate and consumption devices with improved efficiencies are more widely used.

The adoption of nuclear power in the business-as-usual alternative would lead to other related changes in the environment of the state. Radiation releases would be greatest for the business-as-usual alternative. However, the projected releases do not appear to constitute major immediate or long-term health hazards. Projected increased maximum radiation dosages from new nuclear power plants through 1995 would be 3 to 5 millirems per year. These dosage levels are 0.6 to 1.0 percent of the present maximum allowable dosage of 500 millirems per year established by the Nuclear Regulatory Commission but are 12 to 20 percent of the standard of 25 millirems per year proposed by the U.S. Environmental Protection Agency. Small radiation releases of radium and thorium would occur from coal combustion with a very small potential for adverse impact. Radon-222 could also be released to the environment from uranium mining and milling operations and mill tailings ponds, from geothermal steam plants, and from natural gas combustion, but the potential hazard is small.

Future siting of nuclear power plants in California will be primarily limited by the availability of cooling water at inland locations, and by seismological considerations and distances from urban areas in coastal regions. Assuming use of irrigation wastewater in the San Joaquin and Imperial valleys, and the use of municipal wastewater from the Bay Area cities in the Sacramento/San Joaquin delta region, inland sites could limit nuclear generating capacity to 43,500 megawatts electric (see table 3).

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Coastal siting of nuclear power plants in California would be limited to specific site locations by potential earthquake considerations. Where coastal siting would be permitted, once-through cooling with ocean water would be possible.

If nuclear power in the San Joaquin Valley required the use of fresh water for plant cooling, it would require diversion of 180,000 to 425,000 acre-feet of fresh water per year which is presently being used to irrigate between 60,000 and 135,000 acres of farmland. This potential diversion could be alleviated or eliminated by the use of irrigation wastewater in the San Joaquin Valley or municipal wastewater in the delta region. However, unless it is properly treated, the use of wastewater in cooling towers would increase particulate drift and microbial organism releases to the atmosphere. Perhaps the most serious potentially adverse environmental impact of nuclear power plant siting in the San Joaquin Valley would be the increased water vapor releases to the atmosphere of 400,000 to 900,000 tons per day. These moisture releases would increase humidity levels by 3 to 10 percent in the valley during the winter months. It would aggravate the already serious fogging problems and increase the potential hazards of traffic accidents. Additional problems of irrigation wastewater use are possible soil contamination by sodium chloride, boron, and tritium from nuclear power plants in the San Joaquin Valley. The waste heat releases from power plants to water could cause localized impacts on aquatic life, while atmospheric releases could cause localized updraft conditions. On the other hand, the use of these nuclear plants would reduce significantly the use of oil in plants sited along the coast, leading to major reductions in sulfur and nitrogen oxide emissions

in the coastal regions from electric power plant sources. This would lessen the burden on air quality in these regions.

Development under the business-as-usual assumption would result in electric plant construction expenditures averaging about $3.8 billion per year (in 1975 dollars) within the state of California between 1977 and 1995. This construction activitiy would take place inside the state, unlike much of the investment in the coal alternative to be discussed shortly.

There are uncertainties in the business-as-usual alternative. The cost of uranium ore has climbed in the past two year, from about $8 per pound to over $40 per pound for delivery in the early 1980's. These cost increases have been factored into the analysis (see appendix 2B). Beyond the mid-1980's there is uncertainty in the outlook for uranium costs, and beyond the late 1980's there is uncertainty about domestic uranium supplies. Also, at present there is no operating capacity in the nation for reprocessing spent fuel and none is expected until the early 1980's. The lack of reprocessing forces greater reliance upon activity at the front end of the fuel cycle to supply fresh fuel for nuclear reactors since the fissionable products in the spent fuel are not recovered and used, further taxing existing mining, milling, and enrichment capacity. The delays in closing the fuel cycle reflect the regulatory difficulties surrounding the safeguarding of the recovered nuclear materials and the resolving of problems of radioactive waste disposal. For the business-as-usual alternative to be viable in the long term, these problems have to be solved; yet, if they are not resolved in a timely fashion and nuclear power development is slowed or temporarily halted as a result, the two alternatives, coal and oil, are available for use instead.

B. Summary Findings Relative to the Greater Use of Coal

California utilities currently have operational about 2300 megawatts electric coal-fired generation capacity located out of state and plans for approximately 2000 megawatts electric more to be installed also out of state by the end of 1984. If constraints are placed upon nuclear power and coal is sought as a replacement, these plans for the use of coal would have to be expanded markedly.

If coal use is to be expanded, the required supplies would have to be obtained from out of state, primarily from Utah, Arizona, New Mexico, and Colorado. Most of the coal-fired generating plants would probably be sited in these states, and the electric power would be transmitted to California. A concern is that even though coal reserves are adequate, it may not be possible to expand the coal production and generation capability fast enough to maintain adequate supply capability in the early 1980's due to lack of adequate lead times.

If the expansion of coal capability is accelerated so that coal is available when needed, several conditions must be met:

1. Accelerated demands from other areas cannot be placed upon these same sources of coal
2. The coal supply states must cooperate fully with California to make the additional supply of coal available on an accelerated schedule
3. The coal supply states must make available the cooling water needed to operate the mine-mouth generating plants
4. California utilities must begin investment in the coal alternative immediately after passage of the initiative

if the coal capability is to be available by the early 1980's when it would be needed

5. Air quality standards must not preclude the expansion of the coal-burning capability, nor can undue delays be experienced in the opening of new mines and the construction of new coal plants
6. Federal coal-leasing policy and mined-land reclamation legislation must not impede coal development

If these conditions are not met there is a distinct possibility of electric energy shortages in California in the high coal use option.

Assuming the above conditions are met, however, to replace nuclear and meet the expected growth in electricity consumption, in addition to existing plans, added coal capacity of about 2500 megawatts electric would have to be made operational by 1985, and a further increase of 15,000 megawatts electric would be necessary between 1985 and 1995.

The future siting of coal-fired power plants in California and nearby states may be limited by ambient air quality standards and proposed significant deterioration standards, and to a lesser extent by water resources availability (see table 3). No coal-fired generating capacity could be sited in the San Joaquin Valley or southeast desert regions without further increasing the suspended particulate levels, which are already above allowable ambient air quality standards. In the northern Sacramento Valley, approximately 12,000 megawatts electric of coal-fired generating capacity could be sited without exceeding the federal primary and secondary ambient air quality standards for nitrogen oxides, while the comparable figure is more the 35,000 megawatts electric when based on particulate

standards. Approximately 20,000 megawatts electric of coal-fired generating capacity could be sited in the northeast plateau region in Medoc, Lassen, and Siskiyou Counties when based on federal secondary ambient air quality standards.

Coal-fired generating capacity outside California in the upper Colorado River basin states could be limited by the proposed significant deterioration regulations for sulfur dioxide in Class II areas. Preliminary calculations show that 60,000 to 100,000 megawatts electric of coal-fired generating capacity could be sited in Utah without violating proposed significant deterioration standards when scrubbers are employed but less than 15,000 megawatts electric without sulfur dioxide scrubbing. Approximately 65,000 megawatts electric of additional coal-fired generating capacity could be sited in New Mexico based on proposed significant deterioration in Class II areas based on sulfur dioxide, with comparable levels which can be sited in certain areas of Arizona and Nevada.

Water availability may pose some limitations for the siting of coal-fired power plants in certain areas of California and nearby states. Potential maximum generating capacities of 15,000 megawatts electric to 70,000 megawatts electric could be sited in the northern Sacramento Valley, and 15,000 to 25,000 megawatts electric in the northeast plateau, depending upon the degree of water diversion from existing uses. Potential coal-fired generating capacity in Utah based on cooling water availability could be as low as 44,000 megawatts electric with diversion of 500,000 acre-feet per year to a maximum of 130,000 megawatts electric with diversion of 1,800,000 acre-feet per year.

The siting of up to 16,000 megawatts electric of coal-fired generating capacity in northern California could reduce cooling water requirements in Utah and other states in the upper Colorado River basin by up to 187,000 acre-feet, which would otherwise need to be diverted from existing uses. Maximum coal-fired power plant siting in New Mexico is 55,000 megawatts electric when based on potential cooling water availability. Cooling water availability in most cases will require diversion from existing uses, with serious potential conflicts with water rights priorities, treaties, and allocation policies in many cases regarding agricultural uses, Indian water rights and treaties with Mexico.

If coal is used predominately to replace nuclear, the consumption of coal for California electric energy generation would increase about tenfold between 1977 and 1995, from 6.1 to about 65.0 million tons per year. This represents an average growth rate of 14 percent per year between 1977 and 1995, or, the requirement that a new mine be opened approximately every eighteen months to supply coal for California's use. This added coal requirement can be compared with the expected total production in 1995 of 53 million tons for the entire region under normal development patterns without constraints on the development of nuclear power. Such rapid expansion could result in severe sociocultural impacts outside California in the four southwestern states of Arizona, Colorado, New Mexico, and Utah where a relatively large influx of labor into previously sparsely populated areas would be necessary for development of the additional coal reserves to generate electricity for California (see chapter 5).

The projected total increases in air pollutant emissions would be greatest for the high coal case, particularly in terms of increased

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nitrogen oxides. These increased emissions for the high coal case would probably not constitute the same health effects problems as the high oil case. Most of these increased air pollutant emissions would occur in rural areas outside and downwind of major population centers in California and would occur primarily outside the state. Major potentially adverse environmental impacts for the high coal case would be potential damage to agriculture in the Sacramento Valley from sulfur dioxide and visibility reduction in Utah, Arizona, and New Mexico from primary particulate matter and sulfate and nitrate aerosols. Compliance with proposed significant deterioration standards for ambient air quality would necessitate sulfur dioxide scrubbing at all new coal-fired power plants serving California. Nitrogen oxides emissions in 1995 for the high coal case are projected to increase by 59 and 124 percent over the present state totals (both California and other western states) for the medium and high growth rates, respectively, with 49 to 89 percent outside California.

Additional environmental impacts of coal-fired power plants would include solid waste generation, land-use requirements, aesthetic visual impacts, and waste heat releases. The solid wastes generated would be greatest for the high coal case. Land-use requirements would be greatest for the high coal case, and would be concentrated at or near coal-fired power plants assumed in the analysis to be located outside of California. There would be visual impacts associated with the construction of overhead transmission lines from Utah and other states to California. Coal-fired power plants sited in northern California would also need to be carefully sited so as not to release excessive quantities of waste heat

to rivers which might adversely affect sensitive aquatic species such as salmon in spawning areas.

In the medium growth case, the predominant use of coal would increase the delivered average cost of electricity by about 15 percent by 1995 compared to the business-as-usual case. This would bring about a reduction to about 3.6 percent per year (compared to 4.2 percent per year for business-as-usual) in the growth rate of electricity consumption due to the higher electricity prices but would encourage the greater use of natural gas (if available) and oil for direct heating purposes. Total capital spending for utility plant and equipment would be reduced, if mostly coal were used, from about $71 billion cumulative total between 1975 and 1995 with business-as-usual to about $53 billion for the coal case over the same time period. This excludes the costs of coal mines and coal-transportation facilities. In addition, in the high coal case about 25 percent of the spending could be outside the state unlike the business-as-usual case where such spending would be almost entirely inside California. The long-range economic growth and sectoral economic impacts of this movement out of state would be small provided that electricity shortages did not develop, that the coal was available at real costs near today's price, and that planning and implementation of alternate supplies were accomplished in time.

In the short term there could be changes in employment and output in specific sectors of the economy due to changes in electric plant construction activity. If construction of nuclear plants were halted with passage of the initiative, there would be increased unemployment in 1977, directly and indirectly, of about 16,000 workers. This is about 0.2 percent of the expected work force of about 10 million in 1977. Changes

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in the gross output of industries which supply inputs to nuclear plant construction would also occur. The ten industries that would suffer the largest absolute decrease are listed in table 4.

Table 4

CHANGES IN GROSS OUTPUT ASSOCIATED WITH A $500 MILLION DECREASE IN NUCLEAR PLANT CONSTRUCTION IN 1977
(millions of 1975 dollars)

New Plant Construction	-$500
Wholesale and Retail Trade	- 52
Heating, Plumbing, and Structural Materials	- 44
Stone and Clay Products	- 41
Lumber and Wood Products	- 41
Business Services	- 39
Transportation and Warehousing	- 24
Petroleum Refining	- 13
Primary Iron and Steel Manufacturers	- 12
Primary Nonferrous Metal	- 11
Total Reduction in Output	-$777

Total GSP in 1977 = $203,000 million (1975 dollars)

These changes would tend to be centralized around the existing San Onofre and Diablo Canyon nuclear plant construction sites. This is a short-term unemployment effect only, the duration of which would depend on the number of persons temporarily out of work in relation to the size of the labor force, the mobility of those affected, and the on-going pace of local or state economic growth.

C. Summary Findings Relative to the Greater Use of Oil

California utilities currently have operational about 22,000 megawatts electric of oil/gas-fired generation capability. If nuclear power is constrained and oil is pursued as a predominant alternative, the additional generating plants would most likely be sited inside

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California. The oil that could be tapped to meet additional generation requirements would come from Alaska, either directly or indirectly.

To avert possible shortages and maintain viability of the oil option the following conditions would have to be met:

1. Existing air quality standards would have to be relaxed in some areas of California if additional use is to be legally permissible
2. California utilities must begin investment in the oil alternative immediately after passage of the initiative if the oil capability is to be available by the early 1980's when it would be needed
3. Federal action must not be taken to force conversion of such plants to burn coal as made possible by the Energy Security and Environmental Coordination Act of 1974
4. No oil embargoes are experienced
5. Sites and cooling water for in-state oil-fired plants must be available

If these conditions are fulfilled, oil use could be expanded to replace existing nuclear and to meet future requirements with little likelihood of shortages.

The high oil use option presents the greatest potential risks to human health in California from changes in air quality. High oil use would necessitate combustion of large quantities of oil at existing power plants located along the California coast, upwind of existing populated areas.

The increased particulate matter, sulfur oxides, and nitrogen oxides emissions for the high oil case would have the greatest adverse impacts on human health because of the increased formation of sulfate and nitrate

aerosols and photochemical oxidants such as ozone and peroxyacyl nitrates.[46] The greatest potential risks of health effects would probably result from nitrogen oxides reaction products through increased eye irritation, and aggravation of existing heart and respiratory problems in elderly persons. Most of these increased air-pollutant emissions would occur in California, where the increased sulfur oxides emissions would increase the present state total by 82 percent by 1995 for the medium growth case.

The future siting of oil-fired power plants will be determined by federal and California standards for ambient air quality for particulate matter, sulfur oxides, and nitrogen oxides because of the probable coastal location of most oil-fired plants. Some additional oil-fired power plants may be sited in the north and south central coast, northeast Bay Area, or southeast desert air basins without exceeding existing ambient air quality standards. However, it would not be possible to site any additional oil-fired generating capacity in either the south coast, San Diego, or San Joaquin air basins without causing additional violations of ambient air quality standards and aggravation of resultant health effects. Additional fuel oil desulfurization capacity at petroleum refineries may be required to reduce sulfur content from 0.5 to 0.1 percent by weight to minimize the projected sulfate aerosol problems. It will not be possible to reduce significantly the nitrogen oxides emissions from oil-fired power plants along the coast without additional flue gas scrubbing technology which is not presently available.

High dependence on oil also leads to the highest electricity prices of the alternatives available. If oil is used predominately to replace nuclear and meet the growth in electricity requirements, the average cost of electricity in 1995 would be about 25 percent higher than for

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business as usual in the medium demand growth case. This would reduce future growth in consumption to about 3.1 percent per year between 1977 and 1995, compared to 4.2 percent for the business-as-usual alternative and 3.6 percent for the high coal case. The short-term unemployment and sectoral impacts of the oil option would be similar to those in the coal option if construction were halted at existing nuclear sites. As in the coal case there are not expected to be severe long-range economic growth or sectoral impacts in response to such price increases provided shortages do not develop.

Adoption of the high oil alternative would lead to increased oil consumption requirements in 1995 of about 700,000 barrels per day. Even if this oil is supplied from Alaska, an equivalent increase in oil imports would take place somewhere else in the country. The increased cost to the national economy of the additional imports in 1995 would be about $3.3 billion (1975 dollars) compared to estimated U.S. exports in 1995 of about $300 billion (in 1975 dollars). Increasing oil dependence is also counter to the stated national goal of reducing oil consumption.

IV. UNCERTAINTIES ASSOCIATED WITH PASSAGE OF THE INITIATIVE

The quantitative results reported and discussed were based on a set of assumptions about definite sequences of events that might follow different actions related to the initiative. The major uncertainties associated with the assumed future course of events need to be known and understood. Some uncertainties have been cited in the preceding discussion. Other uncertainties are discussed below.

A. The Potential for Shortages of Electricity

It has been stated that little economic impact is expected if constraints are placed upon nuclear power provided the power can be obtained from other sources. The actions that must be taken if shortages are to be averted have been delineated. In 1977 there will be little probability of shortage due to the extent of overcapacity now existing as a result of low demand growth in the last two years. In the long range (1985-1995) there is time to obtain replacements for existing and planned nuclear capability, provided that environmental and political factors do not become binding constraints on the alternative coal or oil supplies. The period from 1979 to 1984 is much more uncertain.

If nuclear plants are derated to 60 percent capacity, predicted demand growth would by 1979 to 1984 absorb the difference between today's margin of reserve (30 percent) and the minimum of 15 percent considered necessary for reliable operation. There are inevitable uncertainties in peak demands that arise from the weather-dependence of the load. There are also uncertainties in future hydroelectric capability because it depends on

rainfall. If peak demands were high and a dry year were experienced, there could well be shortages of capability in the 1979 to 1984 time period. The possibility of shortages in electrical generating capacity serving California in the period from 1979 to 1984 is definitely increased if use of nuclear power is curtailed.

The analyses conducted assume that the utilities correctly perceive, as a basis for their planning, the role that nuclear power will play throughout the future if and when the initiative passes. Clearly this assumption is optimistic. Passage of the initiative does not necessarily imply a complete shutdown of nuclear power in the state, nor does it imply a precise and predeterminable future for nuclear generation. Key decision points exist one year, three years, and five years after its passage. The existence of these decision points shrouds the future of nuclear in considerable uncertainty early after passage. The disruption in orderly utility planning in this uncertain environment could have severe adverse effects.

If utilities take the conservative position of planning for a complete but phased shutdown of nuclear power, and a shutdown does not occur the results of this study overstate the requirements for alternative fuels and the potential for shortages in the transition period of 1979 to 1984. At the same time, these results significantly understate the economic penalties associated with this eventuality, because they do not factor in the misplaced investment that would occur.

On the other hand, if utilities expect and plan for little or no restraint on nuclear power and constraints of the sort analyzed in this report in fact emerge, these results understate the potential

shortages of electricity. Shortages of capability would be almost certain by 1980 unless additional action were taken to curtail electricity demand growth.

The problem of a possible shortage of generating capacity is further aggravated by the fact that gas turbines that formerly took one and one-half to two years to purchase and install are no longer "off-the-shelf" items but are manufactured upon order. As a result the lead time for this type of plant has increased to about three years. If sufficient gas turbines were ordered and introduced into construction shortly after an assumed passage of the initiative, they could be available by mid-1979. But this alternative must be pursued immediately after passage of the initiative if it is to help avert possible shortages by 1979.

It is also true that if nuclear plants are derated, additional base load capacity not now planned would be essential by the early 1980's if California utilities are to have in place sufficient capability to meet peak demand and energy requirements. This capacity must grow after 1981 not only to meet any additional growth in demand, but also to replace further derating of nuclear capability that might occur. Again there is probably sufficient time to obtain this capability if work is begun immediately after passage of the initiative, provided the incremental coal is strip-mined, cooling water is available, actions are not taken to delay coal expansion, acceptable sites for additional oil plants are found, and air quality regulations do not preclude their use.

Again, utilities need to make decisions regarding which fuel supply alternatives they will depend on most heavily in meeting the demand. The uncertainties associated with each alternative, that are beyond the control

of utilities will pose difficult decisions for the utilities. The utilities may find it prudent to carry through the planning and siting for more than one alternative.

Some would argue that if disruption and dislocation were to become a reality with passage of the initiative, steps could be taken by government to mitigate the impacts. This is in part true, but this capability must also be qualified. First, the responsible agency or agencies must recognize the problem, formulate a response, and finally enact the required changes in laws or regulations to help solve the problem. The ability of governmental institutions to act and react in such timely fashion to provide sufficient lead time for implementation of changes must be questioned.

Action that might be taken to lessen the probability of shortages in electric power would be to implement load management programs in the form, for example, of peak load pricing. Such programs would help avert shortages over the time period of concern if they were successful, but our results also indicate that up to 1995 there would be little, if any, short- or long-range price benefit to the consumer (see chapter 3). It must be kept in mind that the implementation of many load management concepts involves large-scale use of sophisticated metering control, and billing procedures. These can be expected to require significant capital investment by utilities and lead times to install and implement.

Another alternative would be power-sharing arrangements with nearby states, but such arrangements might not be feasible. As an example, the Bonneville Power Administration has announced forecasts which state that energy shortages are likely exactly in the time period of most concern.

Finally, if all else failed, government allocation would have to take place, or in an extreme crisis, one might even conjecture that the legal constraints on operating the existing nuclear capability might be lifted.

B. Other Uncertainties

California will continue to be heavily dependent upon oil-fired generation between now and 1985 and this dependence will be increased if constraints are placed upon nuclear. California will obtain significant quantities of Alaskan oil in the future. Nevertheless, in the event of another embargo, one must expect that emergency federal programs would allocate domestic supplies, regionally and sectorally, in an effort to minimize adverse impacts, and that California would be affected.

It has already been stated that existing air quality standards might preclude the siting of new oil plants in populous coastal regions. An alternative might be to site these plants inland. If this is done, the need for cooling towers would increase the cost of such plants and require inland water supplies for cooling. Thus, the effect on electricity costs of the oil option would be greater than our results indicate. Finally, existing federal legislation, the Energy Supply and Environmental Coordination Act of 1974 (ESECA, recently extended by the Energy Policy Conservation Act of 1975), could be used to force such plants to be coal fired in any case.

Economically, the coal option presents the most attractive alternative to nuclear. However, problems in expanding the use of coal could be more of an impediment than the economics indicate.

If rapid expansion of coal supply is to take place in the near term (prior to 1985), it would have to be on strippable resources. The area most favorably located with the needed resources is in New Mexico. The ability to undertake such expansion, however, could be impeded by federal mined-land reclamation legislation.

Extensive diversion of water supplies from existing uses to power plants would have to take place. State agencies in Utah have expressed their willingness to cooperate, but in other states (especially Arizona and New Mexico) the viability of such action is clouded by the issues of Indian rights to this resource and water treaties with Mexico.

All results reported here have assumed a sizable contribution of out-of-state hydro and geothermal power (3800 megawatts electric) in 1985 and the equivalent of 2400 megawatts electric of solar with 6400 megawatts electric of geothermal and out-of-state hydro in 1995 (appendix 2C). Some might argue that these amounts are conservative, while others would call them optimistic. These quantities are uncertain and could aggravate or mitigate the impacts of constraints on nuclear depending on where the actual values lie.

It has been assumed that natural gas quantities currently contracted for are delivered to California, from both foreign and domestic sources. Given the uncertainty associated with the regulation and resource conditions in natural gas markets, this assumption may be optimistic. The analyses assumed that no gas was used for electric power generation but that adequate gas was available for expanded residential and commercial purposes. If the future gas supply has been overestimated, it could significantly change the results reported here because natural gas and

electricity are substitutes for each other in many residential and commercial uses. The less natural gas is available, the more electricity demand there is likely to be. Furthermore, the analysis has assumed the capability exists for price-motivated increases in natural gas consumption in the residential sector in the constrained nuclear cases. If gas supply is limited and this capability is not possible, electricity demand would be much less responsive. The result would be that replacement coal- and oil-generation requirements have been understated in the constrained nuclear alternatives.

It has been assumed that investment in usable nuclear plants would be included in the rate base and amortized over the normal life of the plant in those cases where nuclear is constrained, although this is very uncertain. The value of investment in nuclear plants in California is currently between $2 and $3 billion. Amortized over the normal life of the plant, this value of investment, when averaged over total sales, would contribute about 0.2¢ per kilowatt-hour to the average cost of electricity in California. If such an investment were to be recouped in one year, however, it would increase the average cost of electricity to all California consumers by about 2¢ per kilowatt-hour for that year. If accelerated schemes for recovering the investment were followed, the impact on electricity price of constraining nuclear power could be considerably larger than in the findings reported here. In addition, the price effects reported are statewide averages. Service areas of utilities more dependent on nuclear power than the average would be faced with larger price increases if nuclear were constrained while those less dependent would incur smaller price increases than the state average.

Finally, the business-as-usual cases assume availability of uranium resources and growth in the fuel cycle industries commensurate with needs in the long run. With the uncertainties in today's uranium markets, and the lack of clear regulatory guidelines for investment in some segments of the industry, this assumption may also be optimistic. Nonetheless, if these uncertainties were to limit the growth potential of nuclear power in the business-as-usual case, coal and oil would still exist as possible alternatives.

V. CONCLUDING REMARKS

The major conclusions drawn from the results of the study are:

1. California will likely need additional electric energy supplies in the future. Conservation and improvement in load factor can reduce this requirement but not eliminate it.
2. Large-scale supplies in addition to hydro, geothermal, and solar will be needed. Retention of nuclear as a generation alternative to be used with coal- and oil-based generation provides increased flexibility in supply.
3. There are major difficulties associated with expansion of all sources of electricity. Elimination of nuclear as an alternative will force increased reliance on other energy sources that possess impacts, risks, and uncertainties.
4. Nuclear provides the lowest cost electricity when compared to coal and oil; hence, elimination of nuclear energy will cause the price of electricity to rise in California.
5. There should be few overall economic or sociocultural effects in California if nuclear power is phased out, provided alternatives are available.
6. Increased use of coal to replace nuclear will have severe sociocultural effects in nearby states and significant impacts on air quality and water consumption wherever the coal-burning plants are located.
7. Increased use of oil to replace nuclear will have adverse impacts on air quality in California. The use of oil would

also increase the imports of the country as a whole.

