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ENERGY CONSERVATION

HEARING

BEFORE THE

SUBCOMMITTEE ON CONSUMER ECONOMICS

OF THE

JOINT ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

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ENERGY CONSERVATION

MONDAY, NOVEMBER 19, 1973

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

The subcommittee met, pursuant to notice, at 9:30 a.m., in room 4202, Dirksen Senate Office Building, Hon. Hubert H. Humphrey (chairman of the subcommittee) presiding.

Present: Senators Humphrey, Proxmire, and Javits.

Also present: William A. Cox, Sarah Jackson, Jerry J. Jasinowski, and Courtenay M. Slater, professional staff members; Michael J. Runde, administrative assistant; Leslie J. Bander, minority economist; George D. Krumbhaar, Jr., minority counsel; and Walter B. Laessig, minority counsel.

OPENING STATEMENT OF CHAIRMAN HUMPHREY

Chairman HUMPHREY. The subcommittee will come to order.

This is a hearing of the Consumer Economics Subcommittee looking into the supply and demand situation for petroleum products particularly as it affects the consuming public. For the benefit of our witnesses we have held a series of these meetings starting last April. We had field hearings as well as hearings here in Washington. Speaking for myself as chairman of the subcommittee, we have been trying to sound the alarm on the critical energy situation, or to put it more bluntly, the fuel shortage. Everyone now recognizes this shortage to be a fact.

The press is filled with comments this morning, as it has been for days, about the fuel shortage. Much of this comment has been precipitated by the action of the Arab States in imposing embargoes on the United States and on the Netherlands, and partial embargoes on the Common Market countries of Western Europe and on Japan. I just returned from Western Europe where I had the opportunity of visiting with officers of government, and I don't want to overemphasize, but I think it is fair to say that they know that they are facing a critical difficult situation because of their dependence upon imports of oil.

I want to pose some questions this morning. The reason I do it in the presence of Mr. DiBona is because the White House Office of Energy Policy has an obligation now to the American public which I want it to fulfill, and I pose these questions and observations not in the spirit of an adversary but rather as one who seeks a partner-

ship with the executive branch in coming to a somewhat better understanding of where we are and where we're going.

There is much confusion about basic facts. For example, yesterday's press carried the story from a study of the Library of Congress (the Congressional Research Service) to the effect that we face a 35 percent oil shortage. Other stories are carried to the effect that really the crisis is not nearly what it is painted to be. Then there are stories this morning where the President says that he is opposed to rationing; where Mr. David Rockefeller, on the contrary, indicates that he believes that rationing may have to be imposed and that the time is at hand for it.

So here are my questions Mr. DiBona. I think the American people are entitled to know the answers, and I believe that Congress has an obligation to search them out.

What are the facts relating not only to oil production domestically and internationally and so far as our imports are concerned, but what are the facts on utilization? What segments of our economy use the oil? How much for home heating? How much for industrial work? How much gasoline for our automobiles? How much for other transport—diesel, locomotives, and trucks? How much for the agricultural sector? I believe we need a breakdown of the salient facts that relate to the energy situation as of today, November 19, 1973. What is the trend in terms of consumption and production? What was it 10 years ago? What was it 5 years ago? What has been the trend since 1970 in terms of production and where do we get what we use? What are the prospects in 1975 for supply and demand? What are the prospects for 1980? Where will we get our supply and of what will it consist? How much will be hydroelectric, geothermal, and solar energy? How much will be fossil fuel—coal, oil, nuclear? Does the Government have any agreed-upon figure as to what the utilization will be in the American economy for the year 1980—6 years hence? These projections and calculations are absolutely vital if we are going to have any sense of direction on policy.

What are the options for supply? It is my judgment that we are fooling ourselves. We are unwilling to face the truth. We continue to tell ourselves that all will be well with voluntary conservation. I see no real concerted effort by the Congress or the executive branch or private industry to come to grips with what appears to be, in my judgment at least, a growing crisis. The crisis is not yet here today but it is coming, and when I say crisis I mean a critically short supply of fuel.

Now what are the options to meet this crisis, and what is the time frame in which we will undertake the programs to provide the necessary supply? What kind of research do we need? How much of an effort? Should we go into what we call the Manhattan-type project, where we could pour in the money and the resources, or like we did in the instance of the space program, where we began 5 years behind the Russians and then proceeded with a massive effort to catch up and, really, to surpass their technology? Is it possible, Mr. DiBona—I ask you as a representative of the executive branch—is it possible under certain programs that are highly financed, well organized—is it possible to meet our supply needs, say, in the next 5, 6, or 7 years? What

are the facts as to the refinery situation? How many new refineries are under construction? How many are contemplated? What about the superports? Are they necessary? What about pipeline capacity? Do we have it?

I ask another question. If there were no Arab embargo, would we not have a fuel shortage even if there were no embargo? On the research efforts, I believe it is absolutely necessary for us to know what the Government is putting into the search in energy and fuel and what the private sector is doing. These must be coordinated. We can't just pick up the newspaper and look at an Exxon ad and be satisfied or get a report from the Department of Interior and be satisfied. How many instrumentalities of the Federal Government are in the energy business? How many do you have to coordinate? I gather that there is a large proliferation, and this in itself has its problems.

Now, we come down to what voluntary conservation can accomplish. Now, I do not underestimate it, and that's one of the things we're here to discuss this morning. What can voluntary conservation accomplish, and what are we doing about it? For example, I recommend to you this morning that there be a systematic followthrough with every State government, with State legislative leaders, with mayors, and county officials to not only initiate but to expedite and to monitor voluntary conservation programs. It's my judgment that every Governor should have an energy official, such as you or Governor Love, and his right hand, so to speak. That every mayor must likewise have somebody responsible for this. What are you doing about industry? Have they been called in and told that they are wasters? Is it a fact that European and Japanese industry uses 10 to 20 percent less fuel or energy to make an identical product as American industry? For example, this microphone into which I speak—if it were made in Japan, or in Western Europe, according to a study that I read, it would take from 10 to 20 percent less energy to make this microphone in Europe or in Japan than it does in the United States. Are we wasters of energy, and if so, what is going to be done about it?

And then we have the question: Do we have a rationing plan? Now we came into the allocation program without really getting organized for it. We're allocating a scarce supply. Allocations is a second best in a very difficult and bad situation. I have fought for allocation of our short supply for a long time. But now we are faced with another situation. Do we need rationing? But even if you are not sure that you need it do you have a plan of action. Are the books printed? Are you ready to go to work? Do you know how it will be administered or are we going to wait until we find out for sure that the Arabs are not going to ship the oil we need? I see in the press every so often that somebody says that they really don't mean it. This morning the Arab nations are saying that they're going to let the EEC, the European Economic Community, exclusive of the Netherlands, go for another month without any further limitation on oil shipments, but they'll keep the United States and the Netherlands under their embargo. Are we depending upon the good fortune of Arab inconsistency and lack of coordination and lack of unity? Does the administration have a rationing plan and, if so, is it ready to implement it?

Now, I want to express a personal point of view and then I'll go to you, Mr. DiBona. I am opposed to trying to ration gasoline by high prices and higher taxes. It seems to me that that is an inequitable way of administering a short supply. The higher gas taxes are a heavy burden upon those least able to pay, and higher prices on gasoline due to higher taxes bear most heavily upon the worker, the shopkeeper, the person who has to drive to work in this automobile-oriented society of ours.

When is the administration going to tell the automobile manufacturers to quit making luxurious tanks, and start to make automobiles. What we have really got on the highway today are 400 horsepower tanks that are like mobile living rooms. They're beautiful. I like them, if we've got plenty of oil. But when are we going to start taxing horsepower instead of gasoline? When are we going to tell the automobile industry that there is a fuel crisis, or don't they read the newspapers? I'm saying that the administration and the Congress have some things to do and I'm not picking on the administration any more than ourselves.

On the voluntary conservation I want to commend efforts that have been made thus far. But like most voluntary things, they are only as good as they are supervised. We have a representative here from one of the communities in my home State this morning, a community that has done a good job. I visited that community about 3 weeks ago—St. Cloud, Minn. But this is only the beginning.

Somewhere along the line, the world will have to ask the Arab countries what will be the impact of the embargo on food production. I read in the Washington Post this morning a very misleading story about food supply. It is a story written by a competent reporter who has no very great understanding of what's happening in world food production. I've just come back from a food and agricultural conference in Rome and the World Soybean Conference in Munich, and anybody that thinks the food supply in the world is in a healthy state is deceiving himself.

That's bad enough but you ought not to deceive others. As I said to the representatives of 45 nations in Munich, while the Arab embargo is an inconvenience for us, it could be a disaster for Asia and Africa, because the main reserve food producing country in the world is the United States of America. We exported 50 percent of all the wheat exported in the world, 60 percent of all the feed grains exported in all the world, and 85 percent of all the soybeans exported in all the world, and if the United States of America is to be short of fuel it simply means that our farmers are not going to be able to produce what they had planned on producing. It will cripple our fertilizer industry and that will mean a sharp reduction in feed grains and wheat, and if that happens the prices of food will rise to catastrophically high levels, and there will be famine across the face of the globe. As I said to the 45 nations at Munich, talk to your Arab brothers before it's too late, because we're not going to starve here in the United States. If it's a choice between sending the food over there and keeping it here, as much as I deplore export embargoes, we're going to keep it here. So the implications of the fuel crisis are manifold—jobs, income, food, and the physical well-being of our citizens. Now, Mr. DiBona, tell us how you're going to handle it all.

STATEMENT OF HON. CHARLES DiBONA, DEPUTY DIRECTOR, WHITE HOUSE OFFICE OF ENERGY POLICY

Mr. DiBONA. Thank you, Mr. Chairman.

It is a pleasure to be here. And I appreciate the bipartisan spirit in which this hearing is being held.

Let me start with the first of the many questions that you raised. And that is the series of questions dealing with the size of the present shortage; is there or is there not a real problem here? Let me assure you that this is a very, very real problem and a difficult one. I will give you a summary of the numbers, how we calculate them; and indicate to you why there is some opportunity for uncertainty simply because there is no way to estimate some of the effects.

First, in October we were importing about 1.2 million barrels principally of crude, but including other products, directly from Arab nations.

Senator PROXMIRE. Did you say one or two million barrels a day?

Mr. DiBONA. 1.2 million barrels of crude, including some 100,000 barrels of product per day from Arab states.

In addition, we were importing about 260,000 barrels a day of product from Europe manufactured from Arab crude, and about 330,000 barrels per day of product from the Caribbean area, again, manufactured from Arab crude.

So that the actual imports into the United States were between 1.7 and 1.8 million barrels a day from those sources.

Chairman HUMPHREY. What is that figure again?

Mr. DiBONA. I think that adds up to 1.790—that is, 1.79 million barrels per day of crude and product into the United States.

However, there are a number of things that have to be added in considering that number. The first is that, while our total consumption in the United States has averaged about 17.3 million barrels per day for calendar year 1973, there is quite a cycle in fuel use over the course of the year. The first and fourth quarters use considerably more fuel than the second and third quarters of the year. Therefore, we would have had considerable growth in our imports during this quarter to meet our peak needs, and much more in the first quarter of 1974.

The difference is on the order of a million and sometimes a little more than a million barrels of consumption per day between the peak periods and the slack periods. We tend in the summer to build up stocks of major refined product and to draw those stocks down during winter. This is normal. So we should see some stock drawdown occurring now. Stocks peak in around October. The size of the stocks generally gets to something like 525 million barrels, and they are drawn down on the order of 400 million barrels. And that is simply to try to keep a little more stability in the imports and production by letting these changes in stocks account for part of the shift. This way we don't have to import an extra 2 million barrels per day to cover the winter period; we draw down stocks at the rate of something like 700,000 barrels a day during the peak period, and we build them up during the summer.

The net result of all that is that the October figures I just gave you for daily national consumption have to be increased, not by 2 million

barrels, but by several hundred thousand to a million barrels, depending upon the temperature of the winter.

Chairman HUMPHREY. Are you speaking on a daily basis now?

Mr. DIBONA. If it is a colder-than-normal winter you have to use a few hundred thousand more barrels per day than if it is a normal winter.

So the first thing you have to do with that 1.79 million barrel figure is to add something for normal consumption growth. And there is uncertainty, because we are unable to predict whether the winter is going to be cold or warm.

The second problem is that there are uncertainties inherent in the fact that not only are we boycotted, but other nations also have had their fuel supplies from the Arab countries reduced, and there is a bit of a scramble among consumers. And so how much we get out of such a scramble will affect our supplies.

There are very direct ways in which it might affect us. There are the Canadian imports of around 400,000 barrels per day of crude and product from Arab countries; that is, either crude or product derived from crude and then shipped through third countries to Canada. They import that into the Eastern Provinces and they export to us from the Western Provinces. To the extent that the Canadians try to compensate internally for the fact that they have lost the Arab crude, we could lose additional supplies. It is not possible for them to go too far in that direction, because there is no East-West pipeline in Canada, and their fuel economy is essentially split on a north-south line.

The point I am making is that you could add a few hundred thousand more barrels to the shortage that way.

And, then, finally, the U.S. military has had large offshore procurement of fuels, about 300,000 barrels per day. And most of that is terminated by the Arab cutoff. Therefore, that could be added to the demands upon our domestic supplies.

So you can get this number of 1.79 million easily up to 3 million barrels per day.

Senator PROXMIRE. To 3 million?

Mr. DIBONA. To 3 million barrels per day, as a consequence of those calculations.

My estimate is that it will average about 2.5 million over the whole winter, but that it will be lower than that in the last quarter of this year, the one we are presently in, and it will be well over that in the first quarter of next year. That is, I think it will run a little over 3 million during the first quarter of next year, and in the second quarter of next year it will drop off again because we will have the downward seasonal cycle starting to take place at that point.

So that is the scope of the problem.

Now, if you relate this to average total petroleum use, it is a number on the order of 17 or 18 percent. It is a 3 million barrel reduction, but not on the average of 17, but rather on the peak, which would be over 19. And that will give you a percentage something like 17 percent of our petroleum. Now, that is still a lot.

Chairman HUMPHREY. That is what you say we import?

Mr. DIBONA. No, that is the shortage. We import over a third at the present time.

Chairman HUMPHREY. Of all forms?

Mr. DIBONA. Both product and crude. We are averaging 17 million barrels a day of consumption, and we are running over 6 million barrels a day of imports. So that is well over a third.

Chairman HUMPHREY. You say we are running now between 17 and 18 percent short?

Mr. DIBONA. I think that is a fair estimate of what the winter shortage will be. And that is a very significant number.

Now, before going into the longer run questions that you were asking about——

Senator PROXMIRE. I hate to interrupt, but will you give us your assumptions on that? You say 17 or 18 percent short? You have to make assumptions. No. 1, on what kind of a winter you are going to have. Does that mean a mild winter or a cold winter? And, No. 2, you have to make assumptions on the continuation of the boycott and how comprehensive it is.

Mr. DIBONA. Let me explain those assumptions. The calculations that I gave you were obviously based on the assumption that the boycott continues. It presumes that the boycott continues through, say, April.

The second issue is the question of the temperature of the winter. I was using a normal temperature. If you change that assumption, it can mean plus or minus approximately 300,000 barrels per day.

Chairman HUMPHREY. Now, Mr. DiBona, since we are in a kind of ad lib conversation here without a prepared statement, let me just interrupt again. The President alluded to the shortages this winter in the range of 10 to 17 percent. And you say that you think it is between 17 and 18——

Mr. DIBONA. I meant 17—it depends on whether you divide it by the average or by the peak.

Chairman HUMPHREY. This is a national average, is it?

Mr. DIBONA. That is correct.

Chairman HUMPHREY. Now, the National Petroleum Council in its report issued last week predicted widespread shortages of 25 percent with regional shortages of heavy fuel oil in the Northeast up to 50 percent. And I am sure that if that Council were based in the Midwest they would have included the Midwest. One of the problems with statistics around Washington is that they don't get beyond the Alleghenies. But how do you relate your figures to the National Petroleum Council figures?

Senator PROXMIRE. Could I just throw in one other figure so that you will have them all in front of you?

The Library of Congress issued another report saying that, if we had a severe winter and the embargo continued, the shortage would be up to 35 percent. So we have 10 from the President, 17 from you, 25 from the Petroleum Council, and 35 from the Library of Congress.

Chairman HUMPHREY. That is why, Senator Proxmire, I ask that we get the facts. We have to have some basic agreement on basic facts, because everybody is viewing this problem from a different angle depending on his degree of optimism.

Mr. DIBONA. Let me try to reconcile all the numbers, because I think they are all reconcilable, all except that of the Library of Congress—I haven't seen the background on that—I read the press ac-

count on it, and I don't understand the figures. But the others I do, and I think I can reconcile the numbers to your satisfaction.

First, when I gave the 17 percent figure I was talking about the first quarter of next year. And the 10 percent figure would apply to the early part of this quarter, the fourth quarter of 1973. So the range of 10 to 17 is consistent with that set of numbers.

You can get numbers like 50 percent of home heating oil being short in New England; in fact, you can get that very readily, the whole eastern seaboard, by about late February or early March, using the figures I gave you. You get that if you do not act now. That is, if we don't curtail the use of heating oil now and continue that curtailment all through the winter—even if we have a normal winter—by February and March we will have drawn the stocks down so drastically that we would have to cut heating oil use by 50 percent on the east coast of the United States. It would not be a question of having to cut, that is what would happen. So the notion that we have shortages of 50 percent is clearly consistent with the numbers I gave you; it is just a question of whether we take action now to keep the curtailments at levels like 15 percent and do it through the whole winter, even though we have not yet seen the shortage in terms of the actual stocks available, because the ships are still coming from the Persian Gulf. It takes them over 30 days to get here. The last one has not yet arrived to my understanding. And therefore we could be profligate and continue ahead and then fall off a cliff early next year. So these numbers are quite consistent.

With regard to the Library of Congress estimate, it may be that this calculation is done on the basis of some kind of accumulation of that sort. But with total imports of 35 percent, and as we do not expect to be totally cut off from Venezuela, Iran, Canada, and Indonesia, it is hard for me to see how that figure is arrived at, unless it is calculated on the assumption of no cutback in consumption until we fall off the kind of cliff I just described.

Senator PROXMIRE. They assumed colder temperatures.

Mr. DIBONA. A very severe winter. But it still surprises me, because we may have increased consumption, but it will not be on the order of millions of barrels except for a cold winter. That would be the only explanation. It is true that consumption peaks in the first quarter. That is always the quarter in which we use the most fuel. But it would have to be a very pessimistic view of what happens with regard to our imports, which is not consistent with anything I know. I just don't understand it.

Chairman HUMPHREY. Is it your judgment—this is strictly subject to question obviously—but is it your view that the Arab boycott will continue for at least the next few months? Is that what you are basing your policy on?

Mr. DIBONA. We are basing our policies on the assumption that it will continue through the winter. And I think that is the only prudent course that we can take. This is necessary, because if we do not behave that way and it does, in fact, continue, we are going to be in very, very serious straits by February.

Chairman HUMPHREY. Have you overestimated the volume of Canadian exports to the United States in the light of the problems that the Canadians are facing?

Mr. DiBona. I have taken into account some curtailments of imports from Canada as they readjust a little bit internally. But I have not assumed that those would be very, very large.

Chairman Humphrey. Because of the volume?

Mr. DiBona. Because they have transportation problems in moving it from West to East, among other things.

Chairman Humphrey. What you are saying in substance is that timely action, I mean immediate action, is required to avert a major catastrophe—particularly with home heating oil—later on this winter, is that correct?

Mr. DiBona. We have been discussing mainly home heating oil, but I don't think that it is necessarily the worst problem. It may very well be that residual fuel and jet fuel will be worse problems in terms of percentages. That could very well be the case. We import most of our residual fuel oil, and we are going to have some very high curtailments of residual fuel oil, which is used principally to generate electricity.

Chairman Humphrey. So this could have a tremendous impact upon the economy, upon production, and upon jobs?

Mr. DiBona. I wanted to talk a little bit about that, to talk about what the policy objective is. We are designing a series of steps, and we have taken some steps and are looking for further steps which will, to the extent it is possible, focus the curtailments in the use of energy in the United States within areas which have minimum impact upon the economy. That is, we want to curtail gasoline use in private cars, we want to curtail heating oil use, and we want to curtail use in commercial establishments a little where the use of fuel is not directly related to output; for example, space heating in large shopping centers or the hours of operation in shopping centers.

Another category would be schools. We would urge such steps as shifting the school period to warmer months and out of the cold months.

In the transportation area, to the extent that we can increase load factors, particularly on jet aircraft, thereby not seriously affecting service but at the same time saving fuel, we will take those steps. And those are already in progress.

The point is that, to the extent that we can, we are going to focus the curtailments of fuel in the United States in areas that protect people's jobs, so that people can keep working. This will mean that we suffer some discomfort and inconvenience but do not affect the vitality of the country. And to the extent we can, that is our objective.

Chairman Humphrey. Have you called in, for example, the airlines; have you and Governor Love, who are in charge of this program, called them in and said: "Look, we have got to have a certain amount of reduction, and we want you to prepare new flight schedules and consolidate your scheduling." Has that been done?

Mr. DiBona. Yes, sir.

We started this when we thought there was just a possibility of shortage before we had the Mideast war and the problems that were generated by it. We called them in and told them that we wanted, as an initial first cut, for them to hold their fuel use to the 1972 level of fuel consumption. That was essentially a 10-percent cut in the

amount of fuel they were planning to use this year. And we now have them working with the Civil Aeronautics Board, with the Department of the Interior, with the Department of Transportation and the FAA to redesign their schedules. They will submit those to CAB, which will then review them from the standpoint of the public interest with the objective of going deeper into this.

Chairman HUMPHREY. How long is this all going to take?

Mr. DIBONA. That is in progress right now. And I anticipate that it will only be a matter of days.

Chairman HUMPHREY. Have you met with the key industrial users? The point I was trying to make earlier is that monitoring this voluntary program is the key to it.

Mr. DIBONA. Yes, sir.

Let me say that we, of course, have started first with the Federal Government. And as a fact of some interest in this region, we removed 1 million light bulbs in the region that extends from Philadelphia to Richmond; there are 1 million less light bulbs screwed into the sockets in Federal buildings.

Recently we had a report from Pepco that the conservation measures are showing up on their load circuits. So we are getting some of that.

We have instituted a very close system of collaboration and are working together with the Governors' Conference here in Washington.

We have identified the energy advisers to every Governor; and all but two States now have them, it is my understanding. And we are working closely with them. We have reports from each of those States as to what they are doing. I have here with me Mr. John Gibbons from the Office of Energy Conservation of the Department of the Interior, who is the first director of that office. He can discuss with you in more detail the activities of that office. We have a long list of additional proposed actions in the conservation area. And we are now setting up and investigating ways in which we can involve the industries which would be affected by many of those kinds of measures in to discuss the problems with them.

We have very severe problems which I believe are going to require some kind of rational action with regard to the antitrust and the conflict-of-interest statutes. That is, we do need professional help, both from the energy-producing and the energy-consuming industries, so that as we take these steps we can minimize impact. We have got to have good advice on the impacts of these things. So I think that this is an important consideration, and the emergency legislation ought to be handled as best we can.

There are a series of steps presently underway, and I think we can make some progress. When we have the emergency legislation that is being debated today in the Senate, which will be picked up in the House when it returns after Thanksgiving, we will be taking a good many more mandatory allocation steps in which we take very explicit action, like speed limits, in a number of other areas. We are now preparing a list of things to do when that legislation is ready.

Senator PROXMIRE. You have given us, I think, a very helpful and competent analysis of what you are trying to do. But I was just trying to think what this all adds up to. Supposing we get full cooperation with the States and are able to slow down automobile speeds; and sup-

posing we get good cooperation from the public—as good as you can expect—and get lower house temperatures; and the conversion to coal from oil by industry, and this kind of commercial saving that you have suggested, airlines savings, and so forth; and the Federal cutbacks, and the Armed Forces, which I understand are making a cutback of around 11 percent or so. Supposing we get all of that. What kind of dent will that make in the 17-percent shortage which you say we will otherwise have?

Mr. DiBona. Let me try to go through the figures on that.

Let me say that the figures I am giving you, I think, are optimistic; that is, if we achieve this level we will be very lucky. I think we are going to have to go further and——

Senator Proxmire. That is what I am getting at, the need for rationing.

Mr. DiBona. Let me try and get through the figures.

First we would like to increase domestic production and reduce consumption. We have looked at steps for increasing output of U.S. fuels. Those fuels fall into three categories. The first category is production out of Navy petroleum reserve No. 1 at Elk Hills. We believe that in 60 days we could be producing 160,000 barrels a day from the Navy petroleum reserve No. 1. There are other petroleum reserves on the continent which are not nearly as large but which could produce a little more. And there is Navy petroleum reserve No. 4 in Alaska which by all estimates is larger than the North Slope, but which is not developed.

So we can get 160,000 barrels a day out of Elk Hills. We believe that there also are possibilities of increasing the pumping rate without doing physical or economic damage at existing wells in certain fields in the United States. Needless to say, there is some dispute about it, but I believe we could get up to 350,000 barrels a day.

And, finally, in terms of increasing domestic production, the Federal Power Commission has identified 46 generating plants, electricity generating plants, which are presently burning oil but could be shifted back to coal.

Senator Proxmire. Within this critical first quarter period?

Mr. DiBona. Within 60 days.

We have looked in detail at those and found that this number of plants is probably a little high, that there would probably be something less than 46 that could change within 60 days. Some would probably take a little longer than that because of problems of facilities that have disappeared that the FPC didn't pickup; the siting of oil tanks where the coal was to be stored and things like that. But they nevertheless have the physical capacity. We think we could get up to 300,000 barrels a day equivalent by shifting to coal. That again is the higher estimate. We will be lucky if we can do that well.

Incidentally, there has been a lot of concern about whether or not there would be the coal available in terms of being able to mine it that quickly, and so forth. We do have some relief there because the present coal stocks in the existing generating plants are quite large, as opposed to the situation some years ago. What we are proposing to do is to draw down those stocks when we are shipping coal to the other plants, and then simultaneously to build up our capacity to pro-

duce more coal and transport it. We do have a study group doing nothing but addressing that specific problem right now.

If you add these all up, they come to 800,000 or 900,000 barrels per day. So most of the savings have got to come out of conservation.

Senator PROXMIRE. And those are optimistic assumptions?

Mr. DIBONA. That is correct.

Senator PROXMIRE. It could be 500,000 instead of 900,000?

Mr. DIBONA. That is correct.

And I think that is fair.

Now, we originally aimed at a count of about 170,00 barrels a day on airline service, raising the load factor from 50 to a little over 60. We think we could get the load factor up to 70 or a little better. So I think that figure is probably low. We probably can get more saving from increasing the load factor by compressing the schedule for airline service.

We believe we could get about 640,000 barrels per day by reducing the average temperature of home heat by about 6 degrees, and 10 degrees in commercial buildings.

Senator PROXMIRE. What was that again?

Mr. DIBONA. 640,000 barrels a day.

Senator PROXMIRE. What assumption do you make on cooperation on that? It seems to me that is wide open. When you ask people to go down to 68, I just wonder if you can make any estimate of how many will do it, 65 or 70 percent?

Mr. DIBONA. This is a very high percentage.

Senator PROXMIRE. Is it very realistic to assume that you are getting that?

Mr. DIBONA. I think we are going to get all of that, because we are going to take steps that will force it.

Let me explain a little bit about that. I have to go to a meeting at 11 o'clock with the Energy Emergency Action Group, which is a group of senior people set up to deal with this problem twice a week under the chairmanship of Governor Love, and I am involved in staffing of that effort.

We are looking at a major modification of the present allocation for the middle distillates, whereby we will force a reduction in fuel usage by restricting the amount of deliveries by fuel distributors to homes and commercial establishments.

Senator PROXMIRE. I will bet right in this room we are in now we don't have 68 degrees.

Mr. DIBONA. Well, in my office it is about 65 degrees, and in most executive offices.

Senator PROXMIRE. There is cooperation on the part of many officials, and the Senate has been held down—they are very careful about that. But after all, to expect this high participation in something so amorphous and vague as this—it is awfully hard to expect public cooperation.

Mr. DIBONA. Let me say, Senator Proxmire, that essentially what we are going to do is establish a factor and have it monitored and adjusted by the degree-day formula that the distributors normally use, and reduce the delivery of fuel to each user by some percent——

Senator PROXMIRE. In Minnesota and Wisconsin you are going to have people close to freezing to death. If they don't really appreciate

this in advance and reduce their thermostats they are going to be in dire conditions, because all of us aren't that farsighted.

Mr. DiBona. I think that is absolutely correct.

But let me say that what I am describing here is a proposal that we are making. It seems to me that some sort of step like that has to be taken.

Senator Proxmire. The chairman has an announcement.

Chairman Humphrey. I want to say to Mr. DiBona that the thermostat is set at 60, but the temperature is at 70. There may be some implication that in Congress we create enough hot air to meet some of the energy crisis. The temperature is 74. However, the engineering and technology says it is supposed to be at 60. And I want you to know that the temperature was that high even before I came into the room. [Laughter.]

Mr. DiBona. And finally, to make any program of this sort work there would obviously have to be a letter from someone like the fuel distributor to every individual customer explaining the situation and what the consequences of not turning the thermostat will be.

Senator Proxmire. Will people have any idea of how much they will have to reduce their heat for varying conditions and varying insulation and so forth, with the uncertainties that prevail about future weather?

Mr. DiBona. If we adopted this system it would be based upon a degree-day formula. This takes care of the problem of adjustments to the fact that it is a particularly cold period or warm period. In fact, the way that most fuel is distributed now, the distributor making delivery to your home keeps a record of the degree-days since your last delivery, and then he automatically makes delivery when your estimated consumption would require it. So that there is in being a system which already has some of these characteristics.

Now, as for whether or not the home is insulated and so forth, we would use a historical delivery record corrected for the degree-day formula. So that it is essentially based upon historical use, but significantly, I should say, radically reduced. And everybody will be so informed.

No doubt there are hardship cases. You and I can sit here and think of all kinds of reasons why we are going to have problems. And I would say to you, that is right. And I will also say to you that what we are trying to do here is to spread these shortages as equitably as we can. The alternative is to do nothing and wait until next year and then fall off the cliff.

Senator Proxmire. I think you ought to go ahead, and I am sure Senator Humphrey does, too. But what was your total for heating conservation?

Mr. DiBona. I had a figure—this is for all heating—640,000 barrels.

Chairman Humphrey. What are the other conservation measures that you have listed that might save oil, Mr. DiBona? You mentioned the airlines and home heating.

Mr. DiBona. We have got a series of others that are under consideration. I have given you numbers that totaled up to 2.35 million barrels per day, if you take all of that.

Senator PROXMIRE. You are talking about both production and conservation?

Mr. DIBONA. That is correct, the sum of that. Now, those are optimistic numbers.

Senator PROXMIRE. You haven't touched at all on gas consumption.

Mr. DIBONA. I am sorry, I forgot to give you that.

Our initial estimate of the maximum that we would save as a consequence of steps to reduce speed to 50 miles per hour and make greater use of mass transit and encourage carpools, and so forth, is 600,000 barrels per day. And that is how you get the 2.35.

Senator PROXMIRE. That is in the 2.3?

Mr. DIBONA. That is correct.

Chairman HUMPHREY. Again, there don't seem to be too many people driving 50 miles an hour. I know it is not your fault. But these are the facts of life. I don't think the people really understand yet that this is a serious problem.

Mr. DIBONA. I am afraid that it is clear that we are going to have to take a good many more mandatory steps, and we will take those as soon as we get this energy emergency legislation. Then we can make mandatory many of the things that we are now asking for on a voluntary basis. That is our intent. Our general overall program at the present time is to take as many steps as we can under the voluntary program, including saving on heating oil, because we can do it under this present program. To the extent that we don't have authority, we go out now with voluntary programs. As soon as we have the legislation that permits stronger mandatory action, we will do that. Then finally, as the backup to all of these things, we can take steps that would include formal rationing. It will take us about 60 days to get a reasonable system in place.

Senator PROXMIRE. This doesn't look awfully good. You tell us that all of these savings will add up to 2.35 million barrels, and that this is optimistic. Yet you agree that we will have a 3-million-barrel shortage during the peak in the first quarter, and you say it will take 60 days to put rationing into effect. Shouldn't we start today and make plans?

Mr. DIBONA. That is exactly what we are doing. Let me say that my figures that I have given you were based on present actions that we are already taking. We will be taking a good many more steps in the conservation area, many of which we will make mandatory when possible.

Chairman HUMPHREY. Don't those mandatory provisions that you are contemplating merely fortify the hope of realizing of these optimistic figures?

Mr. DIBONA. No, there are additional steps we can take. For example, we will mandaate the immediate termination of all exterior gas lighting. That is 35,000 barrels per day. It seems like a tiny thing, but there are a lot of gas lights around. There is just a massive use of those lights in the United States. They burn 24 hours a day. And they don't do anything except look pretty.

Chairman HUMPHREY. 35,000 barrels a day, though I wouldn't want to brush it aside, is hardly a figure that touches this problem.

Mr. DiBona. The single greatest thing that will solve this problem——

Senator Proxmire. What are some of the other possibilities that you can mandate to reduce consumption?

Mr. DiBona. We can mandate the speed limit.

Senator Proxmire. You included that, didn't you?

Mr. DiBona. That is included in here.

Senator Proxmire. We are talking about what is not included. You said there were additional steps——

Mr. DiBona. We could eliminate the use of fuels for private or corporate aircraft.

Senator Proxmire. How much is that?

Mr. DiBona. I don't happen to have that figure.

And for boating.

We could conserve through a number of other steps—some of which we could take now, which are presently under study—such as either closing the public parks or reducing the access to them by automobiles.

Senator Proxmire. All those last three that you have mentioned—knocking out boating, knocking out private aircraft, and knocking out public parks—I just wonder if rationing shouldn't come first. All of these are going to seriously affect particular industries; they are going to bankrupt particular businesses.

Mr. DiBona. I haven't finished the list here.

We could impose a stiff tax on gasoline with provisions that we take the regressivity out of the gasoline tax.

We could close gas stations on weekends. We could establish blue laws, Sunday blue laws which would essentially accomplish that. About 25 percent of all gasoline is used by private automobiles on weekends, Saturdays, and Sundays.

Now, there are a number of other steps of that sort. There is the whole question of the hours of operation of stores that is broader than just the question of weekends.

Now, a number of those things could have some very substantial impact.

Chairman Humphrey. What would national daylight savings do?

Mr. DiBona. In certain areas you can get a saving of up to 3 percent. In other areas it is about 1 percent. And the degree of the saving is modified by the possible effect of people driving a little more in the evening, which would tend to compensate for it. So you have got to keep the driving down at the same time.

Senator Proxmire. How about knocking out Sunday driving, as they have done in Europe?

Mr. DiBona. I think that is a very real possibility.

Senator Proxmire. How much would that save?

Mr. DiBona. As I said, on Saturdays and Sundays private automobiles use about 25 percent of the gasoline consumption in the United States. If you take the weekly gasoline consumption—daily gasoline consumption in the winter runs 6.5 million barrels a day; that times 7, is about 60 million, I guess, 55 to 60 million.

Chairman Humphrey. About 45 million.

Mr. DiBona. About 45. And you can divide that—take a quarter of that volume, about 11 or 12 million barrels a week. If you ban Sunday driving you could probably catch around half of that.

Now, you may prefer to ban driving just between the hours of 1 and 5, for example. That would permit people to go to church or come back from areas; or from 12 o'clock on Sunday to Monday morning. What we presently have under study is a whole series of operations of that kind. All I am suggesting is that you could save up to 10 percent of the gasoline, which would be another 650,000 barrels a day.

Senator PROXMIRE. Also they have suggested stopping television broadcasts after midnight. Seriously, I think they have done that in some foreign countries.

Mr. DIBONA. Maybe Mr. Gibbons has suggested it, I haven't actually seen that particular proposal. But there are plenty of proposals around. I understand that that would have 100,000 barrels a day per hour. But I don't know whether that is for prime time.

Chairman HUMPHREY. Wouldn't it be simpler to go into a system of rationing rather than all these devices that require an incredible amount of supervision to make them work? If there is a critical fuel shortage, to which you have testified, and the most optimistic efforts on conservation are still below what the requirements are, wouldn't it be the most sensible thing to outline a specific rationing program and be ready to put it into operation before we face that critical moment in March or February?

Mr. DIBONA. Mr. Chairman, let me say that we are doing exactly that. We presently have a group aggressively pursing the alternative rationing plans and the alternative tax arrangements as well as all these conservation steps.

Chairman HUMPHREY. Mr. DiBona, I am not talking about rationing by raising the market price.

Mr. DIBONA. No; I am talking about three completely different plans. One is a rationing system. Another is rationing through use of taxation adjusted to take out the regressivity. A third is all of the kinds of conservation steps I am talking about here.

Senator PROXMIRE. And then a fourth possibility, and a very real possibility on the basis of what we have been given by the administration, unless Congress mandates otherwise, is rationing through price.

Mr. DIBONA. That is correct.

Senator PROXMIRE. What happens if you ration through price? Then you have just a normal situation, not these optimistic assumptions. Isn't it possible that you could have gasoline selling for $1 or $1.25 a gallon at the pump?

Mr. DIBONA. If we ration through price?

Senator PROXMIRE. If you ration through price, if you don't have mandatory rationing, is that a very real possibility?

Mr. DIBONA. Obviously the price will go up very dramatically, if you took off all price controls. But we presently have price controls, such that that can't happen.

Senator PROXMIRE. But the price controls permit a cost passthrough.

Mr. DIBONA. They permit a cost passthrough. But there is no way that the costs can go to $1 or $1.25 a barrel.

Senator PROXMIRE. Yes; but if you don't permit the price to go up and you don't have rationing, and you have a sort—

Mr. DIBONA. Then you have queues.

Senator PROXMIRE. You do. And it means that the people, including doctors and nurses and policemen and firemen, can't get the gasoline they need now to provide the essential services.

Mr. DIBONA. Unless they get in the queue.

Senator PROXMIRE. But that means you don't produce the fuel you need or have the law enforcement you need—it seems to me that you would have to permit the price to go way up or have rationing of some kind.

Mr. DIBONA. That is correct.

Senator PROXMIRE. Or just permit chaos to develop.

Mr. DIBONA. We aren't going to permit chaos. We are going to try to look to conservation in any case as the first step. We are planning, preparing to take any one of the other steps. Whether or not we need to do it will depend upon how successful these conservation programs are, and whether or not the boycott continues, and what the projections are at the time.

I just wanted to make one point. I have to go back to a meeting. But I just wanted to add one point to this. If you want a humbling personal experience, sit down and try and draft up a rationing plan that is workable and equitable. It is a tough, tough job. And we are proceeding with it. But don't get the feeling that is a simple and straightforward thing to do, and that it would necessarily serve all the interests of the Americans that use it. If we could take other steps we really ought to take them. We ought to press ahead with the conservation. If we have to go to rationing, we will go to rationing. But we ought really to move ahead now as much as we can. I agree we shouldn't lose any time, and therefore we should and are moving ahead with formal rationing plans so that we will have them ready.

Chairman HUMPHREY. That was what I wanted to get at, Mr. DiBona. Obviously, the conservation measures have to be taken. My point is that they have to be supervised, they have to be monitored, and they have to be encouraged, and we have to break this down into regions, States, and localities.

I can tell you that I remember being mayor of a city in the Midwest. When we had a shortage of fuel oil, people didn't come to Washington; they were right in the mayor's office. We used to have to go around with 5-gallon cans in police cars to try to bail people out from critical conditions in the middle of winter; we would pour in just a few gallons of fuel to get by until we could get the fuel oil that was necessary.

I want to be sure that the administration has a system that will see to it that there is a followthrough, not just the Presidential address, commendable as it is, but a day-by-day followthrough. That is for the voluntary part—and then we come to the mandatory features to make compliance mandatory. That is the next step. Do I completely understand that it is now a matter of record that your office is in the process of preparing a system of mandatory rationing of petroleum fuel supplies, in case it is needed?

Mr. DIBONA. Our office, in collaboration with a large group that we put together that will grow to about 80 people, and in collaboration with OMB, which has a group working on that particular issue.

Chairman HUMPHREY. You say working on it?

Mr. DIBONA. Preparing it.

Chairman HUMPHREY. The President said over the weekend that he didn't want rationing.

Mr. DIBONA. That is right.

But he did not say that we are not preparing for all contingencies, including that one.

Chairman HUMPHREY. Rationing is not a very pleasant system, we know that. And I agree with you that it will take a very wise man to make a rationing system that is equitable. But it is the best of the other four alternatives, as I see it. But it takes time to prepare.

Mr. DIBONA. That is correct.

Chairman HUMPHREY. It takes the will to apply it; it takes time to apply it and the will to apply it. I want to be sure that the administration is telling the American people in loud and clear tones what you have said here today, namely that, unless this voluntary compliance system of conservation works, unless the mandatory allocation system works, that you are going to put in rationing. And that will shake some people up. That will bring some people to their senses. But everybody today sort of feels, well, the other guy is going to drive 50 miles an hour. And I'm not going to turn my thermostat down because I know the President didn't turn it down, and somebody else didn't.

I was going to put on my long underwear this morning, but I left them in Minnesota. I would suggest that the long underwear makers might find an incentive here. I did put on my heavy suit. But the problem here in Washington is that the climate is not like it is in some other parts of the country. I was going to suggest a weekend trip, but I don't want you to waste the fuel.

We are going to have to understand—and I say this now as a final word—the seriousness of the problem. Senator Proxmire here has held hearings, and Senator Jackson has held hearings, and I have held hearings. We have been saying for months that this problem was coming about; Arabs or no Arabs, we would have had a problem. We were going to be short. If the Arabs had joined Israelis in a love feast, we were still going to be lost. I am suggesting that as a possibility, but it is somewhat remote, even though Mr. Kissinger is working on it. But we have a shortage of fuel in this country. And from everything I have heard it is going to get worse in the next 3 to 5 years before it gets better. Would you agree to that?

Mr. DIBONA. Yes, sir.

Chairman HUMPHREY. Then don't you think it is time that we bite the bullet, so to speak? Isn't it time that people from all over the land know that the results of conservation measures will be minimal that they will only touch the surface, and that people will have to do things, including industry? Industry wastes between 10 and 20 percent of its fuel, and I believe that is where we have got to focus, instead of going around and telling somebody that you shouldn't drive in the park. That is going to be the day, when you start telling the American people that they are not going to drive in the park. We have got them so that they can't walk in the park now, and now they can't drive in the park.

The main thing is to get at the real consumers of this fuel and crack down.

Senator PROXMIRE. Could I ask one question?

I know you are right. If higher fuel prices or higher taxes are used to ration fuel supplies, my understanding is that each penny of such price increase will mean $1 billion transferred from the consumer to the oil companies or transferred from the consumer to the Government. And it appears on the basis of the President's speech on Saturday night, and his answers to questions on Saturday night, and from the position of the Secretary of the Treasury and the Chairman of the Council of Economic Advisers, that there is a strong possibility that they will increase the gasoline tax rate or permit the prices to rise. Have you any plan to rebate those very large sums so that you don't have a recession in part because you pull so much purchasing power out of the economy with high gasoline and oil prices? Or do you have any standby plans of any kind of tax on the additional profit, the windfall profits, that would accrue to oil companies because of this big increase in price?

Mr. DiBona. As far as I know, we have only been looking at the tax alternative. There are no plans that I know of to remove the price controls on fuels.

With regard to the estimate of $1 billion per penny per gallon, that doesn't include some of the rebates. And I think the number comes out out to about $800 or $900 million per penny a gallon. But it is in the ballpark. Obviously, you would have to develop a system to rebate those funds if you draw that much out of the economy. If you had a 30-cent price increase, you would be getting something between $25 and $30 billion a year out of the economy, and you can set off a recession, unless you develop a system to automatically rebate this money in some way.

Senator Proxmire. And then if you increase the price by 25 or 30 cents per gallon to the oil companies, that would be an unconscionable situation. The oil companies only pay 8 percent of their net in taxes in contrast to the 40 percent average.

Mr. DiBona. This is a tax paid by the consumer at the consumer level.

Senator Proxmire. I am saying you have the option of a tax paid by the consumer, or higher oil prices, and the higher oil prices would mean little of this windfall is shared with the Government because of the tax advantages of the oil companies.

Mr. DiBona. Financially there is a question of the regressivity of the tax. It turns out that poor people; that is, not people in the very lowest income group but those making above $3,000 a year, tend to drive a good deal more. So it is not only regressive in the normal sense, but it is highly regressive. And it would be necessary to have some form of taxation that would deal with that problem.

Chairman Humphrey. Mr. DiBona, we do thank you very, very much for coming over. I understand that Mr. Gibbons will followup on some of the material.

Mr. DiBona. Yes, sir.

Chairman Humphrey. Press hard, will you? You are such a kindly looking man. Could you be a little meaner?

Mr. DiBona. I understand that I will be the most unpopular person in the country next to Governor Love.

Chairman Humphrey. Thank you.

The next witness is Mr. John H. Gibbons, Director, Office of Energy Conservation, Department of Interior.

Mr. Gibbons, we welcome you.

Do you have a prepared statement?

TESTIMONY OF HON. JOHN H. GIBBONS, DIRECTOR, OFFICE OF ENERGY CONSERVATION, DEPARTMENT OF THE INTERIOR

Mr. GIBBONS. No. I didn't realize that I would be called. I came with Mr. DiBona to answer any questions that may be referred to me.

However, I would be happy to try to answer any questions that you have.

Chairman HUMPHREY. Would you like to make any comment that you wish to on what has been said thus far and give us your own evaluation? Your office has been in this business a long time, and obviously you are in the research angle too, are you not?

Mr. GIBBONS. That is correct, sir. I came to Government service about 65 days ago. Sometimes it seems like 6 years, I must say.

So we haven't really been in the business a long time in terms of the creation. The office was created by Executive order in April of this year; I came on board in early September. I would say, sir, that I pretty well agree wholeheartedly with the comments that my colleague, Mr. DiBona, just gave you. I would add only one or two things to his comments.

First, we are preparing a very serious public information campaign in order to do what you mentioned earlier as a very important problem, and that is to try to get the message much more clearly to the American people about the extent of this situation, the fact that there must be participation by all Americans in ameliorating the problem if we are to avoid severe hardships, and simply to get across the fact that we face the problem as a Nation this winter.

We must be careful to avoid the perception that once we make it through the winter, somehow things are going to be fine. We are facing a very severe long-term problem dealing with growth of energy supplies, exceeded by growth of energy demand. And both of those growths are characterized by a great deal of momentum; that is it is difficult to change those numbers very rapidly, and therefore we must be about as quick as possible.

I would be happy to discuss our short-term research, which is related to things that we may be able to do in the next 18 months, as well as some of our longer range programs.

Senator PROXMIRE. I understand that there are about four Federal agencies that are principally concerned with research, of which Interior is one of the more significant and important, and has a large budget for research. Is that correct for research in the energy area?

Mr. GIBBONS. The level of research in the energy conservation area, until the supplemental appropriations request came through, was approximately $9 million, as outlined in Dr. Ray's report which requested the $115 million supplemental for fiscal year 1974. This is divided between work in Interior, Transportation, EPA, Commerce——

Senator PROXMIRE. National Science Foundation?

Mr. GIBBONS. The National Science Foundation, that is correct.

Senator PROXMIRE. And Atomic Energy has a substantial amount?

Mr. GIBBONS. A significant amount of their work is being done at the Oakhurst National Laboratory, for example, now, the requested supplemental appropriation will add about $6 million to this $9 million during this current fiscal year. My office is charged with the responsibility of being the focus and coordinator of all the Federal efforts. So those funds are requested for Interior. However, most of the work will be carried out by various Federal agencies on interagency agreements from our Office. And we will try to insure that the program is rational, comprehensive, and nonoverlapping.

Senator PROXMIRE. Which, if any, of your programs will result in payoff within a year or a year and a half? Research in the area of coal or oil shale, are these real possibilities?

Mr. GIBBONS. No, sir. Those are not real possibilities in this year. In fact, the program I mentioned to you, I should have added, is that research funds for increasing the efficiency of automotive powerplants with motors is in addition to the numbers I gave you, several million more dollars, aimed at trying to get engines more efficient.

Such things as improved supplies, as you have mentioned—oil shale, for example—are not counted as conservation plans. Those are moves to increase the supply and that comes from the rest of the $115 million.

Senator PROXMIRE. Let me ask one more thing before I yield back.

It seems to me that one of the most difficult tradeoffs to establish is the tradeoff between how cold you let homes get as against how far you curtail industrial production. Chairman Stein has said they are going to give top priority to industrial production. And I think maybe that is right. If we lose jobs and lose the ability to maintain a prosperous country, we will be making a big sacrifice. But do you know if any kind of decision has been made anywhere in the Government with respect to how cold we are going to let homes get? We have just had testimony from Mr. DiBona that they are going to provide a pretty rough system, which means we are going to have to turn down thermostats; and maybe a few days before the next oil delivery we won't have any heat at all. Have they calculated how much they will require that thermostat to go down before they will go into a system of rationing?

Mr. GIBBONS. Yes; in the first place, interruption is rationing in effect, because much of the fuel supplies have already been interrupted.

Senator PROXMIRE. I am talking about the particular point that Chairman Stein made—maybe he wasn't speaking for the administration—he said they were going to give top priority to industrial production.

Mr. GIBBONS. That is right. Because until we begin to make inroads on human health, we should pay very close attention to trying to keep our employment. If you ask medical people about home heating, their almost totally unanimous response is that our homes have been too hot and our clothing too thin. The Apollo astronauts' cabin temperature was 70 plus or minus 2 degrees. We opter for 68, because many medical people say that this is nearly ideal temperature, given a reasonable humidity, for human activity; 65 degrees is still within the healthy range. In the Department of Interior, if you want to complain

about the cold, you have to prove your room temperature is below 65, or they won't even pay attention to you.

And so, as we move from our hot houses, as it were, down to 68, and lower, we are not only saving money and energy, we are moving to a more healthy climate.

Senator PROXMIRE. How far are you going to go? That is my question.

Mr. GIBBONS. I would say that the present range of 65 to 68 is as far as we should ever go.

Senator PROXMIRE. Before you will permit homes to get colder than that, you will move to reduce fuel supplies to industry?

Mr. GIBBONS. Quite so.

But we would also encourage people and businesses to reduce the temperature on down to 55 at night, as I do in my home. This means a blanket, but blankets are nice, and the house can be warmed up in the morning.

Senator PROXMIRE. You are not talking about electric blankets?

Mr. GIBBONS. No, sir, but I wouldn't object, because they put the heat where it counts.

Chairman HUMPHREY. You know, I met a gentleman who said that we Americans are a very peculiar lot. He said that in the summertime we air-condition our homes and offices so much that we have got to wear a jacket in order not to freeze, and in the wintertime we heat our homes and offices so much that we have to take off the jacket in order that we don't overly perspire. I think that is the paradox that leads to our trouble, a waste of energy. Your office is supposed to be the conservation office, and your responsibilities are in this area. There was a recent study that was brought to my attention that shows that American industry, as I mentioned earlier—maybe you heard me—in producing a product, whatever it is, a television camera or automobile or whatever it is, uses from 10 to 20 percent more energy to produce that product than is used in an identical product being produced in Japan or Western Europe.

I don't know whether that is again a factual, documented statement, but we get that kind of information. My plea early in my opening statement was that we get specifics that we can agree on in terms of the facts that we are dealing with on production and utilization on new production possibilities, and on reasonably agreed-upon estimates as to conservation that we can work with. As long as there is this lackadaisical attitude and all of the different conflicting points of view, no one seems to take it very seriously until you run out of oil.

Now, in my part of the country, as you know, we are having trouble getting any kind of fuel contracts for many of our schools. We have some contingency plans made to close schools for a couple of months during the winter, which is, it seems to me, one of the less desirable ways of meeting the fuel crisis.

I have a few other questions here that I will just run down, and I would like to get your response. Do you have any assessment at this time of the effectiveness of public compliance with the President's request for voluntary conservation?

Mr. GIBBONS. I don't have any quantitative measures, although we are in conversation with two firms whose job is to determine public

opinion. I only have, therefore, the experience that is related to me by individuals. And that is not sufficient. We hope to have that kind of information within the next week to 2 weeks.

Chairman HUMPHREY. Can't you set up a system through every Governor and every mayor across the country to get you this information? When I was mayor of my city I knew what was going on. And I will guarantee you one other thing, that the people out there will tell the mayor very shortly when they are out of oil.

Mr. GIBBONS. My best technical man is in Phoenix today with the Western Governors' Conference. We have been to the Northwest Governors' Conference as well as the Southeast Conference at Atlanta. We have an arrangement, a joint venture with the National Science Foundation in which we are about to support a staff within the National Governors' Conference as a route to all 50 States so that we can share information between States as well as within the Federal Government. We are arranging a panel workshop for the forthcoming meeting of the National Conference of Mayors, and we are assisting them in this workshop so that they can not only share their own experiences, but we can again provide a coupling between Federal officials and their needs at the local level.

Chairman HUMPHREY. The National Conference of Mayors represents the big cities. The National League of Cities represents all of the cities. I think both of them ought to be called in to emergency meeting. If this thing is as serious as has been indicated, and I believe it is, we have got to quit fooling around with a normal routine schedule. We have got to speed it up and you should call an emergency meeting. We have got big auditoriums around here someplace. We ought to have an emergency meeting of the mayors.

And you ought also to have a meeting of the National Association of County Officials. It has got to be done, and not just by going at it on a routine basis. Don't make it too complicated, just lay out what has to be done and ask them to set up a voluntary conservation program. For instance, on monitoring highway speeds, you don't have any Federal police force that is going to do this; it requires the cooporation of the highway patrols all over the Nation. And they should be called in here and told what needs to be done. If need be, there should be an increase in the personnel of those divisions to see that these speed limits are monitored. Now, these are minor things we are talking about, but they add up. And, I think it has got to be done. Because without monitoring, Mr. Gibbons, it just isn't going to mean a thing, it is nothing but a great speech by the President and pronouncements out of Washington which get lost as they get away from here. I want you to know that it is very noisy in Washington, but, my, it is quiet out in the countryside. This chatter that we have here seldom is heard out there. The boys who write the news here think that everybody is reading it. They are not reading it. And the national TV has got so much stuff going on it all the time that nobody knows what they ought to pay attention to.

Mr. GIBBONS. That is a lack of perception that I hope we can correct. We are preparing, through the assistance of the National Ad-

vertising Council, some major multimedia public interest campaigns—"Public Awareness Campaigns"— concerning the energy crisis. It is a very serious campaign and we hope it will make its mark.

I think one of the problems in Minnesota is typical of the problems you have alluded to; namely, that in the past several decades we have assumed energy was essentially infinite in supply and nearly zero in cost. What that does is to guarantee it is going to be wasted. I heard this morning, for instance, that the number of schools in Minnesota that are well insulated is shockingly low; not lower than elsewhere, but very, very small like only a few percent. I think it is a good example of the fact that we have paid so little attention to being good stewards of energy over these last several decades. It is high time we learned that lesson very well and got to changing our way of doing things.

Chairman HUMPHREY. Have you given any thoughts to encouraging homeowners to save fuel oil by giving them a tax incentive for home improvement by better insulation? In other words, if it is really important, why don't we have a system that says to them, "Look, if you put in the kind of storm windows you ought to have, and if you insulate your walls the way they ought to be, you will have a tax credit, like an investment tax credit or a deduction." That will get you good results, I believe.

Mr. GIBBONS. We have had discussions with FHA about the possible use of improvement loans specifically——

Chairman HUMPHREY. We don't give industry improvement loans, we give them a tax credit. When the steel companies put on an addition, we say, "'Now, you get your 7 percent back; we will give you a little cooky jar to dip into." Haven't you got any cookies for the folks?

Mr. GIBBONS. What I have been working on is some things that we could possibly do without having new legislation, because we would like to do some things very quickly. I agree with you, given the time to develop the tax legislation, that is a very important way to go.

I might mention one other incentive. There has been some leadership, particularly in the State of Michigan, by the Michigan Public Service Commission and the Michigan Consumers Gas Utility. And the leadership—I think the center of leadership in this activity has been in the Public Service Commission. They have turned all of their marketing people into demarketing people, that is, people to try to help their customers save energy rather than use more of it. And one of the new activities which is now finally clear is that the exsalesman for the company will go out and help a homeowner determine how much insulation his house ought to have. And they will help him find the insulation and even a contractor if he wants it; they will finance it and put it right on his utility bill for 90 days without any carrying charge, or over 3 years 1 percent a month, which is less than his credit card.

And though this is a very important way to go, a new way to go at the whole of utilities as is served the public. And we are trying to conserve in cooperating with Governor Milliken in having a working conference in December in Michigan with all the States, Governors' representatives, as well as Public Service Commission representatives,

to get this message across for those people to see what is happening and in that instance to try to take it back home.

Chairman HUMPHREY. What would be your attitude about a little tax incentive? There is an energy bill up here in the Senate. And a thought just came to me here. Maybe I will offer a little amendment down there. You don't think the President would veto it, would you?

Mr. GIBBONS. I can't predict what the President will do. I do think that the incentive is a very important measure to consider. We have looked at this, and one of our problems—for instance, we have looked at the way the FHA appraises homes. If the FHA could take more cognizance of the insulation features of the home in its appraisal, this would be a very direct incentive both to the builder and to the owner. The question that arises there would also arise in the case of tax credits. And that is, what makes sense, how well can you determine that the money that was claimed to have been spent in fact was spent for insulation? I worry about the ease to which one can respond to such a kind of a tax credit. This is not to say that it shouldn't be carefully explored.

Chairman HUMPHREY. One other proposal that has been suggested, and in fact I have a draft of a bill to effect it, is to promote the conservation of all types of fuels by directing and authorizing the President to proclaim a national emergency conservation month, for example, after a brief intervening time in which you could really plan what you are going to do. Would this be helpful?

Mr. GIBBONS. I am not sure, sir. Because the thing I would be very much concerned about, for example, in considering that is that we not mislead the American people into thinking that this is just a short-term thing. I think an energy conservation month might be a good way to increase the awareness of the problem. But I think we should structure it so that they are really aware of the full dimensions of the problem.

Chairman HUMPHREY. On the matter of conserving fuel—we have been talking about heating oil because of the Middle East crisis particularly—but what about conservation of natural gas and electricity? A lot of homeowners have gas and not oil. Some of them heat by electricity. We are talking about measures, for example Mr. DiBona was talking about rather severe measures that might have to be applied in conserving heating oil. What are you going to do about those that use natural gas and electricity for heating?

Mr. GIBBONS. On natural gas, let me answer you in a couple of different ways. One is to identify the present waste of natural gas, for example, in homes as well as in industry. The pilot light in the home accounts for at least 10 percent of the total gas consumption in the home. The technology exists today to replace pilot lights, particularly on new appliances, with electric igniters that will only turn on when you want to turn on the gas. We are pursuing both voluntary and mandatory routes to doing away with the pilot lights. The efficiency of gas furnaces can be improved, although this is a longer term strategy. It provides benefits which will only accrue as one replaces existing furnaces with new ones, or as one builds new homes.

In the area of electricity, I am sure you are concerned that it takes oil and gas and coal to make electricity. And there are several instances around the world that, I think, provide good lessons for us.

The Pacific Northwest, for example, is facing a very severe problem this winter because of a shortage of hydroelectric power, which is most of their electricity. By voluntary programs and vigorous involvement of the Governors they have reduced their electrical demands by a full 8 percent now, which will enable them, if they can hold it, to get through a very critical time.

The Swedes faced a similar problem around the beginning of this decade, and by a voluntary program which, in fact, had some things that weren't quite so voluntary about it, they managed to reduce rather sharply their electricity use. As I understand it, they kept the usual electrical rates up to some average number of kilowatt hours per home or factory. And then this one could use more than that one could if he paid about 20 times more for unit use.

And this highly inverted block structure in that period of time enables people to have an incentive to cut back on use.

I believe that we have mechanisms and potentials for reducing the amount of electricity used in our system, both in our homes as well as the factories. And one of these could obviously be some sort of rationing plan; another, a highly inverted rate structure designed simply for the short term. In the longer term both our office and other offices within the Federal agencies, as well as the State public service commissions, are going to look a lot harder at the basis for the current rate structure of electric and gas utilities and the possible impact of alternative rates. The rate structures were designed some years back in many cases. Now that energy fuel prices are somewhat higher, the question is whether the present decreasing block rate structure of utilities still is the most rational way to allocate energy among the various consumers. Any change that might result will not happen immediately, but—again in the case of Michigan, as well as in other States—public hearings have been held, and the rate structures are under review.

Chairman HUMPHREY. In relation to this question, a fact sheet put out by the Energy Policy Office concurrently with the President's statement of November 7, alluded to consideration of so-called control fees, to dampen extensive use of natural gas and electricity. Do you think you could elaborate on what you mean by control fees, or is this to what you have been addressing yourself?

Mr. GIBBONS. I am not sure of the terminology used, Senator Humphrey. It may well relate to the things I have been speaking about, in terms of fees that allow normal prices of energy up to a certain amount of use and then a sharply increased price for greater use.

Chairman HUMPHREY. This is the Consumer Economics Subcommittee. Now I have noticed that, in the case of the airlines, for example, one thing that has been recommended is a boost in the airplane load factor. That is definitely happening. And it is an appropriate means to enhance fuel efficiency. Cutbacks in airplane service to increase loads, however, also serve to reduce airline operating costs rather sharply. And yet the carriers and the CAB still are talking in terms of raising fares as well. Who will assure for the consumer's benefit that the cost reductions from cutbacks in service at least do not result in higher rates and possibly in somewhat lower rates? Is somebody watching that part of the kitchen?

Mr. GIBBONS. I hope so, sir. I have a technical man who has been working with CAB on those questions. In many instances airline profits. I believe, can be increased by trimming the low-load aircraft. However, if one gets quite serious about this business and goes for very high load factor operations, then it is entirely possible that many aircraft will simply be sitting on the ground, providing no revenue, rather than flying and deriving some revenue.

Now, in many instances an aircraft flying on the order of 35 percent load factor can at least break even and make the mortgage payments on the airplane. If this plane simply is sitting on the ground, then that income is not derived. So I think one has to look at both the pluses and the minuses, and the minuses can become important with a very high load factor.

Chairman HUMPHREY. Of ocurse, it will depend to a great degree on how many passengers, if your planes are filled you make money.

Just a quick question on this whole matter of trucking and ground transportation. I notice it is commented on in the news, because the truckers have said that the 50-mile-an-hour limit is not desirable, that their equipment is designed for efficient operation at higher speeds. The industry that comprises the glue to hold our economy together obviously is our great transportation industry. It seems to me that this industry really is caught between the devil and the deep blue sea.

It is being called upon to conserve fuel, but if trucks reduce their speeds to improve fuel economy—and it is debatable whether this works according to what I hear—this will cut into their carrying capacity, just as if their fuel supplies were cut back by rationing, because the vehicle then performs fewer ton miles in a given time. Therefore, if we are to conserve fuel in this industry without creating transportation bottlenecks all over this country, we must find, it seems to me, an even better way to conserve. But their operations also are constricted by State and Federal regulations. Shouldn't we eliminate deadheading, circuitous routing and other waste required by present transportation regulations? In other words, is there anything that can be done in this whole matter of commercial transportation to reexamine those rather archaic and sometimes special-privileged rules and regulations which really represent tremendous waste in the transportation industry?

Mr. GIBBONS. Yes, sir.

For example, the gateway rule, which I view personally as a historical artifact, requires a truck to go from city A to city B only by going through city C, and this induces a great deal of waste. There is argument within the trucking industry about this, because it shifts competition around among various kinds of trucking fleets.

I believe the Interstate Commerce Commission is considering this month the question of gateways.

Chairman HUMPHREY. I hope that you will remember that the Interstate Commerce Commission is not known for its speed.

Mr. GIBBONS. We hope that we can accelerate that process just a little bit.

Chairman HUMPHREY. You are really going to have to do it.

Have you thought about increasing the load factor on trucks for our Interstate Highway System?

Mr. GIBBONS. Yes, sir. We have asked about load factors. And we have also tried to get some information on the impact of lower speed limits. As one goes above 50 or 55 miles an hour, wind resistance becomes a factor in decreasing miles per gallon. And I am not prepared to accept the story that trucks somehow magically will do better at 65 than 50. I believe that evidence from the Department of Transportation shows that in fact savings will accure in diesel fuels by slowing the trucks down.

Another point here, Senator, is that as we slow down trucks it does induce some hardship on that industry. In fact there is nothing free in reducing energy. Everyone is going to have to take a bit of the burden.

One very important side effect of this, I believe, is that as trucks slow down there will probably be a greater capacity for the railroads to compete for some of the truck freight. This would be through piggybacking or other mechanisms.

Now, rail freight takes four times less energy per ton mile than does the truck. And therefore any inducement, albeit small, to move some of this truck traffic to the railroads, I think, is good news.

Chairman HUMPHREY. Are you going to work on that? Or are we just going to say it is a nice thing?

Mr. GIBBONS. It is for this and other reasons we are doing whatever we can within our office to encourage keeping the trucks along with the automobiles at lower speeds. Our office has no legislation fiat to be able to enforce any of these things at this point.

Chairman HUMPHREY. That is what Senator Proxmire and I are worried about. This is like an expression of good will, a Mother's Day message or a Valentine, unless somebody is going to say that it has got to be done.

You have given a statement that is very revealing. It takes four times as much fuel to move a ton of cargo by truck as it does by rail right?

Mr. GIBBONS. Yes, sir.

Chairman HUMPHREY. And you can document that?

Mr. GIBBONS. Yes, sir.

Chairman HUMPHREY. Now, if you are really going to conserve, and if the fuel problem is what we say it is, it seems to me that this is an area in which there has to be more than just a general admonition.

Mr. GIBBONS. Yes.

One of the general strategies for energy conservation is to trade time for energy, to move things a little more slowly—people and goods—and to move from airline freight, for instance, to truck or from truck to rail or water. Each of those moves incurs longer time for delivery, but with very much less energy consumption in the process.

Senator PROXMIRE. I realize, Mr. Chairman, that the time is getting late, and we have other witnesses to follow. In fact, I would like to take advantage of that by saying that Mr. Freeman, who follows you, has one of the best prepared statements I have read in a long time. I intend to put it in the Congressional Record, it is so good. I want to read one short paragraph from that and call it to your attention, because perhaps you will have left before Mr. Freeman has a chance to give it.

He says:

> The danger increases each day we continue heating buildings, driving cars and operating industrial establishments as though the shortage did not exist. Actions are needed immediately . . . not in January or February. It is a matter of simple arithmetic that the longer we delay beginning a program of rationing in one way or another the greater the risk of shortages that will cause unemployment, as well as seriously disrupting the lives of our citizens.

Now, that is one thing we are going to have to get across: That every single thing counts; that today, tomorrow, and this past week we will have wasted hundreds of thousands of barrels of oil that are irreplaceable. And so that timing is awfully important.

Just to document that a little bit, take just a minute more.

Last spring my colleague, Gaylord Nelson, did one of the most praiseworthy things that any Senator has done in a long time. He went to Burlington, Wis., and persuaded the people of Burlington to try to experiment to cut down on their consumption of fuels. He persuaded a number of people to cut back to what they consumed in 1952. He persuaded another family to try to cut back to the average consumption level in Europe. And he tried to persuade everybody in town to cut down on their gasoline. And even though network television covered it, and he was on the "Today Show" twice, and people knew they were in the public eye—and they are wonderful people out there—despite this less than half of them were able to achieve their goals. Some were, but the majority were not. And, of course, those efforts were voluntary; it wasn't mandatory. It is that hard to do unless you have tough, hard, rationing methods of one kind or another.

The voluntary system, it seems to me, unfortunately just can't work.

And I would like to ask just one other question. And that is whether you have made any projections as to how big a bureaucracy, how many people you are going to need if you have rationing? I know that there are different kinds of rationing. Mr. Freeman is going to suggest a method that would require a relatively small bureaucracy. Have you made any estimate of this kind? I have heard many people say that this is what concerns them most, a matter of 100,000 additional bureaucrats.

Mr. GIBBONS. Senator, I have not, because my office has only been involved to the extent of trying to identify the promising areas for conservation. The task force to design rationing and other schemes for implementation has been working directly under Governor Love's staff and the Office of Management and Budget. I have not been directly involved in that. I personally therefore can't answer the question.

Chairman HUMPHREY. Have you done anything at all on carpooling?

Mr. GIBBONS. Yes, sir.

What we have tried to do in carpooling at both the State and the Federal level is to provide—and again this in our route—to provide some jawboning and information on this point, about success being attained by carpooling, and we have also made recommendations about increasing the cost of parking spaces in Federal lots.

Chairman HUMPHREY. Thank you very much, Mr. Gibbons. We appreciate your helpfulness here this morning. I hope that you will take back to your associates the deep concern here of this committee. I think we speak for a goodly number of Members of Congress.

Mr. GIBBONS. Thank you, Senator.

May I make one final comment? I appreciate very much your point about the urgency of action in the days ahead in order to get through the coming winter that is coming. I think also that we must have action now and in the months and years ahead in order to prepare ourselves better for the problem that will be with us all the way through this decade.

Senator PROXMIRE. You aren't going home by limousine?

Mr. GIBBONS. No; I walked the last time, but I'll try to find a cab this morning.

Senator PROXMIRE. Either that or job.

Chairman HUMPHREY. If you jog, go well armed.

Next we will hear Mr. David Freeman, director of the Ford Foundation energy project.

We have had the privilege of your testimony once before the Foreign Relations Committee, as I recollect. And I am very grateful for your presence here this morning and for your excellent prepared statement.

Please proceed.

Mr. FREEMAN. Mr. Chairman, if I may be permitted to summarize my prepared statement and submit the full prepared statement for the record——

Chairman HUMPHREY. We will put the whole prepared statement in the record, of course. But I want you to highlight it for our listeners and voice the key points of this remarkable prepared statement.

Mr. FREEMAN. Thank you, sir. I shall.

STATEMENT OF S. DAVID FREEMAN, DIRECTOR, FORD FOUNDATION ENERGY POLICY PROJECT

Mr. FREEMAN. Let me say at the outset that the views I express this morning are my personal views, and do not represent the views of the energy policy project, since our report will only be published in the coming year. But I do have a decade of involvement in energy policy in the Government and as a private citizen, and I hope my views will be of some help to the committee.

The crisis that is upon us need not paralyze the nation or cause widespread hardship. Ironically, the fact that we waste so much energy in driving cars and overheating buildings makes it easier for this country to weather the crisis. Japan and Western Europe, for example, use a much higher percentage of a barrel of crude for industrial purposes, thus causing cuts into their economic activities much more sharply than the need to cut back in this country.

But having said that, the worst mistake that we could make would be to fail to face up to the very real shortage that exists today. Without effective action now, including some form of rationing, the energy shortages could trigger a downhill effect throughout the economy. It could move this country into a recession, or even a depression. The

Federal Government has detailed contingency plans for going to war, I guess, with almost any country on Earth. But, unfortunately, we have no detailed plans for this energy crisis, the crisis that has been developing for years.

The national energy budget is badly in the red. I think that Mr. DiBona was very forthright with the committee this morning in describing his version of the facts, and the size of the crisis. I would simply add that, on top of what he says, we have this year a serious drought in the Northwest, so that we start with a natural shortage in that section of the country. Also he did not mention that there is a shortage of natural gas. To the extent that gas supply is less than had been anticipated, industry will be seeking to burn oil. So we have another effect there, an effect that can't be quantified, but which adds to the percentage of shortage. And there is also reason to doubt, as Mr. DiBona suggested, the viability of the measures he suggested to increase supply on any short term basis.

We really don't know how much we could increase the production capacity of the oil wells in Texas. We do know that we are very much like the family in the depression era that kept talking about the imaginary hundred dollars in the bank that they could draw on when things got rough. We tried to draw on the reserves that we thought were there several years ago but they weren't there. We went from 60 percent of total productive capacity to 100 percent but we were pretty close to 100 when we thought we were at 60. So I am personally skeptical of our ability to increase supply and, as everyone else, dubious of the fact that we are saving that much energy today.

Anyone trying to get to work in Washington from the suburbs this morning must realize that we are conducting business as usual in this country. It is important to understand that the United States does not have a stockpile, and that we are in a situation where the only way to balance our budget is to cut back on spending, to use budgetary terms. And there isn't much "dirty" energy available to fill the gap either. Pealing off the layers of environmental protection isn't going to help much in keeping warm this winter, and it could really hurt in keeping well in the years to come. The only answer is to cutback on energy consumption at once, and by everyone, otherwise many people and businesses will run out altogether. The cold hard fact is that we just can't burn what we don't have.

The danger increases each day we continue heating buildings, driving cars, and operating industry establishments as though the shortage didn't exist. Actions are needed immediately, mandatory actions, not in January or February of next year.

But as we consider which actions to take, it is important to distinguish between measures that will reduce demand and really help right away and those measures, taken in the name of the energy crisis that will do little or no good, and could cause great harm in the future.

In my view, Mr. Chairman, we dare not enact a national energy policy to shape America's future in an atmosphere of fear and near panic. If we don't stop to think there is the danger of approving any action that promises more energy in the future without weighing the cost to the consumer or the environment. A national energy policy must find a way to implement our environmental goals, not abandon

them. Such a policy should protect the consumer against windfall profits and not make soaking the consumer somehow seem like a virtue. We must be sure that consumer protection and environmental protection do not become the first victims of the energy crunch.

No one, least of all myself, would question the need to develop a coherent line of policy to balance our energy budget in the years ahead. My plea is that we do so with an understanding that the Nation must reconcile a number of very basic yet conflicting values, and that we are still very low on in the learning curve of just how to do so.

If we face the reality that some array of governmental mandatory actions are needed to cope with the immediate emergency, there are three categories to consider:

(1) Requiring specific actions or inactions, designed to save lots of energy at a minimum incovenience. For example, it could be required by law that thermostats in commercial and industrial buildings be set at 68°.

(2) Rationing available supplies to the ultimate consumer, leaving the choice to each citizen or business as to how to balance his energy budget.

(3) Increasing prices (through taxes) to the level at which the higher prices would cause people to cut back on consumption enough to balance with the supply.

In my view, the most pressing need is to take action, including rationing. No one looks forward to rationing with any glee or enthusiasm. I think it is a false issue to ask who is for or against rationing. We must understand that rationing is going to happen. The question is whether the Government will ration or whether the oil companies will do the rationing.

In ordinary circumstances the market place does the job better. But with a shortage of heating oil and gasoline that could be as high as 20 to 25 percent of potential demand, we would be taking a tremendous gamble with the welfare of the people and the economy if we permitted nature to take its course.

As I shall explain in a moment, I believe there is a role that market forces can play to help ration gasoline and other scarce fuels. But the idea of just letting the oil companies charge what the traffic might bear in a period of acute shortage would result in a multibillion dollar windfall. The price increases won't even help cure the immediate cause of the shortage, since making the oil companies superrich isn't likely to persuade the Arabs to stop the boycott. The higher prices of 20 to 30 cents per gallon would, of course, price gasoline out of reach for many trips and thus reduce demand.

But with the sad state of public transportation in this country there are certain minimum needs for gasoline that simply can't be cut out—needs like getting to work. The working poor would thus be hurt badly by a purely market-oriented solution. And the oil companies—who must share the blame with the Government for our energy unpreparedness—would profit handsomely on the adversity of the Nation.

Raising the price of gasoline by imposing a large new Federal tax of say 30 cents a gallon is certainly a better idea than permitting the oil companies to pocket such huge sums. And it would no doubt cut

out lots of driving. But a pure tax approach would still soak the working poor and consumer generally who must use gasoline for getting to work, shopping, and other essentials.

A purely market-oriented approach with a price increase large enough to eliminate the shortage this year therefore is a cruel idea for almost everyone but the rich people and the oil companies.

At the other extreme is to consider rationing as requiring a detailed comprehensive system which attempts to identify the needs of every class of retail consumer, divide the available supply equitably among them, and provide appeal boards for hardship cases. Such a system in a peacetime economy would require a Government bureaucracy that is not yet organized. It would need to make a lot of tough decisions on where joyriding stopped and where necessary travel began. By the time it got organized and working we would most likely have run completely out of gas.

There is no really good way to ration, but in the circumstances there is no alternative. And the country really can't afford a long debate over how to do it. The greatest danger by far is to drift ahead hoping that the problem will somehow go away.

I happen to think that a basic rationing system for gasoline could be quickly implemented. In the interests of facilitating public discussion I'd like to outline an approach that would not involve a complicated bureaucracy and would call on market forces for help without placing a burden on the consumer. I offer these personal thoughts knowing they are incomplete and could be improved with the hope that they might spur quick action by the Federal Government.

Gasoline could be rationed by estimating the assured supply from domestic production and imports that we know will continue and issuing free coupons to each licensed car owner for an equal share of most of what would be available on a per car basis. This basic ration would amount to about 10 gallons per car per week if the Arab boycot continues. These coupons should be made freely negotiable to encourage car owners to pool their coupons and form car pools or drive less and sell them to people who need or want more gas.

In addition, a small fraction of the coupons would be sold by the Government each month on a first come, first served basis, at say 30 cents a gallon, with the price and number of coupons available adjusted each month in light of supply and demand. An alternative to the Government selling ration tickets would be to impose a tax of say 30 cents per gallon, while also issuing coupons as I have described and providing that the coupons would entitle the holder to gasoline without paying the extra tax.

The Government would, in effect, be using the marketplace instead of appeal boards to allocate a small portion of the gas. The money from the sales of these coupons or the tax should be used to buy new buses and otherwise improve public transportation systems. Service stations would be able to obtain replacement gasoline only in exchange for the coupons they collected from their customers. An integral part of any such rationing plan would be to impose price controls on the scarce energy that would insure that the energy companies do not reap windfall profits.

The reasons for earmarking some of the gasoline for a market-determined allocation is that in a peacetime economy it would be hard

for a rationing board to decide on who should get a priority. Furthermore, it is important for consumers to think in terms of gasoline being worth, say, 30 cents a gallon more, and making their decisions accordingly. Otherwise the pressure on the rationing system will be great and the danger of black-market operations that much greater.

Mr. Chairman, and Senator Proxmire, these thoughts are obviously not a definitive plan for rationing. But I think they provide a basis for discussion. And perhaps it will take some of the hysteria that is associated with the word "rationing" out of the picture, so we can debate a rationing plan in a rational way, if I might say so.

In my view, the longer we put off implementing any such plan, the tougher and more complicated it will become. And if inequities arise under this basic rationing system, we could add the complications as we go along. But this is a plan to begin rationing very, very quickly.

I think it is also important that we give a high priority to measures that will save energy, not only in this year, but each year in the future. My prepared statement refers to measures in this category. Senator Humphrey mentioned one; it would encourage insulation. If you tighten that house, you are going to save that energy automatically every year. And you will save money, too.

Another is large scale Federal support for mass transit. We can't ration gasoline and go to a gasoline-scarce economy without providing people with better alternatives.

Bicycle paths built this winter would help a lot in the spring and summer.

It would help in Detroit if there were taxes on the miles per gallon of the car, so that in the future there would be better incentives for building more cars that have better mileage.

These are all measures that have to be part of our program today that will help us in the future.

Chairman HUMPHREY. I think we ought to call those automobile companies in and ask them why they produced bigger engines than they produced last year when they knew there was an energy crisis. And they have been doing just that. I know why they do it. They make more money off the big cars. But they actually put more horsepower in many of these cars this year than they did a year ago, despite the fact that they have to have emission controls, and despite the fact that they knew there was an energy shortage. The automobile industry just went willy-nilly on its way. And many of these dealers have these big cars stacked up on their lots unable to sell them.

Mr. FREEMAN. Yes, Mr. Chairman, I believe the people of the United States are ahead of the people in Detroit on this issue because for many months now one has had to get on a waiting list almost to get a smaller, more efficient car, and the big gas guzzlers are selling at a discount. Even the financial reward to Detroit for big cars might not be too great in the current circumstances.

Mr. Chairman, the word "crisis" in the Chinese language consists of two symbols: one meaning danger, the other opportunity. We know the danger but there is also a great opportunity. The coming months can be a time when America looks in the mirror and sees what a mess it has made of its cities, and how we have permitted the surrounding countryside to be covered by unplanned circles of topsy-turvy growth.

We have created an America in which people live and work in buildings constructed and operated with no concern for saving energy; an America where people on the average live farther and farther away from their work and spend more and more time in cars that get fewer and fewer miles per gallon; an America where industrial establishments have paid no more attention to the efficiency with which they use energy than the average household.

I was in Japan recently and on the plane going over I sat next to a man who was the head of a delegation from the Portland Cement Association in this country. He told me that he was going to Japan because they have suddenly awakened to the energy crisis, and had learned that in Japan they make cement just as cheaply while using one-half of the amount of energy per ton of cement that we do in the American plants. They were going over on an inspection trip to find out about the Japanese technology. This is a good example of how we have been oblivious to energy both in industrial activity and in the transportation systems.

There is little doubt that we have created the most wasteful society on Earth in the use of energy and material resources. With 6 percent of the world's population we consume 35 percent of the world's energy. Our appetite for energy has grown much faster than our ability to produce, extending our energy lifeline halfway around the world to the large oil wells in the Middle East.

In a way this Nation is very fortunate that the boycott has occurred now.

Chairman HUMPHREY. I want to concur. In a way it was a Godsend. I thoroughly concur in what you said. It will compel us to shape up.

Mr. FREEMAN. For what it does is to telescope the future and show us that the path along which we were sliding is a dead end. Even if the Arab-Israeli dispute did not exist, it is not in the cards for America to continue a gluttonous way of life in a world where most of the people live in a perpetual energy blackout.

We are witnessing the end of an era. As much as we hate to face up to it, the joyride is really over. But that does not mean that we are on the road to a Spartan life, nor does it mean that we cannot in the coming years develop transportation systems, cities, and indeed life styles that are superior to what we must leave behind. To fashion a new America will involve a whole lot more than an energy policy. But since energy is the life blood of modern society it might provide the focal point.

If we could develop an energy conservation ethic it could lead us to solutions to a great many of the ills that beset America today. Modern mass transportations, new cities, either within existing communities or elsewhere, and planned growth in knowledge-intensive industries, are all needed to meet basic needs of society as well as to balance the Nation's energy budget. Growth in these areas that have suffered from too little growth in the past could reshape the GNP in a way that could provide more of the goods and services that America really needs and cut out much of the wasteful use of energy that is a root cause of our current problem.

If the current crisis could wake us up to the need for embarking on a sounder and saner pattern of growth it could turn out to be the luckiest thing that could ever happen to us.

Mr. Chairman, in conclusion it is important that we do not permit the current crisis to give conservation a false blackeye. We are in trouble because we were trying to consume too much, not too little. The Arab boycott may be the proximate cause but if there is hardship and unemployment it has its roots in a decade of Government policy which encouraged the energy companies to push their products with green stamps and promotional rates. Rationing is a byproduct of the policy of promotion and the failure to take actions that can save energy, save money, save the environment, and improve the quality of our lives in the process. The answer to this winter's problem is not to give up on the future but rather move to a pattern of growth and sources of supply more in keeping with a durable society on a planet of limited resources.

Thank you.

[The prepared statement of Mr. Freeman follows:]

PREPARED STATEMENT OF S. DAVID FREEMAN

Mr. Chairman and members of the committee, I was pleased to accept your invitation because I think it vital that everyone acquainted with the energy situation do everything they can to make energy conservation a quick reality in this country. We need to enlist the support and participation of the American people and we need action by all levels of government to develop an energy conservation ethic in this country.

Mr. Chairman, the views I express this morning are strictly personal and are not presented on behalf of the Ford Foundation's energy policy project which I am directing. That particular study of national energy policy is one we hope to complete in the coming year. My views today reflect my own involvement with energy policy over the last decade, first at the Federal Power Commission, later as an energy policy official in the Executive Office of the President and more recently as an interested citizen. I hope they will be of some value of the committee.

The crisis that is upon us need not paralyze the Nation or cause widespread hardship. Ironically, the fact that we waste so much energy in driving cars and overheating buildings makes it easier to weather this crisis. Japan and Western Europe for example use more of their crude oil for industrial purposes than we do. If the United States can quickly make the necessary readjustments in our wasteful patterns of consumption there need not be any serious dislocation in the American economy. The adjustments could in time even lead to a pace and quality of life that in many ways could be superior to the big car—glass house—suburban sprawl—energy and pollution intensive way of life that we have built for ourselves in recent decades. But the worst mistake we could make would be to fail to face up to the very real shortages that exist.

The shortage of fuel we face this year, next year, and for the foreseeable future is not going to be filled by just giving lip service to conservation and trying to continue business as usual in our traveling, heating, and industrial consumption habits. It is going to require mandatory actions by State and Federal governments to assure that everyone does their part to make conservation happen. Without effective action now, including some form of rationing, the energy shortages could trigger a dominoe effect throughout the economy that could move this country into a recession or even a depression. Of course, we are in a very real sense guessing at what might happen. The Federal Government has detailed contingency plans for going to war but no such plans for this energy crisis that has been developing for many years.

For several years many of us have been calling attention to the fact that America has been a society of energy gluttons. Now that it has become imperative to go on an energy diet it is most important that the diet be effective and that the measures taken provide the greatest savings with the least disruption. Perhaps most important of all is to be sure that our efforts are not just a one-shot proposition. We need to shift to a more efficient pattern of growth so that conservation becomes an integral part of the design for America's future, a

future that can be better and more satisfying than the recent past. But first we must cope with the existing emergency.