8 Nuclear power has uncertainties related to fuel cycle closure and waste management and storage that must be resolved.

We conclude that each alternative that we have analyzed has contained within it significant uncertainties with associated risks. Consequently there is no one clear course of action that appears to everyone to be superior to all others in terms of economic, environmental, or sociocultural effects. Different people evaluate alternative sets of risks and uncertainties with different weighting factors; hence, there is disagreement and contention on the initiative which will be resolved by the voters of California on June 8, 1976.

COMMENTS

BY

OVERSIGHT COMMITTEE MEMBERS

Members of the Oversight Committee have provided the following comments on the University of Texas study. These represent the individual views of the members and do not represent the opinions of the University of Texas or the Federal Energy Administration. Volume 4 contains more extensive comments by some Committee members on the complete report (Volumes 2 and 3).

The Oversight Committee was established in response to concerns expressed about the independence and completeness of the FEA funded study. The members of the Committee were appointed by the FEA in consultation with the Chairmen of four FEA Advisory Committees concerned with environmental, consumer, state regulatory, and electric utilities issues.

The Committee served as consultants to the University of Texas throughout the study. Members reviewed the structure, methodology, key assumptions, and drafts of the study. The Committee had access to all working papers and related materials. In addition, three meetings of the Committee were held at the University of Texas in Austin, at which time all elements of the study were evaluated and discussed.

The members of the Committee served as individuals and the organizational affiliations are listed for information purposes only:

Roger Beers - Natural Resources Defense Council
Brant Calkin - Sierra Club
Donham Crawford - Edison Electric Institute
R. William Habel - Florida Public Service Commission
Kai Lee - Institute for Environmental Studies,
University of Washington
Floyd Lewis - Middle South Utilities
Marvin Lieberman - Illinois Commerce Commission
Sylvia Siegel - Towards Utility Rate Normalization
"TURN"

JOINT REPORT OF FIVE OF THE EIGHT MEMBERS OF THE OVERSIGHT COMMITTEE

The undersigned are five of the eight members of the Oversight Committee appointed by the Federal Energy Administration to review the study of the University of Texas' Center for Energy Studies (CES) entitled "Direct and Indirect Economic, Social, and Environmental Impacts of the Passage of the California Nuclear Power Plants Initiative."

In our view, the CES report represents an ambitious academic undertaking, and some of the participants in the study have clearly pursued a careful and thorough approach to their tasks. Ultimately, however, the study is seriously deficient in its analysis of some of the most crucial factors embraced by its broad title. These deficiencies derive, in our judgment, from a systematic bias in the study for nuclear power development, and they create at least the appearance of opportunism in the performance of the contract study for a pro-nuclear administration.

We are also concerned that the Executive Summary of the report reflects in part a seeming bias against the Initiative. This is the third version of the Executive Summary which CES has prepared. The first, in our view, fairly reported the results of the study. The second draft contained blatant disparities in language, treatment, and emphasis which unfairly favored the development of nuclear power and departed in many instances from the actual findings of the study. After objection by most members of the Oversight Committee, this third version was produced.

While the present Executive Summary more fairly describes the results of the study than the second version, the authors have failed to expunge their apparent bias. In particular, Section IV, entitled "Uncertainties Associated with the Passage of the Initiative, is tremendously one-sided. While this section devotes seven pages to the potential constraints and uncertainties associated with coal and oil as electrical energy sources, only a brief, vague reference (covering one-fourth page) is made to any uncertainties in the development of nuclear power.

Ultimately, these uncertainties are dismissed because "coal and oil would still exist as possible alternatives." (p. 55). What this logic ignores is the risk of shortages if heavy reliance is placed on nuclear power and later constraints develop (apart from the Initiative). Elsewhere in the Summary, for example, where it suited the authors' purpose, they argue that if utilities expect or plan for nuclear power development, and constraints later emerge, "shortages of capability would be almost certain by 1980 unless additional action were taken to curtail electricity demand growth." (p. 50). As discussed below, the study in general failed to

consider adequately the potential limitations on the development of nuclear power. 1/

Despite the report's title, it does not consider the full range of economic, social, and environmental impacts of the passage of the Initiative. While the Executive Summary makes reference to some of these problems, the study itself largely omits any analysis of the principal factors which have motivated the nuclear initiative -- the social and environmental impacts and risks of developing a nuclear power economy in California. Therefore, while the report details the potential adverse consequences of increased reliance by California on coal and oil to fuel electric power plants, the reader is deprived of any comparable information about nuclear power.

Our principal observations about the CES study and report follow.

1. The Primary Finding Of The Study, In Our View, Is That Curtailment Of Nuclear Power Would Have Relatively Minor Effects On The California Economy, Employment, And Electricity Prices

A primary subject of the CES study, as we have observed it, was the impact of the Initiative on the California economy. The most sophisticated analytic techniques in the study were employed in analyzing this question. Yet, surprisingly, the Executive Summary pays scant attention to this subject. (p. 29). In our judgment, this is the most significant finding of the study: that the curtailment of nuclear power (if the Initiative's safety criteria could not be met) would have relatively minor effects upon the California economy, employment, and electricity prices during the next twenty years. 2/ Indeed, this conclusion was reached although the study assumed unrealistically favorable cost advantages for nuclear power, including a rate of future cost increases of only 5.5 per cent. 3/

1/ Similarly, the chart on page 16 is misleading to the extent it implies that beyond the outcome of the Initiative, there are six separate problems faced in each case by coal and oil development, while only three for nuclear. As noted below, the third condition for nuclear power -- "long run problems of fuel cycle closure and waste storage solved" -- contains a number of separate, serious problems. Moreover, no reason is given for making the investment of California utilities in the supply alternative a condition of coal and oil but not nuclear. In addition, similar considerations would appear to apply to the supply of uranium as the supply of coal under conditions "2" and "6." Finally, while condition "7" under the coal alternative refers to possible impediments from future federal coal leasing and reclamation legislation, no reason is given for not also listing the possibility of constraints on the nuclear alternative from future federal legislation (now pending in Congress).

2/ Footnote on next page.

3/ Footnote on next page.

In the Executive Summary, this finding is qualified by the "assumption" that "alternative energy supplies are available to California when needed, at reasonable prices, and in the quantities required" (p. 29), but this statement obscures the fact that the study also determined that there would, in fact, be sufficient supplies of these resources -- primarily coal and oil -- available at reasonable prices to meet California's projected electrical needs. When other factors were taken into account, the study still concluded that shortages of electricity are not probable in the next twenty years, if constraints are placed on nuclear power.

2. The Executive Summary Devotes Insufficient Attention To The Potential And Benefits Of Energy Conservation

Neither passage of the Initiative nor its rejection will solve California's energy problem. For this reason, all reasonable options must be studied and considered. In our view, California's need for additional oil or coal for the generation of electricity in the next twenty years (if nuclear power is curtailed) could be substantially reduced or eliminated entirely if further vigorous programs to conserve energy were implemented. Indeed, although the Executive Summary obscures this potential, one of the findings of the study was that the additional hydro-electric, geothermal, and solar capacity expected to be available in the next twenty years could meet California's projected electrical energy needs under the low-growth case, if vigorous conservation programs and

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2/ Similar findings were made in recent studies by the Lawrence Berkeley Laboratories and faculty members of the Stanford University. W. E. Siri, et al., "Impacts of Alternative Electricity Supply Systems for California," Lawrence Berkeley Laboratory, April 1976; M. J. Boskin and R. J. Gilbert, "The Economic Common Sense of Controlling Nuclear Power Development" in The California Nuclear Initiative, Institute for Energy Studies, Stanford University, April 1976. An internal analysis by the Federal Energy Administration, using the Project Independence Energy Supply Model, also supports this conclusion. FEA, "Energy Picture, California and the Western Region."

3/ The study seriously underestimates the future price of uranium fuel and nuclear power plant capital costs, and substantially overestimates the likely capacity factors for nuclear plants. When used in the Regionalized Electricity Model, these estimates result in an extremely high projection of future installations of nuclear plants in California. The high nuclear projection, in turn, greatly exaggerates the study's evaluation of the possible adverse economic, social, and environmental impacts of the coal and oil options, and, correspondingly, underestimates the advantages of these options and the achievability of the conservation option.

load management were implemented. 4/ Hence, the Executive Summary, on page 56, simply misstates the findings of the CES study when it concludes that "[l]arge-scale supplies in addition to hydro, geothermal, and solar will be needed."

Energy conservation strategies would substantially reduce the pollution and adverse environmental and sociocultural effects that the CES study otherwise projected for increased reliance on coal or oil (and that could occur through reliance on nuclear power). Energy conservation strategies are also potentially more cost-effective than building additional generation facilities and could produce more additional employment on a broader geographic scale and in those trades in California where it is most acutely needed. Unfortunately, no assessment was conducted by CES at all of the economic, social, and environmental benefits of vigorous conservation measures.

3. Potential Limitations On The Development Of Nuclear Power Are Not Adequately Considered

While the CES study considers in detail potential constraints on increased reliance by California on oil or coal, the analysis of possible constraints on the development of nuclear power is seriously incomplete. Among the problems that should have been analyzed in the CES study are the possible shortages of uranium ore, uranium milling capacity and uranium enrichment capacity, and the possible shortage of sufficient capital to build the capital-intensive nuclear power plants. Other possible constraints on the development of nuclear power arise from the failure so far to develop (1) a regulatory authority to reprocess and obtain plutonium for reuse in nuclear fuels, (2) a commercially demonstrated means for solidifying high-level radioactive wastes, (3) a detailed plan (let alone facility) for the disposal of high-level radioactive wastes, and (4) an adequate plan for the handling of uranium mill tailings and low-level radioactive wastes. Unless these fuel cycle problems are resolved in the relatively near future, very severe limitations could be placed on the development of nuclear power in California and elsewhere -- whether or not the Initiative passes. Yet, the CES study largely omits consideration of these matters.

4. The Environmental And Social Effects of Nuclear Power Development Are Not Considered At All

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4/ This finding agrees with a recent study for the federal Energy Research and Development Administration by the Lawrence Berkeley Laboratories, which concluded that no new large thermal power plants would be required in California for the next ten to twenty years if extensive conservation programs were adopted. See D. B. Goldstein and A. H. Rosenfeld, "Conservation and Peak Power -- Cost and Demand," LBL-4438, December 1975. Significantly, that study also concluded that these savings could be achieved without fundamental alterations of economic conditions or life styles in California.

From the inception of the Oversight Committee, we have expressed our dismay that no full assessment has been attempted of the environmental and social effects of nuclear power development -- comparable to the extensive analysis of the effects of reliance on coal or oil. Among the major issues of public concern about nuclear development that have been omitted from the study are the following: (1) an assessment of the potential for theft and illegal use of purified plutonium, and a consideration of the extreme toxicity of plutonium; (2) an analysis of the potential for major releases of radioactivity from nuclear power plants and supporting facilities; and (3) a full analysis of the potential risks to public health and safety from the disposal of radioactive wastes.

The analysis of the social effects of nuclear power development in California is equally deficient. Among the major issues omitted from the report are (1) the potential threat to civil liberties that may occur as a result of attempts to prevent terrorist activities or sabotage against nuclear facilities; (2) the potential public reaction to a catastrophic nuclear power plant accident that could occur in California or elsewhere; and (3) the potentially disruptive development that may occur in or near small rural communities, where nuclear power plant siting is most likely.

In conclusion, some aspects of the study will clearly be of substantial academic interest and the work of some of the CES team members has been thorough and objective. In its overall conception and leadership, however, the study has fundamentally lacked these qualities. It distorts the choice which California citizens face in deciding how to vote on Proposition 15, and, given the context in which it was prepared, we are compelled to judge it from that perspective.

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Statement by W Donham Crawford
on the Executive Summary
of the Study of Direct and Indirect Economic,
Social, and Environmental Impacts of the Passage of the
California Nuclear Safeguard Initiative

The Center for Energy Studies confronted a challenging assignment in undertaking to analyze the economic, environmental and social impacts of passage of the California Nuclear Initiative. Time limitations made the analysis even more difficult. It is thus understandable that the study was based on a number of broad assumptions in order for the completion deadline to be met. Two basic assumptions of the study, which are absolutely critical to its ultimate validity, are very likely to prove fallacious.

One is that energy shortfalls in California resulting from adoption of the Initiative could be made up by importing electricity from neighboring states. The likelihood that the requisite generating capacity would be constructed in these states is small. Opposition to such developments was dramatically manifested recently when California utilities sponsoring the Kaiparowits coal burning plant in Utah were obliged to drop the project. This station, not scheduled to enter service before 1981, would have constituted only a small fraction of the out-of-state coal burning capacity which California would require if it were to forego the nuclear option. By failing to place fully in perspective the probability that nearby states would not be willing to assume responsibility for a major portion of California's electric energy needs, the study has failed to convey to the public the grave consequences which the abandoning of nuclear power in California would entail.

The second major assumption which is vital to the report's conclusions and which is likely to prove erroneous concerns increased reliance on the use of oil for electricity generation within the State of California. If the Initiative is adopted, a massive reliance on oil is the only viable alternative in the near term to compensate for the missing nuclear energy, and an immediate lowering of air pollution standards would be essential for utilities to be able to proceed promptly with the financing and construction of new oil-fired plants. The study questions the ability of governmental institutions to take action promptly enough to implement the necessary changes, but the basic conclusions of the study are predicated on such changes being made in adequate time to forestall shortages of electric energy. Based on past experience, those who are opposing nuclear power will be among the first to resist any lowering of air pollution or land use standards. The inevitable delays in resolving these questions, which are certain to result, will make it all but impossible for California to avoid serious electricity shortages beginning in the early 1980's.

In summary, the study does not adequately consider the prospect that two of its major assumptions will prove to be invalid. Groups opposed to economic growth, animated by an elitist view of the world, understand fully that by arresting energy development they can arrest economic development, their ultimate goal. The cost of achieving their objective would be measured in terms of lost jobs, lowered living standards, and diminished individual freedom. It is a cost that would be paid by the people of California.

Comment by Floyd W. Lewis on the
Executive Summary of the Study of Direct and Indirect Economic,
Social, and Environmental Impacts of the Passage of the
California Nuclear Safeguard Initiative

Within the limits of reliability of present techniques for analysis of complex problems involving future projections with multiple variables and unknowns, the Study could be considered a good effort. However, its usefulness as a basis for decision is seriously flawed by the invalidity of a number of basic assumptions and the failure of the Center for Energy Studies to come to a conclusion as to what is considers, the most likely consequences which would flow from passage of the Initiative.

Among the fallacious assumptions are:

1. Adjoining states will cooperate fully to supply California's energy shortfall.
2. Adjoining states will encourage vastly increased strip mining to serve California.
3. Adjoining states will divert water from agriculture to power plants to serve California.
4. Adjoining states will willingly accept greatly increased air pollution from coal-fired plants to serve California.
5. Hydropower will continue to be available from the Northwest, even though Bonneville itself says it will have a shortage.
6. All natural gas now contracted for will be delivered and enough will be available to serve additional residential and commercial loads.
7. Other regions will not increase their demands on low-sulfur coal in the adjoining states.
8. California will reduce air quality standards to allow more burning of fuel oil in the densely populated coastal region.
9. Federal Clean Air amendments will not prevent new coal-burning power plants.
10. Federal action will not be taken to compel conversions from oil to coal as authorized by legislation in 1974.
11. California utilities will "immediately," after passage of the Initiative, begin making large investments in coal-fired and oil-fired plants - notwithstanding the tremendous uncertainty which would exist at that time, the great likelihood of protracted litigation of the question of Federal preemption, and the exposure to such investments proving to be unwise.
12. Load management efforts will improve annual load factor by 13%.

I submit that in the real world, populated by flesh and blood people, including super-active environmental groups, the exact opposite of the foregoing assumptions is much more likely to occur than the assumptions themselves. It is totally unrealistic to expect all of the things to occur each of which would have to fall in place to avoid severe electrical energy shortages in California following a phase-out of nuclear power. I cite as an illustration the recent cancellation, due to environmentalist pressure, of the Kaiparowits coal-burning power plant in Utah, primarily intended to serve California's energy needs. Without nuclear power, the impact of another OPEC embargo would be greatly magnified.

The Study is deficient in that it did not attempt to quantify the severe economic and social impacts which will result from a shortage of electrical energy in California. In that most likely event, should the Initiative pass, some form of governmental allocation, rationing or control of use of electrical energy would almost be a certainty, with consequent loss of personal freedom of action.

Passage of the Initiative will surely mean that Californians should expect to face electrical energy shortages, higher electric rates, adverse effect on the economy, significantly changed life style, less healthy air to breathe and a reduction in individual freedom.

COMMENTS ON THE UNIVERSITY OF TEXAS CENTER FOR ENERGY STUDIES REPORT

Marvin S. Lieberman
Chairman of the Illinois Commerce Commission
Robert J. Podlasek, Ph.D
Technical Advisor

The Study dramatizes that in the area of electric energy the significant effect of the Initiative goes beyond the borders of California. The Study is an ambitious attempt to quantify the direct and indirect economic, sociocultural and environmental impacts of the passage of the Initiative. It succeeds to the extent that the underlying assumptions are valid. It fails in that it does not test the assumptions nor assess the implications resulting from a failure of those assumptions, i.e., the shortage of electric power resulting from constrained nuclear capacity and a lack of an in- or out-of-state substitute. The potential for shortfall of electricity in California hinges upon the willingness of neighboring states to site plants of all types. Not only is the cooperation of neighboring states necessary but there must be a willingness on their part to absorb the adverse environmental and social consequences that would accompany the growth of the energy industry within their borders. The cancellation of the Kaiparowits project in Utah illustrates the vulnerability of out-of-state projects; despite economic benefits, sufficient environmental problems apparently caused the demise of the project.

The reader must keep in mind at all times that the study "assumes other states will cooperate fully to supply California with whatever energy or resources it needs and at prices normally commensurate with production costs." That assumption drives the analysis and all of the conditions associated with that assumption must be evaluated before substantial reliance can be placed on the report's conclusions.

Because of the assumptions, there is the real potential for the report to be abused by quoting it out of context. For example, pro-Initiative groups can say that the primary finding of the Study is that curtailment of nuclear power would have relatively minor effects on the economy, employment and electricity prices in California. This ignores the assumption underlying that finding, i.e., that the required electrical generating capacity will be available from in- or out-of-state sources. On the other hand, opponents of the Initiative can say that the Study shows that if the Initiative passes, the cost of electricity for California residents will increase. This ignores the Study's finding that, should the Initiative pass, the total residential electrical bills in California may not increase due to improved load management and price-induced conservation.

It is difficult in the one page allotted to each member of the Oversight Committee to comment adequately on the executive summary and we refer the reader to our somewhat more extensive comments on the complete report which are contained in its appendices. Unfortunately, the results of this Study are certain to add additional controversy to the already emotionally charged environment surrounding the California Nuclear Safeguards Initiative. If the Study does nothing else, it graphically demonstrates the need for multi-state cooperation in the field of energy and without stating it shows an absolute mandate for a clear, comprehensive and responsible energy policy at the national level.

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ENERGY CONSERVATION

TUESDAY, FEBRUARY 24, 1976

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON ENERGY
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D. C.

The subcommittee met, pursuant to recess, at 10:10 a.m., in room 6206, Dirksen Senate Office Building, Hon. Edward M. Kennedy (chairman of the subcommittee) presiding.

Present: Senator Kennedy.

Also present: John G. Stewart, subcommittee professional staff member.

OPENING STATEMENT OF CHAIRMAN KENNEDY

Chairman KENNEDY. The subcommittee will come to order.

This is another hearing before the Subcommittee on Energy in the series on energy conservation that began last November in Waltham, Mass. The subcommittee heard further testimony in Washington, D.C., on February 2 and 3, 1976.

These hearings are important for two reasons:

First, a variety of witnesses has provided the subcommittee with a wealth of information on the potential benefits that energy conservation provides both individual energy users and the Nation as a whole. The savings in energy and dollars that can be achieved without sacrificing economic output or American living standards are very impressive. On the basis of this testimony, I can find no justifiable excuse for the United States not moving as expeditiously as possible to take advantage of cost-effective conservation opportunities.

There is a second and more basic reason why I consider these hearings to be important and this reason is directly related to the Nation's fundamental strategy for dealing with the energy crisis.

The administration has been attempting to carry out an energy program that has as its priority concern the achievement of energy independence by 1985. Steep price increases and large Government expenditures to expand domestic energy production, coupled with rash rhetorical salvos against the OPEC cartel, have been at the core of the administration's energy strategy.

Congress has properly resisted this approach. Over the course of the past 2 years we have learned that there is no apparent way, at any reasonable cost, of eliminating U.S. dependence on Arab oil of 1985. Indeed, we will be hard pressed to hold imports to a constant proportion in the coming decade. We have also learned that many of the production options we viewed initially with great enthusiasm,

especially the high technology projects such as synthetic fuels, shale oil, and nuclear power, will involve much more time and far higher costs than anticipated.

Moreover, I would argue that creation of a strategic petroleum reserve, such as authorized by the Energy Policy and Conservation Act of 1975, provides the best insurance against the economic and political threats of another oil embargo. It is surely preferable to the administration's posture of alternating between hints of military intervention against OPEC and saying we lack the muscle to bargain effectively with the OPEC nations.

These several factors have brought us to the point of beginning a major reassessment of the question that is at the heart of the energy crisis: How can we best assure adequate energy supplies for the United States at prices that neither disrupt nor distort our national economy?

It is in pursuing answers to this basic question that an emphasis on energy conservation has great merit. Conservation opportunities are widespread and in many cases highly cost-effective. Unlike emergency curtailment of use, cost-effective measures to achieve energy efficiency will create income and jobs. Much conservation will be cheaper, quicker, and less environmentally damaging than a corresponding expansion of production. Most important, consumers will realize substantial dollar savings through more efficient use that could not be achieved by just expanding supply at high prices to feed our wasteful habits.

Of course, energy conservation is only one part of the three-dimensional jigsaw puzzle that symbolizes the energy crisis. As I have said before, solving the puzzle requires that many different pieces be identified and matched; many different actions, some large and some small, must be taken.

But in examining the way we use energy in this country, and in recommending ways to increase the efficiency of this use, we clearly are on a path to more workable and effective long-term answers. We are breaking out of the pattern of energy use that caused many of the environmental and economic dilemmas that presently confound us.

This morning we are privileged to have with us a varied group of witnesses who will address the issue of energy conservation from a number of perspectives. These witnesses include Robert Lind, professor of business and public administration, Cornell University; David Wood of the Massachusetts Institute of Technology; John Autry, vice president and director of public affairs, Johns-Mansville Corp.; Sheldon Cady, executive vice president of the National Mineral Wool Insulation Association; Ernest Hueter, chairman of the board, Interstate Brands Corp.; and Nicholas Panuzio, Commissioner, Public Buildings Service, GSA.

We had initially expected testimony today from Mr. Seamans, Administrator of ERDA, and also Governor Apodaca of New Mexico. Governor Apodaca had to return for a special session of the State legislature, and Mr. Seamans will be with us later in the month.

So, we will open our panel this morning with Professor Lind from the graduate school of business and public administration, Cornell University. Professor Lind?

STATEMENT OF ROBERT C. LIND, PROFESSOR, GRADUATE SCHOOL OF BUSINESS AND PUBLIC ADMINISTRATION, AND DIRECTOR, ENERGY POLICY STUDIES UNIT, CORNELL UNIVERSITY

Mr. LIND. Mr. Chairman, I'm Robert C. Lind, professor of economics and public administration in the Graduate School of Business and Public Administration at Cornell. I am also director of the energy policy studies unit at Cornell.

My oral statement will be rather brief this morning in order to allow a good deal more time for questioning. Let me say, I am delighted to have the opportunity to be here this morning.

Energy conservation will play a major role in maintaining our high level of production and prosperity in the face of growing energy scarcity and rising energy costs. The role of conservation probably will be as important in meeting our energy needs as the development of new sources of supply. Energy that is saved through conservation can be put to other uses. Therefore, conservation is a direct substitute for additional sources of supply. Whether we should invest in new supplies or in conservation should be determined on the basis of which is more cost-effective. If the cost per barrel of energy saved is less than the cost per barrel of producing additional energy, then we should choose conservation. Any balanced program will include both investments in conservation and new sources of supply; however, in the past we have concentrated on new technologies for producing energy as opposed to conserving it through more efficient use. I believe more emphasis should be placed on conservation.

Conservation occurs when we substitute other inputs for energy in the production process, for example, insulation for fuel in space heating and also when we reduce uneconomical or wasteful uses of energy. However, when we consider energy conservation, we must keep clearly in mind that conservation always involves a cost and we must ask, do the benefits from conservation justify these costs? More conservation is not necessarily better. The ultimate in conservation would be to eliminate all uses of energy. The absurdity of this clearly illustrates that energy conservation is not an all-or-nothing proposition. The basic questions are how we should conserve energy and how much we should conserve and not whether we should conserve.

These questions in turn are part of the larger economic issue of how to allocate efficiently our scarce resources, including scarce energy resources. Energy conservation must be evaluated in terms of this larger perspective and not in terms of energy savings alone. To do this we need a method for measuring the benefits and costs of various conservation options so that we can weigh one against the other. Such a methodology is developed and presented in the report, "Benefit-Cost Methodology for Evaluating Energy Conservation Programs",[1] prepared for the Federal Energy Administration, Office of Conservation and Environment by Science Applications, Inc. I'm one of the coauthors of that report, and it's available to you. John Stewart has copies.

[1] The report may be found in the subcommittee files.

In response to the subcommittee's request, I will address some of the basic concepts and findings of this report in my oral statement; however, I would encourage you to read the report in its entirety for a more complete treatment of the economics of energy conservation.