The Nation's energy budget is badly in the red. The available supply of oil is going to be somewhere between 10 to 25 percent short of the potential demand in the months ahead if we continue a business as usual pattern of consumption. There is no way to close that kind of gap by increasing supply as long as the Arab boycott continues.

It is important to understand that the United States has no stockpiles, little or no excess production capacity and only one defense department reserve that could, if produced, add some 150,000 barrels per day as compared to a potential shortage of 2–4 million barrels of oil a day. And there is not much "dirty" energy readily available to fill the gap either. Peeling off the layers of environmental protection isn't going to help much in keeping us warm and could really hurt in keeping us well in the years to come. The only answer is to cut back on energy consumption at once and by everyone, or many people and businesses will run out altogether, because we cannot burn what we do not have.

I have great faith in the ability and willingness of the American people to respond to the situation that we now face provided their leaders take decisive action that requires everyone to share in the inconvenience. Some people will turn down their thermostats and stop joyriding voluntarily but there are too many questions in the minds of people about whether the crisis is real, whether everyone is sharing equally and about which measures are really effective and which are not, to expect the degree of conservation required from a voluntary program.

The danger increases each day we continue heating buildings, driving cars, and operating industrial establishments as though the shortage did not exist. Actions are needed immediately * * * not in January or February. It is a matter of simple arithmetic that the longer we dely beginning a program of rationing in one way or another the greater the risk of shortages that will cause unemployment, as well as seriously disrupting the lives of our citizens.

As we consider which actions to take it is important to distinguish between measures that will reduce demand and really help right away from those measures taken in the name of the energy crisis that will do little or no good now and could cause great harm in the future.

We dare not enact a national energy policy to shape America's future in an atmosphere of fear and near panic. If we don't stop to think there is the danger of approving any action that promises more energy in the future without weighing the cost to the consumer or the environment. A national energy policy must find a way to implement our environmental goals, not abandon them. Such a policy should protect the consumer against windfall profits, and not make soaking the consumer somehow seem like a virtue. We must be sure that consumer protection and environmental protection do not become the first victims of the energy crunch.

No one, least of all myself, would question the need to develop a coherent line of policy to balance our energy budget in the years ahead. My plea is that we do so with an understanding that the Nation must reconcile a number of very basic yet conflicting values, and that we are still very low in the learning curve of just how to do so.

If we face the reality that some array of governmental mandatory actions are needed to cope with the immediate emergency there are three categories to consider:

(1) Requiring specific actions or inactions, designed to save lots of energy at minimum inconvenience. For example, it could be required by law that thermostats in commercial and industrial buildings be set at 68°.

(2) Rationing available supplies to the ultimate consumer, leaving the choice to each citizen or business as to how to balance his energy budget.

(3) Increasing prices (through taxes) to the level at which the higher prices would cause people to cut back on consumption enough to balance with the supply.

It seems to me that an optimum program of action could well draw on all three categories of action. The most pressing need is to take action—including rationing—to reduce demand immediately. No one looks forward to rationing with any glee or enthusiasm but we must understand that the issue is not whether to ration or not; it is a question of whether the Government will ration or whether the rationing will be left up to the oil companies. In ordinary circumstances the marketplace does the job better. But with a shortage of heating oil and gasoline that could be as high as 20–25 percent of potential demand, we would be taking a tremendous gamble with the welfare of the people and the economy if we permitted nature to take its course.

As I shall explain in a moment I believe there is a role that market forces can play to help ration gasoline and other scarce fuels. But the idea of just letting the oil companies charge what the traffic might bear in a period of acute shortage would result in a multi-billion dollar windfall. The price increases won't even help cure the immediate cause of the shortage, since making the oil companies super-rich isn't likely to persuade the Arabs to stop the boycott. The higher prices of 20–30 cents per gallon would, of course, price gasoline out of reach for many trips and thus reduce demand. But in the sad state of public transportation in this country there are certain minimum needs for gasoline that simply can't be cut out—needs like getting to work. The working poor would thus be hurt badly by a purely market-oriented solution. And the oil companies—who must share the blame with Government for our energy unpreparedness—would profit handsomely on the adversity of the Nation.

Raising the price of gasoline by imposing a large new Federal tax of say 30 cents a gallon is certainly a better idea than permitting the oil companies to pocket such huge sums. And it would no doubt cut out lots of driving. But a pure tax approach would still soak the working poor and consumer generally who must use gasoline for getting to work, shopping, and other essentials.

A purely market-oriented approach with a price increase large enough to eliminate the shortage this year therefore is a cruel idea for almost everyone but rich people and the oil companies.

At the other extreme is to consider rationing as requiring a detailed comprehensive system which attempts to identify the needs of every class of retail consumer, divide the available supply equitably among them, and provide appeal boards for hardship cases. Such a system in a peacetime economy would require a Government bureaucracy that is not yet organized. They would need to make a lot of tough decisions on where joyriding stopped and where necessary travel began. By the time it got organized and working we would most likely have run completely out of gas.

There is no really good way to ration but in the circumstances there is no alternative. And the country really can't afford a long debate over how to do it. The greatest danger by far is to drift ahead hoping that the problem will somehow go away.

I happen to think that a basic rationing system for gasoline could be quickly implemented. In the interests of facilitating public discussion I'd like to outline an approach that would not involve a complicated bureaucracy and would call on market forces for help without placing a burden on the consumer. I offer these personal thoughts knowing they are incomplete and could be improved with the hope that they might spur quick action by the Federal Government.

Gasoline could be rationed by estimating the assured supply from domestic production and imports that we know will continue and issuing free coupons to each licensed car owner for an equal share of most of what would be available. This basic ration would amount to about 10 gallons per car per week if the Arab boycott continues. These coupons should be made freely negotiable to encourage car owners to pool their coupons and form car pools or drive less and sell them to people who need or want more gas.

In addition, a small fraction of the coupons would be sold by the Government each month on a first come, first served basis, at say 30 cents a gallon, with the price and number of coupons available adjusted each month in light of supply and demand. An alternative to the Government selling ration tickets would be to impose a tax of say 30 cents per gallon, while also issuing coupons as described above and providing that the coupons would entitle the holder to gasoline without paying the extra tax.

The Government would, in effect, be using the marketplace instead of appeal boards to allocate a small portion of the gas. The money from the sales of these coupons or the tax should be used to buy new buses and otherwise improve public transportation systems. Service stations would be able to obtain replacement gasoline only in an exchange for the coupons they collected from their customers. An integral part of any such rationing plan would be to impose price controls on the scarce energy that would ensure that the energy companies do not reap windfall profits.

The reasons for earmarking some of the gasoline for a market determined allocation is that in a peacetime economy it would be hard for a rationing board to decide on who should get a priority. Furthermore, it is important for consumers to think in terms of gasoline being worth, say 30 cents a gallon more,

and making their decisions accordingly. Otherwise the pressure on the rationing system will be great and the danger of blackmarket operations that much greater.

Mr. Chairman, I present these thoughts, not as a definitive plan, but as a basis for proceeding at once. If hardships or inequities result, exceptions could be added. But in the current circumstances the longer we delay the tougher and more complicated the job will become.

It is important that we also give high priority to measures that will save energy, not only this year, but every year in the future. Actions in this category would include:

(1) Federal low-cost loan programs or tax incentives to facilitate more insulation, storm windows, and other investments in existing buildings to save energy automatically each year.

(2) Large-scale Federal support for public mass transportation. On the average in the city you can get where your going on a bus with one-third the fuel required than if you drive your car.

(3) Federal funding for the construction of bicycle paths on an urgent basis. There were more bicycles than cars sold in the U.S. last year and people will ride them much more if they can do so without the danger of injury and pollution on the city streets.

(4) Taxes or performance standards that would result in new cars being built that have much better mileage. More cars that get 20 miles per gallon rather than 10 can be built in the coming year and a family car that does 35 miles per gallon is entirely feasible in the future.

(5) Enactment of a stiff tax on the use of scarce natural gas and oil as fuel by industrial plants. This would encourage greater efficiency and switching to domestic coal in the years to come.

There is not time to discuss all the energy conservation actions that could be initiated. Most of the discussion has centered on houses, office buildings and transportation. But industry can save energy too without cutting down on industrial production if they have sufficient time and incentive to adjust. We must distinguish between a sudden unexpected shortage which could cause unemployment from a future in which industry can adjust to the fact that energy is a scarcer and more expensive item. In the current emergency keeping production and employment going should have a very high priority—wearing a sweater at home cannot be compared with the loss of a paycheck. But in the future, industry can expand and employment grow with a slower rate of growth in energy consumption than in the past.

Mr. Chairman, the word crisis in the Chinese language consists of two symbols one meaning danger, the other opportunity. We know the danger but there is also a great opportunity. The coming months can be a time when America looks in the mirror and sees what a mess it has made of its cities, and how we have permitted the surrounding countryside to be covered by unplanned circles of growth.

We have created an America in which people live and work in buildings constructed and operated with no concern for saving energy: an America where people on the average live further and further away from there work and spend more and more time in cars that get fewer and fewer miles per gallon; an America where industrial establishments have paid no more attention to the efficiency which they use energy than the average household. There is little doubt that we have created the most wasteful society on Earth in the use of energy and material resources. With 6 percent of the worlds population we consume 35 percent of the worlds energy. Our appetite for energy has grown much faster than our ability to produce extending our energy lifeline half way around the world to the large oil wells in the Middle East.

In a way this Nation is very fortunate that the boycott has occurred now. For what it does is to telescope the future and show us that the path along which we were sliding is a dead end. Even if the Arab-Israeli dispute did not exist, it is not in the cards for America to continue a gluttonous way of life in a world where most of the people live in a perpetual energy blackout.

We are witnessing the end of an era. As much as we hate to face up to it the joyride is really over. But that does not mean that we are on the road to a Spartan life, nor does it mean that we cannot in the coming years develop transportation systems, cities and indeed life styles that are superior to what we must leave behind. To fashion a new America will involve a whole lot more than an energy policy. But since energy is the life blood of modern society it might provide the focal point.

If we could develop an energy conservation ethic it could lead us to solutions to a great many of the ills that beset America today. Modern mass transportations, new cities, either within existing communities or elsewhere, and planned growth in knowledge-intensive industries, are all needed to meet basic needs of society as well as to balance the Nation's energy budget. Growth in these areas that have suffered from too little growth in the past could reshape the GNP in a way that could provide more of the goods and services that America really needs and cut out much of the wasteful use of energy that is a root cause of our current problem.

If the current crisis could wake us up to the need for embarking on a sounder and saner pattern of growth it could turn out to be the luckiest thing that could ever happen to us.

Mr. Chairman, in conclusion it is important that we do not permit the current crisis to give conservation a false blackeye. We are in trouble because we were trying to consume too much, not too little. The Arab boycott may be the proximate cause but if there is hardship and unemployment it has its roots in a decade of Government policy which encouraged the energy companies to push their products with green stamps and promotional rates. Rationing is a by-product of the policy of promotion and the failure to take actions that can save energy, save money, save the environment, and improve the quality of our lives in the process. The answer to this winter's problem is not to give up on the future but rather move to a pattern of growth and sources of supply more in keeping with a durable society on a planet of limited resources.

Chairman HUMPHREY. Mr. Freeman, I want to express a note of personal thanks to you for some very thoughtful and sensible proposals. They are provocative, and they give those in the Government who are working on these matters something to measure and think about that could be very helpful.

So that I may understand with some degree of precision here, you are talking about dividing the available supply that we estimate is available, taking into consideration the boycott, and prorating that supply individually, on which basis you estimated that we would have about 10 gallons per week per car, is that right?

Mr. FREEMAN. Yes, Mr. Chairman. I would make conservative assumptions about the imports, recognizing that probably in the coming months some of the imports from non-Arab nations may be diverted to Europe and Japan, and recognizing that some of the imports from Canada and Venezuela will be in that category. We would make a conservative estimate of what we know we have got, recognizing also our shortage in refining capacity and all the bottlenecks in the system. Then knowing what the people can have in the next year, we should issue ration coupons on a per-automobile basis, with a pro-rata share for everyone as an initial ration, perhaps reserving 5 percent and whatever extra we might have for distribution by the market using either the tax option or the coupon-purchase system.

Chairman HUMPHREY. Now, let's say, for example, that you were talking about 30 cents a gallon. The first 10 gallons would be tax free of that new tax. Is that correct?

Mr. FREEMAN. That is correct.

Chairman HUMPHREY. And then there would be additional gallonage available, and you would be able to get tickets for it, but you would have to pay the extra 30 cents?

Mr. FREEMAN. That is right.

The hope is that, with the coupons in a sense worth 30 cents a gallon, peope will start making their decisions about driving cars on the basis of gasoline being worth about 80 cents a gallon. If they coud save it, they can, of course, sell their coupon and get the money. I think it is necessary to try to get some help from the marketplace if we can do so without soaking the consumer.

Chairman HUMPHREY. Wouldn't this result in sort of like scalping tickets at the football game?

Mr. FREEMAN. The difference is that everybody gets some tickets to begin with.

Chairman HUMPHREY. But wouldn't there be kind of a buildup, a marketplace estimation on what available tickets there were, wouldn't you start to get really some brokers in the ticket business, the gatherers that say, "Look, I can get to a ticket company or ticket user; I can pick you up a few tickets; I've got a little operation going in Detroit or Washington, and I can pick up a thousand tickets, but it is not going to cost 30 cents a ticket. If you want them, brother, it's going to cost you $1.50 a ticket."

Mr. FREEMAN. I don't think there is any way that we can avoid that kind of a shenanigan, if you want to call it that, in any kind of rationing system. It seems to me that when you have a supply that is this much less than demand, and you try to ration it, there are going to be some people trying to make a fast buck on it. But I would say this: the idea that I propose at least gives everyone a fair chance to make a profit on his tickets if he wants to. It has a basic equity to it, I should think.

Chairman HUMPHREY. You put this rationing on gasoline. But what about heating oil?

Mr. FREEMAN. I thought that the gasoline issue is the key issue. We devote over 50 percent of a barrel of crude oil to gasoline. And, in a sense, heating oil and the household consumption of natural gas is a matter that perhaps is not susceptible to quite the same system. On heating oil the Government is going to have to do something along the lines that Mr. DiBona suggested, with sharper and clearer warnings to people soon—in the sense that heating oil is going to have to be rationed by the fuel dealers. I frankly am not sure that even the system I am talking about could be implemented quickly enough to handle the situation this winter. We will have to have rationing of heating oil and work across the board with many mandatory mechanisms.

Quite frankly, I thought of the system only in terms of gasoline, because I though that was the crux of the problem. The other point is that, if we can ration gasoline, then there will be more flexibility in making more heating oil and middle distillates out of the barrel of crude. And if we could solve the problem of equitably allocating to the ultimate consumer the gasoline that we have available, I think that the lessons we learn there could be applied to the other fuels.

Chairman HUMPHREY. I agree. I just want to get your explanation, because it is a barrel of crude we are talking about, and if you can save

on the gasoline there will be much more crude left for other fuels that you need. I just want to have our record more precise on that.

You have listened to the testimony this morning, and you have been very much involved in this for a long time, Mr. Freeman not only in the energy problem, but the energy question as a part of our total economy. Do you believe the administration appreciates the gravity of the situation, and the size of the looming shortage? From what you have heard, and what you have read, does it seem to you as a citizen in this country that the Government really understands what we are up against?

Mr. FREEMAN. The administration is not a monolithic unit. It consists of a lot of individual people. Many of them understand the situation. And in listening to Mr. DiBona this morning I had a feeling that he had a grasp of the facts and understood what needed to be done. The real question is whether there is the willpower at the very top to take the actions that are needed. We were advised, I think, very early in this administration, to watch what they did and not what they said. I guess I am personally in favor of most of the words that I hear. The President's messages keep getting better each time. The only trouble is that the problem keeps getting worse faster.

Chairman HUMPHREY. We saw what happened on allocations. They just waited and waited until the very last minute, and the allocation program is in trouble right now.

Mr. FREEMAN. I am hoping for the kind of action that Mr. DiBona indicated from his review of the facts is needed. It seems to me that we don't have time for a debate on whether we use option one or option two or option three. Anyone who drives to work in the morning, or looks around, can see that by and large we are proceeding on a business as usual basis. The country is waiting for leadership to tell them rather precisely what sacrifices they need to make with an understanding that everyone is making them.

I have a lot of faith in the ability of the American people to weather the crisis and, as we said earlier, to turn the corner to make some fundamental reforms. But I think it is going to take more decisive action-oriented leadership than has yet been implemented, although I must say that I have a feeling that a great many people at the top of the Government understand the problem quite well.

Chairman HUMPHREY. The Government speaks with many voices. I was very much disturbed this weekend to read that the President downgraded the possibility of rationing. It seems to me that, when the administration alerted its forces here a couple or 3 weeks ago because of the Mideast crises, that had a traumatic effect upon the country. Everybody was talking about it at once. They went on to deal with the situation as one involving national security, and it was dealt with decisively and, in the eyes of some, too overtly dramatically.

Now, here we have a situation that is really a continuing one and, according to what I read and what you said—and I listened to you before—that situation is going to get worse before it gets better. The easy days are over and behind us, and things are going to get more difficult year after year, even if the Arabs embrace us. Is that your view of it?

Mr. FREEMAN. I don't see any help coming of the kind that has been suggested. Our research and development programs can't come

through with very quick results. But, still, we are not a helpless pitiful giant. This country can balance its energy budget. I think we have to distinguish the actions that are needed immediately and take them, but not use the energy crisis to sell controversial, often counterproductive policies that will shape our future. I refer specifically to the feeling that somehow we can water down the clean air laws on a semipermanent basis. Wearing a sweater at home at night is, I think, a mild inconvenience compared to living in the kind of polluted air that we now have in our cities. If anyone has been in Tokyo, as I was 2 weeks ago, and seen a traffic cop out there directing traffic with a gas mask on, you get a view of the future that is chilling. This country has the technological capability to develop a clean energy future.

What disappoints me is the failure to hear that a determination to implement the environmental goals and to protect the consumer is part of the development of a national energy policy, and this failure is coupled with the failure to take decisive steps that would really do some good this winter. These are complicated issues that deserve thoughtful debate. For example, we are urged to embrace a massive support program as one of the items in the President's legislative program. If we are not going to be able to import much oil from the Middle East, it seems to me dubious wisdom to make a superport program one of the "must" items in a crash legislative program.

And the same can be said for some of the issues dealing with the decontrol of natural gas, an issue that has been fought over since 1954, while the country had ample supplies of gas for 15 years under price controls.

There are a number of these issues that are terribly controversial that seem to be swept under the so-called energy crisis rug. Meanwhile, we are not taking the kind of action to cut spending in energy and balance our budget deficit. We need those cuts immediately, in my view.

Chairman HUMPHREY. I want to thank you. I couldn't agree more. And I want to especially thank you for placing here on the record again the balance that is needed. This business of trying to repeal the Environmental Protection Act, this business of trying to revise the whole Natural Gas Act, all in the name of the energy conservation, I think, is complicating people's understanding a great deal. And the lack of interest in what happens to this consumer, in terms of prices or availability or equitable distribution of supply, I feel also is something that needs to be emphasized.

My final question: Do you recommend rationing now?

Mr. FREEMAN. I do.

Chairman HUMPHREY. Promptly?

Mr. FREEMAN. As soon as we can get the coupons printed and issued. It seems to me otherwise you are running the risk of the very thing that Mr. DiBona was talking about, of marching up to the top of the hill and falling off the cliff.

Chairman HUMPHREY. Thank you very much.

Senator PROXMIRE. Mr. Freeman, you differed with Mr. DiBona, as I understood it, on the degree of the shortage. He said it was about 17 percent—he estimated it under various assumptions, but it seems to come out at about 3 million barrels a day. Do you have a different

figure? You said 2 to 4. Does that mean that you think—just roughly—that it is a little more, or are you more precise than that?

Mr. FREEMAN. Senator Proxmire, I think that anyone who attempts to tell this committee that he knows the extent of the shortage with any degree of precision is kidding himself. And I would add that my range of figures reflects a greater degree of pessimism, perhaps, than Mr. DiBona has about his ability to increase supply.

Senator PROXMIRE. That was something else. As I understand it, you felt that with his increase in production and the reduction that he estimated, we might be able to get in consumption would add up to a total of 2.3 million, and you thought that was too optimistic? Of course, he said it was optimistic, too.

Mr. FREEMAN. The item I would mention over and above the shortage items that he mentioned, is the natural gas shortage that would be cumulative to the oil shortage. He also did not mention the fact that we start with a drought in the Pacific Northwest where we have less energy than we had expected. He also didn't seem to consider the possibility that by choice, or because it would happen anyhow, some of the imports from Iran, Nigeria, Venezuela, and Canada, that we expect to receive in this country might go to Japan or Europe because their situation might be so much more desperate or because they might outbid us for some of these supplies, or——

Senator PROXMIRE. There has been a tendency on the part of almost everyone in the administration and many of the people in the economy, on the basis of the Wall Street Journal article, to feel that the whole thing depends on the duration of the Arab boycott. I have heard the other day that if the Arab boycott were over today, that we would still have shortages, that it would require some kind of conservation, plus rationing for a while. What is your view?

Mr. FREEMAN. My view is that we were in for a shortage of energy without the Arab boycott. And most of the measures that have been taken thus far which are short of rationing will be needed in one degree or another without the Arab boycott. At this stage of the game if the Arab boycott ended tomorrow, there is already enough withdrawn from the system that we would be in a precarious situation.

Senator PROXMIRE. In addition, isn't it true that we are operating at close to 100 percent of our refining capacity? Isn't it also true that we are increasing our consumption at a 3½ or 4 percent rate a year compounded, so that many people argue that we will be consuming five times as much energy at the end of the century if we continue at this pace?

Mr. FREEMAN. I think one way of describing it was that the Arab boycott was the straw that broke the camel's back—we are sliding into more and more of a deficit each year. And this just telescoped the future. We had a shortage of refining capacity, and the Arabs have taken care of that—we don't have a shortage now, because we don't have the crude. But that doesn't mean that the shortage still isn't a bottleneck. If the crude supply were resumed we would be short of gasoline next summer anyhow. Many of us stated that a year ago—that the gasoline shortage was going to be worse in 1974 than in 1973 and still worse in 1975. What has happened now is that the uncertainty over imports has caused the oil companies probably to again

delay, or put a question mark around their expansion plans for refineries. We have yet to really fully appreciate the enormous and complex problem and the fact that we are going to be living in a decade of tight energy supply. Perhaps that might be a way of life for more than a decade. And it might not be all that bad.

Senator PROXMIRE. So we are likely to have rationing or something close to it, rationing perhaps as much as 5 or 10 years, when you consider the enormous explosion of demand for oil all around the world, and the thinking of the Arabs that they have a terrific asset that will increase in value as the time goes by—on the other hand, those assets are going to be depleted as they sell them off. If I were in the Arabs' position, certainly from the standpoint of my economic benefit, I would be very reluctant to end the boycott. I would be very happy to see a system in which you would tend to sell on a measured basis, and let your price rise, and not permit the boycott to be ended and sell whatever the market would take over the next few years.

Mr. FREEMAN. There is no question that was an option the Saudi-Arabians were considering before the use of oil as a weapon came into the picture. Actually, Lybia imposed a flat ceiling on its oil production years ago, for the very reason that you suggest. In a sense we were in trouble before the Arab boycott came into being. I am not sure I would be advocating rationing now if the Arab boycott had not occurred, but it seems to me very fortunate in a way that the situation may be acute enough that we will do something about it. The American people and the American Government, I think, have a habit of really not taking action until we sort of see the whites of the eyes of a problem.

Senator PROXMIRE. There is a limit on the price, however—at $6 a barrel—we then begin to find oil shale would be commercially feasible and economically feasible, and at that point we can bring in our huge oil shale resources, which are bigger than the resources the Arabs have.

Mr. FREEMAN. One thing that we have to remember—I know both you and Senator Humphrey have been concerned with the development of these oil shale resources for many years.

Senator PROXMIRE. Paul Douglas led that fight himself many years ago. In fact, we have had a couple of phases on that. In the twenties we started to develop it, and then curtailed it. Right after World War II, we began again and then cut it back.

Mr. FREEMAN. Oil shale is a good example of the point that I want to make that we have to remember the leadtime. The price of oil may be high enough to make oil shale feasible now but that doesn't mean you can turn on the spigot tomorrow. It takes us 5 years to build a powerplant in this country that we think we know how to build. I would say the leadtime in bringing any appreciable amount of oil shale on the scene is longer, in the 1980 time frame. We have serious environmental problems, which seem to me to be the major constraint in developing oil shale at any fast pace.

Senator PROXMIRE. We have an economic problem that this committee is very aware of, with housing in difficulty, with automobiles in real difficulty, the two major consumption items. One of the big forces we had in the economy was business investment in plant and equipment.

That was expected to increase very greatly in the coming year—it increased last year. And we had expansionary pressures from that direction. Without that, of course, we would probably be moving toward a recession at least. Do you have any doubt that the present uncertainty about the future of energy supplies will have a very severe effect on the other investment plants, just as the shortage of food is bringing the refinery capacity into question?

Mr. FREEMAN. I think it really depends on how promptly and effectively we implement those conservation measures. As I mentioned at the beginning of my testimony, we have enough slack in our system, enough fat, that if we really get tough with the joy riding and with the overheating and overcooling of buildings, and with industrial users that are not so crucial—for example, 3 percent of our whole electric power——

Senator PROXMIRE. Let me interrupt. Is there a feeling that we are going to get that tough? Did you hear the President speak Saturday night, and come down so hard against rationing? It would seem to me that if I were in a corporate office and had to make a decision as to whether to proceed with a 100-million-dollar expansion program, I would be very concerned about whether or not I would be able to do it and maintain that tremendously big operation if my fuel supplies were going to be reduced. I think I would postpone it. If many postpone investment plans, that means a recession.

Mr. FREEMAN. There is danger implicit in this situation. I certainly am in no position to predict what will happen. I just feel that if we could take strong enough action we could avoid the worst of it. But, how it will turn out is a very sober question.

Senator PROXMIRE. Just a couple of more questions. I agree enthusiastically with your attempt to combine something like a free market with rationing, I think it is ingenious, and rationing isn't going to work at all in peacetime unless you do have some kind of a free market addition one way or another. But what does this do to the people who really have to use a lot of gasoline, taxi drivers, farmers, small business delivery systems, and that kind of thing, where people are going to need a whale of a lot more than 10 gallons a week if they are going to stay in business?

Mr. FREEMAN. The legislation the Congress just passed, the allocation legislation, gives the Government the power to allocate. Allocate I define as simply rationing and wholesale.

Senator PROXMIRE. Would you say that in that case they might have more than 10, 20, or 30 gallons or whatever?

Mr. FREEMAN. It seems to me that very identifiable end uses such as you mentioned could get a somewhat larger share before the great bulk of the people are allocated on an equal basis. I was simply trying to avoid the problems of ration boards in the field and individual citizens trying to compete with each other for the favor of a rationing board, which in peacetime I just don't see how would work out.

Senator PROXMIRE. In your prepared statement you talk about how this may be a blessing in disguise, and it telescopes the future and shows that the path we are sliding along is a dead end, I think that is very helpful and thoughtful expression here. But I just wonder

how we get to this situation where we have an attitude on the part of our country that people want to conserve energy. After all, it is a great thing to be able to get in your car and drive on a beautiful fall, spring, or winter day for that matter. It is pleasant to take your family out traveling, or to take a nice long motor vacation. This is the kind of thing people like, and it takes a whale of a lot to reverse that attitude. It seems to me that rhetoric won't do it. But we have to overcome it somehow. The only thing I can think of in the longrun that is workable is the market price, let the market prices really go up. That would tend to discourage it. We don't want a generation of rationing.

Mr. FREEMAN. We certainly don't. I agree with you that for the long haul the market price can reflect the value of energy, and people will have a greater incentive to save if they can save money in the process. But I don't think any of us would want suddenly, in a time of acute shortage, to jump to a full market oriented solution for the reasons that we have always mentioned.

On the supply side, we have an abundance of coal in this country, and there are areas that can be stripmined and reclaimed, where the countryside is rolling and the rainfall is sufficient. We have technology that is on the verge of being implemented to take the sulfur and the contaminant out of coal. There need to be authoritative voices coming out of Washington to tell the industry that those pollution control devices should be installed and made to work. I think a tax on the scarce energy, with perhaps an investment credit for making the conversions, might be something worth considering. It seems to me that we need a national commitment over the next 10 years to convert all of the industries that have just facilities for making heat from oil and gas to coal. That I think is much more implementable, much more feasible than believing that somehow the R. & D. problems that are just on paper today, and in small pilot plants, can be completed, and that we can get any commercial hardware from them by 1980.

Senator PROXMIRE. I am talking about the life style of 200 million Americans—George Herman had a delightful little suggestion on the radio. What he said is: "Let's put meters on everything." So when you put your toast in the toaster you see it is costing a couple of cents; when you turn on the TV it is costing you a certain amount. When you are driving your car it is kind of like a taxi meter—meters attached to everything you use, so you begin to do a lot of walking.

Chairman HUMPHREY. His brother-in-law is in the meter business, no doubt.

Senator PROXMIRE. If not, he is going to get into it.

Mr. FREEMAN. My observation is that the American people are very anxious for an opportunity to improve their life style, and if we just make the public investment to improve transportation systems and put to work the technology that we have, that we would have a great deal of support for such activities, activities that would save energy. For example, beefing up the railroads in this country, perhaps electrifying them, so that we do not depend entirely on the petroleum, which is our troublesome source of energy. The fortunate aspect is that many of the plans that over the long haul will get us out of the energy deficit are needed to solve other problems, such as cleaning up the air and eliminating the transportation bottlenecks of this country.

Senator PROXMIRE. Thank you very much.

Chairman HUMPHREY. Thank you, Mr. Freeman, very much.

We are going to continue in the hopes we can complete our testimony here. I am going to ask Mr. William Ball to come next. And we will try to keep our questions down and see if we can't proceed here and get most of this out of the way.

Mr. Ball, you are chairman of the public awareness committee, St. Cloud Energy Commission. I was there in your community, as you know, and I want to compliment your civic leadership upon the program that you have initiated there. You may want to tell us about it, and I thought it would be good if you have for this record what is going on in a thriving community where you are taking the local initiative.

STATEMENT OF WILLIAM J. BALL, CHAIRMAN, PUBLIC AWARENESS COMMITTEE, ST. CLOUD ENERGY COMMISSION

Mr. BALL. Thank you, Senator. It is certainly a pleasure for me to represent Mayor Alcuin Loehr before this committee.

The St. Cloud energy situation became a matter of vital concern in December 1972 when St. Cloud heating oil reserves reached a dangerously low level. An areawide crisis was averted only because of unusually mild temperatures during January and February. Fuel problems arose again in May 1973 when the St. Cloud airport was threatened with the cutoff of their aviation gas when a major fuel supplier withdrew from the St. Cloud area. As the result of these two events, St. Cloud Mayor Alcuin G. Loehr organized an energy study commission in May 1973 to assess the fuel and energy situation in the St. Cloud area. Gordon Haglund, president of Consolidated Oil Co., a major St. Cloud fuel distributor, was named chairman of the group which soon became the St. Cloud Energy Commission. Mr. Haglund, along with other members of the community including energy suppliers, large industrial energy users, the St. Cloud Civil Defense Department and St. Cloud area citizens together outlined a program to identify the St. Cloud energy situation and to inform residents of the St. Cloud and national outlook.

As a member of the energy commission representing a large industrial user, I was named to head a public awareness committee whose objectives were identified as follows:

(1) To create an awareness of the local and national energy situation.

(2) To gain support for current and proposed energy conservation programs.

(3) To encourage participation by St. Cloud area businesses and residents in energy conservation programs.

(4) To prepare citizens of the St. Cloud area for possible mandatory conservation or allocation programs in the future.

In order to accomplish these objectives, the public awareness committee was divided into three subcommittees, each with a specific assignment relating to overall objectives. A public relations subcommittee was established with responsibility for transmitting energy related information to the public through the news media. A second subcommittee was established as a speakers' bureau to provide both

qualified speakers and source information for direct communication to the St. Cloud community through school groups, business meetings, service clubs, churches, and other citizen groups. The third public awareness subcommittee was assigned the responsibility for planning and implementing an Energy Week promotion to focus public attention on the energy situation and to encourage communitywide participation in energy conservation programs.

It was decided that a fall date would provide the right setting for energy. During late October and early November, Minnesota residents begin to prepare for a long winter that normally includes 2 or 3 weeks of subzero temperatures. And, since a late October chill in the air can usually be relied on to provide a preview of winter, it was decided that this would be the best time for Energy Week. Residents would be thinking about heating their homes and would be much more receptive to conservation programs at a time when the threat and problems of a fuel shortage could easily be seen. Therefore, Energy Week was proclaimed by the mayor of St. Cloud for the week of October 29 through November 2, 1973.

Preparations for Energy Week included a comprehensive program to involve all aspects of the St. Cloud community in Energy Week activities. Literally every sector of the community was involved in energy programs either through the publicity given Energy Week activities or through their own direct participation. The Energy Week Subcommittee was expanded to include members of the St. Cloud school systems, local merchants, local manufacturers and processors, local churches, the news media, energy suppliers, service clubs and individual citizens.

It was decided very early in the planning stage that Energy Week needed a focal point in order to center public attention on a key event related to the energy situation. Because of his active leadership in energy conservation programs, Senator Hubert Humphrey was invited to address an energy luncheon for business and civic leaders of the St. Cloud community. Other speakers invited to participate in the energy luncheon included St. Cloud Mayor Alcuin G. Loehr, St. Cloud Energy Commission Chairman, Gordon Haglund, and Minnesota Civil Defense Director, James Erchul.

At this point, I would like to introduce another celebrity. This is "Little Quintus," a citizen of St. Cloud who symbolizes our interest in the wise use of energy. Quintus was created by the St. Cloud Energy Week Committee to serve as a visual reminder of energy conservation programs throughout the community. The name given our friend and the Roman numeral V on his shield reminds St. Cloud citizens to turn their thermostats down 5 degrees. To emphasize that point, the thermometer replaces the more traditional sword in his right hand. Our friend Quintus became our mascot, our leader and our energy ambassador by providing a central theme and symbol to be used in all Energy Week advertising and promotional programs.

These Energy Week programs included a variety of activities planned to emphasize energy conservation throughout the community. Examples include:

"Little Quintus" energy reminder stickers were distributed to area businesses including merchants for their use as bag stuffers.

Manufacturing plants held employee meetings to emphasize energy conservation measures within their operations and in the homes of employees.

Free bus service on 2 days of Energy Week was arranged with the Metropolitan Transit Commission to encourage the use of public transportation rather than private automobiles.

An energy conservation poster contest was conducted in St. Cloud area schools with prizes for the most original presentation of energy conservation ideas.

Area merchants promoted Energy Week through advertising and special sales on energy conserving products such as sweaters and furnace filters.

The local news media provided extensive publicity describing Energy Week activities including both news reports and the presentation of energy conservation tips.

A citywide energy saving contest was conducted with prizes for the best energy conservation suggestions.

Energy Commission members appeared on local radio stations and television programs to discuss Energy Week and other energy topics.

In total, energy conservation became a known and popular subject throughout the community. The major energy speech given by Senator Humphrey at the energy luncheon indicated the importance of St. Cloud Energy Week activities. The extensive press coverage provided by the local and regional press indicated acute interest on the part of area citizens and provided them with further information on the energy situation. In total, interest and cooperation on the part of every segment of the community provided the timeliness of this program and the interest and support provided by an informed public.

A more concrete indication of the success of St. Cloud Energy Week can be seen in the followup and continuing programs undertaken throughout the community. I would like to give you a few examples of these independent actions taken voluntarily on the part of members of our community.

Merchants associations throughout the St. Cloud area have proposed plans for drastically reducing or eliminating Christmas lighting displays. Merchants have also turned out advertising signs and cut down on the use of display lights. They have reduced their thermostats to 68 degrees and are now considering a reduction in store hours during the coldest winter months to conserve on fuel and electricity.

Senator PROXMIRE. Mr. Ball, let me interrupt for a minute. I have to leave right now. But I do want to congratulate you on a superlative effort. This is the kind of thing that should be done throughout the country. You set a fine example for the rest of the country. I have had a chance to go through your statement, and I see you have gotten results. I think this is most imaginative, it is a superlative example for the rest of the country.

Thank you very, very much.

Mr. BALL. Thank you.

Chairman HUMPHREY. Proceed, Mr. Ball.

Mr. BALL. The St. Cloud Area Chamber of Commerce assumed a major role in continuing energy conservation programs by organizing task forces for all chamber divisions. These groups will visit and

provide energy advice to all area businesses to insure that St. Cloud fuel shortages have a minimum effect on the local economy.

Many St. Cloud manufacturers and processors have taken independent decisive actions to conserve energy. Holes-Webway Co., a manufacturer of photo albums, has adopted a 4-day workweek by eliminating Friday operations through the winter.

Our company, DeZurik, a manufacturer of industrial valves and related process control equipment, has adopted a number of energy conservation programs including a night blackout of all except emergency lighting and a reduction in temperatures throughout the building. We are also actively seeking a means of using heat generated in the foundry to heat our building. During Energy Week, we conducted an energy contest with prizes for the best employee suggestions for conserving energy. Those suggestions relating to plant operations are currently being studied by our engineering department.

St. Regis Paper Co. in Sartell, Minn., is emphasizing the conservation of plant services including steam, compressed air, electricity, and water.

The most important contribution of Turbodyne, a manufacturer of gas turbines for electrical generating plants, is an around the clock work schedule in order to meet utility plant construction requirements.

The city of St. Cloud has reduced electricity consumption by cutting out unnecessary lights and lowering the wattage of bulbs in halls and other noncritical areas. The police department has been instructed not to leave patrol cars idling unnecessarily and the fire department is keeping its main doors closed. Studies have been undertaken to inspect all public buildings and assure the efficiency of insulation and heating systems.

Churches throughout the community have emphasized energy conservation through programs in their own buildings. More important, however, the local ministerial association has gotten together to encourage members to preach energy conservation sermons emphasizing both the social and moral requirements to use this natural resource wisely.

St. Cloud area schools are incorporating a variety of energy conservation programs including reductions in lighting and of building temperatures. The Sauk Rapids, Minn., school system has taken measures to control the cold air intake on furnaces.

Since all schools have interruptable fuel contracts, schools throughout the St. Cloud area have made plans to schedule makeup school days during warmer spring months in the event of closure due to fuel shortages.

Perhaps most important of all conservation programs are the actions taken by individual citizens to conserve energy in their homes and in their private automobiles. At present the St. Cloud Energy Commission Public Awareness Committee is outlining a program to study the effect of Energy Week and the degree of participation by individual citizens in energy conservation programs. It is apparent, however, that many of these measures have been put into practice already. A reduction in highway speed around the St. Cloud area can readily be seen. Many individual citizens have reported on energy conservation measures in their homes including turning down of their thermostats,

the checking and improvement of insulation in their homes and a conscious effort to cut out unnecessary lights. The St. Cloud Jaycees' annual Christmas home decorating contest this year will give prizes not for lighting but for displays which do not use energy.

Members of the St. Cloud Energy Commission feel that Energy Week was a major success in the St. Cloud area. Cooperation with Energy Week activities indicated the acceptance of energy commission programs by all segments of the community. More importantly, voluntary actions taken by individual citizens and businesses have demonstrated the success of public awareness programs which brought the facts of the energy crisis to citizens of St. Cloud, Minn., in a believable and meaningful way.

Most important of all, however, are the followon programs now underway in both the public and private sectors of the community. Energy Week by itself would mean nothing if it did not result in concrete actions by public officials, business groups, school officials, and individual citizens. The task force approach is designed to achieve positive and unified action throughout all segments of the community. We believe that these local programs combined with leadership initiatives at the State and National level can result in an energy conservation plan which will have the backing of the people of this Nation. And if the people are behind it, the plan cannot help but succeed.

Thank you.

Chairman HUMPHREY. I am very grateful for your presentation here today, Mr. Ball. And I want to say that the reason you were asked, or the community was asked, was because in visiting St. Cloud and reading the materials that were presented to me during my brief visit with the leaders of the community, I came to the conclusion that here was a community that was doing what other people were talking about. And I would like very much for this proposal of yours and the actual program that follows the proposal to be brought to the attention of the authorities here at the Washington level. I wonder, have you briefed anyone in Mr. Gibbons' office? You heard Mr. Gibbons here from the Office of Energy Conservation of the Department of the Interior this morning. He was the second witness this morning—have you been called in by that Office?

Mr. BALL. No, we have had no communication from that Office. However, we have sent a copy of our energy press kit, which you received a copy of, to Governor Love and also President Nixon, but we have had no response from those offices yet.

Chairman HUMPHREY. Has Mayor Loehr sent any of this material to the National Municipality League, for example, or the National League of Cities?

Mr. BALL. Not to my knowledge.

Chairman HUMPHREY. I would recommend that you do so. You tell the mayor that I suggested that both the Conference of Mayors and the League of Cities or the National League of Cities, and also the Conference of Governors, should receive information about this program. In fact, if you have the information, if you have the press kits available, we will see that they get there.

Mr. BALL. Fine.

Chairman HUMPHREY. But I do think it would also be very good to have the mayor or your energy group to follow through.

Mr. BALL. Yes, we can take care of that.

Chairman HUMPHREY. I would ask that a member of our staff get copies of this. Do you have extra copies of this?

Mr. BALL. I brought some extra copies, and we can provide others.

Chairman HUMPHREY. We can also follow through, but I want you to follow through from the local basis because it sometimes means more to hear from somebody at the operating level in the local community.

Do you have any comment that you would like to make about the testimony this morning insofar as Federal Government witnesses are concerned? Did you feel the sense of urgency here on the part of the Federal Government?

Mr. BALL. Senator, one thing that I would like to comment on is that the energy crisis is nothing new to us in Minnesota. We dealt with this crisis last winter. We were actually short on fuel oil at certain parts of the winter. And as I indicated earlier in my testimony, if we had not had an unusually mild winter in Minnesota we would have had a severe crisis in fuel oil last year. So this is not something that is new to us. We recognized last May when this was set up that we were probably going to have a shortage in Minnesota and in the north-central area, even without what has transpired subsequently with the Middle Eastern crisis. So that we don't feel that there is anything new about this. We don't feel that the Middle Eastern crisis is the thing that created it. We feel that this is something that was coming on us, and it is going to be a continuing thing. I do feel that we have not had at the national level the same feeling of urgency about this. And as you see, one of the things that we tried to do is to get across to our citizens, our local citizens at least, the urgency of this. But we feel that unless this is also coming from the national level, that our State and national offices have to have the same sense of urgency, or the people aren't going to believe that we are telling them the straight story. So we really urge you here in Washington to exercise leadership, and exercise leadership promptly, to forego the very urgent problems that we have in this area.

Chairman HUMPHREY. Have you any way of assessing what the effect in any national conservation program in St. Cloud has had upon your fuel situation?

Mr. BALL. As of this time, we have not been able to assess this at all. And I don't think that we will be able to measure it too well for several weeks at least, because, of course, we have just really reached a peak with our energy conservation programs within the last month.

Chairman HUMPHREY. Do you feel that conservation, that intensive conservation in what you call your St. Cloud Energy Conservation Week was helpful?

Mr. BALL. I think it was extremely helpful. Also, practically everyone that I talked to, even though they did not know who I was, would bring up the subject of fuel shortage and the energy problems. And I think this has been a very effective plan, and I would recommend it for adoption on a national basis.

Chairman HUMPHREY. We do thank you very much.

Senator Javits, any questions?

Senator JAVITS. No, thank you.

Chairman HUMPHREY. Mr. Ball, we appreciate your taking the time to come to Washington and share this with you, and giving us those brochures that will present a very different description of what you are doing at the local level.

I again want to say, so that it will be very clear, that the staff is to see to it that copies of this program from the St. Cloud Energy Commission get to the U.S. Conference of Mayors, the National League of Cities, the National Association of County Officials, the National Legislators' Conference, and the National Governors' Conference.

Those are conservation-oriented groups at the request of the President. Here is an actual program that is underway, and not theory, but has been implemented. I am sure that your people would be more than happy to counsel with or advise people that come to you.

Mr. BALL. We would be very enthusiastic about it.

Chairman HUMPHREY. Thank you very much.

Mr. BALL. Senator, I would like to leave my friend, "Little Quintus." here in Washington.

Chairman HUMPHREY. Put him right up here, I would like to have him closer up here so that we can see him.

I notice he is carrying a thermometer. Is it set at 68?

Mr. BALL. It is set at 68.

Chairman HUMPHREY. I came to the conclusion that the room is up that high—when I looked at the thermostat up there, it is set at 60, because those television lights increase the temperature very substantially; as a matter of fact, this may be one of the largest heat radiating operations that you can get.

Now, we want to have Mr. Haufler, executive vice president of the Certain-teed Products Corp., and Mr. Mosely is here representing Mr. Doig of the Shell Oil Co.

Proceed.

STATEMENT OF GEORGE J. HAUFLER, EXECUTIVE VICE PRESIDENT, CERTAIN-TEED PRODUCTS CORP.

Mr. HAUFLER. Mr. Chairman and Senator Javits, you and the earlier speakers have made such a potent case for my subject on insulation and energy conservation in buildings that maybe I should just say that I agree. While we are not in the long underwear business, I think the strong similarity is here.

Basically what I am going to be talking about is bundling up our buildings to conserve energy.

And seriously, I am honored to be here to testify before you—and I trust you will find my comments of some value in pursuing the kind of solutions to our energy crisis.

To keep within the time guidelines for this oral presentation, I am going to abstract in several areas from my prepared statement. And since you have copies of my prepared statement, I am going to go directly to my main topic, specifically, the question of fuel used for home comfort.

In 1970, 14 percent of our energy was consumed within the home * * * and over three-fourths of this was used for space heating and air-conditioning. This is a substantial quantity. By 1985, the total fuel consumption in the United States will have doubled, and at current rates, the home comfort uses will have increased by at least 50 percent.

This increase in usage will certainly keep pace with—and very probably exceed—any increase in fuel supplies. However, it is possible today to cut fuel usage without reducing comfort, and to do this at a minimal cost in both energy and dollars.

Most of our homes are heat sieves.

A vast amount of the heat generated is immediately lost by leaking out through the walls and roof. Our furnaces work overtime to produce warmth which largely rises to—and out from—our attics. More heat can be saved by proper insulation than by any reduction in thermostat setting that people will tolerate. A fully insulated house can be kept at a comfortable 72 degrees with no more fuel expenditure than is required to keep a poorly insulated house at a chilly 61°F.

Fifty percent of our existing homes waste one-third the fuel supplied to them just because they are uninsulated. Although the remaining residences have varying degrees of insulation, added together we are needlessly squandering over 20 percent of the total fuel supplied for home heating—simply because of lack of proper insulation.

Although FHA insulating requirements have recently improved and are moving toward fully adequate standards, most of today's existing homes and a vast majority of new homes now under construction fall far short of those levels.

I know you are concerned about absolute quantities, so let me break this down another way. The average uninsulated house of 1,600 square feet of space wastes 700 gallons of fuel oil each year. While partial insulation helps, some 200 gallons of fuel oil or more will still be wasted because of the lack of full insulation.

Insulation pays for itself. The dollar cost to the homeowner for insulation is quickly paid back in fuel savings. A typical four-bedroom house, with 1,600 square feet of living space, can have the ceilings and walls fully insulated while under construction for $325 and generate a payback in 2 years. A handy homeowner who wants to add insulation in the attic of his existing house can do it in 1 afternoon for $100 to $200, armed only with a sharp knife and the sure knowledge that his fuel bills will go down. An insulating contractor can do the same job of saving energy and money for the homeowner—for about 50 percent more—still a reasonable sum when the work pays for itself in 2 to 5 years. These savings statistics are for a home in the geographic center of population in the United States, which is Belleville, Ill. In colder climates like Minnesota, this payback would be as quickly as 1 year.

Incidentally, these paybacks have been calculated on today's fuel cost, so if we see a doubling of fuel cost as many project, these paybacks are going to be twice as fast.

The potential and the economics, I think, are startling.

The contrast between existing waste and potential savings is also startling. That typical 1,600 square feet single family home is consuming 50 percent more fuel than it would if only 6 inches of attic

insulation were added. A professional insulation contractor or a do-it-yourself homeowner can install 6 inches of attic insulation in an existing home in 1 day. This single change not only pays for itself in fuel savings in a short period, but if implemented promptly on a broad scale, would bring about a large reduction in the "fuel gap" in a relatively short period of time.

Gentlemen, I would like to make this point:

Adding attic insulation to our existing homes is especially attractive because: A. The attic is the most accessible space; easiest to insulate; B. It produces the greatest savings effect, typically over two-thirds of the total savings that can be achieved by insulation; C. The number of existing homes is so high; and D. Payback to the homeowner is so attractive. These are opportunities, but let's look at a problem.

All of these energy savings are available only if sufficient quantities of insulation continue to be available * * * a situation which is now seriously jeopardized by the scarcity of fuel and fuel derivatives employed in the insulation manufacturing process.

The Federal Government is currently implementing a fuel allocation program to all American industry, including the insulation industry, which threatens to worsen the energy crisis almost immediately by shutting down insulation plants. The insulation industry is unique, because it is a net energy conserving industry as opposed to an energy-consuming industry. A properly insulated house saves in each and every year of the building life 20 times the amount of energy required to manufacture the insulation. In just 18 days the energy investment by the nation to provide insulation is paid in full. In 30 years of a building's life the savings amount to a phenomenal 600 times the original energy manufacturing expenditure. Can you make any other investment which guarantees a 5 percent return per day each day for 30 years or more?

While this payback itself should clearly demonstrate the need to keep our insulation plants running, fuel curtailments, and particularly interruptions, make the problem worse by multiplying the energy wasting impact. The critical nature of uninterrupted energy supply is well outlined in my written testimony at this point, so I will omit the technical details of our manufacturing process and simply summarize by saying this: This is a high temperature around-the-clock process. It is not subject to quick changes in capacity. Curtailments have varying effects; all of them are energy wasting. At the least every unit of fuel reduced has a disproportionately larger reduction in output. For example, a 10-percent reduction in fuel reduces the output 15 percent. A 20-percent reduction reduces it 30 percent. And a 30-percent reduction in fuel puts the furnaces out of business.

There is a further loss in time and fuel by cycling, and at worst, serious furnace damage and long outage can be caused by rapid curtailment.

I need to emphasize this point. This is not a 1975 or 1985 question. A fuel curtailment today would start a perpetual 5-percent daily drain on the Nation's energy bank this December, which is compounded daily thereafter. Action is needed now.

Let's look at the Nation's need in this regard. We will be adequately housed and construction will continue regardless of the avail-

ability of installation. Family formations alone demand 2 million new units a year.

What happens if insulation production for these new units is reduced so there is not enough insulation to go around? Simply, these new houses, instead of being fully insulated, will be underinsulated—and, in some cases, inaccessible spaces will remain uninsulated forever.

Instead of returning 5 percent a day to the Nation's energy bank, as insulated homes, they will be withdrawing 5 percent a day from the bank, as uninsulated homes.

With such a large potential of waste that can result from the unavailability of sufficient insulation, I must ask you for relief from fuel restrictions which will be counterproductive when placed on the insulation industry. Such restrictions, in our opinion, would be a penny-wise, pound-foolish policy guaranteed to increase energy shortages. While I recognize that energy regulation is a new undertaking, to date the necessity of energy conservation through continued insulation production has not been given recognition in the allocation of energy supply.

Chairman HUMPHREY. I will have our staff look into this for you.

Mr. HAUFLER. I think we need to cut through the redtape on this. I suggest insulation manufacture needs an immediate essential industry rating which includes phenol, a fuel derivative, as well as fuel itself.

An important clarification I would like to point out, that the primary and preferred fuel used in this industry is natural gas, so we are not asking to get in line for oil allocations. And many economists seem to be indicating that such natural gas would be available if prices were decontrolled.

I would just like you to know that this would be acceptable to us, since the nature of our process is such that the doubling of gas costs would only increase insulation sales prices on the order of 5 to 10 percent, and doesn't significantly affect the economics and the paybacks on insulation that I have discussed.

In the interest of time I am going to defer the testimony on corporate actions for energy conservation.

Chairman HUMPHREY. We will include all the testimony in the record.

Mr. HAUFLER. Thank you.

Certainly energy conservation is everybody's business, and our own experience indicates that industry can make a significant contribution. We believe this starts at the top by adopting a corporate policy to stimulate energy conservation within the company. We did this at Certain-teed many amonths ago, and our internal program consists of three major elements:

(1) A specialized management and technical effort directed toward fuel conservation and efficiency improvement programs at the plants and headquarters.

(2) The enlistment of broad-based employee support for suggestions and cooperation in implementing job-related energy conservation activities.

(3) An educational program for our employees to stress conservation activities in their personal lives and influencing others within their communities.

Following the first phase technical effort, we developed the "Certainteed Energy Savers Group" to involve all our employees and make each of them an activist energy saver at work, at home, in transit, and in the community. This phase of the program is now being implemented in all of our plants to involve over 10,000 employees in such programs as:

Displaying energy-saving bumper stickers, window decals, buttons and other local promotion material provided; savings bonds awards for outstanding energy-saving performance and ideas; magazines and a monthly newsletter about the Energy Savers activities throughout the company—and the Nation.

A key executive was appointed whose sole responsibility is to coordinate the Energy Savers program, and outside consultants were engaged.

We have set an objective of 15 percent reduction in our energy consumption. While this is greater than the national business objective, I am convinced that with this concerted effort, we will achieve at least that goal.

Insulation can be one of the major offsets to the energy shortage. At this point I would like us to examine the quantitative national effect of inadequate insulation versus upgraded and full insulation on the demand for residential energy a few years hence.

As soon as we can add attic insulation to most of our existing housing inventory, 600,000 barrels daily can be conserved. Upgrading to full insulation in new houses to be built in 1974 alone can conserve about 65,000 barrels of oil per day. Each year a similar number of new homes constructed will add similar savings. Starting from the 1974 savings of 65,000 barrels per day, by 1983 the savings in this housing sector will amount to over 600,000 barrels per day. And this is not cumulative but on a daily rate.

The balance sheets look something like this:

Existing homes without insulation will require 2.7 million barrels of oil per day. With beefed-up attic insulation, this is reduced to 2.1 million barrels per day.

New homes built after 1973 using current insulation practices will require 1.7 million barrels per day. New homes with full insulation will require only 1.1 million barrels per day.

Total residential heating requirements as they stand now can be as high as 4.4 million barrels per day, but with upgraded conservation efforts through insulation alone, this figure can be reduced to 3.2 million barrels per day, a savings of over 25 percent of our sizable residential needs.

Estimated dollar savings to homeowners for heating alone during the decade would total up to $40 billion. So the sooner we can accomplish the job, the closer we approach this goal.

At this point we can add energy savings on air-conditioning that are a bonus from these same insulation practices. Conservatively, over 200,000 additional barrels per day will be saved for a grand total reduction of 1.4 million barrels daily.

I have asked you for relief from fuel restrictions to the insulation industry. Now I would like to ask you to consider assistance or incentives for the already overburdened homeowner. I have discussed this earlier in my testimony.

It has long been national policy to encourage businesses to invest in the future of America: I am urging a policy which will encourage American homeowners and builders to make the same kind of investment. I will summarize briefly and say that I have suggested a program of incentives enabling American homeowners to make this necessary investment in America's energy future. Such a program might include: (1) Tax credits for a portion of the interest payments on home improvement loans for this worthwhile purpose; (2) Federally guaranteed low-interest loans, fully subordinated to the principal mortgage; and (3) Tax investment credit for all or part of the cost of insulating.

In addition to these incentives, mandatory Federal and State standards requiring full insulation for all new construction are necessary to replace present standards which apply only to FHA financed housing. FHA, by the way, currently covers only some 20 percent of new housing under construction.

Federally funded broad-scale consumer awareness programs to alert homeowners, builders, and others to the energy and cost savings associated with proper insulation, double glazing, storm windows and doors, and weatherstripping are also necessary.

These are a few possible suggestions; you gentlemen of the Congress will certainly have others.

The cost to our Government would be minimal; the benefits, enormous. It would reduce our peak as well as our average energy demands; reduce and help to eventually eliminate our dependence on foreign sources for fuel, and of course, benefit the balance-of-payments problem which concerns us all.

And, not to be forgotten, is the benefit to our environment. Energy conservation pays a big dividend in helping to clean up our environment by reducing the total consumption of polluting fuels.

Mr. Chairman, I would like to wrap this up in the form of a conclusion; I might just suggest, with the chairman's permission, I did omit one portion of my prepared statement that dealt with corporate action for conservation.

Chairman HUMPHREY. We will include it all in the record.

[The prepared statement of Mr. Haufler follows:]

PREPARED STATEMENT OF GEORGE J. HAUFLER

INSULATION AND THE ENERGY CRISIS

Gentlemen, during the past several months, the people of this Nation have been told they may not have enough fuel for their homes and cars, and to support our industries and jobs. We have been warned that we may have to pay exorbitant prices for those fuel supplies which do exist. We have been instructed to drive less, to heat less, and to air-condition less. We have been threatened with school closings for lack of heating fuel and plant slowdowns to conserve energy. We have heard of a "fuel gap"—the difference between our production and our needs.

In short, the specter of potential shortage threatens to affect every aspect of our daily lives.

Virtually all of the programs proposed to reduce our fuel consumption have one thing in common—sacrifice. Yet, there are other actions that can be taken which do not compromise our standard of living and still enable the ordinary citizen to help ease the energy crisis. I refer to energy conservation.

I suggest that, while asking our citizens to cut down on such essential uses as home heat, we focus at the same time on more efficient uses of the fuel which

is available. Today I am going to address myself specifically to the question of fuel used for home comfort.

(Incidentally, for simplicity of presentation, I have followed several ground rules. While I make reference to total fuel consumption, the detailed statistics have been related to the heating side of residential fuel usage, since this is the preponderant consumption portion, and is our immediate winter concern. Air-conditioning energy impact is similar and has been included in the summary totals. Second, all energy units are expressed in oil equivalents. Third, since insulation is the greatest contributor to fuel conservation, we have confined the savings discussed to those from added insulation. Double glazing, storm windows, storm doors, and weatherstripping can also make a beneficial contribution to reduced fuel usage. These, in combination, can save as much as one-third more. Statistics on these savings are shown in the charts attached to this statement.)

In 1970, 14 percent of our energy was consumed within the home—and over three-fourths of this was used for space heating and air-conditioning. By 1985, the total fuel consumption in the United States will have doubled, and at current rates, the home comfort uses will have increased by at least 50 percent.

This increase in usage will certainly keep pace with—and very probably exceed—any increase in fuel supplies. However, it is possible today to cut fuel usage without reducing comfort, and to do this at a minimal cost in both energy and dollars.

INSULATION REDUCES HOME FUEL CONSUMPTION

Most of our homes are heat sieves.

A vast amount of the heat generated immediately leaks out through the walls and roof and is lost. Our furnaces work overtime to produce warmth which largely rises to—and out from—our attics. More heat can be saved by proper insulation than by any reduction in thermostat setting that people will tolerate. A fully insulated house can be kept at a comfortable 72° F with no more fuel expenditure than is required to keep a poorly insulated house at a chilly 61° F.

Fifty percent of our existing homes waste one-third the fuel supplied to them just because they are uninsulated. Although the remaining residences have varying degrees of insulation, added together we are needlessly squandering over 20 percent of the total fuel supplied for home heating—because of lack of proper insulation.

Although FHA insulating requirements have recently improved and are moving toward fully adequate standards, most of today's existing homes and a vast majority of new homes now under construction fall far short of those levels.

I know you are concerned about absolute quantities, so let me break this down another way. The average uninsulated house of 1,600 ft.^{2} of space wastes 700 gallons of fuel oil each year. While partial insulation helps, some 200 gallons of fuel oil or more will still be wasted because of the lack of full insulation.

INSULATION PAYS FOR ITSELF

The dollar cost to the homeowner for insulation is quickly paid back in fuel savings. A typical four-bedroom house, with 1,600 ft.^{2} of living space, can have the ceilings and walls fully insulated while under construction for $325 and generate a payback in 2 years. A handy homeowner who wants to add insulation in the attic of his existing house can do it in one afternoon for $100 to $200, armed only with a sharp knife and the sure knowledge that his fuel bills will go down. An insulating contractor can do the same job of saving energy and money for the homeowner—for about 50 percent more—still a reasonable sum when the work pays for itself in 2 to 5 years. These savings statistics are for a home in the geographic center of population in the United States. In colder climates like Minnesota, this payback would be as quickly as 1 year.

The contrast between existing waste and potential savings is startling. That typical 1,600 ft.^{2} single family home is consuming 50 percent more fuel than it would if only 6 inches of attic insulation were added. A professional insulation contractor or a do-it-yourself homeowner can install 6 inches of attic insulation in an existing home in 1 day. This single change not only pays for itself in fuel savings in a short period, but if implemented promptly on a broad scale, would bring about a large reduction in the "fuel gap" in a relatively short period of time.

Adding attic insulation to our existing homes is especially attractive because:

A. The attic is the most accessible space; easiest to insulate.

B. It produces the greatest savings effect, typically over two-thirds of the total savings that can be achieved by insulation.

C. The number of existing homes is so high.

D. Payback to the homeowner is so attractive.

FUEL ALLOCATION CAN WASTE FUEL

All of these energy savings are available only if sufficient quantities of insulation continue to be available * * * a situation which is now seriously jeopardized by the scarcity of fuel and fuel derivatives employed in the insulation manufacturing process.

The Federal Government is currently implementing a fuel allocation program to all American industries, including the insulation industry, which threatens to worsen the energy crisis almost immediately by shutting down insulation plants.

The insulation industry is unique, in that it is a net energy conserving industry, rather than an energy consuming industry. A properly insulated house saves in each and every year of the building's life, 20 times the amount of energy required to manufacture the insulation.

In just 18 days, the energy investment by the Nation to provide insulation is paid in full: In 30 years the savings mount to a phenomenal 600 times the original energy manufacturing expenditure! Can you name any other investment which guarantees a 5-percent return per day, each day, for 30 years or more?

While this payback itself should clearly demonstrate the necessity to keep our insulation plants running, fuel curtailments, and particularly interruptions, make the problem even worse by multiplying the energy wasting impact. To show the critical nature of uninterrupted energy supply, let me explain to you how insulation is made.

The manufacture of insulation, like that of steel, is a high temperature furnace process, but carried on continuously at 2,700° F., 7 days a week, 24-hours a day. There is no way, with current technology, that insulation can be made in furnaces operating at below the required process temperature. Under certain curtailment circumstances, furnaces would be "banked" to an intermediate temperature of 2,100° F., and then have to be idled hot for enough days out of every month to achieve the mandated fuel savings. To stop the furnaces entirely would mean that the materials inside them would harden into glass, and the furnaces would have to be stripped down and laboriously cleaned before they could be restarted.

In moving to "hot idle," temperatures must be reduced gradually, and 50 percent down to 30 percent of full fuel input is required. This fuel is completely wasted. Additionally, lost time for cool-down and start-up amounts to 6 days.

Cooling the furnace down completely from 2,700° F. takes even more time: 7 days to cool down and 9 days to heat up; a loss of 16 days.

A sudden curtailment of fuel would destroy the furnace from thermal shock. Eight months of production time would be lost to secure the materials and reconstruct the furnace.

For small reductions in energy, there is a disproportionately larger loss in insulation capacity. For instance, a 10-percent reduction in energy would result in 15 percent reduction in output; a 20-percent reduction in energy would mean a 30-percent reduction in output * * * and with 30 percent reduction in energy, insulation production is stopped completely in gas and oil fired furnaces.

This is not a 1975 or 1985 question. A fuel curtailment today would start a perpetual 5 percent daily drain on the Nation's energy bank this December which is compounded daily thereafter.

ALLOCATION MUST RECOGNIZE THE NATIONAL NEED

Let's look at national needs.

This Nation will be adequately housed, and construction will continue regardless of the availability of insulation. Family formations alone demand 2 million new units a year.

What happens if insoluation production for these new units is reduced so there is not enough insulation to go around? Simply, these new houses, instead of being fully insulated, will be under-insulated—and, in some cases, inaccessible spaces will remain uninsulated forever.

Instead of returning 5 percent a day to the Nation's energy bank, as insulated homes, they will be withdrawing 5 percent a day from the bank, as uninsulated homes.

With such a large potential of waste that can result from the unavailability of sufficient insulation, I must ask you for relief from fuel restrictions which will be counterproductive when placed on the insulation industry. Such restrictions, in our opinion, would be a penny-wise and pound-foolish policy guaranteed to increase energy shortages. While I recognize that energy regulation is a new undertaking, to date the necessity of energy conservation through continued insulation production has not been given any recognition in the allocation of energy supply.

CORPORATE ACTION FOR ENERGY CONSERVATION

Certainly energy conservation is everybody's business, and our own experience indicates that industry can make a significant contribution. We believe this starts at the top by adopting a corporate policy to stimulate energy conservation within the company. We did this at Certain-teed many months ago, and our internal program consists of three major elements:

1. A specialized management and technical effort directed toward fuel conservation and efficiency improvement programs at the plants and headquarters.
2. The enlistment of broad-based employee support for suggestions and cooperation in implemeting job-related energy conservation activities.
3. An educational program for our employees to stress conservation activities in their personal lives and influencing others within their communities.

Following the first phase technical effort, we developed the "Certain-teed Energy Savers Group" to involve all our employees and make each of them an activist energy saver at work, at home, in transit, and in the community. This phase of the program is now being implemented in all of our plants to involve over 10,000 employees in such programs as:

Displaying energy-saving bumper stickers, window decals, buttons, and other local promotion material provided;

Savings bonds awards for outstanding energy-saving performance and ideas;

Magazines and a monthly newsletter about the energy savers activities throughout the company—and the Nation.

A key executive was appointed whose sole responsibility is to coordinate the energy savers program, and outside consultants were engaged.

We have set an objective of 15 percent reduction in our energy consumption. While this is greater than the national business objective, I am convinced that with this concerted effort, we will achieve at least that goal.

INSULATION CAN OFFSET THE ENERGY SHORTAGE

Now let us examine the quantitative national effect of inadequate insulation versus upgraded and full insulation on the demand for residential energy a few years hence.

As soon as we can add attic insulation to most of our existing housing inventory, 600,000 barrels daily can be conserved. Upgrading to full insulation in new houses to be built in 1974 alone can conserve about 65,000 barrels of oil per day. Each year a similar number of new homes constructed will add similar savings. Starting from the 1973 savings of 65,000 barrels per day, by 1983 the savings in this housing sector will amount to over 600,000 barrels per day.

The balance sheets looks like this:

Existing homes without insulation will require 2.7 million barrels of oil per day. With beefed-up attic insulation, this requirement is reduced to 2.1 million barrels per day.

New homes built after 1973 using current insulation practices will require 1.7 million barrels per day. New homes with full insulation will require only 1.1 million barrels per day.

Total residential heating requirements as they stand now can be as high as 4.4 million barrels per day, but with upgraded conservation efforts, this figure can be reduced to 3.2 million barrels per day, a savings of over 25 percent of our sizable residential needs.

Estimated dollar savings to homeowners for heating alone during the decade would total up to $40 billion. So the sooner we move, the closer we approach this goal.

At this point we can add energy savings on air-conditioning that result from these same insulation practices. Conservatively, over 200,000 additional barrels per day will be saved for a grand total reduction of 1.4 million barrels daily.

HOMEOWNER AWARENESS AND ASSISTANCE

I have asked you for relief from fuel restrictions to the insulation industry. Now I would like to ask you to consider assistance or incentives for the already overburdened homeowner.

It has long been national policy to encourage businesses to invest in the future of America: I am urging a policy which will encourage American homeowners and builders to make the same kind of investment.

Today, if a man chooses to insulate his new or existing house, he faces financial problems because of increased initial costs. True, he will recoup his investment in fuel savings during the next few years—but today is when dollars are tight and today is when he must spend the money, and today is when he must begin paying interest if he borrows the money, as so many are forced to do. And today is when he may be rewarded by his State and local government by having his house reassessed upwards and seeing his taxes go up—all because he tried to do his bit toward easing our critical energy shortage.

May I suggest a program of incentives enabling American homeowners to make this necessary investment in America's energy future. Such a program might include:

1. Tax credits for a portion of the interest payments on home improvement loans for this worthwhile purpose;
2. Federally guaranteed low-interest loans, fully subordinated to the principal mortgage;
3. Tax investment credit for all or part of the cost of the insulation.

In addition to these incentives, mandatory Federal and State standards requiring full insulation for all new construction are necessary to replace present standards which apply only to FHA financed housing.

Federally funded broad-scale consumer awareness programs to alert homeowners, builders, and others to the energy and cost savings associated with proper insulation, double glazing, storm windows and doors, and weatherstripping are also necessary.

These are a few possible suggestions; you gentlemen of the Congress will certainly have others.

The cost to our Government would be minimal; the benefits, enormous. * * * It would reduce our peak as well as our average energy demands; reduce and help to eventually eliminate our dependence on foreign sources for fuel, and of course, benefit the balance of payments problem which concerns us all.

And, not to be forgotten, is the benefit to our environment. Energy conservation pays a big dividend in helping to clean up our environment by reducing the total consumption of polluting fuels.

CONCLUSION

In the interest of time and clarity, I have focused on residential requirements and have not discussed the similar energy savings from proper insulation in the nonresidential sector. Because of the greater diversity of energy uses within the mechanical systems and structures of commercial and industrial buildings, as well as in piping of the process and utility industries, this potential savings is much more difficult to quantify, but an extremely conservative estimate is that it is 50 percent or more of the residential savings already outlined.

The total energy savings available simply through good insulation practices is over 2 million barrels per day. Since this represents a significant percentage of our total energy requirements and a much larger percentage of the total energy gap * * * and as a frame of reference is greater than our current total dependence on Midddle East oil * * * these programs must be aggressively pursued.

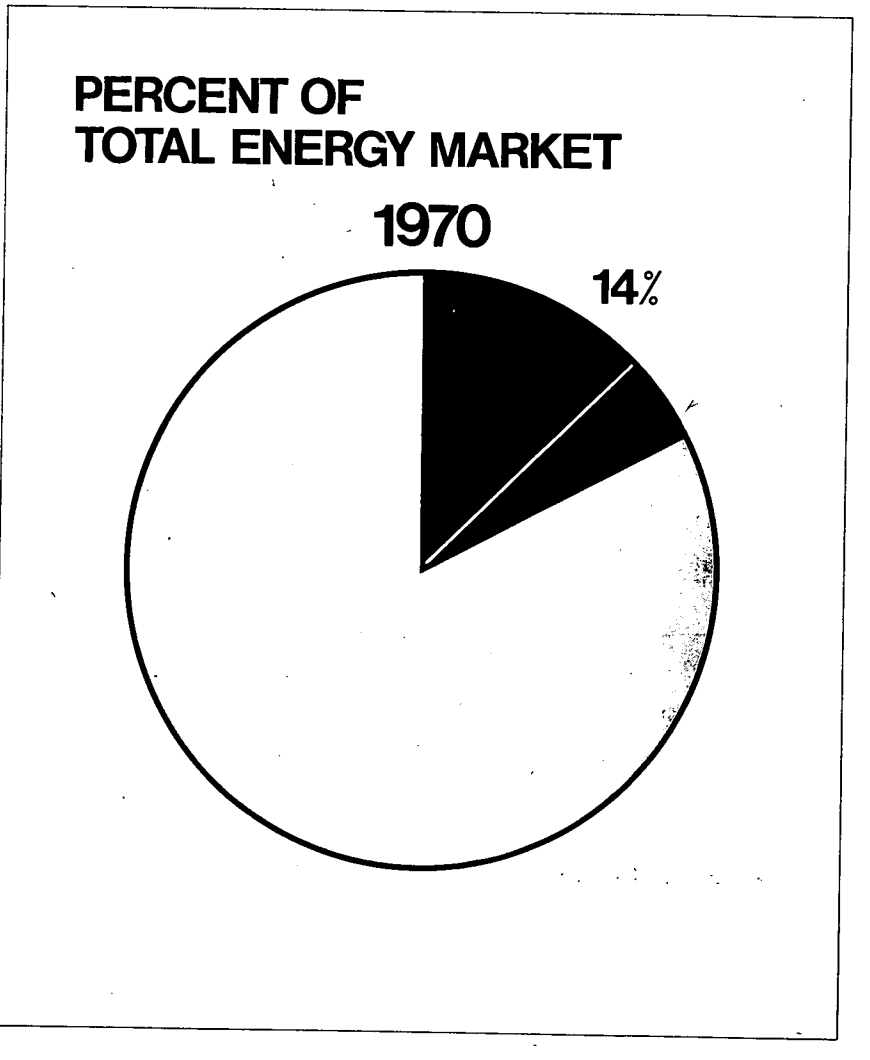
We need not wait for new technology; there is no hardship or sacrifice; and the effect can generate nothing but the many favorable benefits outlined.

Gentlemen, to achieve all of these benefits, it is imperative that:

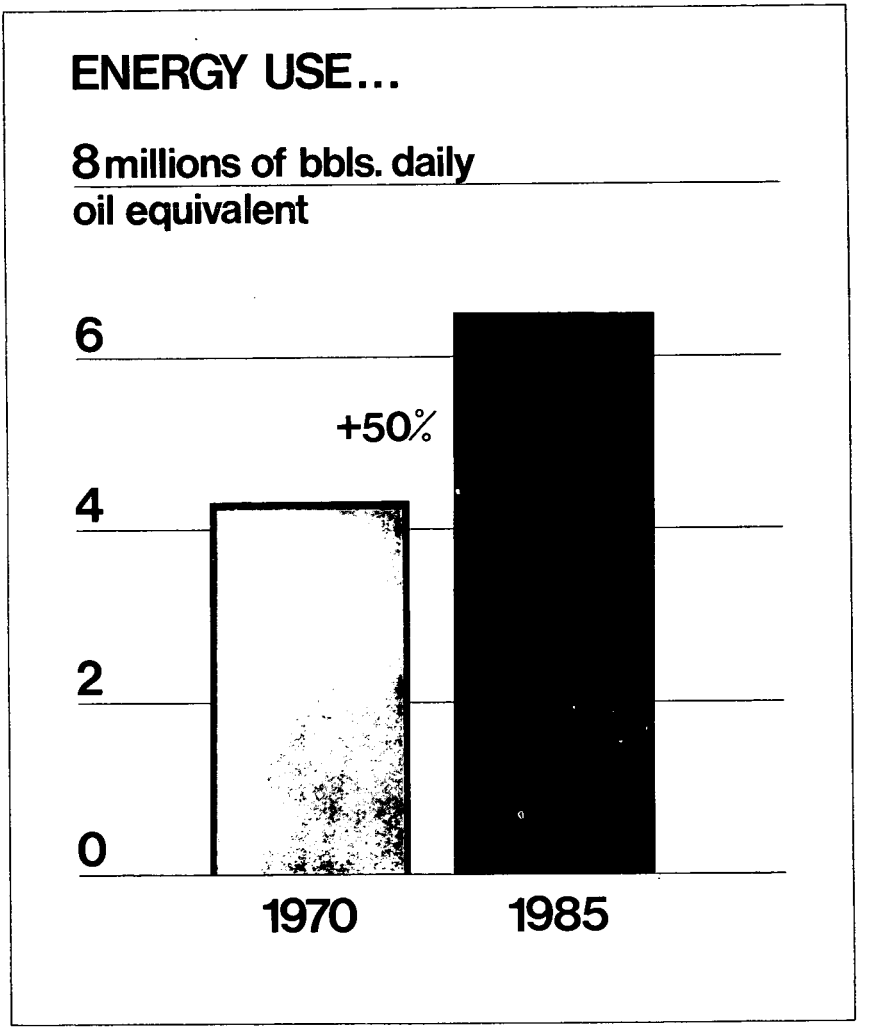
1. Insulation as an energy conservation industry be guaranteed the necessary supply of fuel and fuel derivatives to remain operative.
2. The programs for awareness and support by the public sector be encouraged by your leadership and direction.

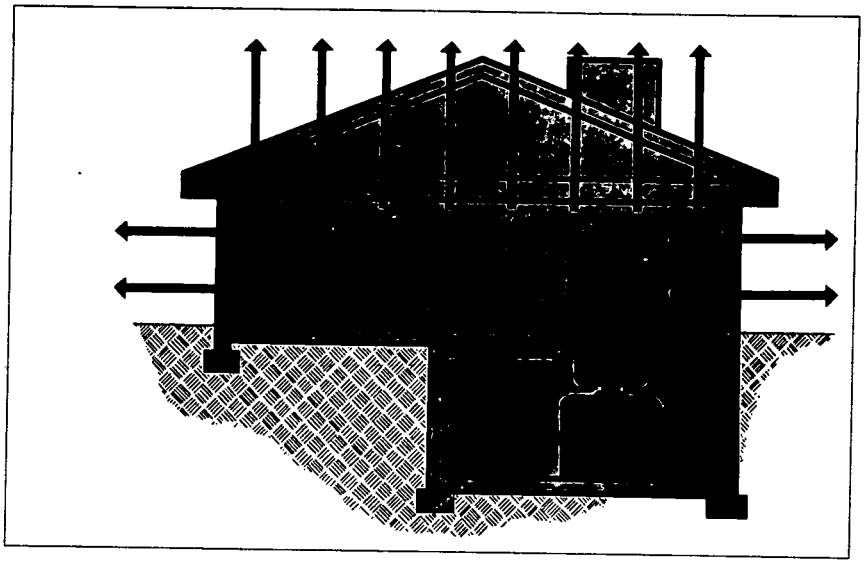
I thank you for your attention, and of course, I am available to you now and at any time in the future to help answer questions and provide research information on these matters.

RESIDENTIAL MARKET

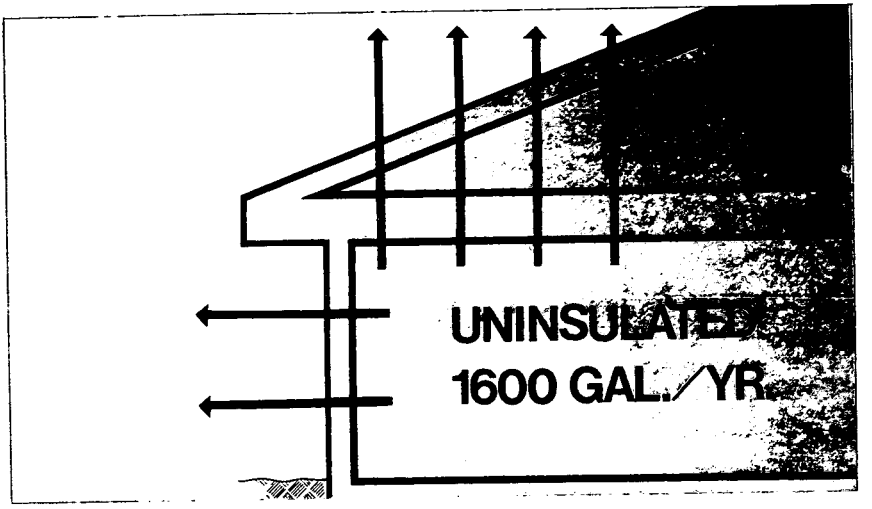


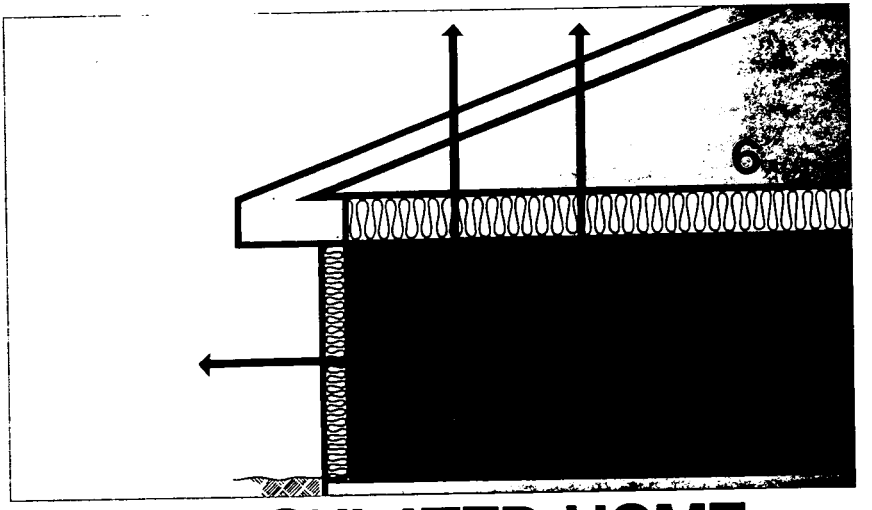
RESIDENTIAL MARKET



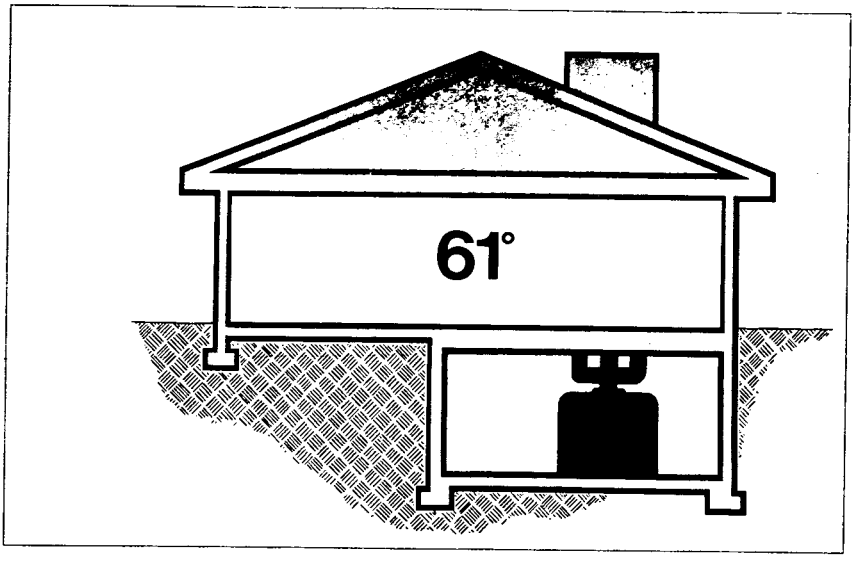


UNINSULATED HOMES ARE HEAT SIEVES





AN UNINSULATED HOME WASTES 700 GAL./YR.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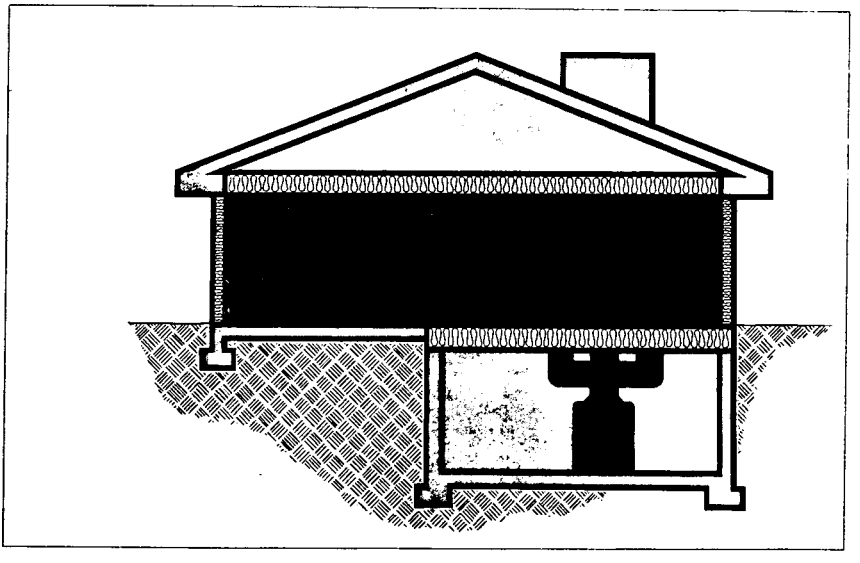
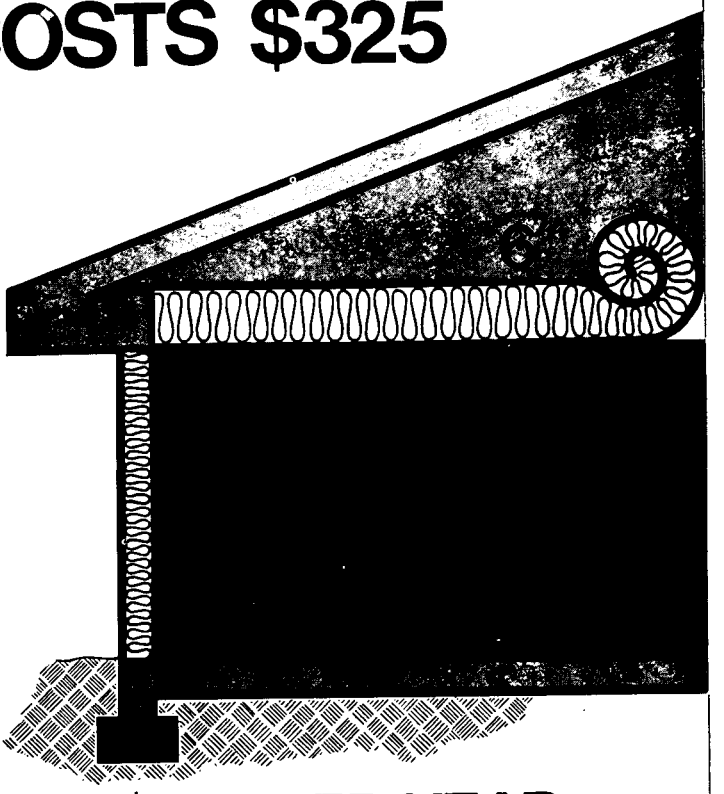