To conserve energy we must either invest in new energy-saving technologies that substitute other inputs for for energy or give up some goods and services. In the first case there is a cost in terms of capital and other inputs that are substituted for energy; in the second case the cost of conservation is the value to consumers of the goods and services foregone. On the positive side there are savings in energy costs.

Consider an investment in an energy conserving technology; namely, a more efficient automobile engine. The costs will be those of developing and producing the new engine; the benefits will result from a lower cost of transportation for the consumer. These benefits can be divided into two parts. Suppose that the new engine would be 20 percent more efficient. Then if an individual were to buy the same size car and drive it the same number of miles, he would save 20 percent on his gas bill and this represents a benefit. However, because of this technical breakthrough, driving an automobile is cheaper and he will therefore buy more automobile transportation. This also represents a benefit to him.

More specifically, he will drive somewhat more miles and buy a somewhat bigger car. Therefore, there will not be a 20-percent decrease in gasoline consumed because part of the savings will go into more transportation. Now, this is not necessarily a bad thing as by decreasing the cost of transportation we have created a benefit for the consumer from more transportation although this does lower realized energy savings. In the report we estimated the present value of benefits from a 20-percent increase in the efficiency of new automobiles beginning in 1980 to be $47.82 billion. The present value of gasoline savings is only $11.97 billion. Therefore, the value of total energy saved is less than one-fourth of the total economic benefits.

Now, these numbers are significant for three reasons. First, the magnitude of the economic benefits from a modest increase in automobile efficiency is large and therefore would justify a significant investment in research and development. Second, the numbers demonstrate that the value of realized fuel savings greatly understates the benefits from this conservation measure. Finally, it is clear that conservation technologies which reduce the cost of goods and services that use energy result in more of these goods and services being purchased. This creates a benefit for the consumer who otherwise would have to cut back on his consumption as energy costs rise. Energy conserving technologies allow us to maintain our standard of living in the face of rising energy costs by offsetting in part their effect on the cost of the final product.

If the objective were, on the other hand, to achieve greater energy savings, this could be accomplished by putting a tax on gasoline that would just offset the cost reduction produced by the more efficient engine. This would leave the cost of driving unchanged so that consumers would not increase their automobile's size nor the number of miles driven. This policy, however, would reduce the benefits to consumers by $3.6 billion, but would increase the fuel savings by about

$29.63 billion. This tradeoff of benefits for energy savings is an important policy choice and the benefit-cost methodology described in the report allows one to pose this tradeoff in quantitative terms.

The objective of reducing energy consumption alone is open to question. What we should seek to achieve is efficient use in the sense that we do not use energy where the value of its product is less than its cost or less than its value in some alternative use. One of the major reasons why we do not use our scarce energy resources efficiently and, in particular, why we underinvest in conservation, is that energy is priced below its true social cost. Because of regulated fuel prices, it does not pay individuals and firms to conserve as much as they should from the point of view of efficient resource allocation. A policy of raising fuel prices to competitive levels either by deregulating prices or by imposing taxes on fuels that are regulated would stimulate efficient energy conservation.

Even if energy prices represented the true cost of using energy, there would be a role for Government. The support of research and development, the provision of information, and Government action to remove institutional barriers to the implementation of cost-effective conservation measures should be pursued. The latter is often called commercialization in connection with new technology. We must remember that from the point of view of the individual business considering energy conservation, it must be a paying proposition. Therefore, we can analyze what is required to implement the new technologies by analyzing whether they are good investments from a private point of view and by determining if there are market imperfections which may impede their adoption.

If energy prices continue to be too low to bring about appropriate energy conservation, then, in order to obtain such conservation, financial incentives in the form of subsidies will be required. While this will never produce a solution that is as efficient as that produced by appropriate energy prices, it may produce a reasonable "second best" solution.

To summarize, energy conservation offers a great potential. The benefits from cost-effective investments in conservation result from energy cost savings that allow us to maintain and increase our standard of living in the face of high energy costs. These benefits may substantially exceed the value of realized energy savings. Energy prices that are below the true cost of energy are a major disincentive to conservation. Finally, energy conservation should be looked at in economic terms and benefits compared with the costs. For those options with positive net benefits, incentives should be structured so that they will be adopted by the private sector.

Chairman KENNEDY. Very good. Why don't we get to Professor Wood, and then we will get to some questions.

STATEMENT OF DAVID O. WOOD, PROJECT DIRECTOR, ENERGY MANAGEMENT AND ECONOMICS, ENERGY LABORATORY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Mr. WOOD. Thank you. I'm David O. Wood, project director of the energy management and economics program at the MIT Energy Laboratory. Today I am representing myself and my colleagues, including

Lawrence Linden and James Meyer of the Energy Laboratory research staff, and Professor David White, who is director of the MIT Energy Research Laboratory, and also a Ford professor of electrical engineering at MIT.

We have submitted a prepared statement of our views to the subcommittee. I will briefly summarize these views for you.

We feel quite strongly that any coherent national energy policy will of necessity include legislative, institutional, educational, and research initiatives to encourage efficient development and use of energy resources. Developing this component of an overall national energy policy will require three kinds of information. First, information is required on the relationship between proposed institutional, legislative, educational research initiatives, and the market factors which influence energy consumption levels and patterns of energy utilization.

The second kind of information that is required to evaluate initiatives is information on the expected interaction amongst programs of detailed, or specific initiatives.

And, finally, the third type of information is information on interaction between programs of conservation initiatives and other related energy policies and aspects of national policy in the form of environmental policies, or policies stimulating economic growth.

Measuring and evaluating such information is a complicated process, complicated by the fact that energy is not something that is used directly, but rather is something used in combination with other factors in production, including appliances, equipment, structures, labor, and other materials to produce energy services. The market factors will combine with various conservation initiatives and other policies, such as pricing regulations and environmental control, to determine the evolution of the characteristics of the technology, including more specifically energy utilization efficiency and the rate of energy utilization.

Sorting out the expected contributions of a specific initiative to changing energy consumption levels and patterns are the other factors which determine consumption levels and patterns in terms of these efficiencies. This is, in our view, the central issue in evaluating any particular initiative.

We emphasize the difficulty and importance of performing this kind of analysis—measuring conservation effects of particular initiative—because our review of the most comprehensive analyses to date of energy conservation potential—those studies performed by the Federal Energy Administration, ERDA and the Energy Project of the Ford Foundation—seem deficient in this regard. Taken together, these comprehensive assessments of energy conservation potential do provide important new information on the technical possibility for achieving lower growth in energy consumption with technologies involving the redistribution of growth away from dependence upon scarce, nonrenewable resources.

However they seem incomplete in not providing sufficient detail as to the effects of envolving energy prices upon energy utilization efficiency, the separate incremental effects of specific initiatives, and the interaction between these initiatives and policies specific to other national goals. We feel these deficiencies are not due to a lack of understanding on the part of the FEA, ERDA, or energy policy project analysts, but rather stem from the difficulty in assembling the appropriate data and developing appropriate analytical techniques.

We believe, however, that this work must go forward because it is essential to obtain such detailed evaluations to select combinations of energy conservation initiatives which are simultaneously effective, internally consistent, and consistent with other energy and national policies. These efforts must be strengthened by an increased recognition of their importance in formulating a coherent national energy policy, and by insuring that sufficient resources are devoted to support the required information development, analysis and initiative evaluation.

Chairman KENNEDY. Maybe we could run over these tables in your testimony, Mr. Wood.

Mr. WOOD. Mr. Chairman, we included some summary tables in our prepared statement, which summarize the estimates by FEA, ERDA and the Energy Policy Project, potential growth energy consumption levels, and also specifically petroleum consumption levels without a conservation program, and then with a conservation program.

Even though these analyses were performed with entirely separate, very distinct methodologies, in the short-term period from the present through 1985, they tend to produce rather strikingly similar results. Starting from a quite different forecast of what energy consumption possibilities would be without conservation program, the three studies end up with roughly the same result, especially when you look at aggregate consumption. The FEA concludes that in 1985 aggregate gross energy consumption would be about 94.2 quadrillion Btu's; ERDA arives at exactly the same conclusion; the Energy Policy Project arrives at a slightly lower number, 91.3 quadrillion Btu's. You observe the same sort of pattern with respect to petroleum consumption.

In the longer run, to the year 2000, there is a little bit more variance between the estimates, but again they are strikingly similar.

We don't draw any comfort from this similarity, however because the methodologies involved are substantially different, and the analysis that produces these numbers is not, in our view, sufficiently specific with respect to the particular programs of conservation initiatives that would produce these results in an economically meaningful way. So, while the analyses may suggest technical possibilities, they do not provide us with what we would view as a reasonable certainty that the economic conditions that produce these results were in fact stimulated by a particular program of initiatives being considered. Thank you.

Chairman KENNEDY. Thank you, Mr. Wood. Your prepared statement will be included in hearing record.

[The prepared statement of Mr. Wood follows:]

PREPARED STATEMENT OF DAVID O. WOOD*

INTRODUCTION

Conservation of energy resources through reduction of demand and increasing efficiency of utilization is an important element in national energy policy. Recent major evaluations of intermediate and long-term energy conditions in the United States suggest that significant reductions in energy consumption are possible using currently-known technologies and at current energy prices. Further reductions or adjustments to a more desirable pattern of development may be possible through legislative, institutional, and educational initiatives. Evaluation of such policy initiatives to insure the capture of improved efficiency and socially desir-

*Prepared in cooperation with Lawrence Linden and James Meyer, research staff, Energy Laboratory, MIT; and David C. White, director, Energy Research Laboratory, MIT, and a Ford Professor of Electrical Engineering, MIT.

able evolution of energy consumption patterns must be a significant component of a national debate on the role of the public sector in facilitating the smooth transition from a depletable to a renewable energy resource based economy.

In this testimony we discuss the factors affecting the evolution of energy consumption patterns focusing upon the potential interactions of policy initiatives with market behavior and review the major estimates of energy conservation potential. We conclude that significant data development and further analysis is required to make these evaluations truly useful for conservation policy formulation and analysis.

MEANING OF ENERGY CONSERVATION

The most significant aspect of energy utilization is that energy is never directly consumed. Rather, energy is always used in conjunction with other factors of production to produce goods and services. In manufacturing, energy is combined with capital, labor, and other material inputs to produce manufacturing output. In the household sector, energy is combined with stocks of appliances and structures in producing services such as space conditioning or hot water. In the transportation sector, energy is used together with stocks of automobiles, busses, and other transportation equipment to provide transport services. Finally, of course, energy may be used as an input in the production of other energy types such as coal to produce electricity for end use demand and/or electricity to produce nuclear materials.

Thus, identifying and evaluating measures by which the level and pattern of energy consumption is changed must of necessity include a consideration of how the change was effected vis-a-vis the stocks of energy-utilizing appliances, equipment, and structures. Two factors characterize the relationship between energy consumption and this stock: the rate of utilization of the stock, and its energy utilization efficiency. The rate of utilization determines the production of services from a stock of given efficiency. Energy saving initiatives to reduce energy-produced outputs are therefore concerned with the rate of utilization. Included in this category would be turning down thermostats and walking to work instead of driving. It is usually in respect to measures in this category that the issue of "life style" is raised.

Changes in efficiency occur when the technologies for using energy are changed, either the characteristics of the stock of energy utilizing devices, or the procedures by which energy and this stock are combined. For example, a person who insulates his home but does not lower the thermostat is increasing the efficiency of energy use; he is not decreasing consumption of household amenities. Another example: a person who drives a smaller car back and forth to work is increasing the efficiency of energy utilization; he is not necessarily changing his level of consumption of transportation services.

Energy prices play an important role in determining the rate of utilization and efficiency of energy-using devices, as well as the evolution of the demonstrated feasible technologies for producing a given type of energy service.

Changes in energy prices may be expected to change energy consumption patterns through substitution of other, less expensive energy types and substitution of more efficient capital through application of known or development of new technologies. Each possibility is composed of the feasible technical substitution possibilities, economic factors determining the choice of a particular feasible technology, and knowledge and information about these possibilities. Feasible technical choices mean both that the technology will exist and that the prohibitions of any legislative or institutonal initiatives are satisfied.

Institutional and legislative initiatives may affect these choices in one of five ways. (1) Policies which directly affect the price of energy. Examples would include various forms of energy taxes and regulation of energy prices or of the prices of other products and services which are substitutable for energy. (2) Policies which mandate a particular rate of energy consumption either for a specific capital type, such as the recently enacted miles per gallon standards for automobiles, or for an energy customer. Examples would include schemes, for rationing gasoline to individuals or households. (3) Policies which mandate some characteristics of the energy utilizing device. Environmental controls would be an example. (4) Policy initiatives involving the development and dissemination of information on energy substitution possibilities including both costs and characteristics of technologies. Examples range from providing more direct information on appliance energy requirements, such as the EPA mileage tests, to informative on how to calculate life cycle costs of appliances in order to permit more precise economic evaluation by the energy purchaser of the most efficient technologies for his purposes. Associated with this form of education, then, could

be programs to provide the data necessary for these calculations, both through public testing programs and through manufacturer certified information. (5) Policy initiatives which expand the variety of technological options available to satisfy a given demand. This is the role of research, development, and demonstration (R,D&D).

The five classes of policy initiatives are, of course, not independent. In particular energy pricing policy may result in adverse affects in terms of technology development which, in the long run, is consistent with conservation and environmental goals. Appendix I includes as an example a discussion of the Sterling engine, an advance heat engine which is approximately 25 percent more efficient than a comparable internal combustion engine (ICE), while having almost no environmental impact. The development of this engine will be hindered by the control of petroleum prices since the commercial potential of this technology depends critically upon the trade-off between first cost of the engine, known to be significantly higher than for a comparable ICE, and operating cost. Current policies stimulating development include mile-per-gallon regulations and environmental restrictions. An understanding of the impact of these policies will be critical in formulating and evaluating any public program intended to support development of this engine.

This example points up the importance of focusing analysis of consumption initiatives at a detailed technological level, relating the particular initiative being considered with information on relevant market factors and other policies influencing the economic factors, feasible technical options, and the evolution of these options. In the next section we briefly review the major assessments of energy conservation potential to determine how successful they are in performing these integrated evaluations.

POTENTIAL FOR ENERGY CONSERVATION

In the past eighteen months three independent assessments of conservation potential have been published,[1] including studies by the Federal Energy Administration (FEA), the Energy Research and Development Administration (ERDA), and the Energy Policy Project of the Ford Foundation. Table 1 summarizes the estimates from these studies in terms of potential impact on aggregate consumption levels, and more specifically upon consumption of petroleum products. While there are some differences in the projections under the assumption of no conservation program, there is surprising unanimity amongst these three independent efforts concerning the expected consumption levels assuming conservation programs, especially in the intermediate period of 1985. This is especially interesting in view of the fact that each of these studies was carried out independently utilizing entirely different methodologies.[2]

TABLE I.—ENERGY CONSUMPTION ESTIMATES WITH AND WITHOUT CONSERVATION PROGRAMS FOR THE YEARS 1985 AND 2000

	Aggregate gross energy consumption				Petroleum consumption			
	Without conservation		With conservation		Without conservation		With conservation	
	1985	2000	1985	2000	1985	2000	1985	2000
FEA	102.9	NE	94.2	NE	38.0	NE	33.5	NE
ERDA	105.7	163.7	94.2	114.0	47.1	70.5	34.6	40.3
EPP [1]	116.1	186.7	91.3	124.0	39.5	58.9	31.6	37.3

[1] Estimates taken from ch. 2 and 3 and appendix F of EPP, "A Time to Choose: America's Energy Future." Cambridge, Mass.: Ballinger Press, 1974.

NE=Not estimated.

[1] See, Federal Energy Administration, Project Independence Report. Washington, D.C.: U.S. Government Printing Office, November, 1974. Energy Research and Development Administration, A National Plan for Energy Research, Development, and Demonstration. (ERDA–48) Washington, D.C.: U.S. Government Printing Office, June, 1975. Ford Foundation Energy Policy Project. A Time to Choose: America's Energy Future. Cambridge, Mass.: Ballinger Press, 1974.

[2] It is not our purpose to provide a detailed review of these studies. Some critical evaluation of the FEA effort may be found in MIT Energy Laboratory Policy Study Group, The Project Independence Report: An Analytical Review and Evaluation. (MIT–EL–75–017) Report Submitted to the National Science Foundation, May, 1975. For an evaluation of the ERDA effort, see Office of Technology Assessment, An Analysis of the ERDA Plan and Program. Washington, D.C.: U.S. Government Printing Office, October, 1975.

The ERDA assessment proceeds by assuming fixed end use demands and analyzing the energy consumption changes due to a scenario of changes in energy utilization efficiencies. The efficiency scenario is based upon a detailed, but unpublished, analysis of feasible technical developments. However, no analyses of the actual program of market factors and policy initiatives which would produce these changes is provided. Whether the improved efficiencies might be induced by likely price developments, or whether additional legislation and institutional initiatives are required, and if so how they interact, is not specified.

The FEA analysis provides more information on the relation between prices and particular conservation initiatives, as well as analysis of the technical feasibility of the result. The FEA approach includes prices as a determinant of demand, with the stipulation that these demands can be reduced further at a given price by a specific initiative. Unfortunately the distinction between the change in stock efficiency due to the changes in prices and the change due to the initiative is not maintained. Where such analysis is provided, it appears that the entire change in efficiency is attributed to the initiative. Unless price effects are assumed to be zero, an unlikely situation, this leads to an over estimate of the potential for a specific initiative and an under estimate of market influences upon efficiency. Also, as with the ERDA estimates, no analysis is provided on the likely interactions between market factors and the various combination of initiatives on the evolution of technology.

The Ford Foundation Energy Policy Project (EPP) approach is similar to ERDA's. For a given set of end use demands for energy services, a technical analysis is provided which estimates changes in utilization efficiencies, where the changes are assumed to be consistent with post-embargo energy prices and with existing technology. No specific detailed initiatives are examined in the context of the forecast and little direct analysis of the implications of the higher prices for stimulating the evolution of new technological options is provided. The EPP analysis does provide an independent econometric analysis of the expected changes in energy consumption levels and patterns due to the higher energy prices, with the result that the price sensitive estimates are generally in line with the estimates generated by the technical analysis. Thus the overall results of the technical analysis are argued to be consistent with a particular set of relative prices, even though particular technical developments hypothesized need not be.

SUMMARY AND RECOMMENDATIONS

Taken together, these three comprehensive assessments of energy conservation potential provide important new information on technical possibilities for achieving lower growth in energy consumption with technologies involving a redistribution of growth away from dependence upon scarce non-renewable resources. However, in our view, these analyses are incomplete in not providing sufficient detail as to the effects of evolving energy prices upon energy utilization efficiency, the separate and incremental effects of specific legislative and institutional initiatives, and the expected interactions between these initiatives and policies specific to other national goals. We feel these deficiencies are not due to a lack of understanding on the part of government or EPP analysts, but rather stem from the difficulty in assembling the appropriate data and analytical techniques. Work, such as that cited above,[3] is underway at both the ERDA and FEA to improve both the data and analytical capabilities. This work is essential to obtain the detailed evaluations we feel are essential in selecting combinations of energy conservation initiatives which are effective, internally consistent, and consistent with other energy and national policies. These efforts must be strengthened by increased recognition of their importance in formulating a coherent national energy policy, and by ensuring that sufficient resources are devoted to support the required data development, modeling, and analysis systems.

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[3] In more recent FEA analyses of the transportation sector, this problem is dealt with directly by developing an econometric model of the demand for gasoline which directly relates the price of gasoline to the miles-per-gallon efficiency of the automobile fleet. See Cato, D., M. Dodekohr, and J. Sweeney, "The Capital Stock Adjustment Process and the Demand for Gasoline: A Market Share Approach." Federal Energy Administration, December, 1975.

APPENDIX I

INTRODUCTION

The areas for policy initiatives and the associated problems of measurement and evaluation can be effectively illustrated by considering two specific technology areas with which we have some familiarity: automotive engine technologies and space conditioning of commercial and institutional buildings.

AUTOMOTIVE ENGINE TECHNOLOGIES

Research, development, and demonstration (R,D&D) on automotive engines provides an excellent example of potential positive and negative interactions between market behavior and conservation policy initiatives.

Alternative automobile power systems can be roughly divided into three categories, including systems not too dissimilar from the internal combustion system (ICE), advanced heat systems, and electric vehicles. The category of close alternatives would include the Wankel spark-ignition engine, the various types of stratified charge engine, and the diesel. Generally speaking, these engines would use similar manufacturing processes to those now in use. Except for the Wankel they offer some fuel economy advantage over today's ICE, but no significant improvement in air pollutant emissions. These engines may be considered as technology which either is available now or will be in the next few years. The second category of alternative powerplants, advanced heat engines, would include the Stirling engine, the Rankine cycle (or steam) engine, and the Brayton cycle (or gas turbine) engine. These engines may offer significant improvements over the ICE in both fuel economy and air pollutant emissions, but will require substantial development programs before they could conceivably be mass produced at reasonable cost. The earliest that these significantly penetrate commercial markets would be the mid-to-late 1980's. Finally, there are electric vehicles with great potential for changing the composition of energy consumed in transport and of the environmental impact. However, as with the advanced heat engines, the realization of an electric vehicle which could seriously compete with the ICE will require a major R&D effort, especially on advanced battery systems, whose success is by no means assured.

How will potential legislative and institutional initiatives affect the development of these technologies? Clearly, the behavior of the automotive industry in developing to commercial scale new engines technologies will be responsive to changes in their environment—such as regulated fuel prices, regulations on fuel economy, and air pollutant emissions. What trade-offs must be identified and measured as a basis for reaching policy decisions?

For illustrative purposes, we consider the Stirling engine as an example. This engine is probably the most novel of the alternative powerplants now under consideration, in that it is very different from the ICE, and has received less attention in this country in th past than any of the others. The Stirling engine is a closed cycle, external combustion engine. The use of external combustion means that the combustion process can be continuous and can be designed for low pollutant emissions without seriously affecting the performance or fuel consumption of the engine. Technically the engine is extremely efficient, consuming at least 25 percent less fuel than today's ICE, because of the unique thermodynamic cycle over which the sealed hydrogen operates. In terms of other characteristics, including size and weight, durability, maintenance requirements, easy start-up, acceleration response, noise and vibration, etc., the Stirling engine has the potential to match the ICE. The most important open question on the Stirling engine is manufacturing cost. There is little doubt that, principally because of the necessary use of super-alloys in the hot part of the sealed gas system, the engine will cost considerably more than an ICE of similar power. Estimates range from 20 percent more and up. Thus, manufacturing cost will be the focus of future development efforts.

Accepting this evaluation of the Stirling engine, it is clear that in order for the development process to proceed in an orderly way, there must be the prospect that the increased manufacturing costs of the engine must be at least balanced by the decrease in operating costs, most especially fuel costs, over the life of the

engine. In the last four years, Philips Research Laboratories and the Ford Motor Company have been engaged in the joint development of a Stirling cycle automobile engine. Proving ground testing of the first vehicle powered by the Ford-Philips prototype engine is now underway. Ford intends to carry the program forward, but have stated that they are counting on development support from ERDA if the engine is to have a chance to be brought into mass production within the 1980's.

Thus, the public sector could encourage further development of the Stirling engine by some kind of subsidy program. Such a decision will require an assessment as to whether the natural play of market forces and the impact of present government interventions in the automotive market will provide the incentives for reasonable investments in this technology. If incentives for socially desirable rates of development for this technology are inadequate, then government policies other than R&D subsidies may more efficiently obtain the desired result. Factors to consider in this analysis would include the following:

The emission standards of the Clean Air Act, which have been in effect for eight model years now, have brought about significant increases in industry support of R&D on alternative automotive power systems. Indeed, these standards are responsible for Ford's interest in the Stirling engine. The Act, however, in both its basic structure and its complicated legislative and administrative history, has provided strong incentives fr short-term, evolutionary, patch-up changes to the ICE, such as the catalytic converter. This is due to the continuing pressure for immediate changes, the uncertainties in emission standards both within the next few years and over longer periods such as in the 1980's when the Stirling engine could be available, and the inflexible requirement that virtually all vehicles produced in any given year meet the identical emissions standard. The automotive industry uses a very capital-intensive, relatively inflexible, engine production process which produces engines at a relatively low cost. The Act seems to have had the unfortunate effect of reinforcing the natural bent of such an industry to make evolutionary, rather than revolutionary, changes in its product technology.

The recently passed Energy Policy and Conservation Act contains gradually tightening fuel economy standards which apply to each manufacturer's new car fleet. Although it is hard to say now just what impact these new regulations will have on industry R&D, it appears that the flexibility inherent in the use of fleet-wide standards will be favorable to a gradual sorting-out of technologies which conserve fuel, such as the Stirling engine.

The petroleum price controls of the Energy Policy and Conservation Act will provide a negative incentive for investment in fuel conserving engines such as the Stirling. Low fuel prices decrease the incentives for more efficient engines. Since commercial development of the Stirling engine will almost certainly hinge on the trade-off between a higher manufacturing cost and reduce operating costs, policies which hold fuel costs at lower than market clearing prices over the next few years will certainly delay demonstration and development of this technology. Thus, whole holding down the price of petroleum products may be socially desirable for other reasons, its effects on investments in R&D on advanced fuel-conserving technologies is bound to be adverse.

In summary, in complex markets where the government is already involved, such as the automobile market, careful examination must be made of the impact of present government interventions on industry behavior in this regard. Consideration should be given to a balancing of short-run goals which require further use of present technology and long-run goals which only new technologies can achieve. National policies for low domestic fuel prices need to be weighed against their impact on consumer behavior and industry investment in R&D. Direct government support of R&D may be useful, but if other incentives are not well aligned, then the new technologies developed will never see the marketplace and thus not have a real impact.

SPACE CONDITIONING OF COMMERCIAL AND INSTITUTIONAL BUILDINGS

Like automobile engines, the energy requirements for space conditioning of commercial and industrial buildings may be subject to significant reductions through a combination of procedural and technological innovations. For this area of energy consumption, the government intervention and market factors seem simpler than for automobile engines. The significant increases in energy prices, coupled with a wide spectrum of technologies for increasing energy utili-

zation efficiency at life cycles costs only slightly higher than those associated with technologies being used in the pre-embargo world, make this sector a prime candidate for intensive analysis to identify conservation potentials.

Perhaps one of the best documented examples of energy savings due to improved management techniques and procedures is the MIT experience. The energy budget at MIT is divided about evenly between the cost of fuels and the cost of electricity. Approximately half the electricity used is used to operate pumps and fans associated with heating, ventilation, and air conditioning systems. An additional 15 percent is used for direct support of air conditioning systems. Of the fuel use, approximately 30 percent is used to support air conditioning systems. By developing and practicing good management in the operation of these systems, MIT has been able to realize reductions in electricity and steam use over approximately 20 percent and 25 percent respectively. We anticipate that these results can be significantly improved as we automate more of the management system.

Significant improvements in the energy utilization characteristics of commercial and institutional buildings can be achieved through the application of three methods of conservation, including automatic control techniques for moderating energy consumption, optimizing building ventilation systems, both controlled and incidental, with respect to energy consumption characteristics, and finally by improving information on the actual energy use characteristics of projected buildings.

The application of automatic control techniques for moderating energy consumption in buildings has already demonstrated cost savings that return capital investment in a very few years. Electric power demand management with computer systems has, in several instances, paid for itself in periods as short as 14–16 months. Moderation of peak demands has a further benefit that more efficient use is made of the installed capacity of the electric utilities. Power management has not only demonstrated lowering of peak demand but has also resulted in substantial total electrical energy savings.

An important aspect of automatic control systems is the potential to retrofit to existing buildings. Even smaller total savings in many existing buildings can have a larger impact than greater individual savings in new construction, at least in the intermediate term. Existing buildings offer the challenge of variety in their conservation problems and opportunity for savings.

The most effective use of automatic control systems requires some technology developments. At present, computer technology has far outpaced that of sensors and controls for space conditioning systems in buildings. To take full advantage of the potential of automatic control in conserving energy, this situation must be corrected. In a recent study, for example, of a high-rise office building under construction in New York City, the Citicorp Building, we estimated that 25 percent of the space conditioning energy could be saved by optimizing the use of outside air. This is in a building that has been designed from the outset to conserve energy. It employs insulation, double-glazed reflective windows, reduced lighting power, and a number of other conservation techniques heretofore neglected in the design and construction of commerical buildings. The achievement of optimum use of outside air in practice depends critically upon the proper functioning of sensors and controls. The sensor and control systems commercially available today reflect past emphasis on low first-costs. The substantial increase in recent energy prices may be expected to simulate technological development in this area, resulting in the prospect of substantial additional improvements in the energy efficiency of both new buildings and retrofitted existing buildings.

Another area in which significant contributions to conservation of energy may be realized is providing improved information on expected energy use for new buildings. Engineers find it difficult to estimate expected energy use patterns in new buildings because few measurements are available providing a detailed partition of expected energy use within the building. The heating or cooling system size to meet design specifications will in fact function at partial capacity much of the time. The wide safety margins common in building-system-design further mitigates against efficient use of operating space-conditioning-plant at part capacity have a potential for energy conservation. These are operational as well as technical solutions to this problem. Ventilation fans were often stop-start, that is, full power or none. Under all but extreme conditions, partial power would be adequate. Variable speed fans under continuous control could do much to reduce peak demands produced by stop-start fan systems. Again, we would expect that the substantially increased energy prices are providing substantial incentives to improve estimates of partition energy use in new buildings.

One area where we would anticipate that substantial savings would accrue to automatic control systems is in the area of building ventilation. Building ventilation, both controlled and incidental, represents a major load on the space conditioning system. Incidental ventilation is a function of building location, construction, configuration, and use. Incidental ventilation can be a dominant load on the building space-condition-system, particularly in office buildings at the beginning and end of the work day, with the influx and departure of residents. Ordinarily control building ventilation is maintained at set levels, often in accord with requirement of building codes. The simple operational expedient of shutting down control ventilation on hot or cold days when incidental ventilation is at a peak could save substantial amounts of energy. School classrooms usually have even more incidental ventilation, and often codes require excessive amounts of control ventilation. An examination of code requirements, usually developed during the period of relatively cheap energy, in light of building utilization, is needed to insure the maintenance of health while minimizing the use of energy.

Chairman KENNEDY. Mr. Wood, what are the principal conservation programs that you people have found to be the most effective?

Mr. WOOD. Well, we haven't performed our own assessment of the potential for individual conservation initiatives. We include in our prepared statement some discussion of the potential for conservation in space heating in commercial and institutional buildings. At MIT we have some direct experience with implementing new technology for giving us more efficient utilization of our plants at MIT.

We also have some research going on which indicates that if the higher energy prices continue, there are technologies which we could expect to emerge fairly rapidly, within the horizon of the next 5 years, which would increase even more the savings that we have already experienced. In particular, these are technologies that combine automatic control techniques with sensor equipment.

We also include some discussion of possibilities in conservation potential with automobile engines. We discuss in particular the potential of the Stirling engine, without necessarily advocating any sort of initiative to support development of the Stirling engine, but use that as an example of the kinds of issues that would have to be addressed in an analysis of any program to support that engine.

Chairman KENNEDY. Would you want to elaborate a bit on that?

Mr. WOOD. Well, we see the development of engines such as the Stirling engine, which is an advanced heat engine and which demonstrated a greater fuel efficiency—approximately 25 percent more efficient than a comparable internal combustion engine, with little or no environmental impact—as something that is consistent with both a conservation and an environmental ethic.

The initial development of that engine has been stimulated by such things as the miles-per-gallon standards of the Energy Conservation Act. It seems to be hindered by such things as the price regulations on petroleum embodied in that same act. So, there are counter forces in related policies that would have to be taken into account, we would have to understand, in developing a program for suporting that engine.

Chairman KENNEDY. Why is that? I don't understand, you mean you can't get the miles per gallon?

Mr. WOOD. The key problem with the Stirling engine is that it has a higher initial cost to a comparable internal combustion engine. So, the key trade off is between initial cost and operating cost. The lifecycle cost of the Stirling engine vis-a-vis the internal combustion engine is going to depend critically on the operating cost, which is primarily

the fuel cost. So, a policy which maintains fuel costs lower than they would otherwise be in the market is going to bias against the development of the Stirling engine.

Chairman KENNEDY. How much more expensive is it?

Mr. WOOD. That's the problem; that's the key issue. The estimates range from 20 percent up. Different experts will give you different numbers.

Chairman KENNEDY. What kinds of savings do you have at MIT in heating and cooling?

Mr. WOOD. The aggregate savings since we instituted a rather broad-sweeping conservation program in 1974 have been approximately 20 to 30 percent of the energy consumption levels prior to that time.

Chairman KENNEDY. How have you done that?

Mr. WOOD. Basically through substituting more detailed procedure, substituting labor for energy. We pay much more attention to the manual control of thermostats. We have programs that insure that thermostats are turned down when buildings are not being used; we shut down major portions of the heating system on weekends, that sort of thing.

That is the sort of immediate step that we were able to take. In the longer run we will replace that kind of labor substitution with capital substitution, by substituting more automatic control systems. You might think of that as an intermediate step. In the long run these automatic control systems will be supported by much more sophisticated sensor equipment, so that we will have much finer control than we would with just the automatic control systems themselves.

The estimate is that when we have implemented all of the procedural and technology solutions to this problem, we should be able to achieve savings of 50 percent or better from where we were in terms of energy consumption levels prior to the embargo.

Also, I might add, we see nothing unique about MIT's experience. In fact, we think that those potentials exist for any set of institutional buildings or commercial buildings.

Chairman KENNEDY. OK; Professor Lind, would you talk a little about your testimony, about maintaining high levels of production and prosperity in the face of energy scarcity and rising energy costs. Could you elaborate a little bit on that? I think there is a general kind of feeling that energy conservation means reduced economic output and unemployment.

Mr. LIND. I think in your statement you touched on the difference between curtailment and conservation. That is central here. When the price of energy goes up, that means that it is going to make goods and services more costly. For a given amount of resources we are going to be able to produce less goods and services unless we are going to do something to offset the effects of energy scarcity in higher prices.

Energy conservation which substitutes other factors of production for energy is a way of getting around this. It is a way of keeping cost of production down in the face of rising energy costs, and also a way of keeping people from having to cut back too much on their consumption.

Let me give you a couple of examples: When you put in home insulation, for example, it not only cuts down on your heating bill, but you may want to take part of that saving and turn up your thermostat

from 65, where you are a little bit uncomfortable, to maybe 67. So, you both have a lower heating bill—not as much lower as it would be if you didn't turn the thermostat up a little bit—but again, some of the effects of the high energy costs have been mitigated through this substitution.

A very important study, and probably the only one on a macrolevel, was done by Hudson and Jorgenson where they tried to take simply a macroeconomic model of the economy and look at the longrun substitution possibilities. They found that we could cut back a great deal on energy use in the long run and not have a very great effect on aggregate output. I think we need to do more work along these lines, looking at the longrun substitution possibilities. Basically, conservation is a substitution affair, where you are substituting other things for energy and production.

Chairman KENNEDY. Have you made any estimates on the conservation in residential and commercial buildings, and industrial property?

Mr. LIND. Yes; in the report that I mentioned in my prepared statement, we looked at and made estimates of the energy savings and the net benefit for five or six insulation-type measures in various parts of the country, and we found that many of them were cost effective. In fact, most were cost effective in many areas of the country, although there were some areas where certain measures were not cost effective. But one of the things that is interesting to point out is the benefits and fuel savings per household in each region of the country for a number of retrofit measures. When you look at fuel types, the fuel types are broken down into homes that have oil and electric, gas and electric, and electric utilities. We see that for wall insulation for a home that is heated with oil, where the price is not regulated very much, there are positive net benefits. For a home heated with electricity, there are enormous benefits from insulation. For a home heated with natural gas, there are negative benefits; in other words, it doesn't pay to insulate.

The point here is that from the consumer's point of view, if you have cheap gas, it doesn't pay to insulate.

Chairman KENNEDY. What if you have more expensive gas?

Mr. LIND. Well, if you have deregulation you will find that for many of these homes that were not insulated, it would become cost effective for them to be insulated, and you would expect that to happen.

In the absence of that, you are going to have to give them some kind of financial incentive, or make it mandatory, in order to get them to do it because it simply doesn't pay for them to do it. There are other ways of doing that.

Chairman KENNEDY. Are these prices pretty accurate in today's market, or do they vary?

Mr. LIND. These prices that were used to make the calculations were retail prices—I'll have to go back and look at the key—they were up to date when this was published.

Chairman KENNEDY. You both talked about savings in automobile engines, and the value of the gasoline savings is only a reasonably small percentage of the total savings. What constitutes the other savings, with the more efficient engine?

Mr. LIND. The work that I did really didn't go into technology. Let's say we could get an engine that was 20 percent more efficient, 50 percent more efficient, what would it be worth to us, what would the benefits be?

Well, if you break it down and say, OK, you drive exactly the same car and drop an new engine in it that is 20 percent more efficient, he would save 20 percent on his fuel bill, and that would be just the gasoline savings.

However, if he responds and says, "Look, I've been driving this small car because gasoline is so expensive and now, with this new engine it's not so expensive," so he can now have a station wagon, can take an extra trip, go skiing, or do something he didn't do before; this is the benefit to him because if he wasn't willing to pay more for the skiing trip than it cost him for the energy, he wouldn't take it. There would be some surplus there; the skiing trip is worth a little extra. This also creates a benefit for him that should be counted as part of the good life. At the same time he uses a little more fuel, and therefore you don't get the benefit and the fuel savings being exactly the same thing.

Chairman KENNEDY. You commented in your paper here about the insulation in walls, ceilings, storm doors and windows, weatherstripping, and other. I have introduced legislation that is cosponsored by a number of other Senators to try to encourage greater energy conservation of homes, buildings and industry.

Do you think that these types of investments that you have outlined here are cost-effective investments for the Federal Government to be encouraging?

Mr. LIND. Well, from the point of view of the individual, most of them turn out to be cost effective. If you take a broader perspective and take in the added social value of saving something like natural gas if it is not correctly priced but is underpriced, then the benefits are even higher, and it is appropriate that the Government play some role here.

Now, the question is, To what extent will Government action of this type foster action in the private sector with regard to insulation that would not otherwise occur, and how large will this be? That is a question that has a great deal of uncertainty about it. But certainly the investment for insulation in most homes, in most areas of the country, is cost effective.

Chairman KENNEDY. OK, thank you very much, gentlemen. Our next panelist, Mr. Autry.

STATEMENT OF JOHN S. AUTRY, DIRECTOR OF PUBLIC AFFAIRS, JOHNS-MANVILLE CORP.

Mr. AUTRY. Good morning, Mr. Chairman.

I am John S. Autry, director of public affairs for Johns-Manville Corp. With me this morning are Mr. Sheldon Cady, executive vice president of NMWIA, a national insulation trade association, and Mr. David Pullen, public affairs manager for Johns-Manville. Mr. Cady will assist me in delivering testimony this morning.

I might say the previous witnesses here have touched on a considerable amount of my testimony.

Energy conservation may well be the most effective step America can take in the near future toward realizing significant reduction in our use of scarce fuels. One of the most useful elements of such a conservation effort is the insulation of our homes and businesses. It is to that particular effort I intend to speak briefly because of my familiarity with the industry which can supply the tools needed to do the job.

First, I would like to underline the benefits to be gained by a major commitment to such an effort. Obvious as these may be, their magnitude has often been overlooked in the larger energy debate.

A major commitment to insulating our homes and businesses promises to reduce residential consumption of energy dramatically. While it is impossible to give precise figures on energy reduction in the commercial and industrial sectors, it is clear the energy savings would be significant, and Mr. Cady is prepared to give you some general figures in this area.

As a public service, my company conducted energy audits for the Federal Energy Administration at 10 manufacturing plants of 2 of the most energy-intensive industries, meat packing and baking. These audits indicated that substantial energy savings could be accomplished at all plants and the costs to achieve these savings could be recovered. And, while I am not prepared to discuss our energy audit program in depth, you may wish to note that "The National Provisioner," a journal for the meatpacking industry, has already observed that: "An average of 15.3 percent on energy consumption and 11.6 percent on the costs of energy at 1975 rates" could be saved if J-M's recommendations were implemented.

I understand that the FEA intends to publish these audits in full to serve as a guide for interested industries, Mr. Chairman, so I will refrain from further comment on them for fear of putting the cart ahead of the horse.

One must keep in mind that until 3 years ago there was no incentive to develop insulation and the consequent cost savings involved to any important extent. This has made America the greatest energy waster in the world today. Thus the gains are there to be made. Additionally, the commercial and industrial sectors account for a large proportion of our total energy use. Any savings must inevitably create a major impact on our overall energy consumption.

It is clear, therefore, that the stakes with regard to insulation are large. But what about the costs? The tax credit for insulation currently being considered by the Senate Finance Committee represents a small financial expenditure by the Government. The loan and guarantee programs considered by this subcommittee and others constitute an even smaller longrun drain on our financial resources. The loans would be repaid. In sum, the costs are not great—though, to be fair, no one can supply precise figures on what a loan or tax credit would cost ultimately because we cannot predict precisely the degree to which these programs will be used by American consumers. But it is reasonable to conclude that we are not talking about a huge drain on the Federal budget in any event.

Moreover, there are a significant number of indirect financial benefits associated with insulation incentive programs. If the incentives are of any value—and I will suggest in a moment why they are—

American industry—including my own corporation— will be required to expand to meet the need for insulation materials. This expansion will create jobs both for the construction workers who will build the plants, and for workers who will run them. Additionally, construction workers of all kinds will be needed in great numbers to install the energy savings insulation materials we will encourage people to buy. Again, there are no precise figures on jobs because we do not know the particular level of demand we will be facing for insulation equipment. But we do know the direction is favorable.

Of course, more jobs mean more tax revenue and less money spent for unemployment compensation in a time of tight budgets and high deficits. Finally, there is the reduction in fuel bills for the business and individual consumer which will result from insulation and consequent lower energy use. This will free money to be spent for other goods and services benefiting a number of sectors of our economy and assist our currently inadequate level of capital investment.

As to the incentives themselves, as mentioned, we believe the insulation tax credit now before Congress to be a strong incentive for the purchase and installation of insulation materials. It is a simple proposal that everyone can understand, particularly those Americans who have not yet been made conscious of the longrun benefits to be gained.

We also believe that loans and loan guarantees are a significantly effective, even if not easily quantifiable, tool to encourage businesses to insulate their plants and commercial properties. This also applies to a lesser degre to the average homeowner. In a time of rising costs and uncertain confidence in the immediate future of the business cycle an attitude of caution has developed among all of us as to the future—and particularly expensive—investments which promise intermediate and longrun benefits, not dramatic, immediate returns. It perhaps ought not to be so, but this attitude has become widespread. It is thus necessary for the Governmnt to invest its resources to change this attitude through incentives which encourage investment in insulation. Again, no precise quantification is possible. But it is certain that such an incentive goes in the right direction, and at an acceptable level of cost.

It is also important to mention that the weatherization assistance programs such as the one currently operated by the Community Services Administration, as well as that envisioned in title I of H.R. 8650, move in the right direction. Again, the result—more insulation as fast as it can be installed—is the objective, and the program presently in operation, as well as the one contemplated, promise to do that job. Thus a commitment to weatherization makes sense.

There are two related efforts not yet mentioned which represent a dramatic opportunity for the Government to make its insulation policy pay big dividends. The first is the upgraded thermal insulation standards for new construction proposed in title II of H.R 8650. Without a commitment to making our new buildings conform to the longrun policy of minimizing our waste of energy, all the incentives imaginable for existing building insulation will be insignificant.

The second, a federally supported program of retrofit for old buildings with exceptionally inadequate insulation, requiring perhaps more investment than any of the contemplated incentives would produce, is essential. We believe a rate of 4 million units per year is a realistic goal, and that, at a minimum, for every three retrofitted, a fourth unit

could be built without any increase in current energy usage. This is clearly the most productive step that can be taken to rationalize the Nation's need for new housing with the goal of controlling and ultimately reducing our existing energy use. Needless to say, the job creation possibilities in the retrofit program would be highly significant for the depressed construction industry.

In summary, we believe that S. 2932 represents not only a positive but an essential step toward making insulation a major weapon in our arsenal of response to the problem of overdependence on foreign energy, and to the development of rational energy policy within the United States. We believe the energy problem is serious. And since we know that insulation returns 600 Btu's of energy for each Btu consumed in the manufacturing process, we recommend strongly that each and every program mentioned here be part of that effort.

I thank you and the members of the subcommittee, Mr. Chairman, for allowing me to appear here today, and upon completion of his reremarks, Mr. Cady and I shall be happy to answer any questions you may have.

STATEMENT OF SHELDON H. CADY, EXECUTIVE VICE PRESIDENT, NATIONAL MINERAL WOOL INSULATION ASSOCIATION

Mr. CADY. Good morning, Mr. Chairman. As John S. Autry indicated, I am Sheldon H. Cady, executive vice president of the National Mineral Wool Insulation Association. The membership of NMWIA consists of nine manufacturers of mineral wool insulation for buildings, and this includes both fiberglass and rockwool insulation.

In my view, the key phrase in section 101, paragraph 8, of S. 2932 is "To supplement and not supplant." I think that the stimulation of energy conservation through loan guarantees and interest subsidies is an excellent concept. In supplementing the tax credit program it will make the tax credit program do what it was intended to do—encourage 4 million retrofit jobs per years. I don't feel this can be accomplished by loan guarantees or interest subsidies alone, nor do I think that it can be accomplished by tax credits alone. Working in tandem, supplementing each other, S. 2932 and the tax credit provision currently pending before the Senate Finance Committee will make the whole thing work.

If I may, Mr. Chairman, I would like to enumerate several points that I think particularly significant to the Energy Conservation Act of 1975.

First, consumers would be directly benefited through a reduction in their fuel bills. We have estimated that upgrading the thermal performance of our current residential sector alone would reduce consumption 25 percent and save $32 billion for the consumer or, to put it another way, enough energy to heat and cool over 15 million living units for a 10-year period.

Second, 4 million retrofitted units per year is a realistic goal. Material and labor to accomplish this is, and will continue to be, available.

The insulation industry has capacity in place today to provide material for 1.5 million new home starts plus 4 million retrofitted units annually over the next 5 years. Beyond that, additional expansion of manufacturing facilities can be accomplished if necessary to supply in-

creased demands as retrofit rates exceeding 4 million units per year. During the early 1970's, for example, the industry supplied material for new housing in excess of 2 million units for 3 successive years, plus substantial reinsulation and remodeling work. Expansion within the industry occurred during that time to supply a much higher level of demand than previously experienced.

Third, at a retrofit rate of 4 million units per year——

Chairman KENNEDY. Mr. Cady, excuse me, they just called me to another meeting, but I want you to continue. I have some questions I will ask Mr. Stewart to ask at the conclusion of your testimony.

Mr. CADY. Very good, sir.

Chairman KENNEDY. I'm interested in the relationship between loans and tax incentives, and the necessity for them. I will ask Mr. Stewart if he would ask some questions, and I will be back in a few minutes.

Mr. CADY. Thank you, Mr. Chairman. Shall I continue?

Mr. STEWART. Yes.

Mr. CADY. At a retrofit rate of 4 million units per year, 40,000 new jobs could be created within the insulation industry itself. Additionally, Mr. Chairman, we estimate that, for every three to four retrofitted units, the energy saved would allow construction of one new unit. A program on the scale we are discussing, therefore, would provide ample employment opportunities for thousands of construction workers in all fields related to energy conservation. Perhaps most important, these jobs would be in the sector of greatest unemployment—unskilled, semiskilled, and minorities.

And finally, NMWIA considers a program of incentives and financial assistance by the Federal Government to be of major importance in encouraging energy conservation measures. It requires an investment of $200 in material to fully insulate the attic of a 1,000-square-foot home. An insulation contractor can do the same job for the homeowner for a relatively slightly higher amount.

To some, this $200-plus figure can be paid for with careful budgeting out of current income. To most, a loan may be required. The size of this loan is not such that it would attract the banking community, thus forcing the homeowner into small loan activities where interest rates are high.

While the installation of insulation is important, it is the overall improvement of the energy conservation in a house that costs substantial sums. Referring to a publication entitled "Retrofitting Existing Housing for Energy Conservation: An Economic Analysis," as a reference, and this was published by the U. S. Department of Commerce, National Bureau of Standards, issued December 1974; this reports that costs of storm windows average $25 each; storm doors, $75; and, while the cost of weatherstripping materials is a maximum of $15 per linear foot, installation prices run as high as $20 per window or door. The replacement of an obsolete heating system also runs into a substantial figure.

The homeowner, then, who sincerely wishes to materially improve the energy-conserving characteristics of his house by insulating, installing storm doors and windows, by having his home weatherstripped and caulked, or by replacing his heating system, could pay many hundreds of dollars. It is in this area where low-interest loans could be of great benefit to our energy independence.

I would like to digress a minute. In this morning's Washington Post there was an article about a black community in Virginia; there was a photograph, and the caption indicated that many of these were being abandoned because they couldn't afford the high electric costs. Now, if those owners had some sort of a financial program, either one or both, supplementing each other, it could be conceivable that many of these houses would not have been abandoned.

Mr. STEWART. They are heated with electric heat?

Mr. CADY. That's what the caption said.

In conclusion, I would like to reiterate what Mr. Autry has said. It is the insulation industry's view that S. 2932 represents a positive step toward improving energy efficiency within the United States. We must repeat, however, that energy-conscious building standards and tax credit for the purchase and installation of energy-conserving products are necessary supplements of any conservation program. Especially without the latter, I doubt that the commercial and industrial sectors which combined use 55 percent of our Nation's energy resources will be able to participate.

I thank you for allowing me to appear here today, and, as Mr. Autry said, we welcome any questions you may have.

Mr. STEWART. Thank you, Mr. Cady.

I think the main question that Chairman Kennedy would want me to ask is to see if you can elaborate a little bit on how tax credits conceivably fit together with loan guarantees and interest rate subsidies in a package. As you know, there is legislation pending that provides for tax credits, and Chairman Kennedy's bill focuses on loan guarantees and interest rate subsidies.

Mr. CADY. Yes.

Mr. STEWART. I think there is a feeling among most of the Members of the Senate and House who are involved in this effort that what they would like to do is come up with the best total package that will provide the largest amount of benefits for the least amount of Federal investment.

Mr. CADY. Right.

Mr. STEWART. So, any elaboration that you could provide in that area, I think, would be quite useful.

Mr. CADY. I didn't mean to imply that they would intimately work together as a package; I can't conceive that. But the word "supplement" did appear in the preamble to S. 2932, and is an important thing.

What is needed is action by the Government to assist in the weatherization and winterization, and what have you, of the private home, apartment, residential building.

The homeowner could take a tax credit if the tax credit bill passed and he took the measures that were necessary, but he might not necessarily have the money to accomplish this in the first place; and that's where the two come in.

Mr. STEWART. That's right.

Mr. AUTRY. If I might add this, Mr. Stewart, the series of insulation programs we submitted to the House Ways and Means Committee on the 6860 bill—and we will be happy to submit those for you to review with staff—indicated that a tax credit of up to 50 percent would not have an adverse effect on the financial resources of the country.

We feel, and I think one of the speakers earlier developed that, people who might not wish to borrow money, they might not have to borrow money to install insulation, we feel they should have the privilege. But many of them, we feel, need an incentive. It is unfortunate, but true, many people are not today retrofitting, although they are beginning to retrofit, as fuel prices increase; that becomes an incentive.

Mr. STEWART. Well, I feel while there might not be a package as such, there would obviously have to be a relationship between the two. I mean, the simplest sort of thing is, if one took a tax credit, he would not be eligible for interest rate subsidies or guaranteed loans.

Mr. AUTRY. That would be reasonable.

Mr. STEWART. One could come up with a somewhat more complicated arrangement, a tax credit provision that would limit the amount to $500, and provide a credit on the first $500, or whatever the expenditure might be. A lot of the jobs are going to be more than $500, and conceivably you could have some kind of a subsidy on the second $500.