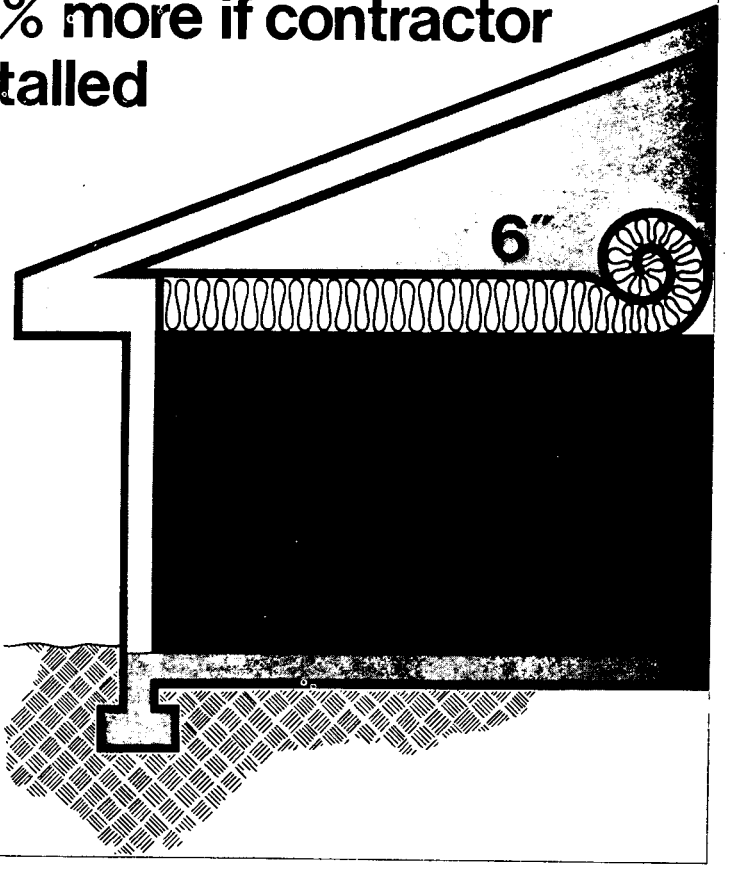
FULL INSULATION IN A NEW HOME COSTS $325



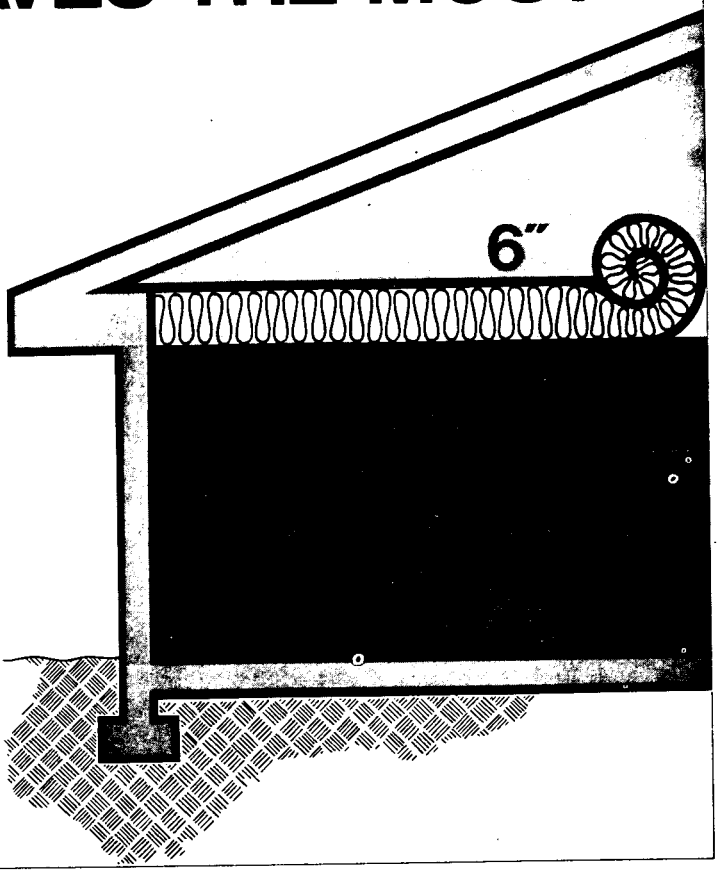
SAVE $175 PER YEAR

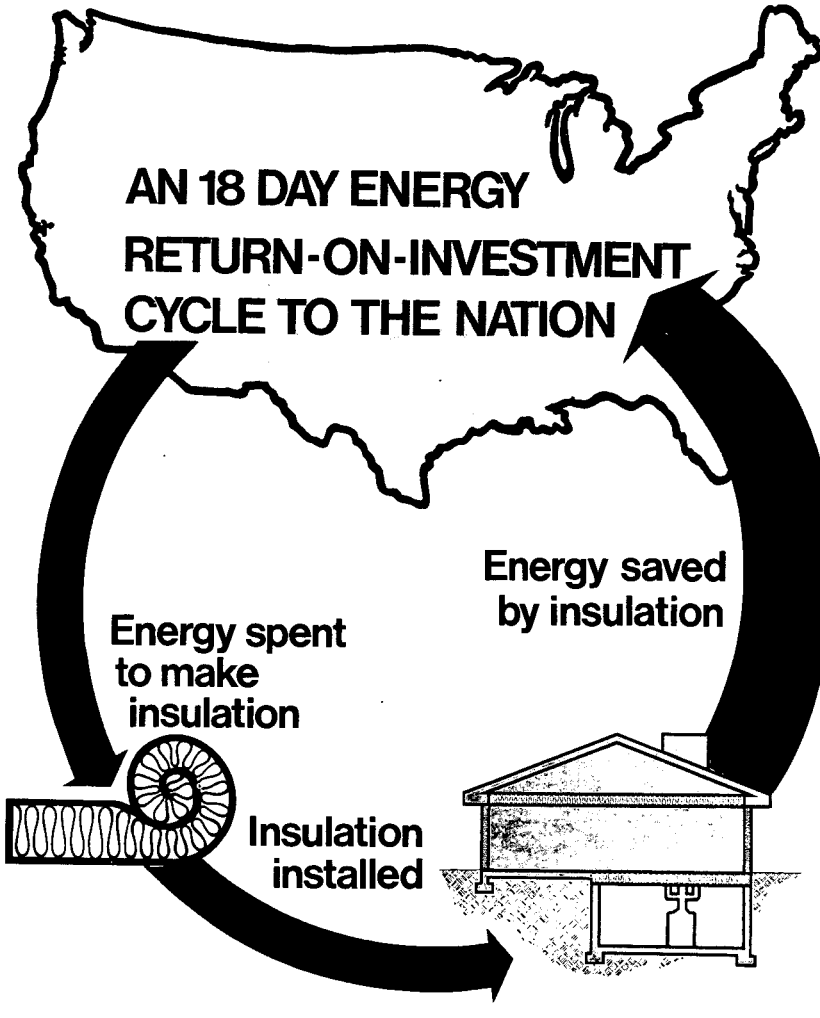
ATTIC INSULATION COSTS ONLY $100-$200 SELF INSTALLED

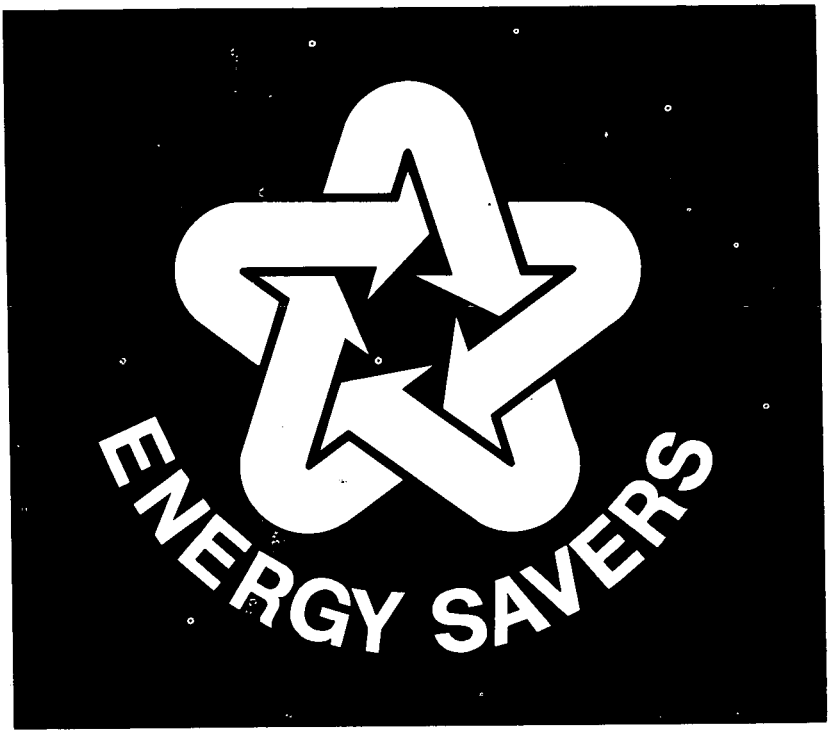
50% more if contractor installed



ATTIC INSULATION COSTS THE LEAST SAVES THE MOST




AN 18 DAY ENERGY
RETURN-ON-INVESTMENT
CYCLE TO THE NATION
Energy saved
by insulation
Energy spent
to make
insulation
Insulation
installed



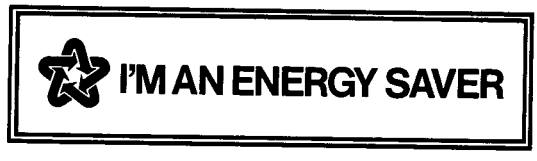
CERTAIN-TEED PRODUCTS CORPORATION

Poster

PROMOTION SPECIALTIES

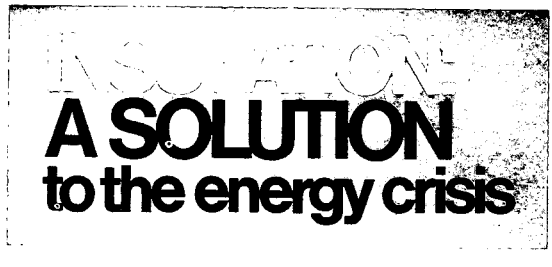
Decals
Stickers
Buttons
Jewelry
Badges
Shoulder Patches

Compact Car
Bumper Sticker
Bicycle Reflector



Posters
Counter Cards

Window Posters
Billboards

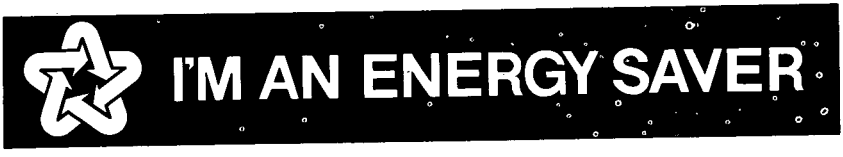


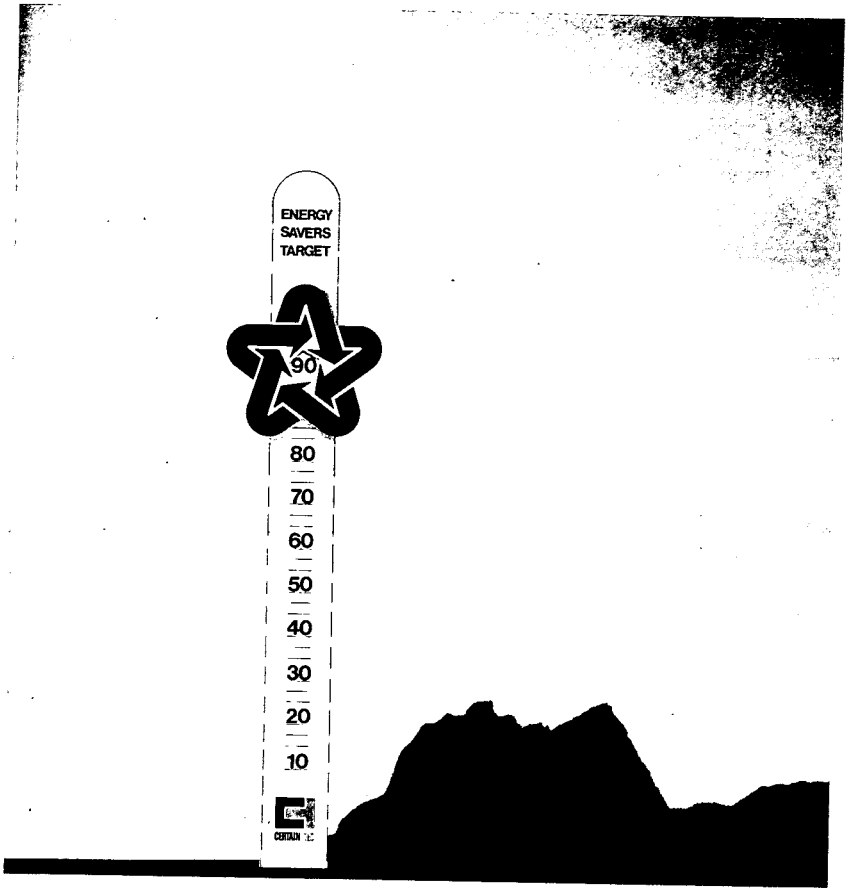
From The Energy Savers Group...Write for yours
CERTAIN-TEED PRODUCTS CORPORATION

Lapel Button

Desk Flag and
Window Decal

Bumper Sticker





Outdoor
Achievement Display

RESIDENTIAL HEATING DAILY ENERGY REQUIREMENTS (millions of barrels) - 1983

Existing Homes without attic insulation	2.7
New Homes with current usage	1.7
Residential Energy Requirements WITH NO IMPROVEMENTS	4.4

Existing Homes with attic insulation	2.1
New Homes with full insulation	1.1
Residential Energy Requirements WITH IMPROVED INSULATION	3.2

SAVINGS	0.6
OF OVER 25%	0.6
WITH INSULATION	1.2

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SAVINGS WITH INSULATION

RESIDENTIAL HEATING	1,200,000
AIR CONDITIONING	200,000
	1,400,000 BARRELS PER DAY

SAVE
2,000,000
BARRELS PER DAY

INSULATE!

CERTAIN-TEED PRODUCTS CORPORATION

Charter

The Energy Savers Group is dedicated to the conservation of energy in all forms without impairing the standard of living which the people of the United States have attained. We will encourage energy conservation by:

1. *Providing information and education on presently available methods, and*
2. *Sponsoring research which seeks new ways to reduce levels of energy consumption.*

Any organization that is ready and willing to take a leadership role and positive action to help the United States save energy is eligible for membership.

The Energy Savers Group

CERTAIN-TEED PRODUCTS CORPORATION

Mr. HAUFLER. I have some material with us that you might find of interest if time permits.

Chairman HUMPHREY. I am running short of time here now. I will just note that we have a series of 10 consecutive rollcalls starting very shortly, and I am going to have to breakoff our testimony.

Let me take a moment to compliment you on your testimony. It is the best documented testimony that we have heard on this whole subject of insulation and how it relates to the fuel problem. And I am hopeful that the appropriate agencies of Government will study this very carefully. We will see that your testimony gets to Mr. Gibbons, Governor Love, and to others that are on the Energy Action Committee. Because obviously what you have said here requires not only effetcive work on the part of industry in the promotion of their product, but also in the Federal financing of homes, in standards that may be applied—and I think that we can get some good out of this right soon. And we will try to follow up on it.

Mr. HAUFLER. I appreciate your assistance.

Chairman HUMPHREY. We appreciate your coming here. I have had a chance to visit with you at my office, and on that occasion I felt that your testimony would be helpful for this record. We have tried to bring into these deliberations and discussions the Government at the Federal level, the State level, and the local level. And outside witnesses from the private sector of the industry or the business sector, and the consumer groups, everybody getting their chance to be heard. And you have made a splendid presentation here, Mr. Haufler, and I want to thank you.

Mr. HAUFLER. Thank you, sir.

May I just add this one point?

We as a corporation are prepared to support in anyway we can your efforts toward national energy conservation, or any such program that might result from it. While we have not had time to go through this material, it deals with the problem of creating public awareness, and voluntary controls obviously are going to require some merchandising. They have to be communicated. And whatever materials that we have and the designs are certainly available to you or to those committees or their use.

Chairman HUMPHREY. I am confident that the private sector can do a great deal in bringing about public awareness. Mr. Ball from St. Cloud has demonstrated that in their own community, a community of around 35,000 or 40,000 people—they have done a great job in bringing in all segments, all parts of the community, from the churches to the schools to the clubs, the business people and the laboring people and the utilities, and the people there know that there is a job to be done. And you can be very helpful with your companies—and other companies can help.

Thank you, Mr. Haufler, very much.

Mr. Mosely, I have to forewarn you. I may have to disappear from this room on a moment's notice. We have the energy bill before the Senate and I am going to have to be there.

You are very kind to come here to fill in for Mr. Doig.

Now, do you want to paraphrase your prepared statement, or do you want to read the whole prepared statement?

Mr. MOSELY. I think I would prefer to read the whole prepared statement.

Chairman HUMPHREY. Go right ahead.

STATEMENT OF ROBERT MOSELY, SENIOR STAFF ECONOMICS SPECIALIST, SHELL OIL CO., TESTIFYING FOR KEITH DOIG, VICE PRESIDENT FOR PLANNING AND ECONOMICS

Mr. MOSELY. Mr. Chairman, my name is Robert Mosely and I am speaking for Keith Doig, vice president of Shell Oil Co. for planning and economics, who is ill. My title is senior staff economics specialist.

I appreciate the opportunity to appear today before the subcommittee on Consumer Economics. First, I will describe briefly Shell's demand forecast, given no supply constraints. Then, I will discuss possible levels of constraints on supply. However, I will spend the majority of my time with you on conservation measures that must be implemented to insure availability of supply for the future.

Our projections of U.S. energy demand through 1990 are the product of continuing study done as a part of our internal planning process. We made these studies available in summary form in March of this year when we published "The National Energy Outlook." A copy of that summary is submitted to the committee for the record.[1] The Shell Oil forecast has built into it several conservation measures. These include (1) 50 percent compacts and subcompacts in the automobile fleet by 1985, (2) considerable savings due to increasing insulation in the residential market, and (3) consideration of the impact of mass transit systems. As a result, the transportation market for energy declines in its annual rate of growth from 7 percent to about 3 percent, and the average annual increase in the residential market decreases from 3 percent to less than 1 percent. Even so, with domestic energy raw material development limited by a host of constraints, the need for increasing imports from overseas goes up sharply over the forecast period.

We estimate that about 15 MB/D of imports may be needed by 1980 and 18 MB/D by 1985 if our wants are to be fully satisfied.

Chairman HUMPHREY. When you say "our," you are speaking of the Nation's?

Mr. MOSELY. I am speaking of the Nation's, yes.

The majority of these imports will have to come from the Middle East. None of the Western Hemisphere sources appear to have the growth capability necessary to satisfy our wants. In the Middle East and some other producing countries such as Canada, there were movements to restrict production and to increase prices even before the recent Arab-Israeli war. The delivered price of much foreign crude oil currently is substantially higher than our domestic prices. Clearly, there is a strong seller's market and imported crude prices must be expected to continue to climb. These actions are not necessarily related to the Arab-Israeli problems. In fact, they can be better understood if we simply consider them as the workings of supply and demand.

[1] See submission for the record, beginning on p. 86.

In addition, there is an understandable reluctance by some oil producing countries to convert their major resource into currencies which have been proven to have uncertain value.

Senator Proxmire, I believe, has already noted this.

We can only expect this combination of high prices and tight supply to last indefinitely. We also must remember that oil demand in the rest of the world is growing as fast or faster than ours. Even the Middle East reserves, large as they are, are finite. Taking these factors into account and with fairly optimistic forecasts of new reserves to be found, it is reasonable to predict that world oil production will peak 10 to 15 years from now.

We recognized a year ago that energy conservation would have to play a large part in permitting a balance of supply and demand in the United States. At that time we began studies which led to the publication last month of "The National Energy Problem: Potential Energy Savings"—a copy of which is submitted for the record.[1]

We did not predict the recent Middle East war nor its exact impact on shortages to this country. Rather, our conservation work was stimulated by our assessment of a long-term dependence on foreign imports. It was designed to look at what could be done through a coordinated Government program coupled with a strong public commitment to make our country as independent from foreign supply as possible.

Just prior to the Middle East crisis, the United States consumed refined petroleum products at a rate of 17.7 million barrels each day. Over 35 percent of this volume was either directly imported or manufactured in the United States from imported crude oil. As a percent of total energy requirements, the United States was dependent upon foreign petroleum for 18 percent of its energy. The current disruption in the flow of oil to the United States due to the Middle East War is estimated by the National Petroleum Council to reach 3 million barrels per day before year end. We agree with this estimate. Furthermore, our need for imported oil is growing each month at the rate of 100,000 barrels per day as our economy grows and as domestic petroleum production shrinks. There can be no question that if the Arab oil embargo persists, it will have a significant impact on every one of us and will affect our economy adversely.

I agree with what the President stated in his November 7 address on countering the domestic energy crisis: "We must therefore face up to the stark fact that we are heading toward the most acute shortage of energy since World War II."

For the short term, we believe the energy supply solution must be found principally in conservation. For example, the recent National Petroleum Council study on "Emergency Preparedness for Interruption of Petroleum Imports Into the United States" considers both additional domestic supplies and potential savings in the residential, commercial, and transportation markets. Please refer ω figure 2, page 32, of that report. The full report is submitted to the committee for the record.[2] This chart shows that added domestic supply can make up about 25 percent of the shortfall. The remaining 75 percent must

[1] See submission for the record, beginning on p. 124.
[2] See submission for the record, beginning on p. 152.

be achieved by use curtailment. The stippled pattern on the chart indicates that only about two-thirds of the curtailment can be achieved by means short of rationing and therefore rationing appears to be essential. These are optimistic estimates of possible savings. Two points are especially important:

(1) If action is not taken now, the conditions will worsen significantly. The National Petroleum Council estimates a 17-percent cut in supply if all recommended steps are taken today, but if present curtailment conditions continue and no action is taken until January 1, there can be as much as a 25-percent supply reduction.

Chairman HUMPHREY. That is the figure that we were talking about earlier today?

Mr. MOSELY. Yes, and that was the reason for a part of the range.

(2) It is important to the economic well-being of the country to try to accommodate this shortfall in those markets where it will least affect the economy, that is, in the residential, commercial, and discretionary transportation markets rather than in the industrial market where fuel shortages can cause reduced production of critical products, plant closings, layoffs, and other depressing effects on the national economy. It is comforting to believe that this is only a temporary discontinuity of imports. Some may think that a simple action such as deregulating gas prices, a Mideast cease-fire, eliminating environmental rules or an accelerated research and development program will dissipate the problem. I simply do not believe this. The problem is too large and complex for a quick and easy solution. However, the problem is not insurmountable in the long term.

We have concluded, as shown in chart 10 of our paper entitled "The National Energy Outlook," that it is possible to achieve an 8.5 million barrels per day savings by 1990. This is an optimistic estimate.

To achieve this level of savings requires a reduction in motor gasoline consumption by use of car pools and smaller cars of about 3,200,000 barrels per day. A savings of 1,200,000 barrels per day in the residential market depends on the use of more insulation and modified comfort levels. Carrying more passengers per airplane can save 440,000 barrels per day.

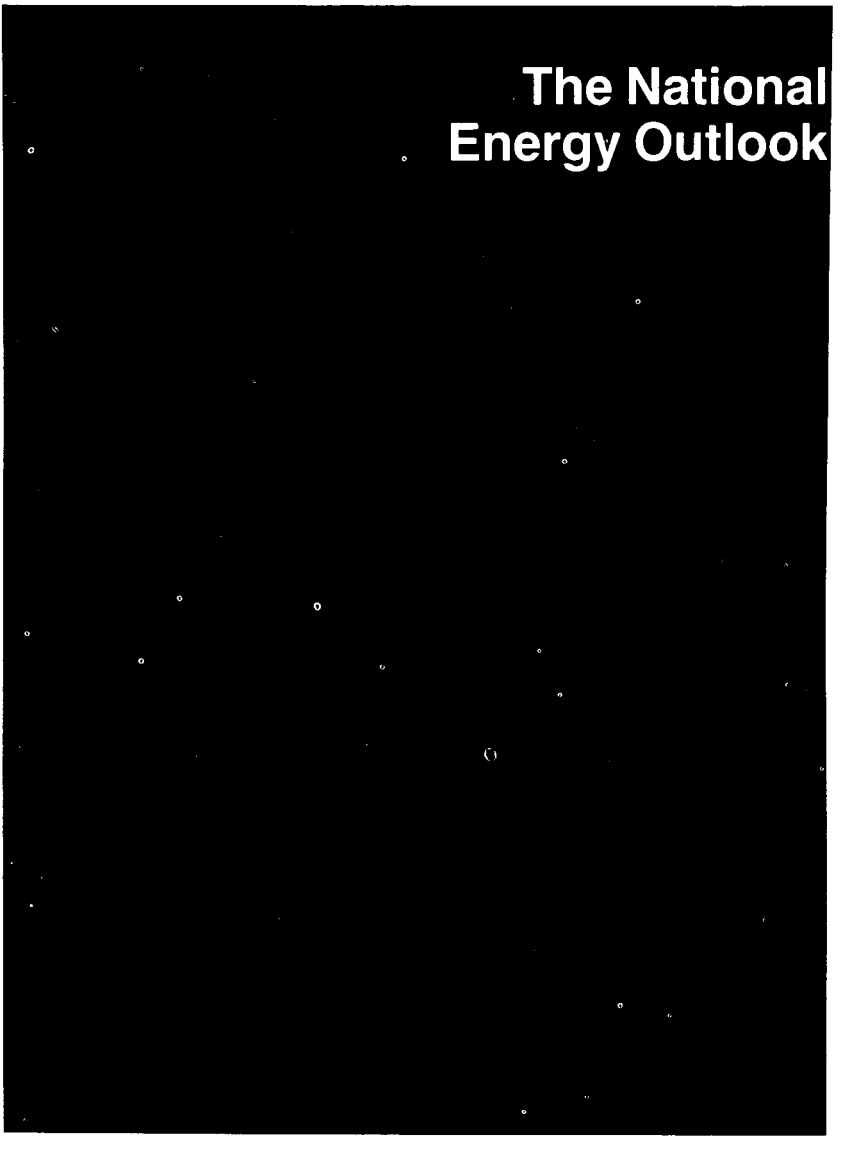
More efficient appliances will save 650,000 barrels per day. In the commercial market we see the potential of 1,500,000 barrels per day savings, and simply as a response to higher energy prices we believe industry can increase its efficiency and save in the neighborhood of 1,500,000 barrels per day.

Our studies on various ways to conserve energy over the forecast period are intended to describe what can be accomplished and the possible timing of those accomplishments. We are not in a position to give specific advice on the implementation of these programs. That should be the responsibility of the American people and their political leaders. In summary, let me emphasize the days of cheap, abundant energy which we have enjoyed are gone—probably forever. We must face up to this problem and start using our best judgment, vision, and some reasonable self-denial.

I urge that we recognize that we are really at a turning point. If we are, it means that we must work harder, pay more, and make some reasonable environmental compromises in the interest of rapid development of our large domestic energy resources. It also means that we must change our life style. This makes the whole problem rather personal. We have to think about whether we really need 5,000-pound automobiles that get 9 miles per gallon downhill with a tailwind. Do we need our homes and offices to be so cool, or so warm, and so bright? I am sure that we can all think of other ways in which we use energy as if there were no tomorrow. Well, for better or worse, tomorrow has arrived,

Thank you.

[The submissions referred to for the record in Mr. Mosely's statement follow:]


SHELL
The National
Energy Outlook

The National Energy Outlook

First Printing March 1973
Second Printing March 1973
Third Printing May 1973
Fourth Printing June 1973
Fifth Printing September 1973
Sixth Printing October 1973
Seventh Printing November 1973

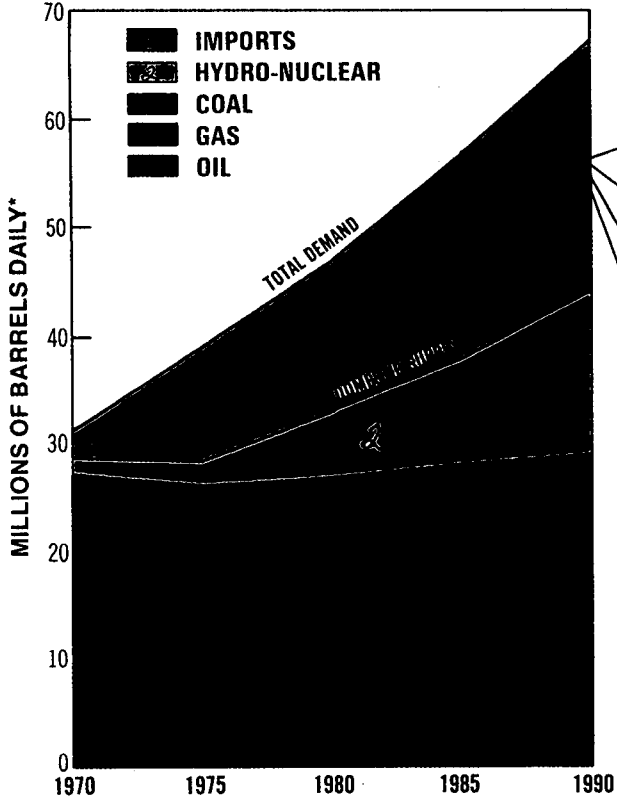
This paper updates previous Shell assessments of the national energy supply and supersedes "The National Energy Position," February 1972, "The National Energy Problem—Implications of Forecast Demand and Supply: Oil and Gas," May 1972.

CONTENTS

Note

In this paper, except where otherwise indicated, barrel of crude oil equivalent is used as the yardstick for comparing amounts of different forms of energy. Energy can be conveniently measured in terms of heat produced and a barrel of crude oil produces, on average, 5.8 million British Thermal Units (B.T.U.s).

THE U.S. ENERGY GAP 1970-1990



*CRUDE OIL EQUIVALENT

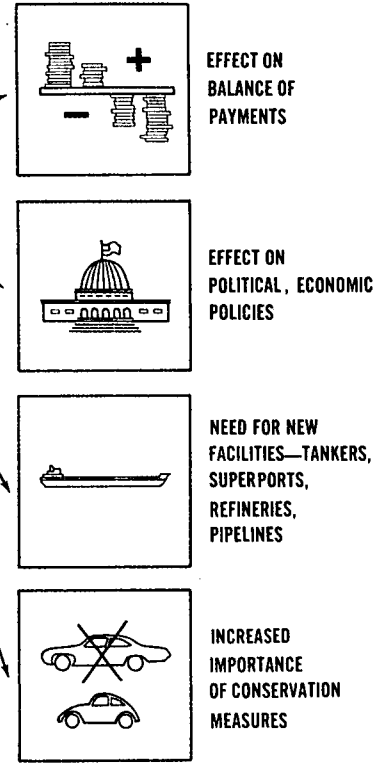


CHART 1

I. SUMMARY

Introduction

Since the last Shell Energy Forecast was prepared, almost two years have elapsed. Although the basic projections we made then remain essentially unchanged, the urgency of the domestic energy gap problem has become even more clearly apparent and difficulties that were just discernible then in relation to imported supplies are now more plainly visible, and have in fact developed sooner than we expected.

The estimates of domestic oil and gas production contained in our 1972 paper were among the more pessimistic that have been published. Now, after further study, and with the benefit of later figures, we reluctantly conclude that our estimate that natural gas production would peak in 1974/75 was too optimistic and that a declining trend has already begun.

Our fresh examination of the energy supply and demand picture confirms that only oil can supply the major part of the growth in the nation's energy needs for the next decade at least. At best, newly found domestic oil can just offset declines in older fields and therefore the additional oil needed will have to come from abroad. Some contribution towards supplying the energy requirement will come from nuclear sources towards the end of the 1970s and this contribution will later accelerate.

We believe that policy options still exist that can influence beneficially the degree of U.S. foreign dependence and the safeguarding of the economy in the years ahead. Some suggestions of measures that might be taken are included in the last section of this paper.

UNITED STATES POPULATION BY AGE GROUPS
1960 - 2000

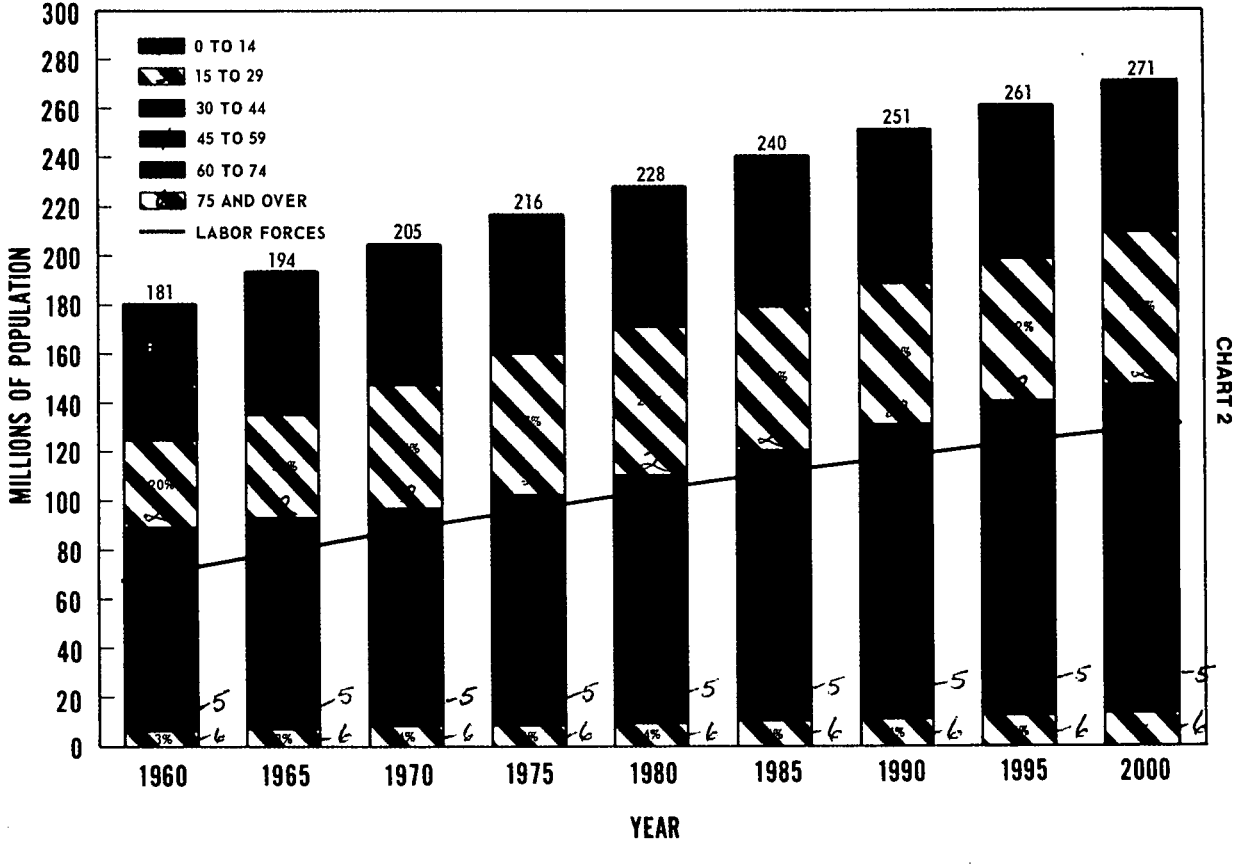


CHART 2

II. THE ENERGY OUTLOOK FOR THE USA

Premises of the Forecast

The forecast on which this paper is based necessarily depends on various premises. The assumptions are as follows:

1. **Population** (Chart 2)

   - There will be population growth at the rate of 1 percent per year. The most probable projection is based on the Census Bureau's series E projections which give by 1990 an increase of 46 million people over the 1970 population of 205 million.

   - The post-World War II "baby boom" generation is now the 15-25-year age group. Between 1970 and 1990 they will increase the labor force from 86 to 115 million and the number of households from 63 to 90 million.

   - The trend to urbanization will continue. Three major areas of population concentration will develop.

     -- Boston to Washington on the East Coast

     -- San Francisco to San Diego in California

     -- Chicago to Pittsburgh in the Great Lakes region

   Smaller urban regions will develop along the Gulf Coast, in Florida, and in other parts of the country.

2. **Economic Growth**

   There will be annual growth in real Gross National Product of 5.7 percent through 1975. The rate will then decline to 4.3 percent and after 1980 to 3.8 percent.

3. **Oil Imports**

   The Oil Import Program will be revised so as to allow imports to satisfy the difference between domestic oil demand and production.

4. **Natural Gas Regulation**

   It is assumed that regulatory control will be modified, with some increase allowed in wellhead prices to stimulate development of new supplies and to reflect the value of gas compared to alternative fuels.

5. **Land Use Regulation**

   By 1975 the Federal Government will develop new guidelines on land use within which states will develop their own plans. These will cater to the siting of energy facilities such as power plants and refineries.

6. **Pollution Standards**

Severe restrictions proposed for auto emissions will be adhered to and the control of sulfur emissions extended.

7. **Technological Developments**

The forecast takes into account foreseeable innovations. These include development of commercial stack gas scrubbing by 1977 and electric battery/fuel cell cars by 1985.

8. **Transportation**

- Individual cars will remain the primary mode of transporting people but there will be a trend to smaller cars as costs escalate. The various forms of mass transit are estimated to have no major effect on motor gasoline consumption in the forecast period.
- Aviation load factors will be about 55 percent from 1975 to 1990.

9. **Residential**

- The average size of homes will decrease. More efficient home insulation will moderate space heating demand.
- The residential market will get preferential allocation of existing gas supply.

10. **Energy Supply**

Crude Oil

Estimates are based on two offshore lease sales totaling 1 million acres per year. North Slope crude from Alaska is premised to reach West Coast refineries in 1976 (although this begins to appear optimistic). Full Alaska pipeline capacity will be reached by 1982. Oil will be available overseas to supply required imports.

Natural Gas

There will be a Mackenzie Valley gas line from the Canadian Arctic by 1978, to which Alaska North Slope gas will be tied in by 1980. Volumes of overseas liquified natural gas (LNG) will be limited due to high costs and uncertainty of sources.

Nuclear

Nuclear development through 1985 is constrained by long lead times of 7-10 years. Thereafter, it will accelerate.

Coal

Long-term growth is envisaged. Environmental restrictions on strip mining will affect rate of short-term growth.

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Unconventional Raw Materials

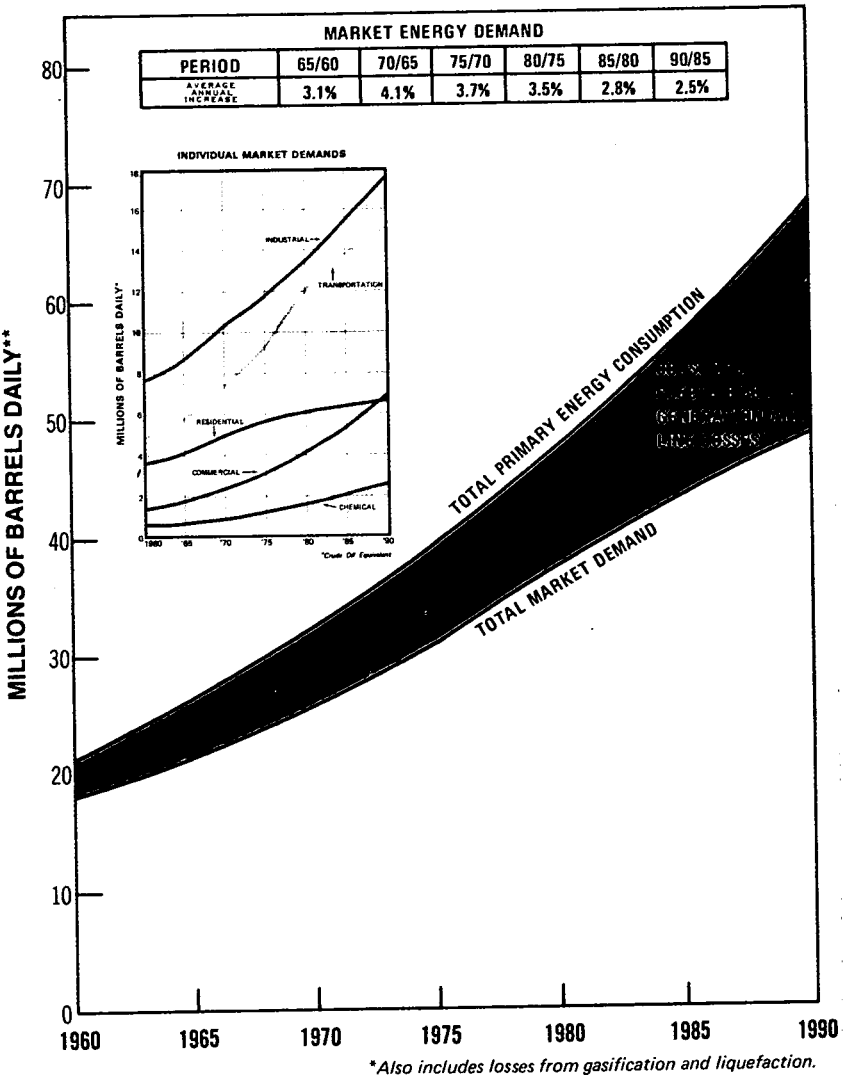
A major effort to develop coal gasification is expected. Shale oil and conversion of coal to liquid hydrocarbons are not projected as significant supply sources before 1990 principally because of technological problems, but also because high manufacturing costs will require a high market price for these synthetic energy raw materials. No other new sources of energy will become substantial suppliers before 1990.

11. **Other Resources**

It is estimated that the supply/demand picture will not be significantly affected by problems connected with manpower, capital and water resources.

CHART 3

U.S. DOMESTIC ENERGY DEMAND



*Also includes losses from gasification and liquefaction.
**Crude oil equivalent.

U.S. ENERGY DEMAND

Summary

The United States—with one-sixteenth of the world's population—consumes one-third of the world's energy. We use more energy to heat and cool homes; we travel more miles and produce more goods than any other nation. Energy cooks our food, lights our way and runs our machines.