Mr. AUTRY. Surely.

Mr. STEWART. That's what I meant by package.

Mr. AUTRY. Surely. People have an alternative, they can study it and decide which is best for them.

Mr. STEWART. The other thing that has occurred to some of us that there is in existence under title I, the home improvement loan program, which is run by FHA. It has existed for 40 years, and it has has been quite successful in the sense that it runs with a minimum of bureaucratic redtape. In fact, a gentleman from FHA told us that a sum total of 34 people run the entire program for the Federal Government, 15 of whom are in the field. The notion of the gigantic bureaucracy is not true, at least in the title I home improvement loan program.

The principal drawback to that is, of course, the high interest rate that one pays, the relatively high interest rate that one pays, which is around 12 percent.

So, another alternative that might be explored is the alternative of perhaps creating a special category within the home improvement loan program for energy conservation loans, where you could have a somewhat lower interest rate, perhaps of 5 percent in Chairman Kennedy's bill; the benefit being that there is a minimum of paperwork involved in the whole home improvement loan program on unsecured loans that are made by local banks and thrift institutions with a minimum of commotion. That seems a possibility as well.

Let me just say, do you have any estimate of the extent to which insulation efforts, insulation jobs in residential homes are financed through the home improvement program, is that a source of much business for the insulation industry?

Mr. AUTRY. I can't speak to that; I don't know.

Mr. CADY. I don't know, either.

Mr. AUTRY. I would think not.

Mr. STEWART. They had a very general estimate, they felt that about 3 percent of their loans went to insulation work of one sort or another; and another 11 or 12 percent went for heating and cooling jobs of one sort or another, which would be air-conditioning and furnaces, things like that.

Another question that I think would be appropriate here—and that relates to the fact that most every witness that has appeared before the subcommittee here has responded favorably to, on incentives to install insulation—and that is, if it would save them money, they would figure it out for themselves and would go ahead and do the work. Why should the Government be involved in this business of providing incentives; what are the barriers to greater activity, particularly in the residential area? Mr. Autry and Mr. Cady, both, if you could respond to that.

Mr. AUTRY. Quite simply, cheap energy in the home—and one of the earlier speakers has spoken of the price of natural gas, natural gas being controlled—it is cheap, and therefore the incentive isn't there. Now that the cost of energy is rising, there certainly will be more of an incentive, but not nearly as much when compared to any other cost increase that the homeowner shares, that has been going up, new cars, refrigerators, or washing machines.

Maybe you have a better answer, Mr. Cady.

Mr. CADY. The fact is that over the past 2 or 3 years in which energy conservation and the advantages of all the steps, including insulation, have been in editorials, they have been in "Shelter" magazines, they appeared everywhere, and still have not inspired the homeowner to act on his own to any great extent, is what completely baffles our industry. We feel that the homeowner not only needs financial incentives that he will have forced upon him by the higher cost of fuel, but some specifics that will force him to save, whether he wants to or not, which would include building standards of certain types that require insulation, and economic incentives.

Mr. AUTRY. It is an educational process, too. Obviously, with the homeowner facing a greatly increased energy bill, he or she will retrofit, or insulate, but maybe not fast enough. This bill could provide a stimulus to move that into an energy-saving program now, rather than 5 or 10 years from now.

Mr. STEWART. One of the assumptions that underlies the Energy Conservation Act that Chairman Kennedy introduced was that it was really an interrelated, interlocked problem. On the one hand there is the information problem; people don't know exactly what they can save, and I think a lot of them are suspicious that these potential savings are overstated; maybe they are true in some ideal case, but they won't be true for them. At the same time, there is a capital problem. A lot of middle, lower-middle income people have problems borrowing the money that they need, or at least at the rates they feel they can afford. So, they simply go ahead and pay the extra fuel costs, rather than take out a loan.

And finally, this is probably the kind of situation in which you first have to make a judgment as to the amount you can save, then you have to borrow the money; then you have to get on the phone and call the insulation contractor; and then you are really not sure what's going on at that point. So, it is just a process that seems to be more difficult and more time-consuming and uncertain than you are willing to tackle—as a result, nothing happens.

So, what the bill is trying to do is put together a system that would vary from State to State and give the States considerable flexibility in designing that system. That would hopefully remove all of these bar-

riers simultaneously. On the one hand there would be an information system, and a person could find out what they can save in their own homes. And on the other hand, they would be given opportunities to borrow the money, or get a tax credit, that would be part of the package; and do it at terms that clearly were cost effective, and economic for them to do. The third would be a rather simple procedure to have the work done, similar to some of the pilot projects that some of the utility companies conducted, where they have done the work themselves.

It has been our assumption that if one were able to remove these three barriers, one might then find a substantial upturn in the home insulation business, the process of insulating homes and commercial buildings. The legislation was written on that assumption.

Do you think that assumption is basically sound?

Mr. AUTRY. I think you state the case very well, Mr. Stewart. With education and information you can remove the obstacles, the barriers; and then, by providing loans or tax credits, you give a person an alternative solution to his or her problem. That will stimulate, we believe, the retrofitting, insulation of home and businesses. I wish you well.

Mr. STEWART. Another question an economist—this being the Joint Economic Committee—will have to ask. Say the bill passed, say it was a booming success and that business really picked up. How would we know, or what assurances are there that the cost of the insulation won't also rise dramatically in response of this very sharp increase in demand.

Is there any way that one can feel some assurance that what happened to oil prices—they have been quadrupling—will not also happen in insulation because if that were to happen all of our carefully factored figures would drop immediately and we will be back where we started from?

Mr. AUTRY. Our president spoke to that to a committee of Congress a little over 1 year ago, on the very same question. Secretary of Labor Brennan asked that question, and the statement was that we wished we had that problem. Our industry has operated under capacity for several years, and it is still under capacity—Mr. Cady spoke to that. With the present industry capacity we could complete 4 million units of retrofit and still do 1½ million new housing starts without expanding.

Obviously, if there is a commitment for a long-range program our company and the rest of the industry would gear up immediately. As to inflation or extreme pricing, I don't think that will happen, I think our competitors will handle that for us.

Maybe Mr. Cady can expand on that.

Mr. CADY. I'm afraid I can't because as a representative of the trade association, I have nothing to do with pricing whatsoever.

Mr. STEWART. I guess you don't have a lot to do with it, but you keep your eye out.

Mr. AUTRY. I would like to reiterate, Mr. Stewart, that the industry has been operating far below capacity and is still operating far below capacity. We simply don't have a capacity problem and we don't foresee it; and with the expansion ability of the major corporations in producing insulation, we don't feel it will become a problem.

Mr. STEWART. How much beyond the 4 million units can one realistically expect to go? Four million is a big figure, if you add that 1½ million new homes, that adds up to 5½ million units. Is that the maximum, or what sort of time scale are you talking about? Is that an economically sensible figure for the industry that you are talking about?

Mr. AUTRY. Yes; we think it is. That figure, for jobs, construction, labor working to install the insulation, that type. We estimate that there are 40 million homes in this country, residential units, that are inadequately insulated or not insulated; and over a 10-year program of 4 million units per year, the homes could be well insulated. But, we are nowhere near that, we, the industry, are probably retrofitting in the hundreds of thousands or less today. So, the potential is there.

Mr. CADY. And in that we are talking about the viewpoint of the mineral wool insulation industry, and there are other industries available for home insulation.

Mr. AUTRY. Oh, yes.

Mr. CADY. I am sure the manufacturers of other types of insulation can expand as well.

Mr. STEWART. Do you have any view, either one of you, as to whether it is better to provide loan guarantees or tax credits, or subsidies as a way to encourage conservation, or is it simply to bring the price of fuel way up? Obviously, the higher the cost gets, the more insulation you are going to get, there is no doubt about that.

The Congress has, in its wisdom, perhaps, attempted to retain some control over most energy prices, and has looked more toward the subsidy of one sort or another. Do you have a view on that?

Mr. CADY. The terms of 2932 in the record indicated the length of payback that has been figured out by the FEA for various types of insulation, roofs, ceilings, walls, and so forth. If the price of fuel were allowed to go wherever it wanted, this payback period, once the job had been completed and paid for, would be considerably extended because of the higher cost of fuel. If the price of fuel were controlled, he would be saving money in the long run because he would have a shorter payback period for the insulation and would also be paying less for his fuel.

Mr. STEWART. How complicated is it for a person to learn how to install insulation. One of the things that people talk about is that that does open up, hopefully, employment opportunities. And in the title I program of 8650, it provides insulation materials that would be installed by a person involved in the Comprehensive Employment Training Act program, in some instances, and other community action programs.

Is that a highly skilled occupation, or one that can be learned fairly easily?

Mr. AUTRY. Different phases of it would require different technical skills. The homeowner can certainly install insulation in his or her attic. We have estimated that the retrofit program, the 4 million units per year would create employment for 40,000 people. That's from the raw material to the attic, it not only involves insulation production, but installing, transportation, and the whole thing. We are sticking with that number.

But to simply install insulation, unless it is a business or commercial venture, it is not a very difficult job. New commercial construction often does require considerable labor.

Mr. STEWART. I was looking through the real estate ads over the weekend, not because I am planning to move, I was curious to see whether or not the whole spectrum of insulation, energy savings, and so forth, had begun to be a part of selling new homes. I was pleasantly surprised to find that in at least half of the ads, in one in particular there was a great huge headline, it was the reason why people ought to buy that house, they were going to save substantially on their fuel bills, and they had heat pumps, and wall insulation and ceiling insulation all spelled out quite specifically. That is an encouraging sign, I think.

Mr. AUTRY. Very encouraging.

Mr. CADY. At the National Association of Home Builders' Convention last January, the theme was energy conservation, and the people who sold energy-conservant products were overwhelmed by the builders this year; this was the first time. It is not only the knowledge that the need has become apparent that has caused this but competition has also started to affect the whole picture.

Mr. STEWART. Thank you very much. Senator Kennedy will be here momentarily, and it would be very helpful if Mr. Hueter and Mr. Panuzio could come up now and begin their testimony, and then the Senator will join us shortly. Thank you a lot.

In the Judiciary Committee there was an executive session called that the Senator had to attend. It was not scheduled, but they do get calls from time to time that they have to attend. It is just two floors down from here, so we hope that he will be here shortly.

Mr. Hueter, would you begin your testimony? The Senator will be here shortly.

STATEMENT OF ERNEST B. HUETER, CHAIRMAN OF THE BOARD, INTERSTATE BRANDS CORP., ACCOMPANIED BY DONALD GERISH, SECRETARY, AMERICAN BAKERS ASSOCIATION

Mr. HUETER. I hope the chairman will get back in time because I have been given to understand that I'm the only representative of the food industry who will be appearing before this subcommittee, and of course energy has a direct bearing on consumer costs. I know the chairman is very much interested in that particular aspect of our economy.

I am Ernest B. Hueter, chairman of the board of Interstate Brands Corp., the Nation's third largest bread baker. I am a governor of the American Bakers Association, and I am a member of the energy conservation committees of the American Bakers Association and the Grocery Manufacturers of America. I am chairman of the board of trustees of the American Institute of Baking, and I serve on the Grain Advisory Committee of the U.S. Department of Agriculture.

It is a privilege to have with me today Mr. Donald Gerish, who is the secretary of the American Bakers Association.

It is my privilege appearing before this subcommittee as a representative of the wholesale baking industry, that segment of the baking

industry which produces and distributes approximately 86 percent of the bread, rolls, and other bakery products sold in the United States.

While I will be directing most of my comments to the baking industry, much of what I have to say is applicable, to some degree or another, to the entire food industry.

According to the Federal Energy Administration the baking industry is one of the 10 most energy-intensive industries of the food spectrum in the United States. The baking industry utilizes directly every form of commercial energy except coal and nuclear power. It utilizes indirectly coal and nuclear energy through its consumption of electricity. As an industry, the bakers operate one of the largest fleets of vehicles, both delivery vans and over-the-road transports, in the United States—approximately 125,000 trucks. We produce the basic foodstuff upon which our Nation depends for nutrition and substance and which must be made available in adequate quantity daily at a price affordable by citizens of all income levels. Most of the bakery products are highly perishable. The industry is highly labor intensive and employs directly 195,000 people.

The wholesale baking industry produces and delivers daily, highly perishable, yet basic nutritious food consumed by almost every citizen in the United States and particularly by growing children.

The baking industry is one of the largest—if not the largest domestic customer of the American farmer.

It is for these reasons that the baking industry is highly sensitive to the critical energy situation—both short and long term—and is vitally concerned about the legislation and regulations that govern the use and allocation of energy sources.

Therefore, in the development of any energy program, the aforementioned facts, many of which are applicable to other basic foods in varying degrees, must be borne in mind. Since not all industries nor all products are of equal importance to the health, well-being, and physical requirements of the American citizen, a wise energy program will require exceptional consideration for exceptional products and services such as perishable basic foodstuffs and the delivery thereof.

The objectives of an industry conservation program must embody several criteria:

One, conserve energy.

Two, but in so doing it must hold down or reduce, if possible, consumer prices, particularly food.

Three, it must maintain or increase employment levels.

Four, it must protect and improve the productivity and profitability of industry. Sick companies do not make a well nation.

Five, it must insure that the American consumer is fed well nutritionally and in adequate quantity and variety.

The American Bakers Association and its members have been involved with energy conservation and efficiency improvement in cooperation with the Federal Energy Administration for about 2 years now. The association has, through its energy task force, voluntarily instituted comprehensive energy data reporting procedures for participating companies—of which I believe there are now 400—and has agreed with the FEA to meet a goal of 15 percent energy conservation, or energy reduction and use—by 1980. However, to meet this goal, the industry needs effective Government support.

Tables 1 and 2 [1] show the first energy survey of the industry. Completed last summer, it shows an improvement in energy efficiency in the first 6 months of 1975 of 2.7 percent over the first 6 months of 1972. This energy saving was accomplished in the face of low production rates in the first half of 1975, compared with 1972.

Now, we at Interstate Brands have been in the vanguard of the industry and association effort.

The result was a corporate energy program developed over a period of 3 years which has already borne fruit. Granted, the program developed slowly and through trial and error, but the important facts are these:

The program has resulted in assisting our government in conserving energy. In 1975 Interstate Brands Corp. used 200 billion Btu's less than in 1972, while increasing production by almost 40 million pounds of product. This reflects a 17 percent decrease in energy consumption.

The program has assisted our employees in becoming energy conservation conscious in their personal lives.

The program has resulted in operational efficiencies which are reflected on the bottom line of the corporate P & L thereby benefiting the stockholders.

The program proves to us, and therefore hopefully to others of the food industry, that a highly productive and workable program can be developed if top management makes up its mind to insist upon it, and if top management follows through on its implementation.

The American Bakers Association in cooperation with the Biscuit and Cracker Manufacturers' Association and with the assistance of the FEA, is now developing a series of seminar programs on energy conservation in the baking industry. These programs will be conducted in various parts of the country and local bakers and their employees will be invited to participate and receive first-hand knowledge of conservation techniques that can be applied in the plants and transportation systems they operate.

The baking industry participated in the Johns-Manville audits you already heard about, and these audits will be used in the energy conservation seminars.

You can see that we are working to conserve energy, but let us give you some information on our supply problems:

Over 90 percent of all the major baking ovens in the United States have direct-fired heating systems using natural gas as fuel. Under today's technology this type of oven provides the most efficient use of energy. It is interesting to know that approximately 30 percent less energy is required than any indirect fire-heating systems. Thus, from a very practical standpoint, in the interest of both energy conservation and cost, it must be concluded that no substitute form of energy for the present gas-fired bakery oven is acceptable.

Natural gas production is falling behind national consumption at an accelerating rate. Many bakeries in recent months have experienced interruptions of their natural gas supply, even though they be on firm contract, thus forcing them to use equally scarce and significantly higher priced propane, the only other acceptable fuel which is, as I think we all know, made from natural gas.

[1] See tables 1 and 2, p. 261.

Natural gas and propane are presently under allocation and the FEA ruled in January that approval of any increase in allocation of propane above 250,000 gallons must be made in the FEA Washington office only. I might point out here, as an aside, that in actual experience of breakdowns, one of our bakeries alone consumes more than 250,000 gallons, and we operate 32 bakeries. It is conceivable that some bakeries could run short of oven fuel unless some system of priority is established to guarantee them adequate fuel.

According to a Federal Power Commission study released last year, one of the projections indicates that by 1985, which is less than 10 years from now, production of natural gas from U.S. continental wells could drop by as much as 67.6 percent below present consumption. Now, 50 percent of our natural gas usage is for domestic purposes, such as home and building heating, cooking, hot water heaters, and so on. The remainder is for all industry, process heat, fertilizer, plastics, propane, and so on. Thus, if this projection were to be realized, we would be producing less natural gas 10 years hence than our present requirements are for domestic purposes alone. Theoretically this would mean that there would be no natural gas available for all of industry.

Congress is attempting to deal with this in several pieces of legislation currently pending. We are pleased that both the Pearson-Bentsen amendment and the Smith amendment contain a food processors' priority, which we believe is vital to the Nation.

The American Bakers Association supports decontrol of new natural gas as a long-term goal. However, we recognize that it must be accomplished in such a way as to minimize the inflationary impact on the economy, and more specifically on basic bread stuffs.

Of equal importance to the points already made is the fact that a change in many of our existing laws and regulations can add immeasurably to increased efficiency of the baking industry, to conserve fuel, and to contribute to holding food prices down. Some examples:

Legislative action could result in significant energy savings if restrictions on intercorporate hauling were removed. It just doesn't make sense, Mr. Chairman, to mandate large rigs deadheading thousands of miles weekly. The Secretary of Transportation has stated that 30 percent—one-third of all of the trucks of the United States of America—are empty at any one time. Government regulation, only, can change that.

Before enactment, it may be well to review prudently the OSHA "heat stress" regulations presently under consideration. There are pending requirements which will require us to use more energy for no productive purposes that we can see.

Another one, FDA and USDA water temperature requirements as well as restrictions on use of chemical disinfectants warrant review.

There is a need for clarification and revision of the Robinson-Patman Act as it relates to backhaul. As you probably know, cost-justified backhauls are not permitted under the existing interpretation by the FTC.

Recognition must be made of the constraint put upon industry in such areas as air pollution, catalytic converters, as an example, visible smoke, noise abatement, and so on; all of which add to cost and restrict the ability to maximize energy conservation.

If in the long run all of these things are forced upon the food industry, and specifically upon the baking industry, they must end up in higher product cost to the consumer.

The Government can help the baker help the Nation by avoiding new measures and altering existing measures that mandate inefficiency—energy waste.

Mr. Chairman, the baking industry is concerned, of course, over possible shortages of other fuels and encourages the development of a priority system to insure that adequate energy in all forms is available to the processors of basic foods, even in times of shortage. Our supply of nutritious food must continue, uninterrupted, in the interest of national health.

The wholesale bakers are working in close harmony with the FEA, the FPC, and other governmental agencies. We stand ready to cooperate with this and any other legislative committee toward a sensible solution to the energy/food supply problem, which could become extremely critical in the near future.

Thank you.

Mr. STEWART. Thank you, Mr. Hueter.

[The tables referred to in Mr. Hueter's statement follow:]

TABLE 1.—ENERGY USE/PRODUCTION

	1972 (1st 6 mo)	1975 (1st 6 mo)
Production (millions of pounds)	2,759.016	2,845.581
Energy use (billion Btu's)	7,713.437	7,748.576
Energy efficiency (Btu's per pound)	2,795.000	2,722.000

	Percent
The improvement in energy efficiency compared to 1972	2.7
The 1980 goal for energy efficiency improvement	15

TABLE 2.—TYPE AND QUANTITY OF FUEL USE

[In billion Btu's]

Fuel type	1972 (1st 6 mo)	1975 (1st 6 mo)
Gasoline	1,748.354	1,611.041
Diesel fuel	1,286.980	1,295.819
Fuel oil	427.826	429.946
Natural gas	3,555.067	3,662.894
Electricity	665.712	713.380
Propane	29.302	35.105
Steam	.193	.389

Note: The American Bakers Association points out in its report that much of the energy conservation effort was thwarted by the present low production rates, as compared to 1972. Although total production showed about a 3-percent increase over 1972, the production rates were lower than the level to which plant capacity is geared. However, with a foreseeable upturn in production, the ABA is confident of increasing the 2.7-percent efficiency improvement to meet the 1980 goal of 15 percent.

Source: Federal Energy Association.

Mr. STEWART. I think we will save the questions we have so that Chairman Kennedy can ask them when he gets back.

I might say as background, at an earlier session of this subcommittee, John Eberhard of the American Institute of Architects' Research Corp. gave us very interesting testimony about potential for

energy saving once that becomes a priority factor in the designing of buildings. He indicated he would be working with GSA and this became of considerable interest to Senator Kennedy. We are pleased that you could get here, Mr. Panuzio; we are very appreciative of that.

STATEMENT OF HON. NICHOLAS A. PANUZIO, COMMISSIONER OF PUBLIC BUILDINGS SERVICE, GENERAL SERVICES ADMINISTRATION, ACCOMPANIED BY WALTER A. MEISEN, ASSISTANT COMMISSIONER

Mr. PANUZIO. We are pleased to be here, and we are pleased to represent Mr. Jack Eckerd, the Administrator of the General Services Administration.

I am Nicholas Panuzio, Commissioner of Public Buildings Service; with me today is Assistant Commissioner Walter A. Meisen. I will submit a statement for the record, and now just kind of skip through it.

Mr. STEWART. Are there any copies of the statement available?

Mr. PANUZIO. We will get copies.

Through the President's Federal energy management program, GSA has undertaken some conservation effort which I think has achieved significant savings in fiscal years 1974 and 1975. Our annual savings amount overall to a 24-percent reduction in 1974, and 27 percent in 1975, in real terms equivalent to approximately 2.8 million barrels of oil this year.

We have achieved these results through an aggressive GSA energy conservation program in our buildings. I have attached to my prepared statement a description of our energy conservation mission undertaken by GSA, not only within our Public Building Service, but by our Federal Supply Service as well. As you may know, the General Services Administration's PBS Division is responsible for over 10,000 federally leased and owned buildings with an inventory of 250 million square feet. Forty percent of the energy traditionally consumed in office buildings can be conserved. On the average we have saved nearly 30 percent of the energy through modifications and operating procedures. Saving the remaining 10 percent, however, we must now look at a cost. In fact, we are saying that the last 10 percent, when we are only dealing with savings cost, we will be spending some money before we are able to see any savings.

At GSA our energy conservation work in office buildings has three major thrusts. First, the design of energy-efficient buildings for our future office needs; second, modification and retrofitting of existing inventory of office buildings, which is substantial; and third, institution of building operating standards and practices to reduce energy consumption.

To achieve conservation of energy in our new facilities we have developed a series of handbooks entitled, "Energy Conservation Design Guidelines for Federal Office Buildings." Nearly 5,000 of these handbooks have been sent to the construction industry in both the public and private sector. A second printing of these guidelines, which has been updated somewhat, is available and has been available

since 1975, with expanded sections dealing with the whole question of solar energy and the use of computers in energy conservation.

The second booklet that we have published is "Energy Conservation Guidelines for Existing Office Building," and this is beginning to be made available to the private sector; and we believe this is the area where the greatest potential for conserving energy exists, and this is through modification of existing facilities, especially since 85 percent of all facilities we have will be in operation by the turn of the century.

The third book which we have published is our "Energy Conservation Guidelines for Building Operations," these guidelines are based on the knowledge and expertise we have gained in reducing the energy consumption in buildings by nearly 30 percent just by using activities dealing with operations.

We point out, for instance, that in most of the Federal buildings we operate, we have taken out every other light. We do not have all the lights on, such as in this Senate hearing room. And I am sure on a beautiful day like this, if the lights were turned out by someone on the staff, you will find that they are really not needed at all, and there would be 100 percent of energy savings this morning.

Mr. STEWART. Why don't we experiment?

Mr. PANUZIO. If you will turn them off, turn at least half of them off, we will obtain a 50 percent savings within the Senate.

Mr. STEWART. The problem is that you can never find the switch.

Mr. PANUZIO. We put that in the handbook. I must say, I'm sorry we have caused so many problems.

Mr. STEWART. That's all right. It causes me to recall the item I saw in the paper a couple of weeks ago, suggesting that there are plenty of problems on all levels. Mr. Sant, the Assistant Administrator for Conservation of FEA found difficulty in turning the thermostat down in his office because the old Post Office Building doesn't permit that. It can be done very easily, and he was going to see to that. A reporter commented it was something like 82 degrees, or something, in Mr. Sant's office—perhaps it wasn't that hot, but it was certainly far above 68 degrees.

I think that perhaps gets to the point that a lot of these buildings were built, most of these buildings were built when energy was no problem, and it's just awfully difficult to achieve the savings you otherwise could.

Mr. PANUZIO. We found that, of course, many of our buildings are of that era, and earlier. We have found that through some of these energy conservation devices we have had a great response on the part of the people who work for the Federal Government.

Certainly, we are pleased to cooperate with Senator Kennedy in the energy conservation bill that he has sponsored, along with bills sponsored by others.

Unlike the modifications of operating standards, the modification of retrofitting of existing facilities to achieve energy conservation will require in many cases significant capital investment. We recognize the need of strong support by the Congress of those actions which will enable major energy conservation modifications of Federal buildings. Obviously some existing facilities are more energy-inefficient than

others, and in a formal program we could concentrate on those buildings that could be modified easily.

We have been trying to collect some data, having under construction two new buildings as major energy improving buildings, both of them are under construction, one in Manchester, N.H., and one in Saginaw, Mich., which is an environmental demonstration building as well.

Both projects were utilized solely to provide an additional source of heating and cooling of the building. We think they are going to provide a great deal of information for us to base some of our future plans on.

For instance, the Manchester Energy Conservation Demonstration Building has a number of important features; different energy systems on various floors, to evaluate the efficiency of the program; heat pumps, storage of waste heat, and so on.