Energy consumption more than doubled in the last 20 years. As shown in Chart 3, consumption will double again between 1970 and 1990, increasing from the equivalent of 31.8 million barrels of crude oil daily to 67 million barrels. The annual average growth rate, however, is predicted to be lower at about 3.8 percent.

The nation's energy is primarily used by five major markets: transportation, industrial, residential, commercial, and electricity generation.* Of these markets, electricity generation, transportation, commercial, and (within industry) chemical, grow faster than total energy demand. Other markets grow more slowly. A particular feature of the U.S. energy consumption pattern has been the sharp rise (8.2 percent 1971/72) in the demand for distillate oils. This has been caused by various factors. Shortages of natural gas have led to switches to oil. Then there have been the effects of environmental and sulfur restrictions on the use of coal and residual fuel oil for electricity generation. This combination of circumstances has caused domestic distillate to be used increasingly for boiler heating.

The Transportation Market

The overall growth of the transportation market can be seen by the blue line in the inset of Chart 3. What is not clear from the chart is the important role motor gasoline plays in the total transportation picture. The annual miles driven by the average driver have been increasing linearly for the last 20 years. The prospect is that this will continue to be a highly mobile society, and therefore transportation will continue to be a major energy consumer.

Fuel consumption per mile is expected to increase significantly. Emission control and safety devices fitted to new automobiles will decrease average miles per gallon by about 15 percent during the late 1970s.

Battery and fuel cell cars are estimated to have no major impact before 1990. There may be 2 million such cars by 1985 and 6 million by 1990, but this will be less than 5 percent of the total car fleet.

Aviation kerosene-type jet fuel has been a rapidly growing portion of the transportation market. Future growth rate is expected to decrease as market saturation occurs and as larger, more efficient aircraft continue to displace the present fleet. Seating capacities of aircraft have risen steadily over the years and this trend should continue if only by replacement of older, smaller aircraft. Fuel consumption per seat mile of newer planes, which use more efficient engines, is much lower than for previous models.

Although electricity itself is a form of energy, it takes a prime energy resource—oil, coal, gas, hydropower or nuclear energy—to generate it. Thus electric utilities are a market.

The Industrial Market

Chemical and allied products apart, industry will show only a modest growth in energy consumption. The level of industry consumption will also be moderated by industry's improved efficiency in energy use, and this trend is likely to be further stimulated by rising energy costs. Dupont and Alcoa, for example, have already developed plans for achieving significant fuel economies. Shell Oil has committed itself to achieving a 10-percent reduction in energy use in refineries over a period of 2 to 4 years.

Petrochemical feedstock demand will grow very rapidly at an average annual rate of more than 5 percent.

The Residential and Commercial Market

Several factors—particularly population and disposable income—influence the demand for energy of the residential market. It is estimated that this demand will increase from the equivalent of 5 million barrels in 1970 to 6.7 million barrels daily in 1990. Growth in this market is likely to be slower than in the past as the result of better heat insulation in new houses, coupled with the trend toward smaller, mobile and multiple family dwellings which have reduced requirements for space heating and cooling.

The commercial market includes stores, office buildings, schools, hospitals and government buildings. Consumption of energy is directly affected by the level of business activity and the demand for public services. It is estimated to increase at more than 5 percent annually and in volume to amount to about 7 million barrels daily by 1990. In both the residential and the commercial markets, gas will be the main supply source throughout the period but electricity will play a growing role.

The Electric Utilities Market

Electricity is a convenient form of energy for customers. It is normally available continuously and automatically, and the precise amount needed is instantly delivered so that the user needs no inventory. Discounting conversion and line losses, it is efficient and it causes the consumer no pollution problems. For these reasons industry has turned increasingly to electricity with a resulting growth rate annually during the last decade of nearly 8 percent. Looking ahead, between 1970 and 1990, an annual growth rate of 6.4 percent is forecast. The industrial market (including oil and gas companies) is the largest purchaser requiring 41 percent in 1970 and 42 percent in 1990. The residential market which today accounts for almost a third of electricity sales is estimated to fall to 22 percent by 1990 mainly because of energy conservation measures. The commercial market is rapidly increasing its electricity use with the spread of air-conditioned shopping centers, schools and office buildings, and it is expected to account for 34 percent of total demand by 1990.

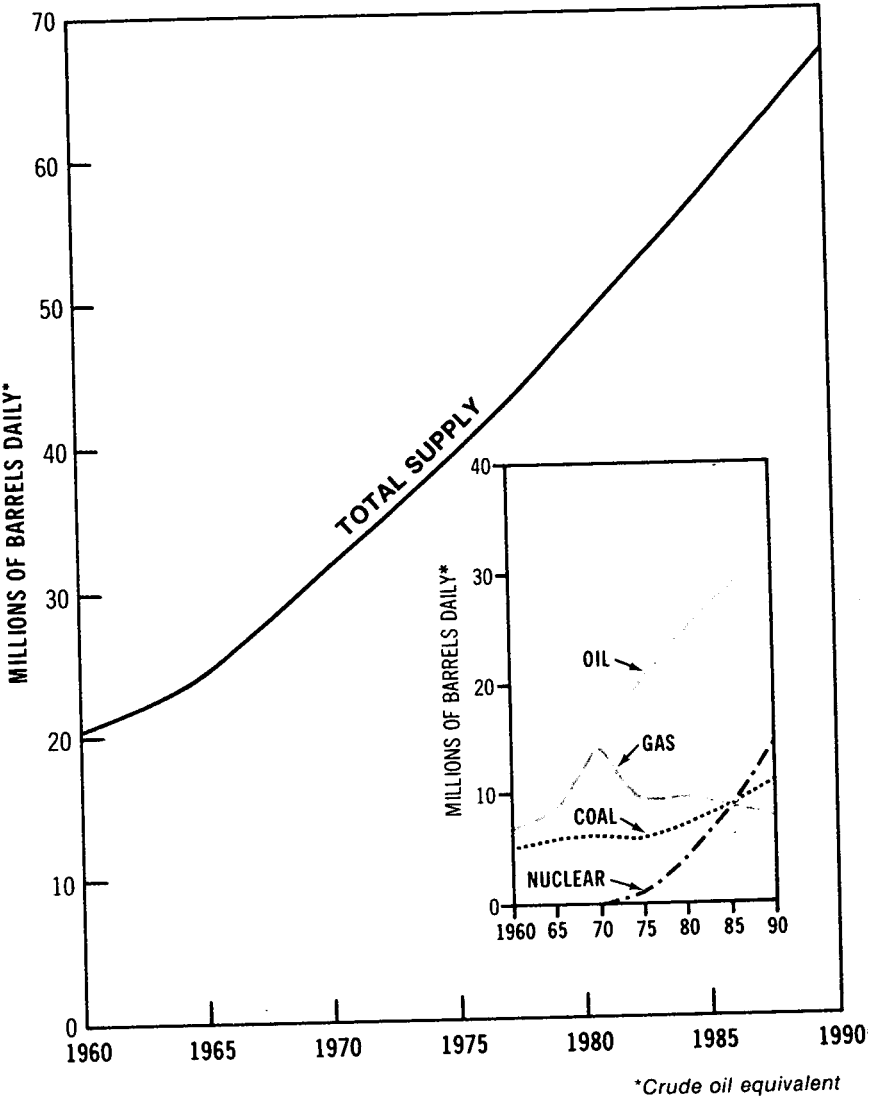
Fuel Requirements of Electric Utilities

Energy requirements during the period to 1990 will be met from various sources: nuclear, coal, natural gas, oil and hydroelectric power.

The use of natural gas is forecast to decline because of supply shortage, and hydroelectric power will show only modest growth because of lack of suitable sites. Short-term, oil will replace gas in the fuel supply, and coal will increase its role after stack gas scrubbing is developed fully by 1980. But in the long term, nuclear power will be the fastest growing source of fuel for utilities and will be 58 percent of total supply by 1990.

CHART 4

U. S. ENERGY SUPPLY



*Crude oil equivalent

U.S. ENERGY SUPPLY

Summary

How the United States is expected to meet its energy demand is shown in Chart 4. As the graph shows, oil will be the immediate mainstay of our energy diet, and during the '70s, its contribution to total energy requirements will increase from 44 percent in 1970 to 50 percent by 1980. This increase reflects the projected decline in natural gas supplies and the fact that alternative energy sources will all take a long time to develop. However, domestic reserves of oil and gas are diminishing, and it now appears inevitable that the United States—which now depends on foreign sources for over 25 percent of its petroleum needs—will become considerably more reliant on imports. During the 1970s, for example, most of the growth of the nation's energy requirements (16 million barrels per day) will have to be supplied by imports of foreign oil. By 1990, it is projected that imports will account for about two-thirds of the country's oil needs.

With regard to other energy sources:

Natural Gas, which in 1970 supplied one-third of our requirements, is in a declining reserves position. Domestic production has already peaked and is declining, and it is estimated that its share of energy supply will be reduced to 8 percent by 1990 (See page 19). Imported gas will contribute an additional 3 percent by 1990.

Coal's potential is very large, but the increasing severity of air quality standards, environmental problems associated with strip mining, mine safety and labor problems, and competition from gas and oil, have depressed the industry. The rate at which it can expand is limited.

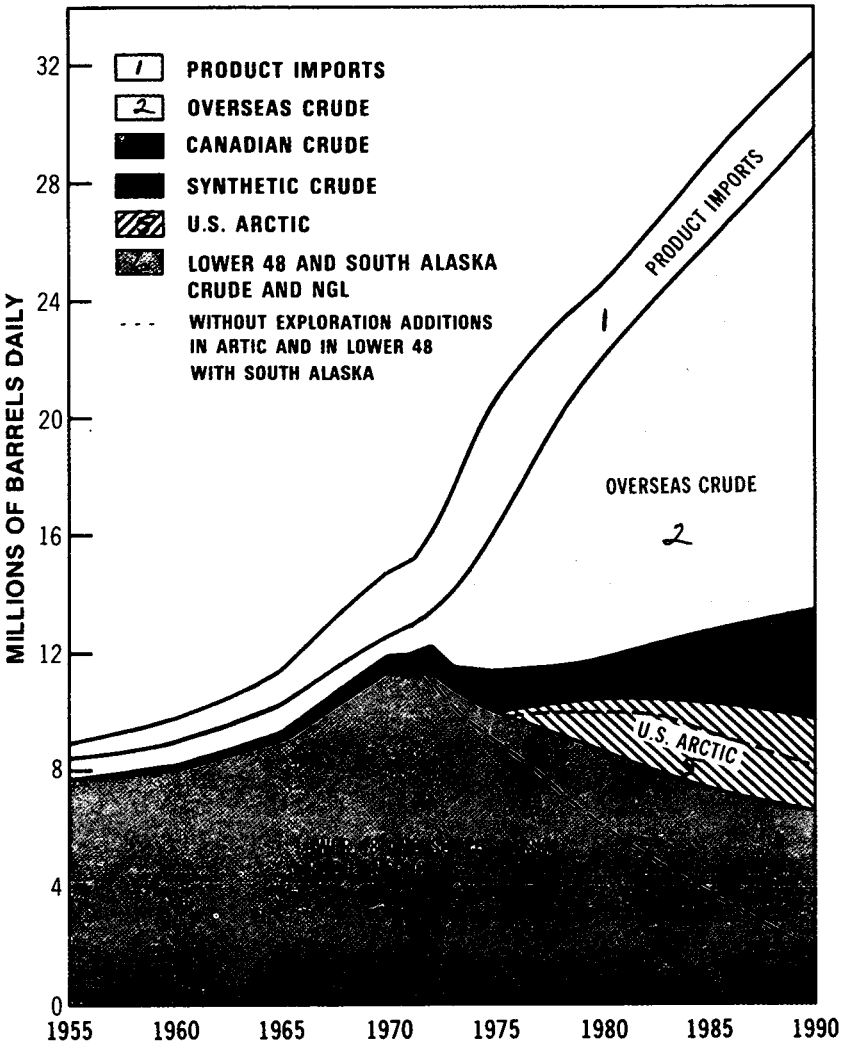
Nuclear power is expected to develop rapidly but lead times are long and environmental concern over safety and pollution is strong and unlikely to be quickly surmounted. By 1980, nearly 9 percent of energy supplies will come from nuclear reactors. However, by 1990, this is projected to reach 22 percent.

Other sources of energy are either limited by natural resources, e.g., hydropower and geothermal power, or by the need for commercial large scale processes to be developed (as in the case of oil from shale, and solar energy).

Use of solid wastes could become a source of energy. However, economic and technological factors make it unlikely that this can have substantial impact during the period of this forecast.

CHART 5

U. S. PETROLEUM SUPPLY



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Oil

Steadily increasing demand, coupled with reduced natural gas supplies, coal's environmental drawbacks and the delays in nuclear power, have created an energy gap which can only be filled by oil. Demand on supplies is currently about 16 million barrels per day. This is expected to increase by 1990 to nearly 33 million barrels per day.

Domestic production, shown in yellow in Chart 5, will not be able to meet this demand. It is now considered that U.S. crude oil production has peaked at just over 9 million barrels per day and will now decline, even though Arctic crude and production from discoveries in the Lower 48 slow this trend. Production from the Arctic is expected to average about half a million barrels daily in 1976 and is forecast to peak during the late 1980s at 3 million barrels per day. Development of Prudhoe Bay in Alaska along with other discoveries in the Arctic and Lower 48 should help to hold U.S. crude production around the 9 million barrels per day mark during the 1980s.

The dotted lines on Chart 5 indicate the extent to which production would fall were there no additional oil discoveries. There certainly will be new discoveries and the lines show that by 1990, more than half the combined supply from these areas is estimated to come from sources still to be found.

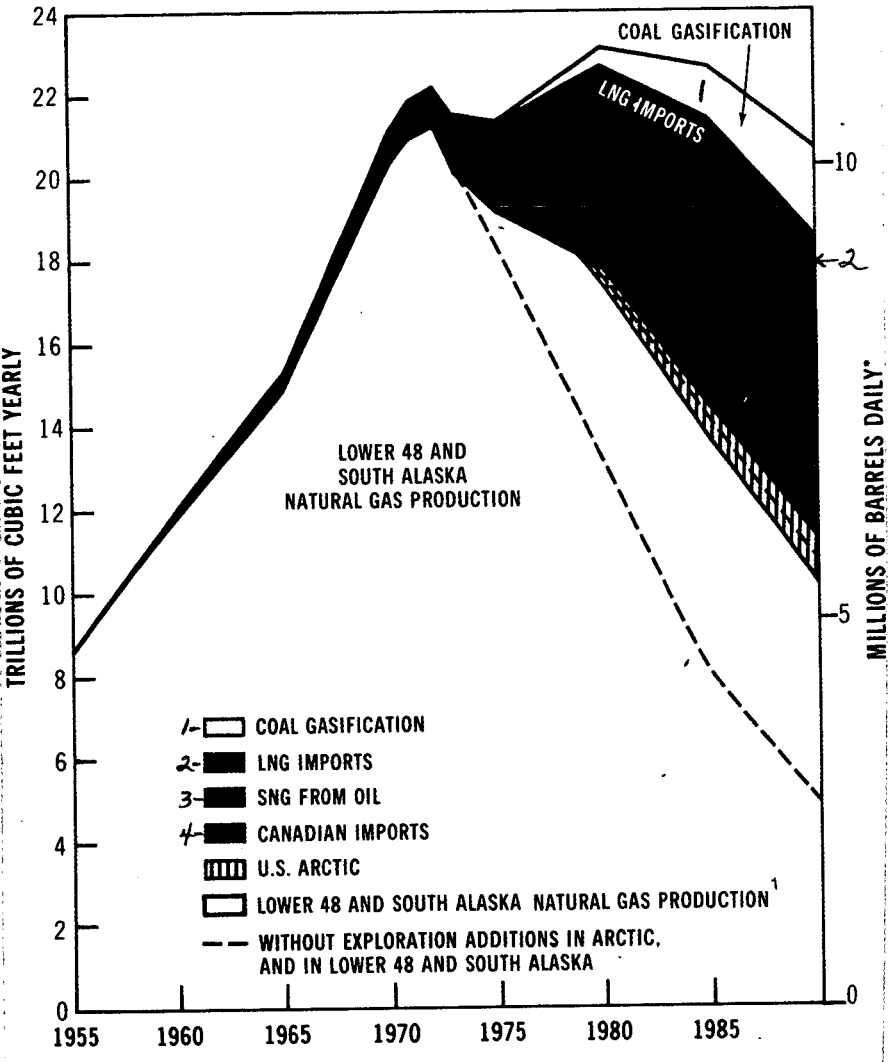
During the period to 1990, oil from shale and coal will make a small contribution of say 1.5 million barrels per day to total energy supplies. An accelerated development program could increase these quantities to perhaps 3 million barrels per day by 1990, but the rate of progress is likely to be limited by pressures on the construction industries and such considerations as water availability, mining labor and mining equipment.

As shown in Chart 5, the remainder of the U.S. oil supply must come from increasing amounts of foreign, including Canadian.

The dramatic change in prospect for the U.S., from being a nation largely self-supporting for its energy needs, to one heavily reliant on Middle East crude, is dealt with later in this booklet in the section on changing world supply patterns.

CHART 6

U.S. GAS SUPPLY



[1]AFTER NET STORAGE, FIELD, TRANSMISSION AND EXTRACTION LOSSES

*Crude oil equivalent

Natural Gas

Natural gas currently provides about one-third of the nation's energy. There are two reasons for its importance. First, it is extremely clean fuel. Second, it has been a relatively inexpensive fuel. The price, however, has been regulated by the Federal Power Commission and for years the industry has maintained it has been artificially low. While the low cost was intended as a benefit to the consumer, it had the long-term negative effect of causing shortage. While bargain prices, plus the fuel's cleanliness, have caused too many users of other fuels to turn to natural gas, the low wellhead prices dampened incentive to explore vigorously for new supplies.

As a result, production has exceeded reserve additions in three of the last four years and the declining trend in reserves is expected to continue. We believe production peaked in 1972, will show a decline in 1973 and will continue downward. The speed of decline will depend on the scale and degree of success of new exploration activity.

The dotted lines in Chart 6 indicate the extent to which production would decline were there no additional exploration discoveries. To an extent this is theoretical as there almost certainly will be some new discoveries. However, the lines show that even in the depressed production situation forecast for 1990, about one-half the supply from these areas is estimated to come from sources still to be found.

The declining production of natural gas will be offset to some degree by the arrival in the late '70s of Alaskan and Arctic gas, Canadian imports (whose volume will depend on Canadian demand and on exploration results in Canada), gas derived from coal and oil and imported liquefied natural gas. Together these supplementary sources are estimated to contribute about 11 trillion cubic feet per year by 1990, or about half of total supply.

Coal

Coal is the nation's most abundant source of fossil fuel and at present rates of consumption we have a several-hundred-year potential supply. However, because of the availability of relatively cheap alternative fuels, air quality regulations, surface environmental concerns, and the prospect of nuclear energy rendering its product obsolete, the coal industry has failed to grow in line with the rate of energy demand. During the 1960s few new mines were opened and little was done to expand older mines. The Federal Mine Safety Act of 1969 caused many to close completely.

The indications are, however, that the trend is changing, and our forecast projects coal production increasing from the current level crude oil equivalent of 7 million barrels per day to 12.5 million barrels daily in 1990. Strip-mined Western low sulfur coal should be a major supply source in the future. Development of this resource is contingent on reconciling environmental objections to strip mining which today threaten its growth.

Coal is costly to transport compared to other forms of primary energy, and with emphasis on Western strip-mined coal, improved transportation networks will be required to deliver these supplies to major consuming areas at competitive prices.

The growth of the coal industry will depend mainly upon solving safety, health and environmental problems and implementing commercial processes for sulfur removal from stack gases, and gasification and liquefaction.

Hydropower

Hydropower potential is limited by the number of available natural sites and by the very high capital costs of new projects.

Conventional hydroelectric power generated 16 percent of the total electric power used in the United States in 1970. Although the F.P.C. has estimated a large undeveloped potential, few new additions are expected, and we forecast that the percentage of power supplied from this source will decrease to about 6 percent of total electricity generation by 1990.

In terms of the nation's total energy hydropower currently provides about 4 percent, and this share will slightly decline during the period of our forecast.

Nuclear Power

Nuclear power is the long-term key to the U.S. energy future. New electric utility plants are forecast to be mostly nuclear in the future due to increase in costs of fossil fuels, limitations on their availability and the need to meet increasingly stringent pollution criteria. However, long lead times for nuclear energy will continue to place the major burden of power generation on fossil fuels during the next decade.

However, the nuclear industry is not without its problems: siting of new plants is difficult, and the adequacy of the emergency core cooling design and of radiation emission standards is being questioned. Future progress will be contingent on solving these problems.

Breeder reactors are not expected to be commercially significant before 1990. Current estimates indicate uranium ore availability will be adequate for the foreseeable future provided that the price is allowed to rise. Nuclear power is thus forecast to make an increasing impact on energy supplies after 1980 and by 1990 to be contributing 22 percent of total energy needs.

Nuclear fusion is not expected to provide energy supplies during the forecast period. Long term, however, the hope is that it will become a major source of energy.

Geothermal Energy

Geothermal energy can be tapped from various locations in California, and perhaps some other states, but the total contribution this can make to the energy supply picture by 1990 is considered to be minor. This estimate is based on the technical and economic problems still to be resolved in relation to large scale development.

Prospective Sources

Rising energy costs increase the attraction of solar energy applications, particularly for space heating in temperate climates, and in de-salinization of brines in hot, dry areas. Competitive economics are likely, however, to limit any wide application before the late 1980s.

III. PROBLEMS ARISING FROM THE DEMAND/SUPPLY PROJECTION

Community Problems

The nation's soaring demand for energy poses a series of difficult and interrelated questions and problems. Society determines what the growth pattern shall be, and the extent to which voluntary and imposed measures ought to be taken so that the economy of the country and patterns of living are best safeguarded.

Both the demand and the supply side of the energy picture can clearly be affected by society choice and society action. Thus, demand for energy could be moderated in the years ahead by the adoption of energy conservation measures. How seriously the American people will be willing to adapt their life styles to energy imperatives is difficult to foresee, but some parameters are given in a short examination of energy conservation possibilities in section V. Similarly, the supply pattern can be affected equally by the decisions to take or not to take action (or to delay action, which means much the same thing) on such points as the deregulation of natural gas prices, the speeding of construction of the Trans Alaska pipeline, the greater encouragement of domestic exploration and production activities through incentives and more frequent offshore lease sales, and the adoption of land use policies that enable vital refinery and electricity power plant construction to proceed. (For fuller treatment, see section VI.)

These and other related questions such as the severity of environmental standards and the health of the national balance of payments situation are matters for citizens, legislators and government officials to decide.

It should be noted, however, that our supply-demand forecast has been estimated on the basis of forward looking government action and has built into it significant allowance for the beneficial effects of reasonable incentives to the domestic industry. If, however, conditions for the industry turn out to be less favorable, then the severity of the problems arising from the widening gap between domestic demand and domestic supplies of energy will certainly become all the more acute.

The whole energy problem is also much affected by the time scale. While it seems possible that different energy scenarios could develop after 1980/85, the pattern for the next decade seems already largely determined. The oil industry is thus faced now with a number of practical problems that must be solved promptly if the public is to get the supply service it needs.

Oil Industry Problems

Provision of Crude Oil

As previous pages have shown, increased energy demand in the next 10 years can only be met by oil supply. To provide by 1980 10 million barrels per day over and above present consumption levels is, by any standards, an immense undertaking. Put graphically, 10 million barrels per day is equivalent to the production of more than five new Alaska Prudhoe Bay fields. To supply oil in this quantity calls not only for the discovery of new fields both at home and overseas, but also for transportation and terminal facilities for the large increase in imported supplies, a massive expansion of refinery capacity, and enormous amounts of capital.

Most of the increase in energy demand will have to be met from foreign sources. The realistic prospect is that a vigorous domestic exploration and production effort will at best only enable the current supply level to plateau instead of decline. To date, the physical problems involved in importing very large volumes of crude oil and products have been given inadequate consideration. Nor has there been much broad public appreciation of the international dimension in which oil supply questions will have to be resolved. For this reason, the import need is dealt with later in the context of the changing pattern of world supplies.

Refinery Capacity Expansion

To process the additional crude oil supplies, a vast expansion of domestic refinery capacity is called for, amounting to some 8 million barrels per day in 1970/80 period. Because of environmental problems and capital costs, the industry is likely to make maximum use of the expansion possibilities of existing refineries. This forecast assumes timely and appropriate land use policies and environmental regulations that do not make the construction of new refineries and the expansion of existing plants impossible.

Pipeline Capacity

It appears that by 1980, there will be need for new pipeline capacity beyond present expansion potential both for crude oil and products. This will include product pipeline capacity from the Gulf Coast to the East Coast and crude pipeline capacity from the Gulf Coast to the Midwest.

Shipping and Port Facilities

For its crude and product imports, the U.S. will need by 1980 tanker capacity equivalent to about 325 supertankers, the class of giant transport capable of carrying 1.5 million barrels of oil. This means the arrival daily of six such supertankers, and since these ships cannot be unloaded in a single day's time, approximately 25 receiving berths will be necessary.

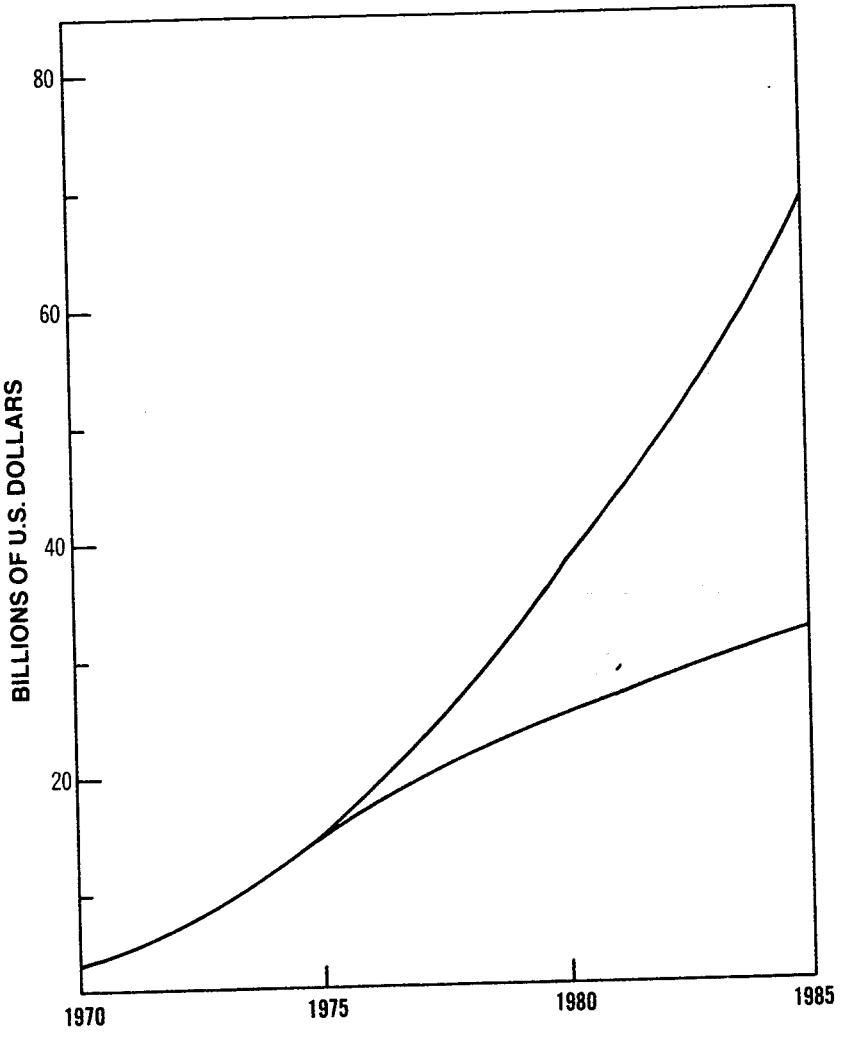
If receiving berths are not available, the alternative is offloading in the Bahamas or Nova Scotia and then reloading on to smaller ships capable of entering U.S. ports. This, of course, means increased cost.

Capital Investment

Provision of these and other necessary facilities will require huge capital investment. During the 1970/1980 period, this is estimated to total over $150 billion.

CHART 7

RANGE OF COSTS OF U.S. OIL IMPORTS



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Cost of U.S. Oil Imports *(Chart 7)*

By 1985, the total annual cost of imported oil could rise to between $30 billion and $70 billion, as shown in Chart 7. These figures are calculated by applying our forecast volume demand against a range of published projections of future oil prices made by responsible experts. Even by 1975, and using present crude oil prices, expansion of imports will add $8 billion to the import bill.

The seriousness of this dollar outflow is of prime significance in the determination of future U.S. energy policies. Sections V and VI discuss possible conservation and government measures which might ease this situation.

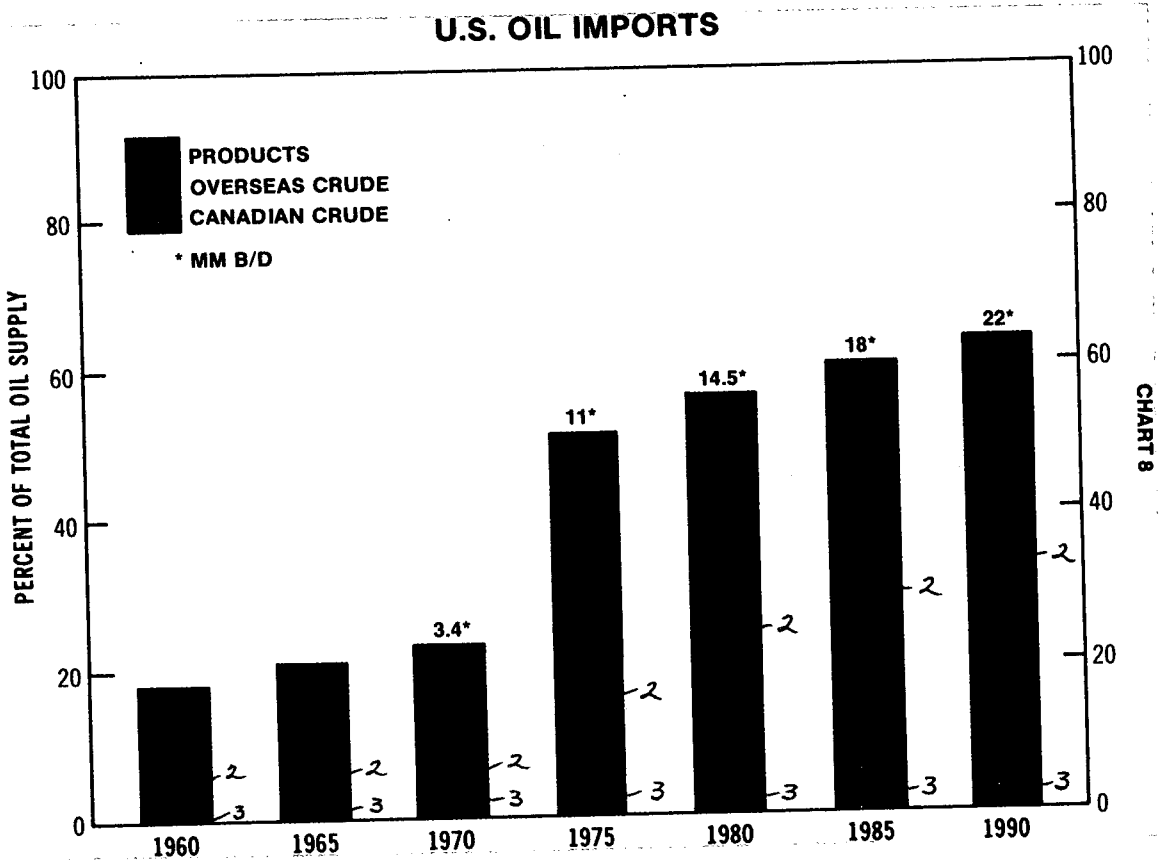

U.S. OIL IMPORTS
PRODUCTS
OVERSEAS CRUDE
CANADIAN CRUDE
* MM B/D
PERCENT OF TOTAL OIL SUPPLY
100
80
60
40
20
0
1960
1965
1970
1975
1980
1985
1990
3.4*
11*
14.5*
18*
22*
2
3

CHART 8

IV. THE INTERNATIONAL DIMENSION
U.S. OIL IMPORT NEEDS AND WORLD SUPPLIES

Crude Oil Imports

Our forecast is that U.S. imports of overseas crude oil will increase dramatically from 700 thousand barrels per day in 1970 to 4.3 million barrels per day in 1975. Western Hemisphere sources will be unable to expand their supplies significantly and almost all of this increase will therefore come from Eastern Hemisphere sources in the Middle East and Africa. The significance of Eastern Hemisphere supplies is shown in the following table.

Projected U.S. Imports
(million barrels per day)

	1970	1975	1980	1985	1990
Total crude imports	1.3	5.7	11.4	15.0	18.3
Overseas crude imports	0.7	4.3	10.2	13.2	16.2
Eastern Hemisphere imports	0.3	3.6	9.2	11.7	14.2
Eastern Hemisphere as % total	23	63	81	78	78

Product Imports

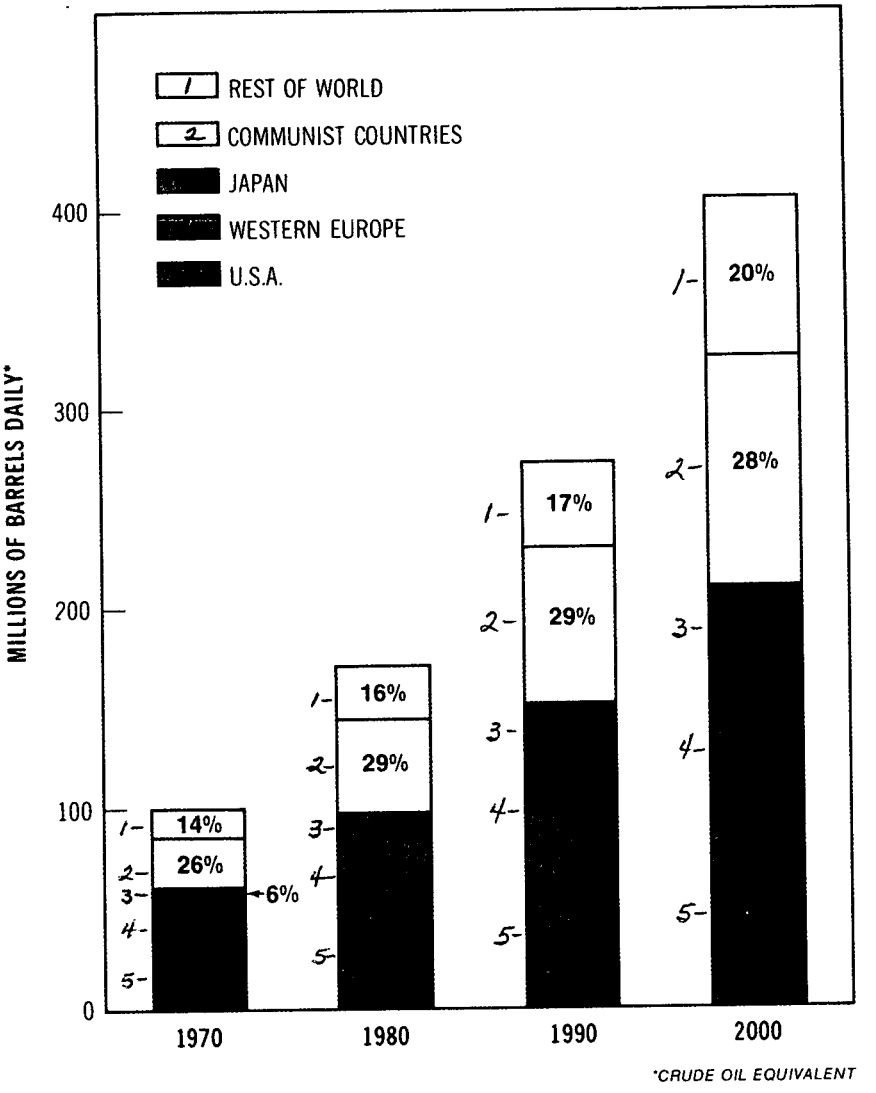
Although long term there are clear balance of payments advantages in having import regulations that favor U.S. domestic refining, in the short term, for reasons outlined on page 11, there will probably have to be a rapid increase in distillate and residual imports if demand is to be met. The extremely rapid increase in these requirements between now and 1975 will strain the world's refining capability.

The vast expansion foreseen for U.S. oil imports (Chart 8) will necessarily have profound effects on worldwide energy supply patterns in the years immediately ahead, and repercussions that are difficult to gauge over a broad range of political and economic matters.

Some further indications of the world energy position and outlook are given in the maps and text that follow.

CHART 9

WORLD ENERGY CONSUMPTION



*CRUDE OIL EQUIVALENT

World Energy Demand

World energy consumption is expected to nearly double between 1970 and 1980, increasing from the equivalent of 100 million barrels of crude oil per day to 170 million barrels. By the year 2000, it is projected to increase fourfold, reaching the equivalent of over 400 million barrels daily.

During 1970, the U.S. consumed about one-third of the world's energy. Its share is forecast to decline to 22 percent by 2000, because energy growth rates in Japan, USSR, East Europe, and the developing world are all projected to be higher than in the U.S. over the next 20-30 years.

Relative growth rates are shown in the following percentage table.

	1970-1980	1980-1990	% A.A.I. 1970-1990
U.S.A.	4.1	3.4	3.8
WESTERN EUROPE	4.8	5.0	4.9
JAPAN	7.2	7.2	7.2
COMMUNIST AREAS	6.5	4.9	5.7
OTHERS	6.8	5.5	6.1
WORLD	5.5	4.8	5.1

Reliance on Imports of Free World Industrialized Societies

Charts 10, 11, 12 and 13 in the pages that follow demonstrate the significance of Middle East supplies in the future of world energy consumption.

Chart 10 shows the extent to which Western Europe, Japan and now increasingly the U.S.A., are dependent for their major energy supplies on imports.

Chart 11 shows the predominance of the Middle East in the world oil reserves position. The Middle East contains about 70 percent of the free world's proven reserves, and on current projections is likely to account for about half of the additions to reserves in the next decade.

Charts 12 and 13 show the dramatic impact of the U.S. energy shortage on the pattern of world oil movements that is forecast to take place between 1970 and 1980.