I think it is important that we participate—and we have, as I indicated in my statement—with other agencies to try to come up with the best possible program for Government use.

One of the things that we have pointed to for some time is that there are approximate savings of about 40 percent potential—30 percent of that is possible through some minimal changes in operational adjustments; the other 10 percent is increasingly expensive, and frankly, decreasingly cost-effective as a result of these assumptions 60 to 70 percent of our current fossil fuel requirement will remain.

Even if all the conservation steps we are talking about were to take place, any major programs, retrofitting, limits itself primarily to conservation of existing fossil fuels, and limits itself to 10 percent, in effect, of energy consumption. Only, frankly, from major programs, stressing implementation of other energy sources, such as solar energy, can we make an impact on our remaining 60 to 70 percent energy.

In fact, we are saying, for us to now start putting together programs to accomplish additional savings, we are going to have strong support to come up with new methods of providing solar energy at a reduced cost. Right now we are experimenting in many ways to build, to provide, to retrofit buildings with solar collectors; that is so expensive that it is almost impossible to do. Programs have to be developed where these solar collectors become available at less cost, moderate cost, or we are not going to be using them in the future.

We think we have done a good job at GSA, and we certainly think that a great deal will be done on our part to work with local and State governments. State and local governments are far behind because they do not have the technical expertise. We think a good deal can be done with our cooperation in helping State and local governments achieve some type of conservation program.

We will stay to answer any questions that you or Chairman Kennedy would like us to answer. Thank you.

Mr. STEWART. Thank you Mr. Panuzio, your prepared statement will be printed in the hearing record.

[The prepared statement, with an attachment, of Mr. Panuzio follows:]

PREPARED STATEMENT OF HON. NICHOLAS A. PANUZIO

Mr. Chairman and Members of the Committee: I am Nicholas A. Panuzio, the Commissioner of General Services Administration's Public Buildings Service. On behalf of Jack Eckerd, the Administrator of General Services, I very much

appreciate this opportunity to discuss the importance of energy conservation and the roles it might play in national energy policy.

We at GSA fully support efforts to improve upon energy efficiency and conservation practices which will contribute to a successful national energy program.

Through the President's Federal Energy Management Program, GSA's energy conservation efforts have achieved significant energy savings in fiscal year 1974 and 1975 over fiscal year 1973 as the base year. Our annual savings amounted to an overall 24 percent reduction in energy consumption in fiscal year 1974 and a corresponding 27 percent reduction in fiscal year 1975. In real terms, the reduction is equivalent to approximately 2,800,000 barrels of oil per year.

We have achieved these results to date through an aggresive GSA energy conservation program in Federal buildings, in procurement and usage of energy-efficient products, in motor vehicle management, and through intensive joint efforts with the Federal Energy Administration, the Energy Research and Development Administration and other Federal agencies, as well as with state and local public authorities and the private sector. I have attached to my prepared remarks a brief description of the energy conservation initiatives undertaken by GSA.

I would today, however, like to concentrate the balance of my remarks on GSA's initiatives for the conservation of energy in Federal office buildings. Currently, GSA is responsible for 10,000 federally owned or leased buildings with an inventory of 250 million square feet of space nationwide.

From our experience in energy conservation in office buildings, we have found that approximately 40 percent of the energy traditionally consumed in office buildings can be conserved. If, on the average, we have saved 30 percent of the energy a building uses through modifications to operating procedures, to save the remaining 10 percent we must "try" a little harder. And sometimes we must be prepared to spend money in the short term to save energy and money in the long term.

At GSA, our energy conservation in office buildings has three major thrusts:

(a) The design of energy-efficient buildings for our future office needs;

(b) The modification or retrofitting of our existing inventory of office buildings to make them energy efficient; and

(c) The institution of building operating standards and practices to reduce energy consumption.

To achieve conservation of energy in our new facilities, we developed a handbook entitled "Energy Conservation Design Guidelines for Federal Office Buildings." The primary purpose of these guidelines is to assist architects and engineers in designing energy conservation features within Federal buildings. Since March 1974, over 5,000 of these handbooks have been distributed to members of the construction industry, in both the public and private sectors. The unique feature incorporated in the guidelines is the concept of a performance-oriented energy goal. The energy goals allow freedom in designing a building, with the exception that the building must meet a specified energy performance standard. Many new and innovative procedures for conserving energy have been developed by allowing this freedom.

These guidelines for new buildings have been so successful that in 1975, after receiving many suggestions from the design profession, GSA revised the original edition and published a second edition. In this edition, we have expanded those sections dealing with solar energy and the use of computers in energy conservation. We are continually updating these guidelines.

For our current inventory, we developed guidelines entitled "Energy Conservation Guidelines for Existing Office Buildings." It is in this area that we believe the greatest near-term potential for conserving energy exists—through the modification or retrofitting of existing facilities—especially since 85 percent of all existing building will be in operation at the turn of the next century. I will speak more on this shortly.

In the area of energy conservation through more energy-efficient operating standards and procedures, we will very soon publish our "Energy Conservation Guidelines for Building Operations." These guidelines are based on the knowledge and expertise we gained in reducing the energy consumption in our buildings by 30 percent through changes in the operations of the buildings. They will receive the same nationwide dissemination as our design guideline for new and existing buildings.

We are proud of these energy-reduction achievements.

Incidentally, Mr. Chairman, I believe the Energy Conservation Symposium co-sponsored by yourself, the Small Business Administration of New England and

the Associated Industries of Massachusetts sharply demonstrated the appeal of energy conervation. It happens that all copies of our guidelines placed in the literature section of the symposium were sold out, and many visitors obtained information about GSA's Regional Business Service Centers in order to purchase additional copies. Needless to say, we are highly pleased to be able to participate in symposiums of this type which accelerate the energy conservation awareness of this country.

Unlike the modification of operating standards, modification or retrofitting of existing facilities to achieve energy conservation will require, in many cases, significant capital investments. Over the last two years, we have concentrated initially on minor repair and alteration work such as roof repairs, thermo window installation, insulation, etc. But we recognize the need and strongly support action by the Congress which will enable major energy conservation modifications to Federal buildings. Obviously some existing facilities are more energy inefficient than others, and in a formal program we would concentrate on buildings whose energy usage demonstrates the greatest potential for energy savings and on modifications which would yield the returns in energy and dollar savings in the shortest "pay-back" period. One example that would accomplish this is an energy control system designed to spread the electrical load in a building. This process reduces the amount of electrical demand at "peak demand periods." By rescheduling the demands of energy-consuming processes in a building, significant reductions in utility billings can be achieved.

We, as others, are aware that the lack of reliable data on comparative costs and benefits of alternative energy conservation measures inhibits the widespread adaptation of good, but unproven, new technologies. Recognizing this, we developed, as you are aware, an energy demonstration building in Manchester, N.H., and environmental demonstration building in Saginaw, Michigan, which, while primarily an environmental demonstration project, will exemplify energy conservation design through low heat gain and loss through walls and roof, dual glazed windows with overhang protectors, and low wattage lighting.

Both projects will utilize solar collectors to provide an additional source of heating and cooling to the buildings. The size of the collectors will vary from 8,000 square feet for Saginaw to 4,600 square feet for Manchester.

If I may, Mr. Chairman, I would like to digress for a minute to emphasize a most important concern. That concern is the need to recognize the provision for increased initial cost limitations to accommodate energy conservation equipment in Federal buildings. We believe by establishng an energy budget figure low enough and by covering the increased costs for energy-efficient equipment, new systems and technologies, such as solar energy systems, stand a good chance to gain a foothold as a source of cheap, dependable energy.

The Manchester energy conservation demonstration building has a number of important features in addition to those I noted earlier. These include differing energy systems on various floors to permit evaluation of efficiency, heat pumps, storage of waste heat for reuse, modular boilers and pumps, and especially cycled chillers that produce chilled water at off-peak hours. The building is heavily instrumented and will provide real data for analysis of the true costs and benefits of energy saving alternatives.

General Services Administration is also involved in an end-use energy conservation exchange program with several agencies: Federal Energy Administration (FEA), Energy, Research and Development Administration (ERDA), Department of Commerce (DOC), Housing and Urban Development (HUD), National Aeronautics and Space Administration (NASA), and National Science Foundation (NSF). This program has been ongoing for more than two years and represents a valuable forum to prevent duplication of energy conservation activities and to trade usable energy information between agencies.

GSA and FEA lead responsibility for the Energy Conservation Site Visit Program, a program which engages the cooperation and participation of many Federal agencies in a regional level. The objective of this program is to survey effective, proven energy conservation techniques which can be shared throughout the Federal Government. Site visit surveys were conducted on 287 facilities covering all 10 regions during March and April, 1975. Benefits from this program are gained not only by gathering energy-saving ideas from regional programs, but also by directly sharing information by individual agency headquarters.

Another important interagency task group in which GSA is an active partner is the Interagency Panel for Terrestrial Applications of Solar Energy

(IPTASE). Composed of ERDA (lead agency), FEA, DOC, GSA, HUD, DOD, NASA, and VA, this panel serves as the focal point for the interchange of information on solar energy research, development and demonstration. Thus, each agency can take advantage of the results of solar activities in other agencies and avoid duplication of effort. In this area GSA is currently considering the potential for solar energy retrofit applications on 10 existing Federal buildings. The studies cover such things as size and location of collector panels that could be accommodated: modification required to existing heating, cooling, and hot water systems to utilize solar energy; energy storage capacity requirements; projected savings in conventional fuel and energy through the use of solar energy; and the cost of the solar retrofit installations.

Mr. Chairman. I thank you for this opportunity to discuss the GSA contribution to our Nation's energy conservation program. I would be pleased to answer any questions you or other members of your committee may wish to ask.

Attachment.

SUPPLEMENTARY INFORMATION ON GSA'S ENERGY PROGRAM

We are submitting the following brief description of GSA's Federal Supply Service (FSS) initiatives which have been or will be undertaken to reduce energy consumption and promote energy conservation within the Federal Government.

Mileage Reduction Program—This action plan requires that all executive agencies establish a program that will result in a 15 percent decrease in miles traveled by agency owned, commercially leased and rented and privately owned vehicles from that traveled during fiscal year 1975, the base year.

Acquisition and Use of Compact Sedans—Regulations have been issued which require that agencies purchase compact sedans to replace intermediate and standard sedans, except for law enforcement vehicles.

Subcompact Sedan Procurement—FSS will purchase 200 subcompact sedans, 100 of which will be acquired on the basis of low bid price and 100 of which will be acquired on the basis of bid price plus operating cost of gasoline, using a modified life cycle costing approach.

Driver Education—Present a Defensive Driving Technique course in which the role of the driver in conserving fuel is emphasized. Operating technique and maintenance tips which increase gasoline mileage for both Government vehicles and privately owned vehicles operated by Government employees are stressed during the course.

Operational Testing—FSS has conducted testing of several add-on devices such as an overspeed warning device and three acceleration indicators to determine their effect on gasoline consumption. We also conducted testing on radial, bias, and bias-belted tires and feasibility testing of an electric van for use in the FSS shuttle operation between Crystal Mall, the Central Office and Regional Office.

Procurement of Energy Intensive Products—Under the Experimental Technology Incentives Program (ETIP), experiments have been conducted for energy intensive products, including room air conditioners, refrigerator-freezers, hot water heaters, and cooling ranges, using procurement incentives such as performance specifications, and life cycle costing to improve appliance efficiency and thus reduce the energy consumption per unit of output.

Implementation of Section 510 of the Energy Policy and Conservation Act—This authority requires a system to control and monitor the acquisition of passenger vehicle (purchase and lease of 60 days or longer) for the Federal executive agencies to insure that the vehicle acquired achieve an average of 18 miles per gallon or the average fuel economy standard set forth in Section 502 of the Act, whichever is greater.

The following is a listing of energy conservation activities and programs in which GSA is engaged:

Public Buildings Service

Energy management of 10,000 Federal buildings.
Energy-efficient design of all new buildings.
Retrofitting designs for existing buildings.
Solar energy programs for new buildings.
Interagency program to identify buildings for solar retrofit.
Interagency identification of buildings for conventional energy retrofitting.
Natural gas conservation policies for Federal facilities.

Nationwide Federal de-lamping program (approximately 3.4 million fluorescent lamps).
Conservation guidelines brochure program.
Energy site visits with FEA.
(10-year) Multi-Year Action Plan to improve energy efficiency in Federal operations.
Pilot/demonstration projects (Manchester-Saginaw—Topeka).
Application of energy use analyses.
Solar energy Government buildings project in coordination with FEA.
Interagency end-use conservation meetings.
Interagency panel for terrestial application of solar energy.

Federal Supply Service

Fuel conservation in Federal vehicles.
Procurement emphasis on compact sedans.
Reduced use of large sedans and limousines.
Life cycle costing and procurement of energy savings products under the Experimental Technology Incentives Program (ETIP).
Energy resource recovery.
Public utility activities.
Operational and demonstration testing of energy saving products.
FSS brochure on energy conservation.

Automated Data and Telecommunications Center

Common teleconference centers.
Computer time sharing.
Travel-by-phone campaign.

Federal Preparedness Agency

The Federal Preparedness Agency (FPA), under the authorities of the Defense Production Act of 1950, as amended, has also been heavily involved in several aspects of the current national program for energy independence. Under the priorities and allocation authorities of the Defense Production Act, FPA has helped facilitate the timely construction of the Trans Alaskan Pipeline System and has been developing impact analysis and contingency plans for alleviating the impact of various energy and other resource shortages.

Mr. STEWART. Well, I guess the prudent thing to do is just to push ahead, right? At this point I think I know about as much of Senator Kennedy's whereabouts as you all do, but he did indicate he was coming back and I trust he will.

But, I do have a couple of questions, Mr. Panuzio, that I might throw out in the interim.

Are there any new buildings currently under design, or under construction by GSA that you could tell us about to dramatize the energy savings that are possible from what John Eberhardt referred to as energy conscious design? He gave startling examples of that in his testimony, where they were cutting energy budgets by a half to two-thirds of what they would have been.

Mr. PANUZIO. Why don't I have Mr. Meisen cover that. As I said, there are two new buildings, one of which is in Saginaw, Mich., and that not only deals with energy conservation, but it deals with the whole question of environment; and the one in Manchester, N.H., which is very much dealing with primarily energy sources.

Mr. MEISEN. I think, judicially, before the last couple of years the average office building used between 150,000 and 250,000 Btu's per square foot a year. In analyzing the Manchester project, which I think is the one Mr. Eberhardt talked to you about, we feel fairly confident that a building designed with energy conservation from the start could achieve much greater savings than what we get by retrofitting a building. We set a target, after careful analysis with the Bureau of

Standards, of 50,000 Btu per square foot. So, that is about 20 percent of what the average building was using at that time.

We actually designed the Manchester building with about 52,000 Btu as the projected usage in that building of all energy. We will be monitoring it carefully to see if that is actually true, based on the calculations.

We have found as well, when that was first published, there was serious concern as to whether that was a reasonable target. We have since had testimony from many, many people that they find with that as a goal, they can in fact achieve it. As a matter of fact, we are looking at some other potential systems now which involve covering large spaces, where we think we can get down to 20,000 or 30,000 Btu per square foot. So, the potential is there in new buildings, but that still doesn't address the vast numbers of existing buildings that exist in the United States.

Chairman KENNEDY. What do you have for rental space, do you have guidelines for rental space too?

Mr. MEISEN. We use a similar criteria for office buildings although we obviously can't dictate as to Btu's because most rental buildings are already in existence, but we do reduce our lighting requirements and reduce our heating requirements in those buildings where we have the major portion of space—not where we just occupy one floor. But where we occupy most of the building we insist that the heating systems be turned down, the lights be reduced, to try to assure that we get energy savings. We don't have as much control in those buildings.

Chairman KENNEDY. Well, do you use that as a criteria that your rents are based on?

Mr. PANUZIO. It is part of our leasing procedure. When we go into new leasing procedures, it is part of our operation. We are, of course, still carrying a number of leases which are long-term leases, and in those we have tried to negotiate with the people in the building to try to get as much energy conservation as possible.

Mr. MEISEN. Where our leases require the construction of a new building to satisfy that lease, we use the exact same criteria as we do when we construct our own buildings. Where we are actually leasing pieces of existing buildings, we can't be quite as stringent.

Chairman KENNEDY. What is the relationship between the GSA and ERDA on energy projects?

Mr. MEISEN. We work very closely with ERDA. We have both discovered some of the problems with solar energy, namely the consolidation and dissemination of available data at a given point in time. The technology for solar collection is expanding daily, and we find that by sharing the data not just with ERDA, but FEA and NASA, and many other agencies, that the biggest role that ERDA has been able to help us with is keeping us apprised of what developments are taking place in the solar energy field.

Mr. PANUZIO. The two buildings that are under construction in Saginaw and Manchester, ERDA provided substantial funds for solar collectors; I think $300,000-plus and $400,000-plus in the other.

Chairman KENNEDY. You mentioned a 17-percent saving. Can you tell us what part of that is more effective management, and what is capital improvements, capital investment?

Mr. HUETER. That is 100 percent through management. We began an audit 3 years ago, Mr. Chairman, which was about as detailed an

audit as can be made on energy. As I mentioned, the baking industry uses every form, directly or indirectly, of energy sources. Therefore, it had to be a very indepth study to begin with. We had a special study, a special audit for just operations, another one for electrical consumption. Most of your bakers are totally powered by electricity; and of course the third was done for natural gas, which was one time used for boilers. We converted completely over from boilers; that was one area. We have converted over from gas-fired boilers now over to oil-fired boilers. This was, of course, in an effort to conserve natural gas. The baking industry must have natural gas.

We have not put in very much new equipment yet. There are some plans for conversion of certain items, but, of course, the biggest item in a bakery is the oven. As I mentioned, to convert the direct gas-fired ovens to indirect-fired ovens, whether they be heated by oil or coal or electricity would mean ripping out the eixsting ovens. There has been no conversion, successful conversion unit yet. The oven companies are working on it, but as of right now there is not a good, successful conversion unit. Therefore, your ovens must be gas fired with standby propane or butane, as a standby fuel.

Chairman KENNEDY. What sort of managerial steps did you take?

Mr. HUETER. Well, I think that any successfud energy conservation program must be started at the top. The chief operating officer must be the man, or the chief executive officer must be the man, who says "We are going into it". He then must staff his organization to, first of all, make the audits. That is the most important thing because then he knows exactly where he stands in the consumption of the various forms of energy. Depending on the size of the organization, I think, he would then have to build his energy staff. There is no pat answer to your question, every case would be different, I think.

Chairman KENNEDY. Mr. Hueter, what sort of incentives does the industry really need in trying to do the job, capital investing?

Mr. HUETER. Well, there has been much discussion of that. I think incentives are required. Of course, the obvious incentive is, if a company can afford the capital expenditure, then the savings realized from the capital expenditure is the first significant inducer. Perhaps a shorter period of amortization would be one. There are many small bakeries that need assistance in financing. I think some relief in the form of financing would encourage a baker to make what changes he could faster than he could make them otherwise.

While investment incentives are very important, we want to make it clear that probably the most critical need of the industry today is a priority for natural gas for our direct-fired ovens. No amount of financial incentive in the short term can replace this critical need.

We have set a goal in the baking industry with FEA of reducing our total energy consumption by 15 percent. Our company alone in 3 years has been able to cut itself down by 17 percent; so, we feel confident the industry as a whole can do that. But this is without going into much additional equipment.

Where we really need help, Senator, you know, government asks industry to conserve energy, at the same time invoking rules and regulations and laws that force us to use more. We need Government help to achieve Government's objective; any hindrance that we get just makes the job that much more difficult, and adds to the cost of the product. In the case of basic food products it gets pretty touchy when you

have to increase the cost of a loaf of bread because of regulations that don't make sense in the first place.

Chairman KENNEDY. What sorts of regulations are you talking about?

Mr. HUETER. Well, I mentioned some of them in my statement. For instance, legislative action could result in significant energy savings if restrictions on intercorporate hauling were removed. It just does not make sense demanding large rigs deadheading thousands of miles weekly. The Secretary of Transportation has stated that 30 percent of all trucks on the roads in the United States are running empty at any given point in time—30 percent. One-third of the big rigs are empty at any one point.

A case in point in our own company. We have a cake bakery down in Atlanta, Ga.—nearby—and we have a bread bakery on the east coast, in Virginia. We ship bread from the bread bakery to the cake bakery, a couple-thousand mile haul, and cake from the cake bakery to the bread bakery. Government regulations prohibit us from taking that one truck and sending it up with cake; filling it with bread, and bringing it back. Instead we must start two trucks, they go up, make their delivery, and deadhead back empty. That doesn't make sense if you really want to save fuel.

Another one, we'd better take a good look at what's happening over at OSHA on these heat-stress regulations. The baking industry has gotten along all these years, for generation after generation, and nobody has dropped dead in front of an oven yet; but all of a sudden we are faced with the possibility of having to lower the temperatures in front of and behind an oven. Well, how are we going to do that?

We are going to have to put in air-conditioning units to be blowing cold air on the people—they are all going to die of pneumonia, I think—but we are going to have to use more energy to solve a problem that we don't know exists.

Another one, the FDA and USDA water temperature requirements put a restriction on chemical disinfectants, a review.

There certainly is a need for a revision of the Robinson-Patman Act as it relates to backhaul. Cost-justified backhauls are not permitted under the existing interpretation by the FTC. Here again we run into the same problem.

We send a big rig out, two men driving it, who go thousands of miles to drop off their load. They could pick up raw materials that are otherwise shipped in by common carrier, but we are forbidden from doing it; therefore that truck must come back empty.

Recognition must be made of the constraints put upon industry in such areas as air pollution, visible smoke, noise abatement, all of which add to cost and restrict the ability to maximize energy conservation.

And in the long run, as these rules and regulations—I am talking, obviously, in generalities—there are probably some that are very good and should be effected, but a lot of them shouldn't. You are going to end up with an increased cost of the product to the consumer.

Chairman KENNEDY. The FEA has been studying energy use in the food cycle, where are the areas of potential savings, at the farmer level, or processing, or marketing, or what?

Mr. HUETER. The cost of distribution that I have just touched on is one. I can't speak for the farming area, I just don't know, Senator, I would be totally unqualified.

Within the baking industry itself, I think, our first immediate opportunity would be in transportation; the second would be in various things that we are doing now, and some accelerated program of putting in new equipment, new devices.

We do some things, for instance, in southern California. Last year, if you remember, there was a shortage, oil from the Middle East didn't get to Los Angeles and the Los Angeles Basin, and as a result this—all the electricity generated in Los Angeles and the Los Angeles Basin is generated by oil, a specific type of oil that the Environmental Protection Agency enforced; it is a premium price oil with no more than half of a percent sulfur content. The only way to get that oil is from the Middle East. The shipments didn't come in, and the electrical facilities were not allowed to use any substitute oil, and therefore there was a shortage.

Individuals and industry alike were then told they had to curtail their use of electricity by, I think it was 15 percent. Well, we accomplished that very easily, we just shut off our air-conditioning and accomplished the 15 percent. We could have gotten in trouble with OSHA, but nothing really happened. Nobody passed out from the heat, and we did effect that saving. Commonsense, in many cases can be applied and energy saved, just as we, for example, had today in this room. We can all see just as well without the lights as we did with them. I don't know how much candlepower we are looking at up there, but they are pretty bright lights. Commonsense application.

But industry needs leadership. Industry is quite willing to cooperate, but they need the help of Government. Now, I think all of the baking industry is putting into practice the basic energy conservation program such as turning off lights and shutting off equipment when it's not needed; these are the basics and they do contribute toward your conservation. The big opportunities lie ahead, they are not realized yet.

Chairman KENNEDY. Well, I want to thank all of you for coming, particularly on such short notice, we appreciate very much your adjusting your programs and schedules to be with us.

Mr. MEISEN. Can I just make a very brief comment? You indicated in your bill five considerations that the administration should take in an enacting bill. The one that is most specific and most objective is No. 2, the rate of recovery, of course, and I think that is a very valid one.

I feel, however, it may tend to mitigate against some solar energy installations because they will not have as short a payback as will installation; but they will achieve a market which is sorely needed in the solar energy area, and will thereby conserve the gas fuel, for example, that the baking industry needs, and, you are not going to run automobiles on solar energy, so, it is important that we get solar energy into these fixed installations, such as homes and buildings, if we are going to save the fossil fuels for those things that can't be converted.

So, I would hope that perhaps a minor modification that says that this shall not be as critical in the solar area, this quick payback, as it might be in the insulation area, might be beneficial.

Chairman KENNEDY. That is a very constructive suggestion. I want to thank you very much again for coming.

The subcommittee is adjourned.

[Whereupon, at 12:15 p.m., the subcommittee adjourned, subject to the call of the Chair.]

ENERGY CONSERVATION

TUESDAY, APRIL 13, 1976

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON ENERGY
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10 a.m., in room 1202, Dirksen Senate Office Building, Hon. Edward M. Kennedy (chairman of the subcommittee) presiding.

Present: Senator Kennedy.

Also present: John G. Stewart, subcommittee professional staff member.

OPENING STATEMENT OF CHAIRMAN KENNEDY

Chairman KENNEDY. We'll come to order. This hearing before the Subcommittee on Energy of the Joint Economic Committee is another in a series on the role that energy conservation should assume in our national energy program.

Today we will examine the programs and activities of the Energy Research and Development Administration that relate to energy conservation. In prior hearings, the subcommittee has heard testimony from governors, mayors, other Federal officials, business leaders, consumer representatives, economists, architects, scientists, engineers, and private citizens. Regardless of their individual background or expertise, these witnesses have been nearly unanimous on two points:

First, that a vigorous and comprehensive program of energy conservation is absolutely essential to achieving a balanced and effective national energy program; and second, that the United States does not have such a program today and that we have a very long way to go before we do.

I have described energy conservation as our most underdeveloped energy resource. Roger Sant, FEA Assistant Administrator for Conservation and Environment, has testified before Congress that "* * * conservation is the cheapest source of energy we have." A study released by the Worldwatch Institute concluded that "energy obtained through conservation is the largest source of new energy currently available to the United States."

And George Hatsopoulos, president of the Thermi-Electron Corp. of Waltham, Mass., has testified that

> * * * To produce or supply as much energy as we could save in the next decade, we would need to spend over $50 billion for increased supplies, whereas the capital investments to accomplish these savings would be less than half.

Whether one evaluates the benefits of energy conservation from the perspective of cost-effectiveness, or environmental safety, or required

leadtimes, the results almost always turn out to be favorable in comparison to the steps that are required to expand our supplies of energy through increased production.

This does not mean, in any sense, that we should abandon our efforts to increase domestic energy production. But it does suggest the wisdom of making energy conservation a high priority and highly visible part of our energy effort. It is precisely at this point that Congress has difficulty in understanding the intentions of the Ford administration.

Time and again, when the issue moves beyond general rhetoric and gets down to specific cases—legislation, budgets, priorities—we discover that energy conservation is consistently downgraded, underfunded, or ignored.

Let me illustrate: FEA Administrator Frank Zarb testified before this subcommittee that there exists at least $200 billion of cost-effective investments in energy conservation that should be made over the next decade. But Mr. Zarb's deputy, John Hill, appearing before the Senate Commerce Committee 2 weeks later, labeled as "premature" S. 2932, legislation I introduced that would make a modest beginning in stimulating these cost-effective investments in energy conservation.

We have been told that energy conservation will be identified as ERDA's priority area of activity in the long-delayed, but, I gather, soon-to-be-released program document, ERDA–76. Yet the Office of Management and Budget slashed the conservation budget from $235.3 million to $119.9 million, a reduction $115.4 million. This means that the administration proposes to allocate about 2 percent of ERDA's total budget to energy conservation.

To look at the situation another way, ERDA's total budget for energy conservation, as recommended by President Ford, is less than one-third of the increase proposed for ERDA's nuclear programs.

Despite the acknowledged need for substantial capital investments in energy conservation, the administration is urging Congress to approve very large investment incentives for various production-related activities, such as the $100 billion Energy Independence Authority, the synthetic fuels program, and uranium enrichment, compared to almost nothing for energy conservation.

To many of us in Congress, these decisions by the White House make no sense whatever. The majority of the Joint Economic Committee in its annual report released last month urged that energy conservation be afforded much higher priority. The Senate Budget Committee in its report on the first concurrent resolution for fiscal 1977 noted that "the Administration proposals were deficient in nonnuclear energy programs, particularly in the field of energy conservation."

Members of Congress of both parties are taking the initiative in introducing and working for passage of a number of bills designed to make energy conservation a more meaningful part of our energy effort. I am personally sponsoring, along with 24 other Senators, the Energy Conservation Act of 1976—S. 2932—that would provide new Federal investment incentives and new information systems to bring about energy conservation improvements in existing residential and commercial buildings, in small businesses, and in industry.

We recognize that the problem is less one of convincing agency heads, such as Mr. Seamans, of the importance of energy conservation and it is more one of getting the message through to President Ford and his budget managers in the Office of Management and Budget. Nonetheless, the problem remains and it is one that a growing number of Senators and House Members are determined to solve.

This is the background of today's hearings before the Energy Subcommittee. We welcome Mr. Seamans and Mr. Mannella and look forward to hearing what they have to say. I want to say at the outset how warmly I appreciate your prepared statement, particularly as it is focused on the areas of conservation. It's an extremely impressive document, which I've had a chance to go through.

And there's very little that I could say, except "Amen" in terms of your observations about the importance of preserving in the area of conservation what resources we possibly can from an environmental point of view, a capital investment point of view, a technology point of view and energy efficiency and the rest.

We have heard other statements and comments from other administration officials very much along the same kind of lines, from Mr. Zarb and others. But when the time comes for really supporting some of the legislation, we've had difficulty in getting administration support for the proposition which I've introduced and has gone to the Commerce Committee, Interior, and also to the Banking Committee in this area of conservation.

So with those particular comments, we'd welcome what comments that you'd like to make and then I have some rather specific questions. One I'm going to ask you, Mr. Seamans, is whether there has been any attempt within ERDA and within OMB to evaluate the relative cost-effectiveness of energy conservation options, in comparasion to various supply options.

It seems to me we ought to be able to—we ought to do this—we ought to have such an evaluation so we really are able to know where we're going, what we're talking about, and the best way for us to proceed rather than relying on general expressions about certain energy undertakings.

We're impressed by your prepared statement and comment. We'd really like to be able to work both with you in terms of fashioning a program which would take your statements and comments and really fashion them into some legislation. But we want to hear you this morning on this issue.

STATEMENT OF HON. ROBERT C. SEAMANS, JR., ADMINISTRATOR, ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, ACCOMPANIED BY WADE BLACKMAN, DEPUTY ASSISTANT ADMINISTRATOR FOR PLANNING AND ANALYSIS; AND GENE MANNELLA, DEPUTY ADMINISTRATOR FOR CONSERVATION

Mr. SEAMANS. Mr. Chairman, I have a prepared statement, which, with your permission, I will submit for the record, and then I will proceed to summarize briefly the salient features in my prepared statement.

First let me say that I am accompanied by Mr. Gene Mannella, the Deputy Administrator for Conservation, and also by Mr. Wade Blackman, the Deputy Administrator for Planning and Analysis.

I think that is a good place to start—our planning and analysis function. We were required by Congress to come in last June 30 with a national plan for energy research, development, and demonstration. We are updating that report and will submit it in about a week's time to the Congress.

The revision of the report emphasizes even more strongly than we did in our first report the need for energy conservation and, in particular, the need for energy-efficient conservation technologies. We believe that these technologies must be ranked with several supply technologies as being of the highest priority for national attention.

We believe this because we note that our demand for energy will grow by roughly 3 or more percent per year in the next 25 years if we don't introduce these technologies. This growth will put an unbelievable strain on oil and gas and other energy sources. We think that by putting real pressure on conservation that we can cut down the growth to around 2 percent per year and we think that by so doing that, by the year 2000, this will represent a saving of nearly 20 million barrels of oil a day.

Now, in the conservation area, there are really two choices. One extreme would be to put all of the emphasis on a variety of taxes, on the marketplace, and to allow prices to be the controlling element. The other extreme would be to go all out with energy technology itself. I think the right answer has to be some combination of the two.

But in the extreme where the marketplace provides the solution, we note that in order to save energy, we are tending to increase unemployment. We note that the gross national product does not grow as rapidly as it will by following the other route. So we believe that we must work on more efficient transportation schemes, we must work on improvements in our buildings—better design in new buildings and improvement on existing buildings—and we must find more efficient industrial processes. All this activity breaks down into a wide variety of specific projects that, in effect, will stimulate our economy, but there will be a great deal of additional work to be done to bring in these new technologies.

So, in effect, we'll be saving at the same time that we can be extremely productive. That is the route that we recommend. The ERDA projects are listed in my prepared statement. I don't propose to get into any of them, except one that I'd like to emphasize, and that is related to waste.

We in this country have been profligate in our use of materials and in our use of energy and, as a result, on the order of a billion tons of waste are thrown away annually. This breaks down into municipal waste, agricultural waste, wood waste, and so on.

It is our belief that we can use these wastes by recycling processes and perhaps by the year 1985 we could utilize as much as 200 million tons of this waste on an annual basis. Now this could account for a savings of 500,000 barrels of oil per day. I think there is a great need to work in this area. I might note that we have some modest programs

in conservation for this purpose. The Environmental Protection Agency has additional funds for this purpose.

As far as we are concerned in ERDA, we have the responsibility to see that the job gets done, to have an overview of the research and development and the demonstration projects, but we have no desire to take over, as an agency, all of the work that is going on. We welcome the effort that is now underway in EPA. We think that the total national effort, however, has to be increased dramatically to do what I have described.

Perhaps at this point, rather than to get into any further discussion of the details, I might just say again that we are very happy to have this chance to discuss these very important issues with you here today. Thank you.

Chairman KENNEDY. Well, I thank you.

[The prepared statement of Mr. Seamans follows:]

PREPARED STATEMENT OF HON. ROBERT C. SEAMANS, JR.

Mr. Chairman, Members of the Committee, I welcome this opportunity to be here today to discuss ERDA's energy conservation program and its role in our National Energy Research, Development and Demonstration (RD&D) Program. I am accompanied by Dr. Gene Mannella, Deputy Assistant Administrator for Conservation.

ENERGY CONSERVATION AND ERDA'S NATIONAL PLAN

ERDA fully recognizes the important potential conservation technologies for reducing overall energy demand beginning in the near-term and continuing with increasing impact over the coming decades. The importance of conservation technology is reflected in ERDA's "National Plan for Research, Development and Demonstration," soon to be released in its updated form, which points out that energy conservation is essential to our national well-being in order to relieve the pressure for rapid introduction of new energy technologies and to soften the impact in our economy of the rapidly increasing cost of energy. In the revised plan, energy efficient conservation technologies are singled out for increased attention and are ranked with several supply technologies as being of the highest priority for national attention.

This ranking represents a major change from ERDA's original Plan, issued last June, and is based on further analysis of conservation opportunities. Specific strategic reasons for assigning energy efficiency technologies to the highest priority category are:

A barrel of oil saved can result in reduced imports. Conservation combined with fuel substitution efforts reduces dependence on foreign oil. The focus is on cost-effective approaches since not everything that saves energy should be implemented at this time. Technology development should increase the number of cost-effective approaches available.

It typically costs less to save a barrel of oil than to produce one through the development of new technology.

Energy conservation generally has a more beneficial effect on the environment than does energy produced and used.

Capital requirements to increase energy-use efficiency are generally lower than capital needs to produce an equivalent amount of energy from new sources since most new supply technologies are highly capital-intensive.

Conservation technologies can generally be implemented at a faster rate and with less government involvement in the near-term than can supply technologies.

Energy efficiency actions can reduce the pressure for accelerated introduction of new supply technologies. Since the actions persist over time, the benefits are continuing in nature.

SPECIAL CHARACTER OF CONSERVATION RD&D

It is often assumed that energy conservation exclusively means "doing with less," such as driving fewer miles or turning down the thermostat. This, of course, is a very important part of the President's energy conservation program,

but ERDA's program is addressed to another objective—namely, to introduce more efficient energy consumption technology into our homes, offices, and factories so that each mile driven, each home heated and cooled, and each product fabricated uses less energy and thus lowers overall demand. By building energy efficiency into our goods and services, we can enjoy the same comforts of life at lower cost and environmental impact.

It is also important to understand that energy conservation technologies differ from RD&D activities in new source technologies in that the opportunities for energy conservation are literally all around us. Energy savings are to be found through:

Better design of new buildings.

Improvements to existing buildings.

More efficient industrial processes.

More economical cars and trucks and alternative forms of transportation.

Better designed and equipped electrical energy systems, and

Greater efficiency in the numerous installations (such as furnaces, boilers, engines) where energy is converted from one form to another.

Thus, ERDA's conservation program must interface with nearly every segment of the economy—building construction, transportation of people and goods, power transmission, and industrial processes of all types. Unlike the highly focused and technical programs in some of ERDA's RD&D areas, this program must deal with many technologies and many markets.

Moreover, the main thrust for energy conservation must come from within the private sector. Technological advances must be incorporated into products and processes—and enter our homes, offices, and factories—as the result of actions on the part of individual consumers and of product designers, architects, construction engineers. and many others. This is difficult because energy conservation cannot simply be "inserted" into the economy; it must grow from within. So the problem that we face extends beyond developing better technology; it means striving to accelerate the process by which the private sector brings that technology into use. Thus, the success of our development and demonstration programs is measured in terms of how well they influence the private sector toward early implementation of better conservation technologies.

ERDA'S CURRENT PROGRAMS

Because of the urgency of the energy situation, ERDA's energy conservation program focused during its first year on rapid development and deployment of technologies that will begin in the near-term to conserve our vital energy resources. In addition to these opportunities, a continuing stream of new ideas and projects flows from the scientific community, individual inventors, and entrepreneurs. For example, recent private efforts have produced more efficient light sources and thermally activated heat pumps.

Moreover, technological opportunities need to be considered in the light of alternative socio-economic-regulatory actions such as standards and innovative financing. By and large, most of these conservation technologies will have to overcome problems of economic uncertainties, and normal resistance to the acceptance of new "products." In some instances the large, potential benefits may justify government action in the form of economic incentives or RD&D assistance.

Our work to initiate projects with near-term potential is beginning to pay dividends. With favorable market acceptance, it appears possible to achieve conservation savings in the range of one million barrels per day by 1980.

Some of the near-term projects we have underway are:

Retrofit of local control of heating systems to reduce those all too frequent instances such as open windows being used to cool overheated rooms.

Development of energy efficiency performance standards for all buildings to be supported by HUD.

Introduction of better electric power load management techniques to reduce the use of expensive peak power.

Analysis of fuel substitutes, such as methanol, into the gasoline for standard automobiles.

Retrofit of improved combustion units in oil-fired furnaces in residences, commercial buildings and industrial processes.

The first two projects are aimed at saving energy whatever the source—oil, gas, coal, hydroelectric, etc. The last two illustrate ways to save oil and gas by substituting other fuels in their place.

The retrofit of combustion units illustrates the magnitude of the opportunity in conservation and the special problems of achieving impact. There are approximately 14,000,000 space heating installations in the United States which utilize distillate fuel oil (No. 2). These are located in single family and other small buildings. The total amount of distillate fuel consumed in this market is in excess of 1.5 million barrels of oil per day (MBPD). The program has shown that it is technically feasible to increase the efficiency through the first heat exchanger from a present average of about 60 percent to an average of 75 percent. This represents a potential savings of 300,000 barrels of oil per day.

Exciting as these near-term possiblities are, we have attempted to maintain a balanced effort by initiating a number of activities that will be important by the mid-term (1985–2000) and long term (beyond 2000).

For example, an important element of ERDA's conservation technology program is recovery of energy through the utilization of urban, industrial, and agricultural wastes. By the mid-1980's, it may be possible for the private sector to process most of the 200 million tons of waste classified as readily available. This will require further refinement of some waste systems and biomass conversion technologies, overcoming certain institutional barriers, and substantial capital outlays in the private sector for plant construction. If successful, however, wastes could contribute an additional energy resource amounting to the equivalent of about 500,000 barrels of oil per day.

Additional mid-term technologies include:

A. Total integrated energy systems (TIES) which use the heat currently wasted in electric power generation to provide process heat for a local industrial complex.

B. Thermally activated heat pumps that can drastically reduce the need for fossil energies to supply heating for buildings.

C. Improved designs and materials for reducing the heat requirements of buildings.

D. Bottoming cycle engines that develop power from the exhaust heat of diesel trucks.

E. Automated equipment for peak load management of electrical power.

F. High efficiency, high temperature recuperator systems to capture the thermal energy now being exhausted to the atmosphere in steel, glass, cement, and other high-temperature process industries.

G. Microwave vacuum drying to reduce energy consumption in food processing.

Current activities with a longer term focus include developing a plan for the Nation to follow to introduce new technologies to meet its requirements for a non-petroleum based auto/truck transit system; and evaluating alternative modes for storing large quantities of energy to satisfy the peaking requirements of electric power systems.

Mr. Chairman, this completes a brief overview of the activities initiated during the first year of ERDA's conservation program. We are making progress but we also have begun to realize the complexities involved in identifying and pursuing the most effective means of promoting new technology for energy conservation in the many diverse sectors of the economy. An important adjunct of the work this coming year will be the development of better management tools to help us identify the most significant opportunities and the most effective means of deploying the results of our RD&D efforts.

Thank you and at this time I would be pleased to respond to any questions you may have.

Chairman KENNEDY. As I mentioned, I think, I've had a chance to go through your prepared statement, Mr. Seamans, and I think it's an important one. The thing that really concerns me is that we've had two very important statements in the area of conservation made by yourself and by Mr. Zarb.

I imagine that at least someone is informed of these statements and comments in OMB and yet OMB always has a different reaction when it comes to legislation or budget levels. I'm wondering if you can help us understand that particular dichotomy somewhat better.

Mr. SEAMANS. Yes. As a matter of fact, they are familiar with our views. We have to clear our planning documents with them and so

forth. I think that you have noted that our conservation program is growing quite rapidly on a percentage basis. We go from $75 million in budget authority this year to $120 million in budget authority next year. So in terms of budget authority, that's a 60-percent increase. In terms of our outlays, conservation goes up 65 percent. Now, it certainly is true that if you start off with a very small program and you increase by even a large percentage, it still is a pretty small program.

On the other hand, it is not always recognized that it does take time to put together the detailed planning and to work out the projects and to assemble a team to handle this in a proper fashion. There really is a limit to how rapidly we can grow from one year to the next.

However, we did recommend a larger budget for 1977 than is included in the President's request. This is well known. We recommended that there should be an additional $75 million in outlays. I think when you get down to the fundamentals, putting the management aspect aside, that there is a difference in view as to how much effort should come solely from the private sector and how much can possibly be done by the Government with the expenditure of Federal funds and how these two sources of funds should be put together to get maximum national effort in the conservation area.

I think it is true that OMB feels that the private sector should take up a larger share of this burden. Of course, there is one other factor that always enters into these discussions and that is the matter of overall budgeting and the fact that there has to be, from OMB's standpoint, a total ceiling to be reckoned with. Our role, of course, is to be an advocate of doing all of the things that we think need to be done in energy research and development.

Chairman KENNEDY. Of course, I suppose in the private sector area you have to ask how you are going to be able to provide the incentives in order to be able to do it and how that best can be done. You know, there are those who feel that the best way of doing that is by providing, you know, tax incentives. I have myself serious concerns about whether we're providing tax incentives to various groups—I think with regards to individuals, of course, that presupposes that they have sufficient kinds of income to be able to use the tax credit or a tax deduction and that basically is for middle-income groups or higher income groups.

And it doesn't really provide the resources—particularly for lower income groups or those who are on fixed incomes like the elderly people. So there ought to be able to be, as we have attempted to devise, some front-end resources that can be paid back over the period of savings.

I think in industry as well we have to ask whether that's something that would have been done by industry in any event. We've had impressive testimony, as you're very much aware, about what some companies have done—major savings that have been very impressive. I agree with you about the magnitude of the savings that can be achieved by industry. If you're providing the tax incentives, you have to ask whether the companies themselves wouldn't have done it in any event.

But the real question is: How are you going to be able to get the private sector involved in ways which they may not have done if

they hadn't been able to receive the incentive? I suppose the question was: What was the rationale presented to you as the Administrator of ERDA by OMB when they made these rather dramatic cuts in your requests?

Mr. SEAMANS. First, there was sort of a general discussion along the lines that we are discussing here. But then the actual reductions were made on a case-by-case basis, going through the conservation budget line-by-line. We had a long series of negotiations really on each item. So it really came down to what the benefits were in, say, automotive propulsion and what the benefits might be in a wide variety of projects that relate to more efficient buildings. The same is true of industry, in improved conservation efficiency. That was one that I felt quite strongly about which ended up at quite a low figure, as well as in energy systems and energy storage.

Chairman KENNEDY. Well, looking through that list, Mr. Administrator, it looks like the areas that have been the most dramatically cut back or one of them, at least, is in that buildings conservation project—a request of $65 million down to $21.8 million.

Mr. SEAMANS. That's right. Now, there's a case where this year we are at a level of $12.67 million in budget authority and it is growing to $21.67 million, so it is a large growth area, but at the same time there were a number of what we thought were excellent projects that we recommend very strongly should be carried out.

Looking at the incentives and getting back to that topic just for 1 minute, I think there is a great need for incentives at this time. I feel that there is a very difficult situation today where we're spending $29 billion—we did last year—importing oil, and where the situation is going to get dramatically worse unless we take very positive action in the near term to press ahead with front-end financing in the research, development, and demonstration area.

I think that in addition to that there has to be some mechanism to encourage in some of these high-risk areas, a transfer of the technology over into commercial use and in this area we recommend more use of the loan guarantee. We do have before the House at this time a provision which the Senate approved last year, but which has not passed the House, for a loan guarantee program for synthetic fuels. In this area would be included the recycling of municipal waste.

I think that type support is required in a large number of areas if we're going to get the country off dead center in the conservation field.

Chairman KENNEDY. Well, to show really, again, the priorities, we have, you know, the $100 billion Energy Independence Authority—about $6 billion in synthetic fuels, billions in uranium enrichment. And really in the areas of conservation we have difficulty finding very much on that at all.

Plus you've got the Federal guarantees—all of them are pretty well guaranteed by the Government.

Mr. SEAMANS. In the synthetic fuel program, we recommended a level of $6 billion and, as I said, that was not passed by the House. There is presently a bill before the House that would provide this year for $2 billion in loan guarantee authority, but with the understanding that the total program we had in mind is for $6 billion and

the additional authority would come next year as part of the Energy Independence Authority.

Now, that amount is for roughly 15 plants of various sizes and 5 of those plants were for so-called biomass-type facilities and the waste program comes into that category. But I think each of those plants cost about $100 million and we are talking about several of those plants. So it does get into fairly substantial funding.

You also mentioned uranium enrichment, Mr. Chairman. There is a bill that is now before the Joint Committee on Atomic Energy, the Nuclear Fuels Assurance Act, and that's for $8 billion for support of the private sector in uranium enrichment.

Chairman KENNEDY. Well, you now, the magnitude of those are so significant—I know there are enormously important policy considerations involving each and every one of them and differing views on it—but I don't feel we have nearly the kind of difference in terms of the importance of conservation as we do in these other areas and yet we find a real lagging in terms of developing conservation programs. This is, you know, a matter of great concern to me.

I mentioned just earlier about whether it would make any sense within ERDA and within OMB to evaluate the relative cost-effectiveness of energy conservation options in comparisons with various supply options. Would that make sense in terms of surfacing some of the areas where important savings, as well as investments could be best evaluated?

Mr. SEAMANS. Yes, I think it does make good sense. We have attempted to carry out such studies. We have attempted to come up with estimates that would indicate how much investment and research and development it takes to penetrate the market, and in so doing, save *x* number of millions of barrels a day. This is still very preliminary work.

I think you might like to hear Mr. Blackman just discuss that a little bit more fully.

Mr. BLACKMAN. We are currently implementing within ERDA a program planning, budgeting and review system. The logic of this system involves a series of steps in which the first question we ask is whether or not a particular energy system option—and this would apply to conservation as well as to other areas—can be expected to be funded by the private sector. On order to answer that question, we are trying to replicate the private sector decisionmaking process in terms of their own criteria for investment; that is, in terms of rate of return and exposure and other financial criteria.

If the answer to that question is "Yes," and the expectation is high that they will fund it, then the Government role is rather passive. It's mainly regulatory, we feel. On the other hand, most of the options, or a good number of the options that we look at, will not be expected to be funded by the private sector because of high risk, the scale of investment may be too high, or for many other reasons.

Then we have to ask if the public rate of return is sufficiently high. If we have cases where the public returns are high and the private returns are low, we can justify government involvement. The question then is: Which of the various ways that we have for inducing the private sector to get into the act is most effective?

To answer that question we propose to simulate the private sector decisionmaking process and try to evaluate individually the various incentives which may include loan guarantees, front-end R. & D. support, capital grants, price supports, et cetera. We would investigate which of these incentives would induce the private sector to invest in this option at the least cost to the Government.

We then feel that we could identify which of the available incentive mechanisms is most effective in inducing the private sector to move, and we are currently working on ways of approaching the problem from that point of view.

Chairman KENNEDY. Well, let me ask you, doesn't it usually end up that the supply options always seem to win at the expense of the conservation ones?

Mr. BLACKMAN. No, sir. We have done some preliminary work to try to evaluate the relatively cost-effectiveness of the supply options vis-a-vis the conservation options, and in many cases the conservation options are near term and can be induced into the market sooner. When you discount these situations and compare them to longer term options, they, in fact, come out to be very cost-effective.

Mr. SEAMANS. Senator Kennedy, as I noted in my prepared statement, it typically costs less to save a barrel of oil than to produce one through the development of new technology. Also capital requirements to increase energy use efficiency are generally lower than the capital needs to produce an equivalent amount of energy from new sources.

Chairman KENNEDY. In this area of conservation—the supply versus the area of conservation—on those kinds of studies, are they generally available? Can we have our people work with your people in terms of reviewing those kinds of studies to try and help our——

Mr. SEAMANS. We would certainly be happy to go over them with the staff. I should say that we've only been in business for a little over a year and a lot of these studies are still preliminary.

Chairman KENNEDY. Fine.

Mr. SEAMANS. But we think they're indicative of what we're going to find when we get into more depth.

Chairman KENNEDY. Well, I think that would be very helpful. We, as you know, introduced the legislation on conservation. I think it has been moving along quite well, I think, in the Commerce Committee and they are having the hearings in May in the Interior Committee. I'm very hopeful about both the legislation and the approach that we've taken on it and we've got some definite views of this sort of cost-effective issue. But I'd just like to see, from your own review or studies, whether we're going along in the best possible way.

I'd like to see if we could—we're not a legislative committee—but given what you said about conservation and what Mr. Zarb has said about conservation, it would be very useful, I think, to the Congress just generally and to those who support the legislation that we've introduced, if we could get OMB to try and really express a definitive position. Their response has been, in terms of our legislation, is that it's premature, which isn't terribly reassuring to hear. I mean, either the idea and approach make some sense—or they don't. But with your strong statement and Mr. Zarb's strong statement, I think it would be very helpful if we could work with you in trying to effectively jar the OMB into trying to be perhaps somewhat more forthcoming in

terms of the conservation issue. I mean, it may be that this particular legislative approach is one that they can't embrace.

But I think, quite frankly, we're not hearing that clear voice in the Congress from OMB on an issue which obviously you, from your own testimony, and Mr. Zarb, from his area of responsibility, feels it's of very essential importance in terms of our national objectives.

So I might ask if we could work with you, your group, in terms of seeing if there is something that could be agreed upon.

Mr. SEAMANS. Just let me say one other thing about our relationship with OMB. We inherited in ERDA some excellent work from quite a number of different organizations and agencies. However, there was one area where there was very little work going on in the country and in the Government and that was conservation. We picked up a small amount of effort in electrical transmissions through powerlines and a small amount on automotive propulsion. This whole program, as of a little over 1 year ago, added up to $10 to $15 million. It was a very small effort and involved very few people.