ENERGY DEMAND VS. DOMESTIC SUPPLY

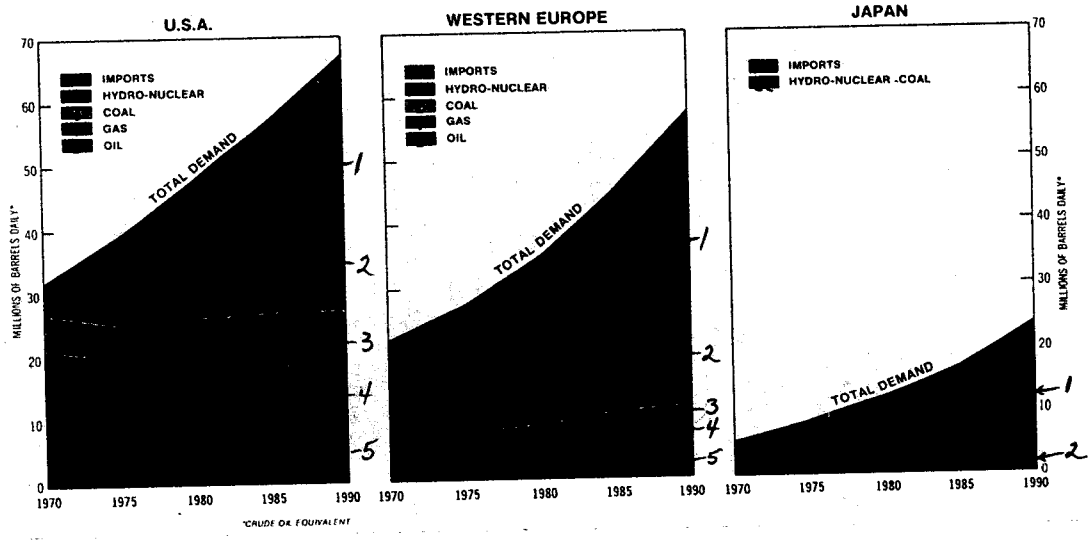


CHART 10

CHART 11

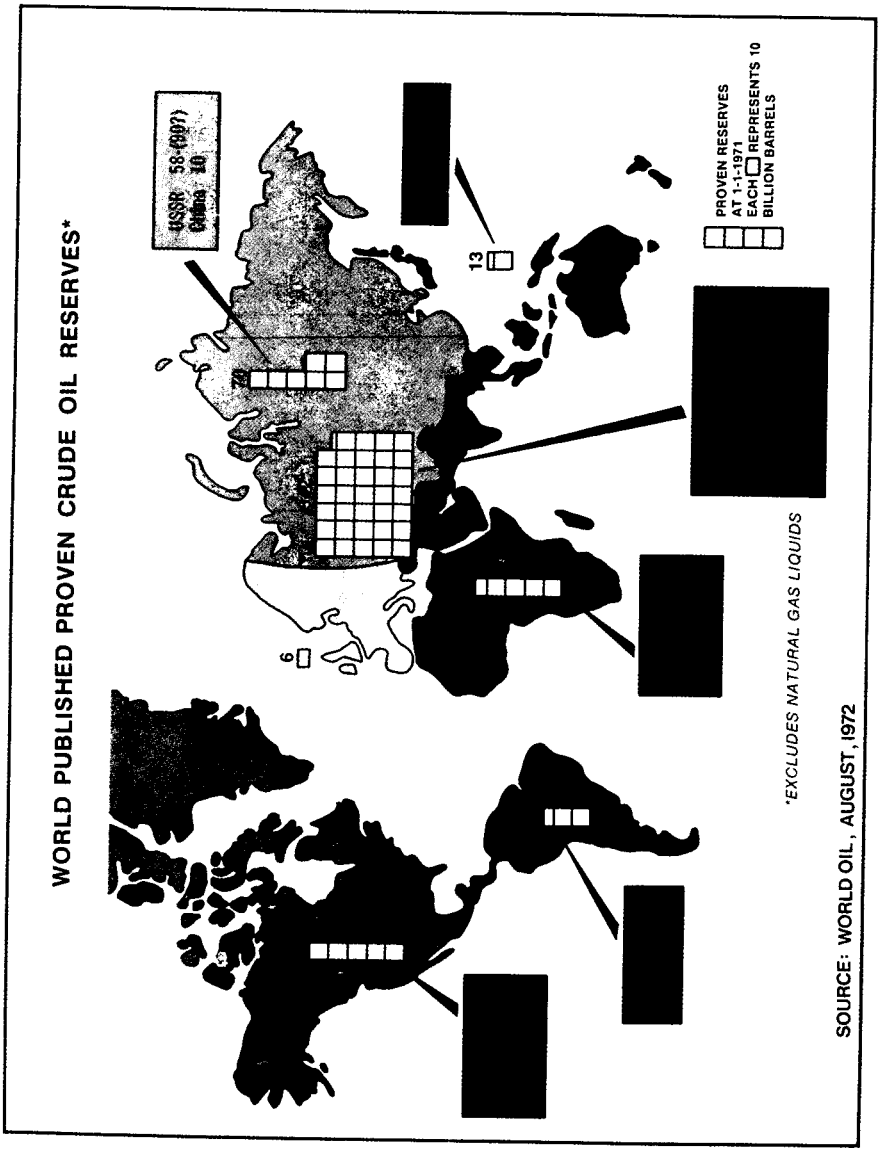

WORLD PUBLISHED PROVEN CRUDE OIL RESERVES*
USSR 58 (1967)
China 10
78
13
9
PROVEN RESERVES AT 1-1-1971 EACH □ REPRESENTS 10 BILLION BARRELS
*EXCLUDES NATURAL GAS LIQUIDS
SOURCE: WORLD OIL, AUGUST, 1972

CHART 12

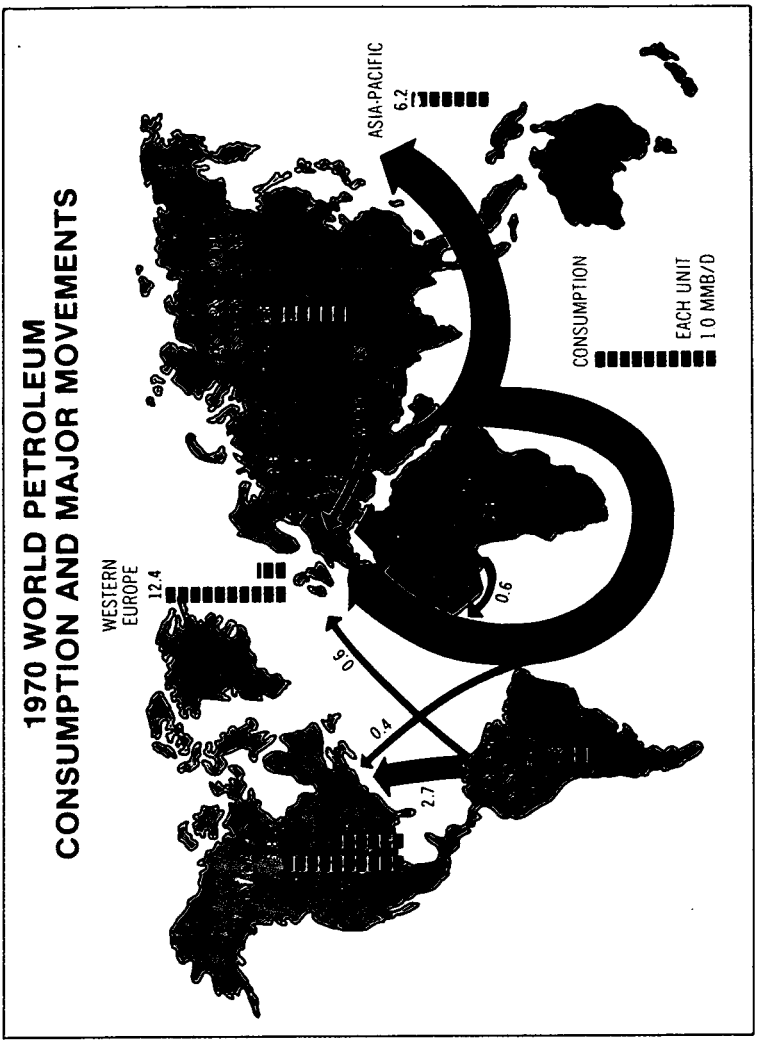

1970 WORLD PETROLEUM
CONSUMPTION AND MAJOR MOVEMENTS
WESTERN
EUROPE
12.4
ASIA-PACIFIC
6.2
CONSUMPTION
EACH UNIT
1 0 MMB/D
9.0
0.4
2.7
0.6

CHART 13

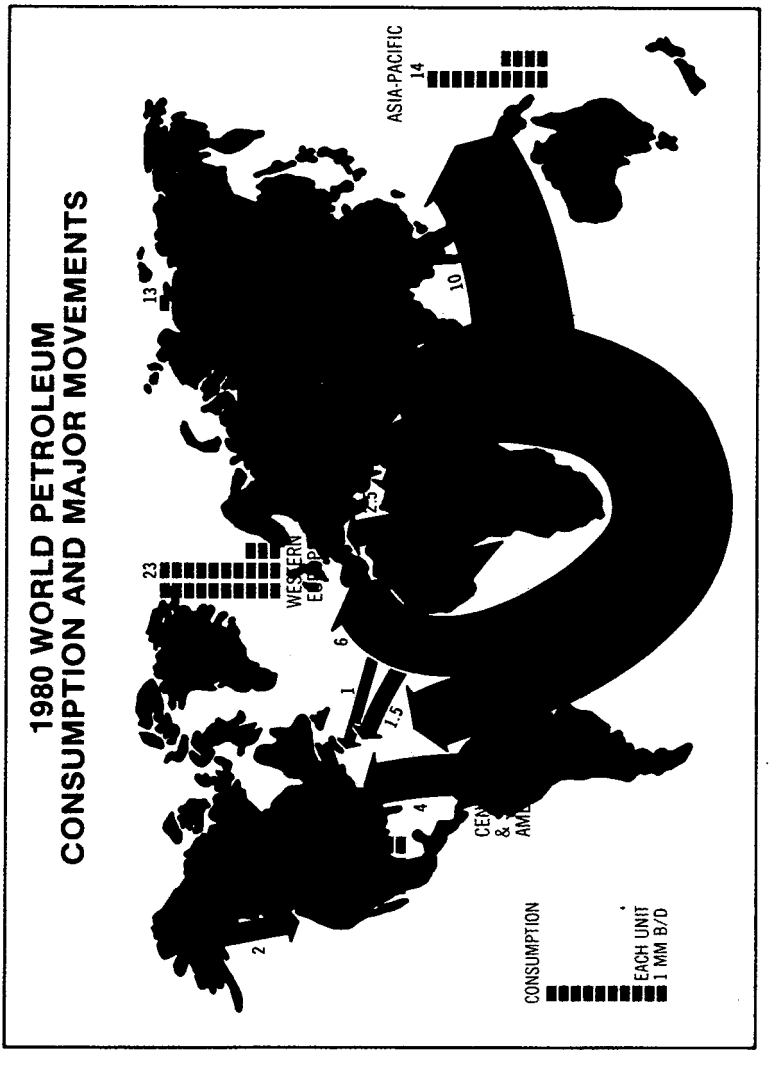
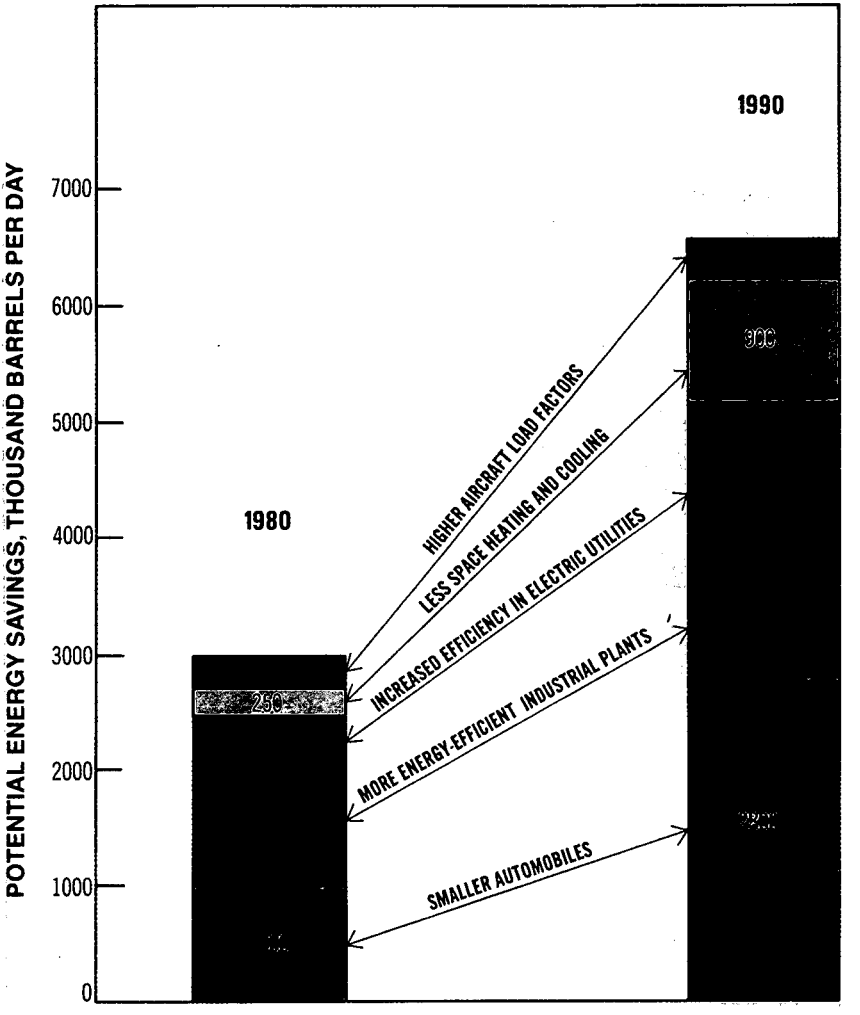

1980 WORLD PETROLEUM
CONSUMPTION AND MAJOR MOVEMENTS
ASIA-PACIFIC
14
23
13
10
6
4
2
1.5
1
CONSUMPTION
EACH UNIT
1 MM B/D

CHART 14

SUMMARY OF POTENTIAL ENERGY SAVINGS



V. POTENTIAL EFFECT OF ENERGY CONSERVATION MEASURES ON ENERGY DEMAND

In view of the increasing demands for fossil fuels detailed in this forecast and the limited sources of domestic supply, widespread interest in reducing growth in demand is developing. The federal government has been particularly active in this area, and the so-called Kupperman Report (from the Office of Emergency Preparedness) and reports prepared for the Senate Committee on Interior and Insular Affairs (Senator Henry Jackson, Chairman) are recent results of this activity. We have evaluated potential reductions in demand which might be achieved and conclude that by 1990, a saving of about 7 million barrels per day (crude oil equivalent) is possible relative to the forecast demand. Many of these savings require changes in life style only achievable through an extraordinary national consensus.

Transportation Market

The largest potential (3 million barrels per day of gasoline) could be realized by increasing the proportion of very small cars in the total U.S. automobile fleet. By 1990, we forecast that half the automobile fleet will consist of compacts or sub-compacts which will average not much more than 15 miles per gallon. A much smaller vehicle designed primarily for urban use and probably seating only two passengers would be expected to obtain 35 mpg or more. Complete substitution of this smaller vehicle for compact and sub-compact automobiles would be possible by 1990 if the energy problem is accepted as being sufficiently severe. The resultant saving in motor gasoline would be 3 million barrels per day if these small vehicles were used for half the total driving.

An additional 450 thousand barrels per day of aircraft turbine fuel could be saved by increasing average load factors from the forecast level of 55 percent to 80 percent. This would undoubtedly cause serious inconvenience to air travelers since many aircraft would be filled to capacity and the interval between flights lengthened.

The combined motor gasoline and turbine fuel savings could be nearly 3.5 million barrels per day.

Industrial Market

The next largest potential saving could be in the industrial market. In some industries, such as iron and steel production, the reasonable expectations for increased efficiencies have been included in our base forecast. In others, new technology not now foreseen can be expected to increase efficiency beyond that forecast.

In the chemical process industries (including petroleum refining), however, increased capital expenditures can usually lead to increased heat recovery and as fuel prices rise, the incentive to make the capital expenditures increases. A 5 to 10 percent decrease in energy use per unit of output can be expected from increased heat recovery. Use of more energy-efficient processes might contribute somewhat smaller savings. Total savings in the industrial market of 1.5 million barrels per day by 1990 seem possible.

On page 12, brief reference was made to energy saving schemes of DuPont, Alcoa and Shell. DuPont now offers a consulting service to industry which aims at achieving a 10 percent reduction in costs to any firm with a fuel bill of $1 million or more. A significant portion of this saving would come from greater efficiency in use. Alcoa has announced a new process for aluminum smelting which would achieve a saving of 30 percent on electrical energy consumption. Shell has already made substantial progress towards achieving its target of a 10-percent reduction in energy use in its refineries over a period of 2-4 years.

Utility Market

Savings in the utility market could amount to 1 million barrels per day of fuel oil by 1990. Over 80 percent of this potential saving arises from more efficient generation, and of this about half is attributable to more widespread use of currently available high efficiency steam plant design and operation. The balance would require commercialization of new system technology such as MHD* or organic working fluids to use low level heat presently rejected to cooling water or the atmosphere. A smaller amount could be obtained from more efficient transmission.

Residential/Commercial

Within the residential/commercial market, the largest use of energy is for space heating and cooling. Recent (1971) FHA insulation standards will reduce this demand if widely applied, and our forecast assumes application in 70 percent of new houses. If the balance of new houses were insulated so as to comply with these standards, a saving of 150-200 thousand barrels per day would result by 1990. Application of additional insulation to the presently existing houses could save an additional 300-350 thousand barrels per day for a total potential saving in the residential market of 400-500 thousand barrels per day. Even more stringent standards have been proposed which could save a further 200-300 thousand barrels per day, but these have not been publicly accepted.

The commercial market (which includes large apartment buildings) could contribute smaller savings estimated at 200 thousand barrels per day. The overall potential saving in the residential/commercial market would be 800,000-1 million barrels per day.

Other Conservation Possibilities

Mass Transit

The development of efficient mass transit is becoming an increasing community priority. Mass transit systems, however, have long lead times and very high capital costs. Hence, the impact on transportation energy demand can, unfortunately, only be a long-term possibility, and for this reason does not figure in Chart 14. The increased use of buses and of car-pooling would similarly have minor impact as only a small percentage of commuters would be affected, but they are worthwhile efforts nevertheless.

Taxation

Increased taxation on automobile horsepower, higher parking charges and the like could have an impact, but it is considered that such measures would be less effective and acceptable than the use of smaller cars. Moreover, the switch to small cars would not require reduction in miles traveled to achieve energy savings.

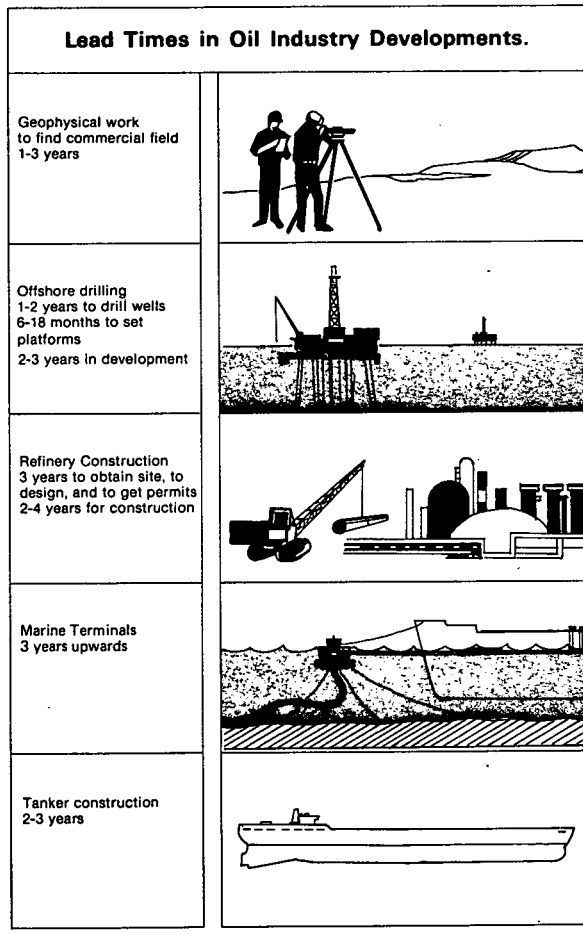
Magneto hydrodynamics—A process for more efficient direct conversion of heat energy to electricity.

Long Industry Lead Times

In considering measures to ease the energy supply situation (section VI), the importance of long lead times cannot be overemphasized. In some activities a sufficient concentration of brains and money can solve problems through "crash" action. In the oil industry, however, as the diagram below shows, planners must think in terms of several years, not months. An understanding of the time factor in oil operations is fundamental.

CHART 15

Lead Times in Oil Industry Developments.



VI. GOVERNMENT MEASURES THAT COULD EASE THE ENERGY SUPPLY SITUATION AND REDUCE DEPENDENCE ON FOREIGN IMPORTS

If the demand/supply forecast outlined in this booklet is even approximately correct, it seems clear that a fundamental transition is taking place in the U.S. energy supply position, with sharply increased dependence on foreign oil the key factor.

There is thus pressing need for new national energy policies and some indications of constructive measures that might be taken are given below:

- Speed completion of facilities for supplying petroleum from Alaska.
- Stimulate maximum production of domestic oil and gas.
  - -- deregulate gas prices, thereby allowing prices to reduce demand and thus also provide capital for new exploration work.
  - -- increase the size and frequency of offshore lease sales.
- Nuclear energy development
  - -- assist in overcoming siting and environmental obstacles.
- Coal
  - -- permit strip mining, given adequate environment and land safeguards.
- Research
  - -- encourage research on alternative energy sources: solar, nuclear fusion, coal gasification.
- Provide incentives to develop commercial coal gasification and liquefaction.
- Provide incentives to industry to substitute the use of coal for oil and gas in industrial and utility applications.
- Assist development of commercial stack gas scrubbing, thus permitting the use of high sulfur oil and coal.
- Reduce product import requirements by facilitating through land use policies the siting and construction of new refineries and power plants.
- Encourage the construction of new tanker terminals.

The success of an action program such as that outlined above depends on the soundness of the measures proposed, on the adoption of a comprehensive set of policies, and on timely implementation. More than ever, the need is apparent for coordination of priorities at government level, so that conflicting social and economic pressures are resolved in the total context of community needs, and patchwork "solutions" avoided.

The National Energy Problem:

Potential Energy Savings

One in a series of Shell Oil papers dealing with topics of national importance

THE NATIONAL ENERGY PROBLEM: POTENTIAL ENERGY SAVINGS

This is one of a series of Shell Oil papers on various aspects of the energy situation.
Others are "Oil and The Environment: The Prospect"
"The National Energy Problem: Implications for the Petrochemical Industry"
"The National Energy Outlook"
"The National Energy Problem: The Short-term Supply Prospect"
"The National Energy Problem: Natural Gas"
Copies of all are available on request from Shell Oil Company, Public Affairs, P. O. Box 2463, Houston, Texas, 77001.

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October, 1973

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CONTENTS

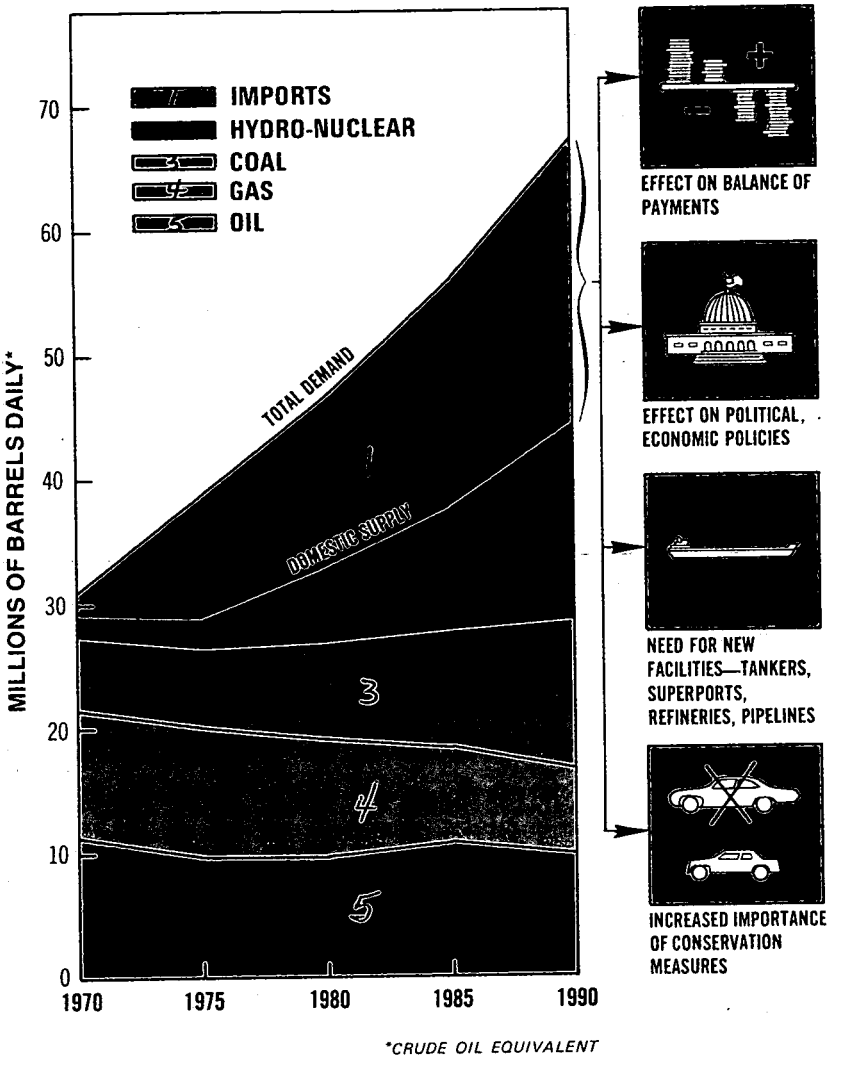
NOTE

This paper concerns energy savings potential measured in theoretical maximums. Except for discussing the substitution of natural gas for electricity in some appliances, the paper does not attempt to compare the relative efficiencies of various fossil fuels or other forms of energy.

Except where otherwise indicated, barrel of crude oil equivalent is used as the yardstick for comparing amounts of different forms of energy. Energy can be conveniently measured in terms of heat produced and a barrel of crude oil produces, on average, 5.8 million British Thermal Units (B.T.U.s).

CHART 1

THE U.S. ENERGY GAP 1970-1990



*CRUDE OIL EQUIVALENT

I. INTRODUCTION

The United States is faced with an energy demand that doubles every 15 to 20 years, but today the nation cannot meet that demand from domestic supplies. Increasingly, it is turning to foreign oil to fill the gap (Chart 1). This is happening at a time when Europe and Japan are increasing their consumption of imported oil. The heightening international competition for crude oil and the desire of petroleum exporting countries for a larger share of profits and control over production have transformed the world petroleum market from what for years was a buyers' market into a sellers' market. It is characterized by rising prices and increasing uncertainty about supply availability.

Against this background of domestic shortages and growing dependence on less secure, more costly foreign supplies, it becomes increasingly necessary to avoid waste, slow the growth of energy demand and improve efficiency in our production and use of energy. These are the basic elements of energy conservation, which in turn can be considered part of the larger necessity of making the most prudent use of all natural resources as a growing world population depletes them at a faster rate than ever before.

While energy conservation itself cannot solve the national supply problem, it can play a valuable role complementing measures to increase availability of oil and natural gas. At a time when the difference between adequate supply and sporadic shortages is marginal, public, government and industry cooperation in achieving sensible economies may avoid inconvenience and hardship. Longer term, the projected effect of the cost of imported oil on the nation's balance of payments suggests ever more strongly the need for vigorous energy conservation efforts.

Considerable present waste of energy is very apparent, and the main reason for this is that the price of energy has been so low. In the future, however, higher fuel costs should play a major corrective role, on the one hand restraining demand and on the other stimulating increased production.

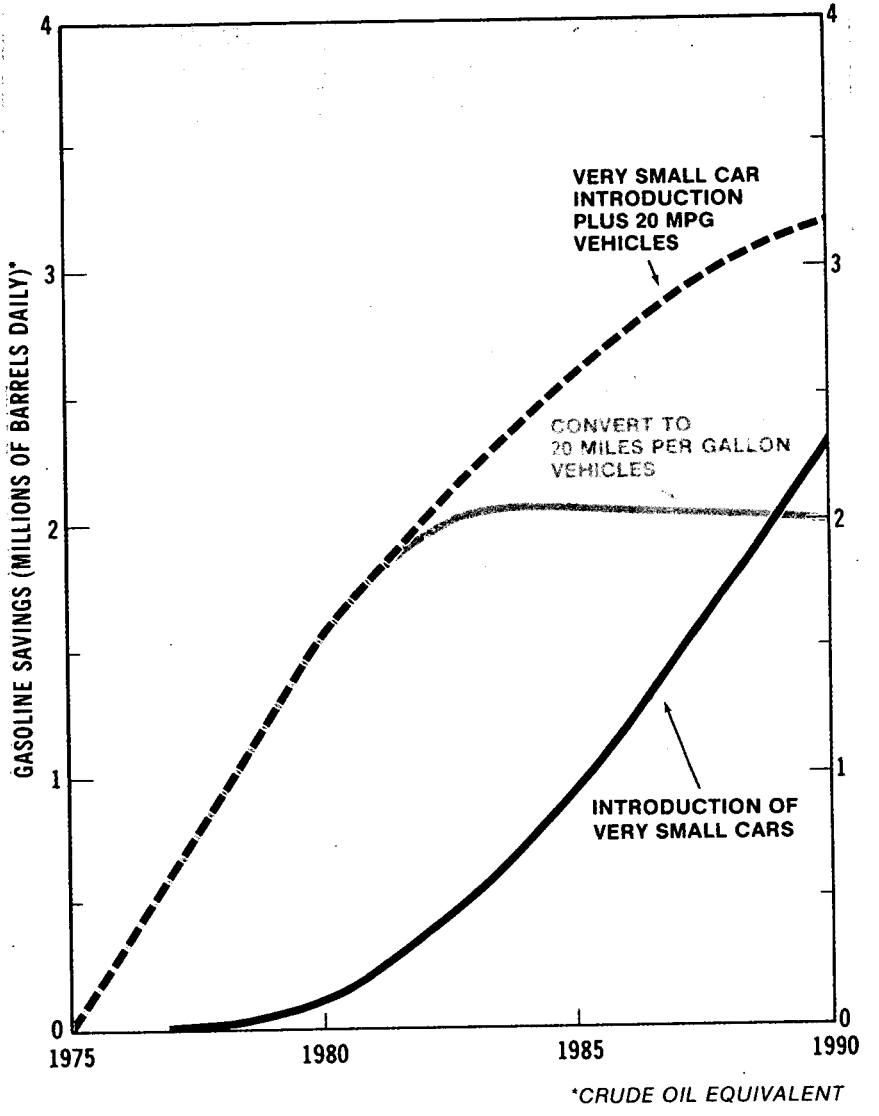
In "The National Energy Outlook," issued in March, we concluded that by 1990, an overall saving of about 7 million barrels per day crude oil equivalent appeared possible, relative to a forecast 1990 total energy demand of 67 million barrels per day (Chart 1). We noted then that many of these savings would require changes in life-styles achievable only through an extraordinary national acceptance.

Further studies we have made now indicate a savings of as much as 8.5 million barrels per day might be achieved if maximum cooperation were attained in the most critical areas. In addition, we estimate that energy conservation measures could lower the projected cost of imported oil in 1990 (almost $80 billion based on published price forecasts) by as much as $30 billion.

Although the purpose of this paper is practical, what it attempts to do is to quantify theoretically potential energy savings possibilities in the various segments of the national life. Clearly, how far potential savings can become real savings will depend on the effect of economic forces in the marketplace, on political decisions taken at state and federal levels, and on the willingness of individual citizens to cooperate. It may be argued that the human and political factors cannot be realistically set aside, and this we appreciate. We hope, however, this exercise will contribute usefully by defining the most worthwhile areas of action and by establishing the savings possibilities that might be attainable (a) short term, (b) by 1980, and (c) by 1990.

CHART 2

POTENTIAL AUTOMOBILE GASOLINE SAVINGS



*CRUDE OIL EQUIVALENT

II. POTENTIAL AREAS OF ENERGY SAVING

A. TRANSPORTATION

The largest potential energy saving — with perhaps the most social uncertainty over whether it can be achieved — lies in transportation. Basing our projections on a high degree of public acceptance of the tradeoffs and major changes in life-styles involved and on the likelihood of some government controls, we estimate that by 1990 some 3.6 million barrels per day crude oil equivalent might be saved in this sector.

Here is a look at the savings we think are possible in the major areas of transportation:

1. Automobiles

(a) SMALL CARS

The biggest portion of potential transportation savings could be in the form of motor gasoline conserved through a substantial substitution of compact and sub-compact cars, and cars even smaller than these, for standard size automobiles.

We estimated in our base 1973 National Energy Forecast that, given current economic projections, about half the U.S. auto fleet by 1985 will be compacts and sub-compacts, getting an estimated 15-25 miles per gallon. As an indication of a trend toward smaller cars, the auto industry reported that in the first five months of 1973, 59 percent of new car sales were in the smaller-than-standard categories and 38 percent of sales were in the compact and smaller classes.

To effect greater gasoline savings than figured in our base forecast, substantial further reduction in auto size and weight would be necessary. If, for example, second and third cars were replaced on a wide scale by much smaller vehicles getting perhaps 35 to 45 miles per gallon, we estimate that by 1990 an additional direct saving of 2.4 million barrels daily crude oil equivalent might result (red line, Chart 2). Again, we recognize that should a widespread switch to such vehicles occur, it would constitute a major life-style change for many Americans, and that such a change might come only as a result of substantially increased fuel costs and/or controversial government action.

The very small cars probably would weigh between 1,000 and 1,500 pounds and would be smaller, especially in length, than most present sub-compacts. Most of them probably would be powered by gasoline engines and Chart 2 is based on this premise. Some might have battery-electric drive or perhaps a gasoline-electric system (although batteries to power a car farther than the 50-75 miles achieved by current prototypes have yet to be developed). They would attain a maximum speed of about 45 miles per hour and would be capable of accelerating from 0 to 30 in 15 seconds. They would carry one or two persons and would be used mostly for urban commuting and other short trips (more than half of auto trips now are of less than five miles). Most of these cars would not have air conditioning or other gasoline-consuming power accessories.

A large-scale switch to very small cars could have its negative effects, however. Since the cars would contain less steel, plastic, paint and other materials, industries producing these materials and their labor forces might experience reduced activity. And the auto industry itself would need an estimated four years or more to change its plant equipment and production procedures to handle changes in car design.

(b) ALTERNATIVES

Two suggested alternatives to the large-scale introduction of very small cars are (1) providing incentive for or requiring **all** cars eventually to obtain at least 20 mpg, allowing a gradual increase to this mileage range, and (2) providing incentive for or requiring a manufacturer's **average** car to get at least 20 mpg. We estimate the savings in crude oil equivalent from either of these alternatives could reach more than 2 million barrels per day by 1990 (blue line, Chart 2).

The dotted line in Chart 2 indicates that a combination of very small cars and vehicles obtaining 20 miles per gallon might achieve a savings of some 3.2 million barrels per day crude oil equivalent by 1990.

(c) FACTORS AFFECTING FUEL ECONOMY

Factors of car design, fuel composition, and driving and car care habits affect fuel economy.

Chief among design factors are weight, engine size and efficiency, transmissions and power accessories, body aerodynamics and tire design. Another major factor, emission controls, affects both weight and engine performance.

Since and including 1968, weight additions and lowered performance caused by more emission controls, government-mandated safety equipment and convenience accessories, have caused a decided drop in fuel economy among standard size cars.

Estimates of these fuel penalties vary. For example:

— A Shell Oil study, using our own tests and data from the auto and petroleum industries, said that fuel economy in standard size autos in general fell 20 percent from 1968 to 1973. It assigned 10 percent of that penalty to the effect of emission controls on engine efficiency, 7 percent to vehicle weight and 3 percent to added accessories.

— Ford Motor Co. told a congressional hearing on energy conservation and fuel use in July that emission controls and added weight have cut the fuel economy of its standard-size four-door sedan in normal city and suburban driving tests from 15 miles per gallon in 1965 to 11.8 mpg in 1973, a 21 percent drop in fuel economy.

— General Motors told the same hearing the average fuel economy of one of its regular-size models on a GM city driving test schedule decreased from 13.7 mpg in 1968 to 10.5 mpg in 1973, a 23 percent drop in fuel economy.

We believe that in the near future, automakers will achieve at least a modest improvement in fuel consumption in new models, by means of weight reduction and more efficient engines and transmissions. Auto companies say this will start occurring by 1975. Introduction of these models and of increasing numbers of smaller cars should at least partially offset the effects of emission controls and power accessories on total motor fuel consumption. An estimate of their impact is built into our base forecast for motor gasoline demand.

As far as fuel is concerned, oil companies are seeking to develop gasolines that not only will produce fewer emissions but also fewer carburetor deposits that both lower engine performance and fuel economy.

Individual driving and car maintenance habits have a major bearing on fuel economy. Drivers can save on fuel consumption by keeping engines properly tuned and tires properly inflated, avoiding rapid starts and accelerations that burn more gasoline, and by driving at slower speeds on the highway.

2. Car Pools

It is difficult to estimate accurately the savings possible from increased commuter carpooling, because geographic location, size of metropolitan areas, types of businesses and residential densities vary so greatly. But, if commuters were persuaded into car pools, we estimate an almost immediate savings of 430,000 barrels per day crude oil equivalent would be possible. This might increase to 620,000 barrels per day by 1980 and to 790,000 by 1990.

The encouragement of carpooling also raises controversial issues — for example, limiting access to cities, limiting parking to automobiles carrying more than one person or giving differential rates which vary with the occupancy of the automobile. Some of these methods already are being tried but so far are not proving highly successful. One example is a higher toll being charged for single occupant cars on the San Francisco-Oakland Bridge.

In our projections, we used a U.S. Department of Transportation survey which estimated that 68 percent of all private commuter vehicles presently carry only the driver. We assumed that of those, one-half must continue to be used in this fashion. This is because either the driver's work hours are not regular enough to permit using a car pool or because there are not other persons near his residence with similar hours and location of work. All other commuters using private vehicles were assumed to ride in three-person car pools, the number being arbitrary and designed to reflect that people sometimes find it necessary to drive by themselves. The Department of Transportation survey also estimated that 34 percent of all car-driven miles were in commuting.

3. Public Transportation

RAIL AND FIXED GUIDANCE SYSTEMS

Rail and fixed guidance transit systems might substantially reduce the demand for gasoline by taking large numbers of commuters out of automobiles. To be successful, however, they would require strong public backing, large amounts of capital and major assistance from the federal government in the form of research, subsidies and tax incentives. And because of the high capital costs and long lead times necessary to plan and build such systems, we feel they are unlikely to cause any significant reduction in automobile travel within the 1973-90 time scale.

The San Francisco Bay Area Rapid Transit District illustrates the problems involved. It was formed in 1958, began construction of a system in 1966 and was expecting to finish it by 1974. During this 15-year period, costs rose from an originally estimated $700 million to $1.5 billion. When completed, it is expected to carry only about 1 percent of the total surface travel and 10 to 15 percent of the commuters in the bay area.

Such systems are energy-efficient at commuter rush hours because they carry large numbers of passengers for the amount of fuel they consume. Their overall efficiency is diminished by the fact they transport a minimum number of passengers at other times and by the 70 percent efficiency loss in converting fossil fuels to electricity to operate the trains.

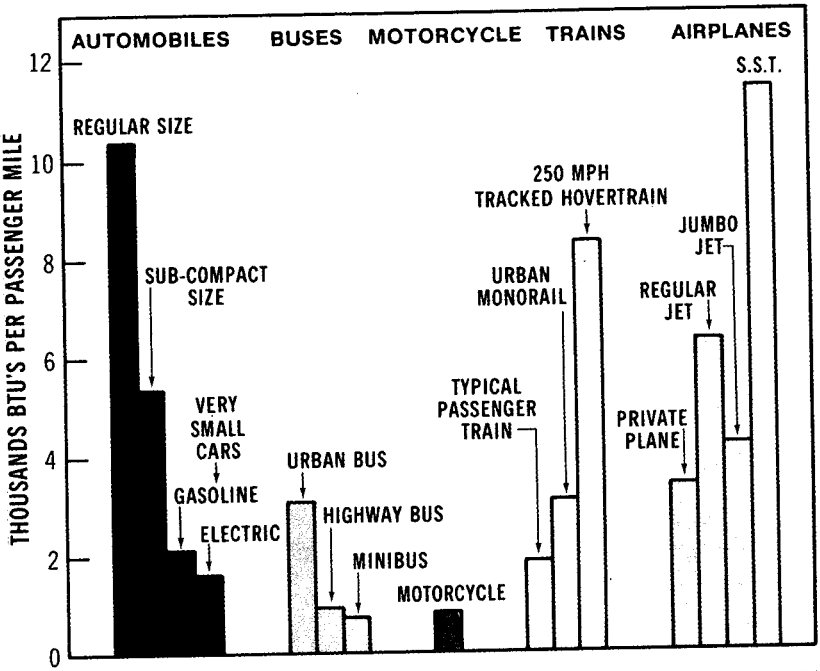
URBAN BUSES

Urban buses are a shorter-term possibility. They might travel in special lanes as they do now in Los Angeles and the New York City and Washington, D. C. areas. An interesting variant is the Dial-a-Ride bus which holds 10 to 20 passengers, can be dispatched in response to a phone call, and provides door-to-door service.

Buses offer high energy savings potential at relatively modest capital cost. We estimate, in fact, that if half the commuters now using cars switched to urban buses, the savings by 1990 could be on the order of 500,000 barrels per day crude oil equivalent.

CHART 3

TRANSPORTATION ENERGY CONSUMPTION OF VARIOUS MODES



	MODE	PASSENGER MILES PER GALLON	NUMBER PASSENGERS	THOUSANDS BTU'S PER PASSENGER MILE
Autos:	Regular Size	12	1.3	10.4
	Sub-compact	23	1.3	5.4
	Very Small (gasoline)	59	1.3	2.1
	Very Small (electric)	78	1.3	1.6
*Buses:	Urban bus	40	12	3.1
	Highway bus	140	22	0.9
	Minibus	175	7	0.7
*Motorcycle:	(2 HP)	160	1	0.8
*Trains:	Passenger train	65	300	1.9
	250 mph Tracked Hovertrain	15	48	8.3
	Urban Monorail	40	20	3.1
*Planes:	Private plane	37	3	3.4
	Regular jet (DC-8)	20	80	6.3
	Jumbo jet (B-747)	30	200	4.2
	S.S.T. (Mach 2.7, U.S.)	11	150	11.4

*Source: *Rice, Richard A., 1972, "Energy Efficiencies of the Transport Systems;" a paper presented before the Society of Automotive Engineers at the International Automotive Engineering Congress, Detroit, Michigan, January, 1973.*

4. Passenger Aircraft

In this study, we project a possible increase in the demand for aircraft turbine fuel that would raise the passenger load factor from the 55 percent assumed in our base national energy forecast to as high as 80 percent. With such an increase in load factor, we estimate potential savings in turbine fuel might range from 330,000 to 450,000 barrels per day crude oil equivalent during the 1980-90 period. Factors suggesting the possibility of higher load factors include the growing recognition by the public and the federal government that air travel is not energy-efficient when seats are empty, the economic benefit to the airlines of filling seats, and the increasing importance of charter flights which tend to raise load factors because of their bargain prices.

Load factors hinge to a large extent on the rate at which the Civil Aeronautics Board authorizes competitive routes. Recently, the CAB authorized airlines to discuss proposals for standard flight times and cruise speeds, operation at higher altitudes and the elimination of competing flights.

One major result of higher load factors might be the need for fewer airplanes. This, in turn, could have a negative effect on aircraft manufacturing and supporting and related industries, and on the labor market in areas where plants are located.

5. Other Transportation

Short and medium distance high speed trains and inter-city buses are established means of getting people out of private cars and commercial airplanes. One successful example is the Metroliner train between New York and Washington. But without major financial assistance and a sizeable increase in general public enthusiasm, these modes of travel appear to hold questionable promise as major energy savers.

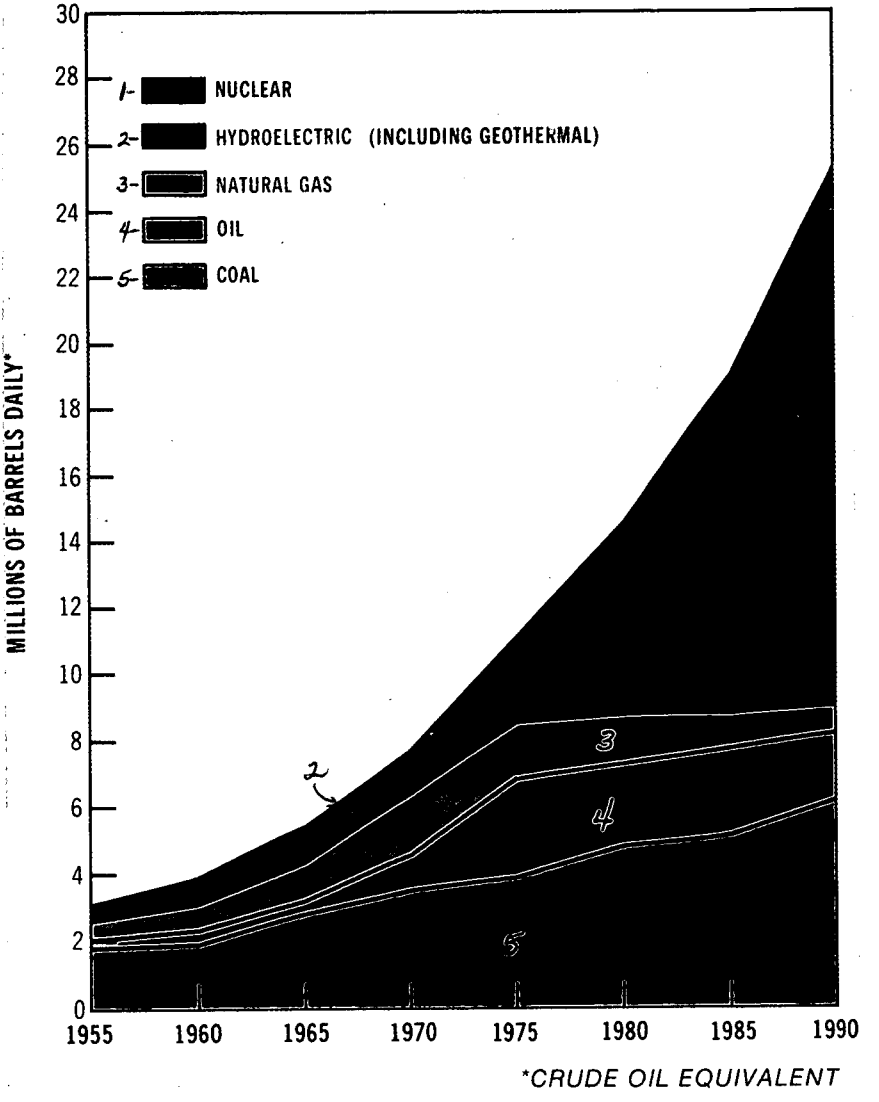
The use of rail instead of trucks for freight has been advanced as another potential energy saver. The difference in efficiency has not been great enough, however, to outweigh the greater convenience of trucks, but this situation could change with rising fuel costs.