We have attempted to build up a staff—and I think we've built an excellent one. We've been trying to put projects together. But I think that I would be the first to admit that when we presented the 1977 budget to the OMB last fall, we had not worked out all the details of some of these projects as well as we would have liked.

I think that the next time around we are going to be in much better shape to justify the projects and to be very specific about what we plan to do.

Chairman KENNEDY. OK. Can I just go into another area, Mr. Seamans? We worked out the final details of the Science Advisory Panel for the President and that ought to be down on the President's desk, signed into law in the early part of May.

Can you tell us what your view of the role of the science adviser is in the formulation of ERDA programs and budget levels?

Mr. SEAMANS. I've testified on quite a number of occasions when I was president of the Academy of Engineering that there is need for a science adviser at the Presidential level. I think that science and technology are at the heart of many, many Government decisions. I think the future of the country depends on how we use our science and technology—whether we're talking about developing our economy, or talking about energy or talking about national security or about foreign relationships, we always get into scientific and technical issues, as well as, of course, socioeconomic and political issues.

But there has not been a voice in the White House that has been able to properly represent science and technology. I think Mr. Stever has done an absolutely superb job, doubling in brass, taking on the responsibility of science adviser, along with the line responsibility for directing the National Science Foundation. But there needs to be someone who is available to the President on a daily basis, available to the President's immediate staff, without the heavy burdens of managing major programs, and who can focus solely on the implications of science and technology for the future of this country.

And, of course, the primary value of having an individual there in this capacity can only be achieved if he has a very close relationship with the President and if the President really is interested in what this individual has to offer. I believe that the present President and Presidents of the future will recognize the importance of taking into ac-

count science and technology in their decisions and this will be achieved by this legislation.

Chairman KENNEDY. Well, hopefully in the areas of budget priorities, whoever the science adviser is going to be, if he is as convinced as you are and as I am and Frank Zarb is about the conservation aspects of it, that we may be able to get some additional voices working on the OMB.

Last year in the area of offshore wind energy, the ERDA authorization for 1976 included a provision, which I had sponsored, to accelerate offshore wind energy demonstration facilities. Although I know there are some risks associated with such facilities, there's also, I think, strong energy potential in steady offshore winds.

Is there anything you can tell us about what projections you can make on when an actual demonstration project may be funded by ERDA?

Mr. SEAMANS. Well, just last fall we put into operation a wind generator in Sandusky, Ohio. This is a 100-kW machine with the diameter of the blades of something like 125 ft. It's a new type of aerodynamic design and the results that we're achieving, the experimental data, encouraging.

Our plan now is to go to four different sites for somewhat larger equipment, going up into the megawatt range. We have not picked the sites. We have made no commitments as yet to ocean siting of wind energy systems. A separate request for proposals has been issued that calls for the study of ocean siting feasibility and design economics. The proposals are due in early May and the assessments that result from the RFP will allow us to determine the extent to which ocean siting merits consideration.

Chairman KENNEDY. As you know, Mr. Seamans, having spent much time up in our part of the country and much time on the sea and on the water, when you see the size of just a small sail and the power that that has in driving a boat through the water and see—look across that breadth of ocean space there—the potential for it, it certainly is something that I hope that we can at least explore in an important and scientific way to see what resources are there.

I have just some final questions that I'd like to ask about the institutional and social problems which exist in achieving meaningful energy conservation. And obviously beyond the question of the Federal budgets, assuming that the bottom line is the number of Btu's actually saved—ERDA must be concerned with these institutional and social barriers. I was wondering how ERDA has been thinking about such matters as industry regulations, patent codes, building codes, you know, lack of consumer understanding of life cycle costs, industry and consumer resistance to change, capital availability and some of those matters.

Could you tell us what thoughts you have on that?

Mr. SEAMANS. Well, certainly there is more to energy conservation than technology and there have to be considerations of our laws and our regulations. In the buildings area, for example, it is our feeling that proper review of the codes and appropriate changes could permit us to build up to very sizable savings in a relatively short period of time. This is done with understanding of the needs for proper insulation and all of the other factors that have to be taken into account in making a really efficient building.

We certainly recognize that in making changes, it can, even though it's beneficial to the whole Nation, put an undue pressure in a given geographic area. We've looked at socioeconomic kind of effects. We believe that where large amounts of construction may be required in areas that have very small communities, that we must be prepared to provide some kind of governmental support so that bond issues can be honored and things of this sort.

We must, in working in this particular area, recognize this is not really ERDA's prime responsibility. We must work—and we do—with the FEA and with other agencies of Government in attempting to come up with sound judgment. Mr. Mannella here has a point.

Mr. MANNELLA. We do recognize, Senator Kennedy, that in order for us to get the technological developments into the bottom line on saving energy, we have to overcome these institutional problems and we have to make sure that the consumer is willing to make the purchases that are necessary.

The area of conservation, though, really has a multitude of interfaces with a lot of systems and portions of the Federal Government, as well as the whole infrastructure of our society. There is no one single thrust we can point to that is going to solve the entire problem.

There are certain things where the regulatory approach is very attractive and, as Mr. Seamans indicated, we work very closely with FEA, and also with agencies such as HUD, and EPA, if it happens to be in their particular area. We do work with the institutional forces such as the American Institute of Architects, with the various trade groups that represent a consortium of the industries, et cetera, in order to expedite implementation of new technology as developed.

Probably one area that is perhaps the most troublesome and the one that we are studying, along with others, is: How do we educate the American consumer to make a decision based on life cycle cost? This is something that the consumer simply has not done up to this point.

We all tend to make decisions based on the out-of-pocket money that it represents. We do not tend to look at the life cycle cost; in many instances we probably couldn't get the information on what the life cycle cost was and in all too many instances we wouldn't really know what to do with it.

We at ERDA recognize that this is a key element and we are addressing it, but as yet have not really found the final answer.

Chairman KENNEDY. Does this include your relationships working with the State governments, who in many instances have been very active in terms of energy conservation programs? Cities have been active. They varied across extensively and some obviously much better than others. Are you working with those groups as well in terms of developing programs?

Mr. SEAMANS. We are, in some cases. We have done extensive work. In some States we actually have a memorandum of understanding. We've had two of those now—one in Arizona and one in Hawaii. But looking at the country overall, I would say our effort is still spotty. It takes time to establish these relationships.

We intend to work in time on a much broader base than we have today.

Chairman KENNEDY. There are some other questions of myself and Senator Javits which I will submit to you in writing, Mr. Seamans.

[The following questions and answers were subsequently supplied for the record:]

RESPONSE OF HON. ROBERT C. SEAMANS, JR., TO ADDITIONAL WRITTEN QUESTIONS POSED BY CHAIRMAN KENNEDY

1. NONBUDGET BARRIERS TO ENERGY CONSERVATION

Anyone familiar with the problems of achieving meaningful energy conservation knows that the problem is more than the size of Federal budgets. A host of institutional and social problems also exist. Assuming the "bottom line" is the number of Btu's actually saved, ERDA must necessarily be concerned with these institutional and social barriers.

Question A. How does ERDA propose to deal with such matters as industry regulations, building codes, lack of consumer understanding of life-cycle costs, industry and consumer resistance to change, and capital availability?

Does each project attempt to develop an individual strategy to deal with these non-technical barriers, or is there a broader effort within ERDA to define and remove these barriers, one that cuts across project lines?

Answer. Institutional barriers differ widely from one area of technology to another. Consumer products present problems of one kind; industrial process improvements present quite another kind of problem. It is important for the R&D manager to understand the entire process that must occur for his technology to find widespread use. This is especially true in those technologies closer to application for which the RD&D itself may be influencing the process of acceptance. So, it is not desirable to divorce the institutional barrier program from the RD&D process.

On the other hand, there are certain aspects of the institutional barriers that are similar. For example, capital investment decisions in industry have certain characteristics that cut across technology differences; also, individual attitudes toward energy savings and life-cycle costs are something that apply to many consumer products. We need to improve our understanding of these common factors, and bring them into the planning of our programs.

Question B. More specifically, what working relationships exist between ERDA and State and local governments? As you know, most State governments are very committed to a more vigorous effort in energy conservation. Cities are also drawing up their own energy conservation programs. How does ERDA coordinate its work with these efforts? How does ERDA coordinate its work with the State energy conservation programs in FEA? How could these working relationships be improved?

Answer. It is true that many states have either taken action or have plans underway to develop their own conservation programs. These programs are moving in many different directions but the important point is that action is being taken in many cases without direct federal assistance. To cite a few examples, at least fourteen states are establishing special offices, councils, or research institutes which will be involved in energy research and development. In New York, the State Energy Research and Development Authority has planned a research budget of approximately $6 million, funded from special appropriations repaid from assessments on electric and gas utilities. In passing, let me note that the Authority plans to conduct some joint projects with ERDA, notably in solar heating and cooling.

A number of universities—Georgia Tech, North Carolina State, Tennessee and Michigan State—just to name a few, have extensive industrial assistance programs that provide industries throughout the state with techniques for improving energy efficiency. These programs are substantially funded by state and local resources.

ERDA does, however, have many interactions with State governments, and we are working to improve these, especially by coordinating with the recently begun FEA state energy conservation program. To cite a few examples:

At the national level we have been working closely with the National Governors Conference and their energy program under the leadership of Governor Salmon.

We provide technical assistance to State and local agencies through a technology utilization program which draws upon the resources of our national laboratories.

Regional assessments of impacts related to introduction of energy technology provide information for ERDA plans and for use by States in making energy policy decisions.

Our Solar Division plans to make available the technical evaluation of proposals submitted to ERDA under the commercial solar heating and cooling demonstration procurement, that cannot be funded, to states that are interested in funding such projects.

States have also had a voice in development of ERDA's National Plan for Energy RD&D. Direct working relations have been formed to facilitate Federal-State cooperation in key decisions like siting large, commercial scale synthetic fuel facilities. We also look to states for support with specific projects. For example, the environmental research associated with biochemical energy development in the Imperial Valley has been closely coordinated with the state of California. And finally, some of our experiments with the energy outreach services will be managed by grants to universities.

2. BALANCE BETWEEN "RISKY" AND "SURE THING" PROJECTS IN ERDA'S CONSERVATION PROGRAM

There has been considerable-pressure by OTA and other Congressional sources to emphasize projects that make sense commercially. This is a proper concern and I know that ERDA has taken these criticisms seriously. But there is another side to the coin. It was expressed in recent testimony before the Senate Commerce Committee by Charles A. Berg, a private energy consultant. Let me quote directly from Mr. Berg's testimony:

"* * * There is a broad latitude for scientific and technical research in energy conservation * * *. What the precise outcome of such an effort may be neither I nor anyone else can say. That is the nature of research: It always entails a high degree of uncertainty as to the precise outcome. (In fact, whenever one can five (sic) the outcome of a project with any high degree of certaintly, the project is not research.) But, I feel confident that the outcome of scientific research in conservation whatever form it may take, is highly likely to be of great national benefit."

Question A. Do you share Mr. Berg's point of view: If so, how would you describe the current balance within ERDA as to "sure thing", highly commercial projects and those that are more "risky" because they involve basic scientific investigation?

Answer. If there is any disagreement here, it is whether there is any such thing as a "sure thing." Mr. Berg seems to be saying that research is never a "sure thing," with which we would agree. But even at a much later stage—when the technology is well proven—the commercial viability is seldom, if ever, a "sure thing."

Our projects are attempting to accelerate the implementation process of new technology. The opportunities (for acceleration) are greatest in the riskier areas which are unattractive to industry. But industry does not necessarily promote an energy savings technology even though it is "attractive." It may be less attractive than another option. So, some of our projects certainly look like they will make good commercial ventures.

It is very difficult to say what the balance between the "risky" and "less risky" projections is. There is probably a slight bias towards more risky projects.

Question B. Are there problems in getting Congress to go along with the need for a certain amount of scientific research, rather than putting almost total emphasis on highly commercial undertakings?

Answer. This does not seem to be a problem—Congress has given good support to our programs and does not appear concerned that some of the work is a number of years from commercial application.

3. SMALL BUSINESS CONCERNS

What is your procedure for handling unsolicited proposals from small research and development companies? How do you decide who will perform the evaluation?

It has come to our attention that out of 3,000 proposals which have been evaluated by the National Bureau of Standards' Office of Energy Related Inventions, only two have been favorably reported to ERDA, although the program

has been in operation well over a year. 878 of these proposals have been turned down; the others are awaiting action. What can be done to speed up this process? Are you being too careful in your evaluation? Is the Office understaffed? Is there some way to weed out the "crackpot" inventions rapidly, so that they don't clog the system, without losing some good ideas?

When a proposal is sent for review to an in-house expert, for example a national laboratory, don't you have a problem with the "not invented here" syndrome? Specifically, isn't there a natural reluctance to recommend funding if to do so would enable a competitor to solve a problem that the evaluator himself is working on? In the event that such a competitive proposal is not in fact funded, what safeguards exist to prevent the government laboratory from appropriating the idea itself?

Legislation has been introduced in this Congress which would mandate a special set aside in funding for small business firms. A similar device has been tried successfully in the RANN program at the National Science Foundation. Do you favor this idea?

Answer. No distinction is made between proposals received from small research and development companies and proposals received from large companies. Responsibility for evaluation of proposals is assigned to a program division and subsequently to a program manager according to the technical and scientific content of the proposal.

The evaluation made by the National Bureau of Standards' Office of Energy Related Inventions are made completely independently of ERDA. The care given to those evaluations and the resultant statistics are in no way determined by ERDA. NBS is in a position to determine ways of weeding out the crackpot inventions, and certainly this appears to be a significant problem. We are not aware that any good ideas are likely to be lost as a result of the procedures followed by NBS.

The so-called "not invented here" syndrome does not present a problem when national laboratories are asked to review proposals. If anything, the tendency is for the scientifically oriented evaluators at the national laboratories to tend to be sympathetic toward the merits of technological development per se without regard for business concerns or the origin of the proposed solutions. The evaluators make recommendations with explanations. If non-objective determinations are made, these usually are readily apparent. If there are any questions concerning the integrity of the evaluators then proposals are sent to other evaluators.

Safeguards are provided by Federal and ERBA procurement regulations as well as statutory and case law. This area of proposal review is well defined. On the one hand, the proprietary and confidential information of the proposer (if any) is protected, and on the other hand, the interests of the government and the public are taken into consideration.

The RANN program and the National Science Foundation are concerned, as a matter of legislation, only with basic and applied research. ERDA must also consider development and demonstration projects. Any comparison between NSF and ERDA concerning set asides for small business would be invalid.

The purpose of ERDA programs is to stimulate research, development and demonstration in energy matters to the fullest extent. Any secondary objectives, such as social or economic supports in favor of a particular interest group, could critically overburden ERDA's primary objective and prevent maximum effectiveness of the ERDA budget and effort.

Some ERDA projects are appropriate for small business involvement, some clearly are not. The determination must be made on a case-by-case basis at the program management level and not be general legislation.

ERDA recognizes the contribution that small business concerns can make and indeed seeks cooperation from the Nation's small business sector. At present there is considerable participation by small business in ERDA programs. ERDA regularly requests small business responses in Program Announcements, Program Opportunity Notices and other competitive solicitations.

Small business set asides are not necessary and would be counter-effective to ERDA's objectives.

4. OFFSHORE WIND ENERGY

The ERDA authorization for fiscal year 1976 included a provision I sponsored to accelerate offshore wind energy demonstration facilities. The House Science and Technology Committee will include in its report this year on the ERDA bill language calling for the initiation this spring of the design studies called for in last year's bill.

Although there are some risks associated with such facilities, there is also significant energy potential in strong, steady offshore winds. What projections can you make on when an actual demonstration project will be funded by ERDA?

Answer. The ERDA is actively investigating off-shore wind energy, however, we cannot make predictions at this time as to the schedule or cost of a potential off-shore demonstration project.

Until recently, the experience and analytical tools were not available to perform design or cost estimates that would result in credible estimates for such systems. The thirty years of inactivity prior to 1975 has led to a situation where considerable differences exist in estimates and opinions in the technical community, due to the very limited calculations then available.

The examination of off-shore wind energy systems has been in both the ERDA plan and in the prior National Science Foundation suggested plan as presented in the Project Independence Blueprint. The experience and analytical capability to adequately perform these analysis is now becoming available. Reporting on our progress each year in this project area was requested in our authorization bill in December 1975. In March 1976, we issued a formal request for proposals for performing conceptual design and economic analyses of off-shore wind systems. The proposals are due on May 13, 1976, and a contract will be negotiated as soon as possible.

We cannot, however, predict the potential of these systems, assess their development problems, nor plan a realistic program until about a year of design analysis is completed. We view off-shore systems as potentially being a route to large blocks of wind generated power since large numbers of high wind sites may be located and the land-use problem is eliminated. They do not, however, necessarily represent less costly energy than land-based systems as compared to equivalent high wind favorable sites on land. Thus, our rapid development of land-based systems should provide both the impetus and the technical experience to proceed rapidly with the development of off-shore systems.

5. ENERGY RESEARCH BEING TRANSFERRED FROM NSF TO ERDA

Virtually all NSF applied energy research relating to energy production, conservation and storage is being transferred to ERDA.

In conservation, for example, many of the projects being transferred will come up for renewal during fiscal year 1977. NSF estimates that in the conservation area alone, $6 million will be required for that purpose, and concern has been expressed to me that funds for these renewals are not included in your fiscal year 1977 budget.

What consideration was given to this problem during the preparation of your budget, and what is the outlook for these projects?

Answer. It is true that with the consolidation of energy R&D in ERDA, the direct energy R&D program within NSF will not be continued. ERDA has been given authority to consider, within its budget, continuation of projects formerly within NSF. Although our priorities within the fiscal year 1977 Conservation R&D budget do not permit continuation of the relevant NSF activity at its former level, ERDA will continue to evaluate the former NSF projects against competing alternatives to determine the most promising projects for possible inclusion in the fiscal year 1978 budget.

6. HYDROGEN FROM LASER FUSION

Has ERDA's Office of Laser Fusion prepared an estimate of the prospects for the generation of hydrogen through laser fusion and evaluated the potential of this process for conservation of hydrocarbon fuels?

Answer. The ERDA Division of Laser Fusion (DLF) has not completed an estimate of the prospects of hydrogen production from a laser fusion energy source. However, it is important to note that before any such hydrogen/methane process can be commercially economic, it will have to exceed the approximate 30 percent efficiency from thermal energy to electrolysis production of H_2 and the laser fusion process will have to be proven economical. Current estimates of economic breakdown rely upon a laser efficiency times pellet gain product of 3 to 4. Current laser fusion experiments are running at one millionth of scientific breakeven which does not include laser system efficiency. A further times 100 to times 1000 gain must be included before a net energy gain can be realized. Therefore, we must move ahead about 8 to 9 orders of magnitude before we reach the economic threshold.

The DLF has a contract with the IRT Corporation of San Diego, California, to study and document the several promising methods of radiolytic and thermal hydrogen production using laser fusion as the energy source. The first report is due in July. The DLF has several proposals in hand to study the optimization and economic regimes of hydrogen/methane production. It is too early to estimate the potential of any of these processes.

KMS Fusion of Ann Arbor, Michigan, has stated that they have developed a system for producing hydrogen using the laser fusion target ouptut as an energy source. They then would produce methane by one of several standard chemical processes. KMSF has not revealed the details of their process to the ERDA and therefore we have no way to estimate the potential thereof.

Our contract with KMSF does not fund any of their hydrogen/methane research. They want to retain all proprietary and patenable positions and therefore have not asked for funding since they would then have to reveal the process details to the Government.

RESPONSE OF HON. ROBERT C. SEAMANS, JR., TO ADDITIONAL WRITTEN QUESTIONS POSED BY SENATOR JAVITS

Question 1. Despite assurances by both ERDA and FEA officials that there is neither overlap nor gaps in the national conservation program wouldn't it be more effective if the entire conservation program were directed by a single agency? What are your comments on such an idea?

Answer. It is not at all clear that a single agency could carry out the conservation functions more effectively. ERDA's prime focus is on RD&D—to make technology, new or existing, available in the marketplace as quickly as possible. FEA's prime focus is to see that that technology is implemented. Although these are complementary and mutually supporting functions, they are different. There is a danger that a single agency would emphasize one to the exclusion of the other.

Question 2. Given ERDA's mission as a long term energy development agency, primarily devoted to post-1985 results, will ERDA devote any significant amount of attention to more near term conservation improvements, or are these left entirely to FEA?

Answer. Many of ERDA's Conservation Programs are expected to have an impact much earlier than 1985. Examples include:

Microwave grain drying.
Annual cycle energy systems.
Waste heat recuperators.
Grid connected energy systems.
Retrofit automotive improvements.
Improved power transmission efficiency.
Power system load management.

Question 3. Your testimony at several points indicates the need for increased capital to implement and develop conservation technologies, and the need for the main thrust to come from the private sector because of the varied technologies and the multiple markets involved. In light of this, what is your view of the need and usefulness of a federal program of low cost loans and loan guarantees to assist the private sector and encourage it to develop new conservation technologies as quickly as possible? Specifically, I would appreciate your comments on S. 3111, the National Technology Development Corporation, which I have introduced with Senator Humphrey, which would make venture capital available to business interested in developing new conservation technologies. A copy is attached for your review.

Answer. Low cost loans and loan guarantees would significantly assist the private sector and encourage the early development of new conservation technologies. It is expected that the application of such financial incentives would eventually result in the early implementation and use of conservation technologies. Many industries could be benefited. Small and medium size firms would probably be the biggest beneficiaries.

The financial assistance that would be available through the National Technology Development Corporation as provided by S. 3111 is clearly needed. It is questionable, however, whether a financial and investment activity could be effectively administered totally independently of an overall National technology development plan or energy plan as proposed by S. 3111. Emphasis seems to be

mainly on the financial considerations rather than on technical and scientific developments. Recoupment of investment would be emphasized rather than the need for research, development and demonstrations. A Technology Advisory Panel would not necessarily be able to provide the guidance required for maximized results from a scientific point of concern.

Financial needs for energy technology development, for example, can most effectively be met within a single organization where the details of both technical and financial problems and solutions are understood and can be administered coextensively.

Question 4. In the area of improving the efficiency of fuel oil consumption in buildings—a field in which fourteen million homes and businesses largely in the Northeast are involved—and where the present efficiency is only about 60 percent—it is my understanding that although ERDA is working on new technologies, such as heat pumps, it does not involve itself to any significant degree in new technologies which could be used to *retrofit* the millions of homes that use oil and that must continue to use oil in the coming decade, no matter what the price. What efforts is ERDA making toward such development of oil burner retrofit technology, and how soon do you estimate these efforts could produce significant results?

Answer. A major effort was initiated at the time the Buildings Conservation program area was established (at the start of fiscal year 1976) to provide options for those end-users that must rely on fuel oil, now and into the foreseeable future, for heating and domestic hot water. The program is in two areas. First, the thermally activated heat pump, a heat pump that can use fossil fuels, such as fuel oil directly to operate the heat pump. Like its electrical counterpart, the thermally activated heat pump extracts the energy available in air—even cold winter air—raises its temperature and provides it to the interior of the building for space heating. Such a heat pump could be retrofitted to homes and buildings currently using oil and/or natural gas and substantially reduce the oil (or gas) consumption required to provide the comfort conditioning desired.

The thermally activated heat pump is an expensive retrofit and probably would only be considered for new construction or when entire heating systems must be replaced.

We are also initiating a major effort for low cost retrofit of oil burning devices, that is to develop high performance burner replacements for existing oil fired systems. The program has been formulated in such a way as to be able to bring to the marketplace in the shortest period of time, equipments with improved efficiency, on a seasonal basis, and which are economically and environmentally sound. A testing capability is being established at the Brookhaven National Laboratory to evaluate new technologies in "side-by-side' tests comparing these technologies to current equipment. Initial testing of new equipment will begin in June. Simultaneously with the development of the testing capability, a Request for Proposals will be issued to all parties interested in developing retrofit equipment. Those intending to respond to this RFP will be requested to submit a device for test at the BNL. This test article must be of technology related to that being proposed for RD&D support. The RFP's will be evaluated for theoretical soundness of the technology being proposed, potential production costs, ability to be retrofitted into existing systems, ability of the proposer to bring the product to market, etc. These evaluations will be coupled with the results of the test program, and one or more contracts awarded for the development of retrofit burners.

The equipment resulting from this activity should be available for wide-scale implementation beginning with the 77/78 winter. The thermally activated heat pump will make its appearance in the marketplace in the early 1980's.

Chairman KENNEDY. I hope that we could try and work with your people here in the development of energy legislation.

As you know, we've made a proposition and a proposal which is going through the hearing process and we've been able to get, I think, some important support from a number of the different groups and people who have reviewed it and studied it. I think it tries to reflect the best judgment of people who have studied this issue. You obviously have a strong commitment in the area of energy conservation; Mr. Zarb does as well. And we're very eager to work with you to try

and see if there are particular features of that legislation that are either objectionable or can't be worked out by men and women of good will.

Or if the approach is basically one which you have serious reservation about, you know, we'll have to do the best we can. But if there's the kind of expression which I think runs through both your prepared statement and oral statement, which I think is very, very much in accord with our thinking and a number of different Members of the Senate, both sides of the aisle, and very much in accord with Frank Zarb's approach, I'm hopeful we can really capsulize that in a way that produces results.

I'd like to be able to work with your people here. I'd like to ask if they would take a look at that legislation and at their convenience—have our staffs try to get together and get, at least from our point of view, some estimate of where you think we might be able to go.

I think this would be very helpful to us.

Mr. SEAMANS. We'll be happy to do that. We feel it is an important bill and basically a sound bill and we'll be providing inputs.

Chairman KENNEDY. Fine. I want to thank you very much. The subcommittee stands adjourned.

[Whereupon, at 10:50 a.m., the subcommittee adjourned, subject to the call of the Chair.]

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