6. Comparative Efficiencies of Transportation Modes

Chart 3 compares efficiencies of various transportation modes in terms of how much energy is required to move a person a certain distance. It shows regular size automobiles are among the most inefficient modes, while very small cars compete favorably with buses and trains. The average occupancy for autos (1.3) is for a typical work trip. Worth noting here is the sensitivity of the comparison of the various transportation modes to the assumed average number of passengers in each case.

CHART 4

ELECTRIC UTILITY ENERGY CONSUMPTION



B. UTILITIES

In "The National Energy Outlook," we estimated that energy savings in utilities could amount to 1 million barrels per day of fuel oil by 1990. Further study, however, has led us to conclude that the growth of nuclear power plants and other factors will in all probability preclude significant savings in fossil-fueled utilities, though some savings are surely possible.

To begin with, the average overall system efficiency of electric power generation by conventional means is only about 30 percent (though some coal-fired plants achieve about 40 percent efficiency). This means that, on the average, 70 percent of the energy from fuels used to generate electricity is lost, mostly as waste heat, in generation and transmission.

We believe now that the growth rate of these conventional fossil-fueled steam-electric plants which could incorporate energy-saving measures, is slowing due to the trend toward nuclear facilities for power generation. This trend is indicated in Chart 4 which shows projected fuel consumption by electric utilities. We feel also that because of the increase in nuclear plants, utilities will be less likely to expend capital to install energy-saving equipment in existing conventional facilities. Also to be considered is the fact that such environmental measures as stack gas scrubbing increase fuel consumption. This process, still not commercially perfected, cleans polluting sulfur oxides and particles from stack exhaust gases.

In addition, other, more efficient methods of generating power, such as magneto-hydrodynamics (which could increase efficiency as high as 60 percent), are unproven, possibly more costly, and require long lead times to develop. Finally, the siting and construction of nuclear plants themselves are hindered by environmental and safety concerns and require lead times of as much as 10 years in some cases.

There are, however, incentives and measures which could result in direct and indirect energy savings in utilities and the residential, commercial and industrial markets which they serve. They include having government offer tax incentives to install new energy-saving equipment, the changing of rate structures to discourage consumption, the establishment of more stringent building codes, and the setting of standards for the most economic use of energy by industries.

Both electric and gas utilities have been encouraged to insist on more rigid insulation standards for new homes before agreeing to provide electricity for heating and cooling, and to urge owners of older homes to improve their insulation. For example, the state of Michigan has urged gas companies to underwrite gas-saving insulation in private homes. Also in that direction, an American Public Power Association program of advertisements and radio spots tells consumers how to conserve energy, save on electricity bills, and purchase appliances which are more energy-efficient.

Other Methods of Power Generation

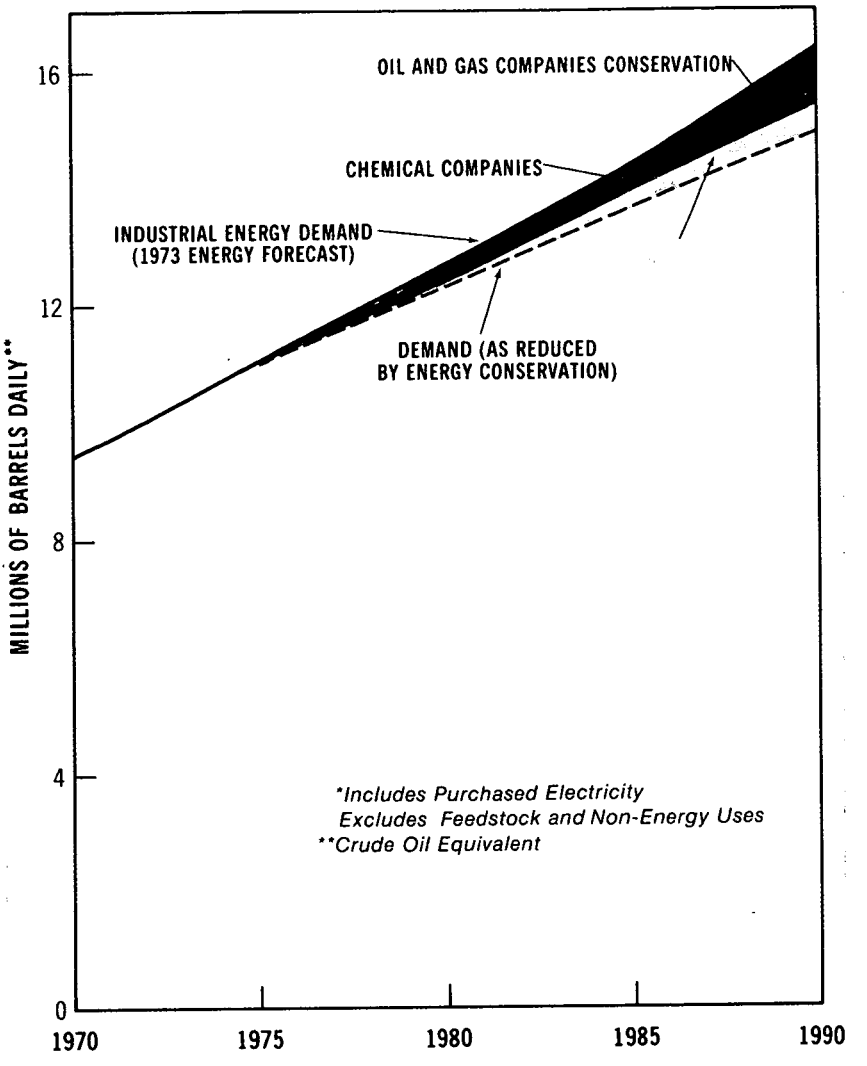
Bottoming cycles — These use waste heat normally rejected from power plants, thereby increasing the plants' overall efficiency. They might save as much as 600,000 barrels per day crude oil equivalent by 1990, but they are costly.

Combination gas-steam turbine systems — They are expected to be more efficient than conventional systems, and this efficiency is expected to make them increasingly attractive as fuel costs rise. Until now, their high capital costs had made them unattractive for most base load requirements.

Fuel Cells — Fuel cells are almost emission-free and their eventual efficiency is projected as high as 80 percent. Though prototype models have produced promising results, the current need for using precious metals in their construction and their use of premium fuels such as hydrogen make them expensive and unattractive at present for base electric power generation. However, we do estimate that use of fuel cells instead of steam-electric plants could save between 100,000 and 500,000 barrels daily crude oil equivalent by 1990, if technological developments make possible their wider application.

CHART 5

INDUSTRIAL ENERGY REQUIREMENTS*



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C. INDUSTRY

Industry consumes more energy than any other sector of the American economy, an estimated 40 to 45 percent of total U. S. energy. However, only moderate energy savings are likely in industry, perhaps 1.5 million barrels daily crude oil equivalent by 1990. There are several reasons for this.

First, fuel costs are less than 5 percent, on the average, of industry's total expenses. Therefore, we do not expect higher fuel costs alone to trigger the major capital expenditures necessary to effect reductions larger than those suggested above. Second, long lead times are required to convert or replace equipment to bring about more efficient operations. Third, environmental measures such as stack gas scrubbing have an opposite effect of increasing fuel consumption.

The savings we do consider possible would be accomplished principally by the recovery and use of heat and power formerly lost in plant operations. This means less fuel and electric power are needed.

The best prospects for industrial energy savings lie in the iron and steel, petroleum refining and chemical industries — all big fuel users. In the iron and steel industry alone, we believe possible a 20 percent decrease in energy consumption per unit of output up to 1985. This has been figured into our base 1973 energy forecast (Chart 5). Estimates of additional fuel savings possible in the petroleum and chemical industries average about 10 percent.

Other major industrial consumers of energy include the textile, mining, food, and paper and allied products industries and the stone, clay and glass products industry. Together, they consume 23 percent of total industrial energy. Miscellaneous industries ranging from machinery to printing and publishing use an additional 10 percent. Only a 5 percent reduction in energy is considered practicable for all these industries.

With energy costs rising and crude oil in shorter supply, the petroleum refining industry, and the closely related chemical industry, are finding it increasingly necessary to reduce both fuel consumption and the amount of purchased power. They are accomplishing these goals principally by recovering and using much of the heat and power once lost in furnace stacks and finished product cooling operations. Cost of the additional equipment to increase heat and power recovery is considered justified by the growing necessity to cut consumption of increasingly expensive fuels and operate more efficiently.

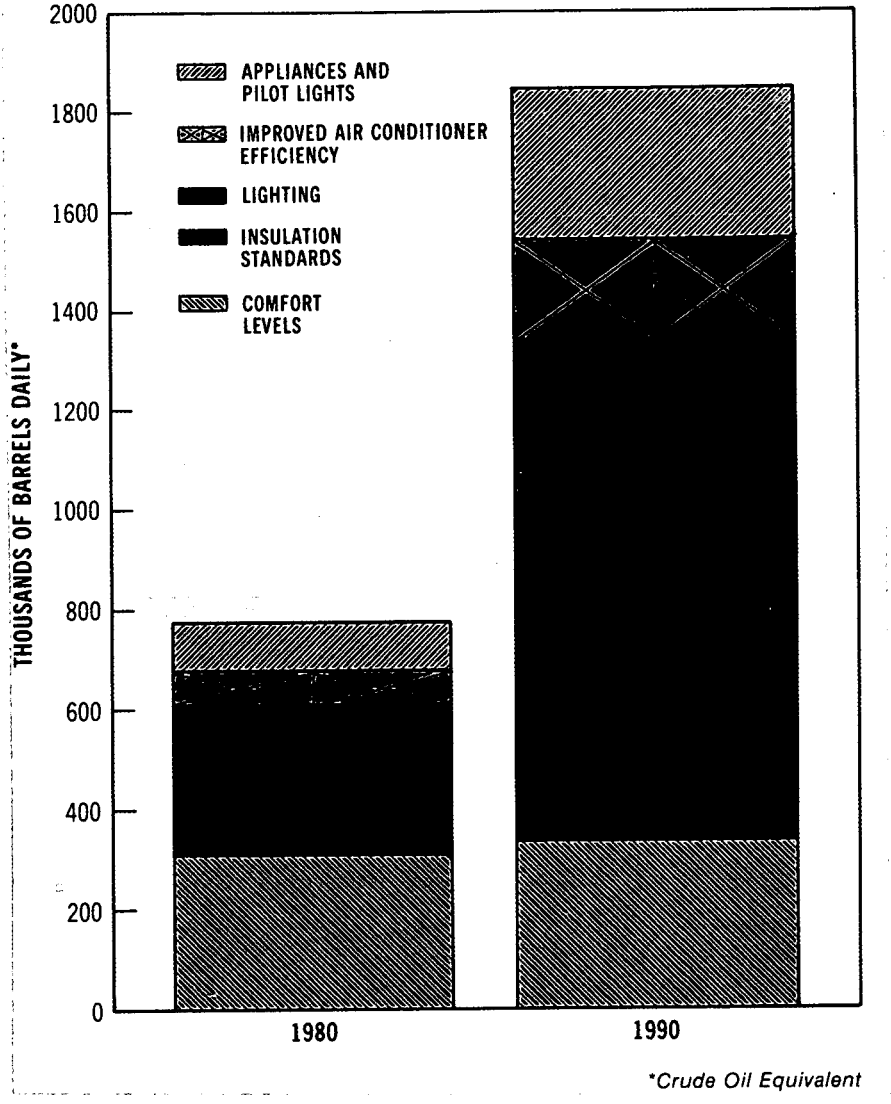
Among individual companies, Shell Oil, for example, has made substantial progress toward a goal of reducing energy consumption in its refineries by 10 percent over a two to four year period. This would amount to 3.5 million to 4 million barrels of fuel oil per year (9,000 to 11,000 barrels daily).

Chemical companies such as DuPont and Dow say savings of 10-15 percent on fuel are possible in almost every chemical complex. DuPont, in fact, offers a consulting service which says that a 10 percent fuel saving can be obtained in plants where the annual fuel bill is $1 million or more.

In the aluminum industry, second only to iron and steel as an energy consumer in primary metals processing, Alcoa has announced a new smelting process which it says will save 40 percent on electricity consumption. In addition, reclamation and recycling of aluminum also helps conserve energy since recycling requires only a small fraction of the energy required to produce primary aluminum.

CHART 6

POTENTIAL ENERGY SAVINGS IN PRIVATE HOMES



*Crude Oil Equivalent

D. PRIVATE HOMES

Private homes offer energy savings possibilities second only to those projected in transportation. We estimate (Chart 6) a total saving of 1.8 million barrels per day crude oil equivalent might be achieved in this sector by 1990. Heating and cooling appear to be the most promising areas for savings, as shown in Chart 7 on page 18 showing residential energy consumption by end use of various fuels.

Heating and Cooling

In our base energy forecast, we include fuel savings expected by 1990 from varying degrees of compliance with stricter insulation standards established by the Federal Housing Administration in 1971. The base forecast assumes 25 percent of existing homes will find it desirable and economic to add insulation sufficient to save 15 to 20 percent of the fuel they otherwise would require for heating and cooling. It also assumes 70 percent of new homes will comply with the new FHA insulation standards, thereby saving 30 to 35 percent of the fuel that would have been required without that amount of insulation.

FHA-approved insulation of the remaining new houses could by 1990 save 120,000 barrels per day more than the savings built into the base forecast. And improving insulation in 75 percent of existing homes, rather than the 25 percent assumed in the forecast, could save another 290,000 barrels per day. This would amount to a total additional saving of 410,000 barrels per day.

Widespread compliance with even stricter proposed insulation standards, primarily for attics and walls, might save another 450,000 barrels per day by 1990. About two-thirds of these savings would come from structures built between now and 1990. Such standards would, however, be difficult and expensive to apply to many existing homes.

Comfort Levels

Significant fuel savings could be achieved if home dwellers lowered their thermostats two degrees (to 70 degrees) in winter and raised them two degrees (to 74 degrees) in the summer. With 50 percent cooperation a savings of 330,000 barrels daily might be possible by 1990. This kind of cooperation can only come either as a result of economics or public spirit, or both.

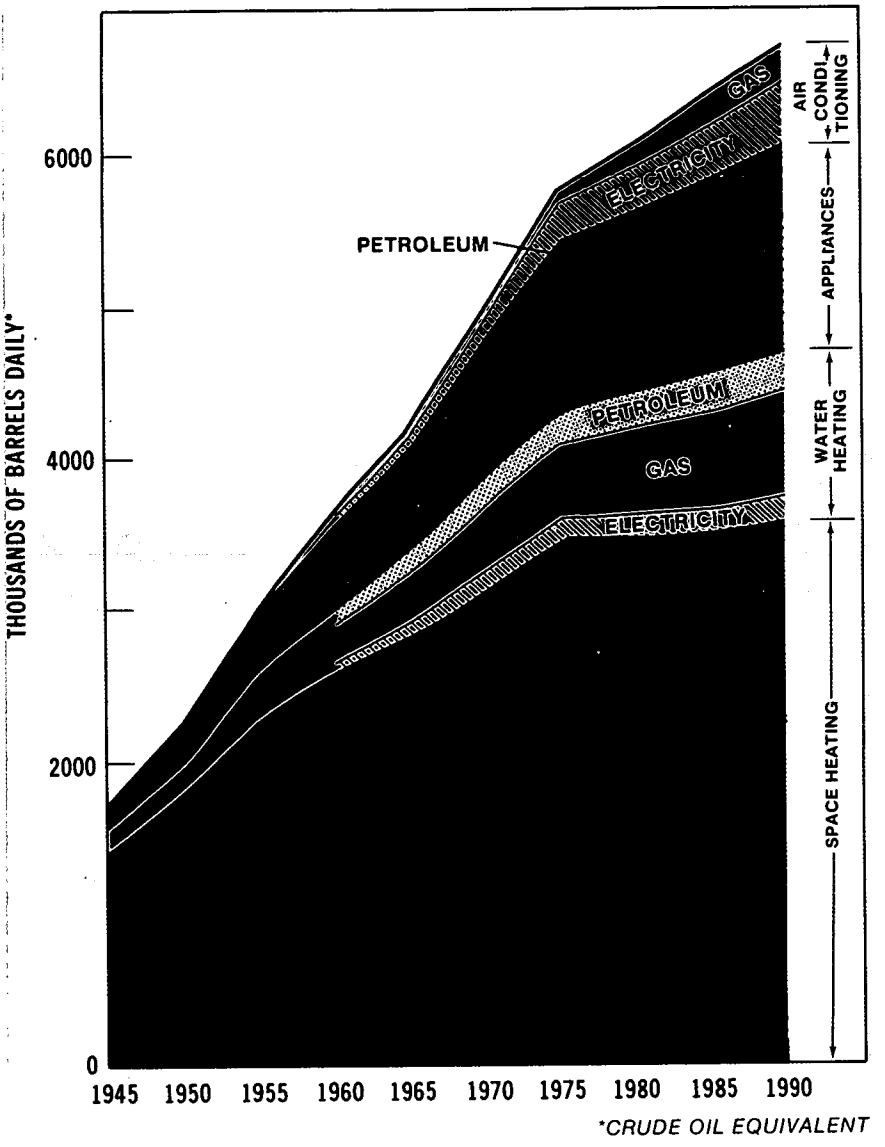
The table below indicates potential savings from increased compliance with FHA insulation standards and acceptance of modified comfort levels. We emphasize these savings would be in addition to those already included in our base national energy forecast.

	1980 Percent Compliance		1990 Percent Compliance	
	Assumed	Savings*	Assumed	Savings*
From increased compliance with current FHA standards				
Existing houses	40	75	75	290
New houses	95	40	100	120
		115		410
From stricter standards				
Existing houses	17	40	75	175
New houses	75	85	100	275
		125		450
Modified comfort levels (2° difference)	50	310	50	330
TOTALS		550		1190

* Thousands of barrels per day crude oil equivalent.

CHART 7

RESIDENTIAL ENERGY CONSUMPTION BY END USES



*CRUDE OIL EQUIVALENT

Lighting, Air Conditioners, Heaters and Appliances

An additional savings of 650,000 barrels per day crude oil equivalent could result from improvements in lighting, air conditioning and heating efficiency and the design and use of appliances. These measures include elimination of unnecessary lighting and limited replacement of incandescent bulbs with fluorescent lights; use of gas instead of electricity for water and space heaters, clothes dryers and stoves; substitution of electric for gas pilot lights, and customer selection of high-efficiency appliances as a result of labeling to indicate efficiency. The potential savings are summarized below.

Appliance	Strategy	Potential Savings** 1980	1990
Lighting	Reduce use by 10%	40	50
	Gradual replacement of one-third of incandescent bulbs by fluorescent lights	20	100
Air Conditioning	Improve average energy efficiency ratio by 25%	70	200
Water Heaters* Clothes Dryers* Cooking Stoves*	Provide incentive to install gas after 1975; assume 50% effective	50	100
	Electric pilot lights required after 1975 on new gas appliances	20	100
Refrigerators/ Freezers	Improve energy efficiency ratio by 10% for post - 1975 models	30	100
	TOTALS	230	650

** Switching from electricity to gas improves overall system efficiency from 30% to 70% by eliminating energy losses in power generation and transmission and substituting the smaller losses in burning gas directly.*

*** Thousands of barrels daily crude oil equivalent.*

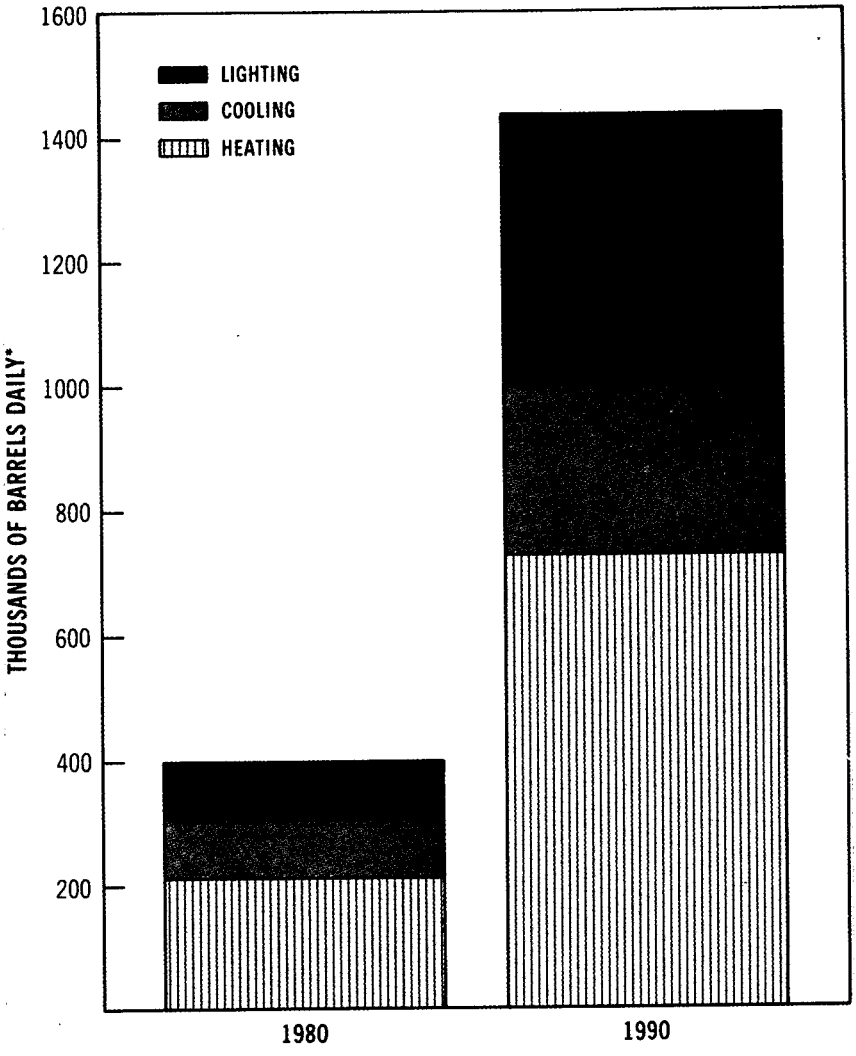
Solar Energy, Heat Pumps

Solar energy has been suggested as a means of reducing our dependence on fossil fuels. However, the technology necessary for solar power to compete with conventional energy is not yet at hand. It is conceivable that by 1980, or shortly thereafter, technological improvements will make possible the use of solar energy in some special applications for space heating and cooling. Longer term, solar energy could be increasingly significant.

Heat pumps have been used for many years as substitutes for, or additions to, conventional heating installations. Costs vary, initial expense being high in comparison to conventional furnaces, though operating costs are somewhat less. As with solar heating, we expect heat pumps to have only modest growth and, therefore, make only a minor contribution.

CHART 8

POTENTIAL ENERGY SAVINGS IN COMMERCIAL BUILDINGS



*Crude Oil Equivalent

E. COMMERCIAL BUILDINGS

We estimate that a total savings of 1.5 million barrels per day crude oil equivalent is possible in commercial buildings by 1990. These savings would be spurred by increasing energy costs and would be achieved principally through improved efficiency in the heating, cooling and lighting of office buildings and large apartment complexes, and by having new construction conform to revised standards for insulation and lighting. Chart 8 indicates the potential savings for 1980 and 1990.

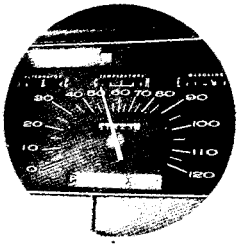
Our analysis was concentrated on space heating, cooling and lighting since they use about 75 percent of the energy in the commercial sector. We estimate that reduced heating fuel consumption brought about by additional insulation (mainly in new commercial buildings), revised ventilation standards, and more economic nighttime and weekend thermostat settings could save 770,000 barrels daily by 1990. In the same way, we estimate improved insulation and ventilation and less demanding thermostat settings in warm weather could save 300,000 barrels daily on fuel consumption for cooling by 1990. In addition, a gradual reduction to 65 percent of current lighting levels in most commercial buildings could save an estimated 430,000 barrels daily by 1990. The 65 percent level is considered reasonable average lighting for most purposes.

CHART 9

ENERGY SAVINGS IN EVERYDAY LIVING

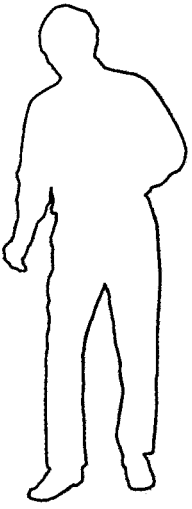
REPAIR LEAKS

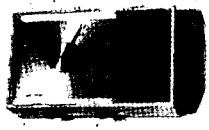
SMALLER CARS



LOWER SPEEDS

IMPROVED VENTILATION

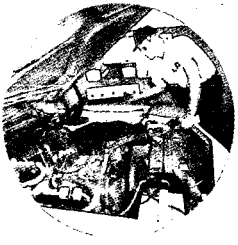




INCREASED INSULATION

ECONOMICAL SETTINGS

PROPER INFLATION



PROPER TUNING

III. ENERGY SAVINGS BY INDIVIDUALS

In previous sections, we mentioned ways in which individuals can conserve energy in their everyday living. Here, we summarize the two general areas where individual actions can have the greatest impact — transportation and the home.

TRANSPORTATION

— Buying smaller, more energy-efficient cars.

— Switching to car pools or mass transit, if available, in traveling to work.

— Walking and riding bicycles on shorter trips - to neighborhood stores, schools, churches.

— Having car engines tuned for better fuel economy and for spotting minor mechanical problems before they become major.

— Keeping tires properly inflated to increase gas mileage. In addition, radial tires provide up to 6 percent better mileage because they produce less rolling friction than other tires.

— Using air conditioners only when really needed, thereby saving on fuel consumption.

— Starting slowly and driving smoothly. Fast starts and rapid acceleration burn more gasoline.

— Slowing down on the highway. Slowing from 70 mph to 50 mph increases gas mileage by about 20 percent.

— Not letting engines idle unnecessarily when parked.

THE HOME

— Increasing insulation in attics and walls, conforming to FHA insulation standards if building a new home.

— Plugging leaks around windows and doors with weatherstripping and caulking.

— Ventilating attics in summer.

— Keeping furnaces and air conditioners in proper working order and filters and air ducts clean and free of obstruction.

— Using storm windows and doors, double or thermal glass and draperies to keep out sun and warm and cold air.

— Turning off unneeded lights. Using fluorescent lights where possible.

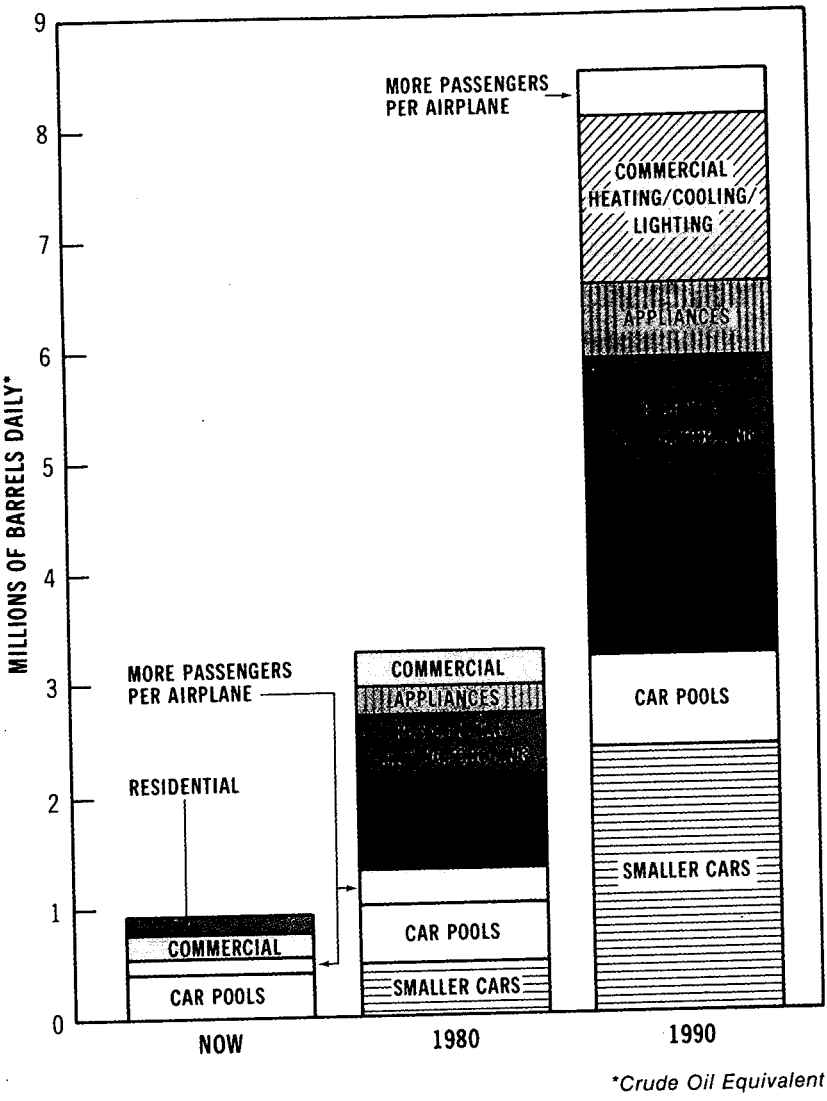
— Turning off appliances, television sets and radios when not in use, and keeping them in good working order.

— Setting thermostats several degrees lower in winter and several degrees higher in summer. Turning off heat and air conditioning in rooms not in use, if possible.

— Stopping hot water leaks.

CHART 10

POTENTIAL ENERGY SAVINGS



*Crude Oil Equivalent

IV. SUMMARY OF POTENTIAL ENERGY SAVINGS

A. SHORT TERM

Although this study is concentrated on the 1980 - 1990 time frame (which would allow significant capital expenditures to be made), we estimate some energy savings (almost 1 million barrels per day crude oil equivalent) are possible in the immediate future. The table below lists those portions of the longer-term savings we believe could be obtained almost immediately, given wide consumer acceptance, achieved in response to fuel price increases and a general awareness of the need for energy conservation. Private and public efforts to educate as regards this need already are having some impact.

POTENTIAL SHORT-TERM ENERGY SAVINGS
(Thousands of barrels daily crude oil equivalent)

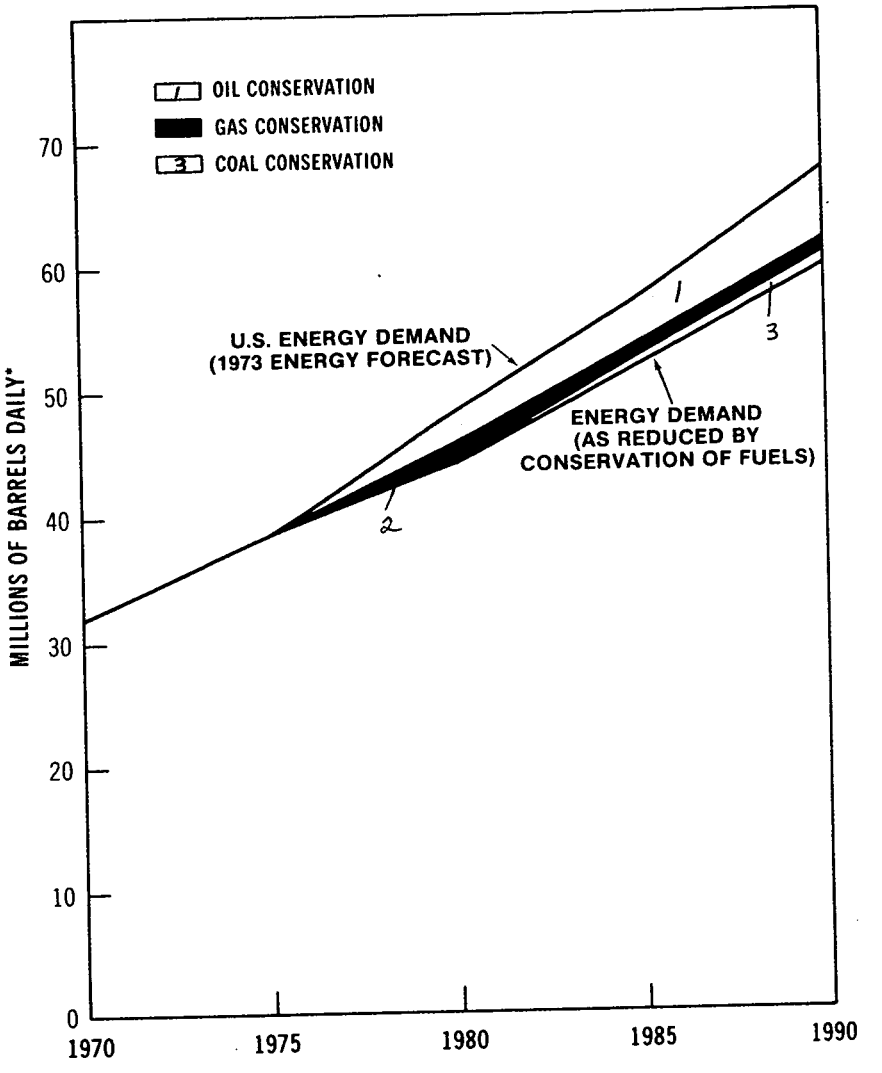
Source	Assumed Compliance %	Savings
Homes		
Modified Comfort Levels (by 2° F.)	50	140
Lower Lighting Levels by 20%	50	25
Commercial Buildings		
Modified Comfort Levels	50	150
Lower Lighting Levels by 30%	50	70
Transportation		
Car Pools (3 persons)	66	430
More Passengers/airplane (load factor increased from 52% to 65%		123
	TOTALS	938

B. BY 1980 AND 1990

We estimate a potential total savings on the order of 3.3 million barrels per day crude oil equivalent might be achieved by 1980, and that savings could reach 8.5 million barrels per day by 1990. But we think attainment of those savings will depend on an exceptional degree of public willingness to take the steps suggested and accept the tradeoffs involved. It appears probable that higher fuel prices in themselves will act as a considerable stimulus to energy conservation. But the full savings potential may only be realized through a higher degree of government intervention than at present seems probable or perhaps desirable. The table on page 27 and Chart 10 summarize those potential savings. Chart 11 on page 26 shows the potential effect of the conservation of principal fossil fuels on projected total energy demand. The savings attributed to each fuel were arrived at through an analysis of the fuels used in the five sectors discussed in this paper.

CHART 11

EFFECT OF CONSERVATION ON ENERGY DEMAND



*Crude Oil Equivalent

POTENTIAL ENERGY SAVINGS, 1980 AND 1990
(Thousands of barrels per day crude oil equivalent)

Source	SAVINGS By 1980	By 1990
Reduced Motor Gasoline Use from:		
Introduction of Very Small Automobiles	400	2400*
Car Pools for Commuting	620	790
	1020	3190**
More Passengers per airplane	320	440
More Efficient Industrial Plants and Processes Including:		
Oil and Gas Companies	450	700
Chemical Companies	150	300
Other Industries	200	500
	800	1500
Less Residential Space Heating/Cooling		
More Insulation	240	860
Modified Comfort Levels	310	330
	550	1190
More Efficient Appliances		
Lower Lighting Levels and Substitution of Fluorescent Lights	60	150
Air Conditioners	70	200
Refrigerators/Freezers	30	100
Electric Pilot Lights on Gas Appliances	20	100
Gas Appliances Instead of Electric (Including water heaters)	50	100
	230	650
Improved Design of Commercial Buildings		
Space Heating	190	770
Space Cooling	80	300
Lighting	100	430
	370	1500
GRAND TOTALS	3290	8470

Savings of about the same amount might be achieved if the average car got 20 miles per gallon. See pages 7-8 and Chart 2 on page 6 for discussion.

**Does not include estimated potential savings from urban buses since such savings would be largely at the expense of savings calculated for increased car pools.*

V. CONCLUSION

With the United States increasingly dependent on foreign oil to fill a widening gap between demand and domestic energy supplies, we must avoid waste and produce and use energy more efficiently. One way of assisting both purposes is to slow down demand through sensible energy conservation practices.

Such practices should complement the restraining effect on energy consumption of higher fuel prices. And they should work hand in hand with measures to increase supply — more federal lease sales, expanded exploration and production, more efficient secondary and tertiary recovery and the development of coal, synthetic fuels, and nuclear and solar energy — to help meet our total energy needs and reduce our dependence on foreign supplies.

Emergency Preparedness for Interruption of Petroleum Imports into the United States

A Supplemental Interim Report of the National Petroleum Council

November 15, 1973

Prepared by the National Petroleum Council's
Committee on Emergency Preparedness
Carrol M. Bennett - Chairman, with the Assistance of the
Coordinating Subcommittee, James S. Cross - Chairman

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SUPPLEMENTAL INTERIM REPORT

INTRODUCTION

On July 24, 1973, the National Petroleum Council approved and transmitted to the Secretary of the Interior an Interim Report entitled *Emergency Preparedness for Interruption of Petroleum Imports into the United States.* This report is a supplement to the July Interim Report and has been prepared expressly to report the findings and recommendations of the National Petroleum Council which are applicable to the interruption of petroleum imports currently being experienced by the United States.

When the Honorable Rogers C. B. Morton, Secretary of the Interior, wrote to the National Petroleum Council requesting an analysis of the Nation's ability to respond to a denial of imported petroleum, hypothetical "study" cases were prescribed (see request letters, Appendix A). Responsive to the Secretary's request, the six cases shown in the tabulation below were chosen for consideration:

Import Interruption Cases Considered

Date of Interruption	Volume (MMB/D)*	Period of Interruption (Days)	Type of Import
1/1/74	1.5	90	Crude
			60/40 Crude/Product
	3.0	180	Crude
			60/40 Crude/Product
1/1/78	3.0	180	Crude
			60/40 Crude/Product

* Millions of 42-gallon barrels per day.

By letter dated October 26, 1973, the Honorable Stephen A. Wakefield, Assistant Secretary of the Interior--Minerals and Energy, wrote to the Council as follows:

> "One of the scenarios of the National Petroleum Council's Emergency Preparedness Study considers a major interruption in foreign oil supplies to the United States as of January 1, 1974.
>
> "Though this phase of your Study is nearing completion, recent events have added new urgency to this scenario. Therefore, I ask that you quickly draw together the work

you have accomplished regarding a January 1, 1974 supply interruption and submit it to the Department of the Interior at the earliest possible date."

This Supplemental Interim Report, therefore, is intended to amplify and expand upon the analyses of a 1974 interruption contained in the July Interim Report. This report is prepared by energy industry experts with the sincere purpose of aiding both government and industry in efforts to alleviate the effects of the current interruption and to cope with the current crisis at hand (see Appendix B for a list of members of the Committee and its Subcommittees). It should be emphasized that this does not represent the final or complete discussion of the 1974 cases, only a compendium of results obtained to date. The final report will be completed as soon as possible.

Prior to the current Middle Eastern crisis, the United States average 1973 refined petroleum product demand was projected to be 17.7 million barrels per day. Of this volume, over 35 percent was either directly imported or manufactured in the United States from imported crude oil. As a percent of total energy requirements, the United States was dependent upon foreign petroleum for 17 percent of its energy.

But this has not always been the case. Up until 1967, the United States had sufficient reserve or spare petroleum producing capacity to more than compensate for a loss in imports availability. The Nation's reserve producing capacity has now been exhausted, and in the short-term domestic petroleum self-sufficiency cannot be regained.

In 1970, about 3.4 of the 14.9 million barrels of petroleum required each day in the United States was imported. A number of factors have combined to almost double the import volume over the last three years:

- Stagnation of domestic crude oil production rates
- Decline of domestic natural gas production
- Delays in planned completion and operation of nuclear powered electric utility plants
- Technological difficulties with the development of sulfur control equipment for coal and oil burning equipment
- Rapid upturn of economic activity, and
- Environmental and safety related equipment on motor vehicles.

In combination, these factors, in addition to normal growth in petroleum requirements, forced demand up 2.8 million barrels per day over the 1970 level. The critical aspect of this growth

is the fact that all of the increase came from foreign--primarily Middle Eastern--petroleum reserves. Middle Eastern countries possess 63 percent of the total non-Communist world crude oil reserves, and the production from these reserves currently represents 42 percent of that in the non-Communist world.

With the resumption of hostilities in the Middle East on October 6, 1973, Arab oil became a diplomatic and economic issue. Since that time, prices nearly doubled, shipments were disrupted, production was cut back and embargoes were enacted. The Committee estimates that by the end of the year, the net effect upon U.S. petroleum supply will reach 3 million barrels per day or 17 percent of the 1973 domestic demand for petroleum products. A reduction of this magnitude will have serious repercussions upon the U.S. economy unless the United States immediately develops and implements a national program to increase supplies and reduce energy consumption on an emergency basis. This should be accomplished within a framework of minimum impact on the economy.

The immediate problems of realizing the potentials of conservation, curtailment and fuel substitution are both administrative and logistic.* Remaining available energy supplies and the results of savings from energy conservation measures will not be evenly distributed throughout the country. However, properly conceived and administered allocation programs will help redistribution greatly. In addition, if the fuel suppliers are allowed emergency flexibility and distribution priorities, the impacts of the denial will be minimized.

Over the longer term, the United States must develop an energy self-sufficiency which will not allow the Nation to be vulnerable to an imports interruption again. Domestic energy resources are more than adequate to meet this goal, but a national goal must be set to develop them. Only through a coherent and cohesive National Energy Policy can we avoid a repetition of the inconvenience and hardship facing the United States today and in the months ahead.

* See Appendix C for a discussion of current and proposed administrative and legal authorities to cope with the current situation.

FINDINGS AND CONCLUSIONS

This Supplemental Report represents the first assessment by the National Petroleum Council's Committee on Emergency Preparedness of the impact of the current denial of Middle Eastern oil on the energy posture and economy of the United States. The magnitude and abruptness of the oil denial, the full impact of which will be felt in the next few weeks and months ahead, place the Nation in an extremely precarious situation.

FINDINGS

The National Petroleum Council's Committee on Emergency Preparedness submits the following findings:

The United States Energy Supply Situation was Tenuous Even Before the Arab Embargo.

Even prior to the Middle East conflict which began on October 6, 1973, and the subsequent embargo of Arab oil to the United States, this Nation was faced with an energy crisis. In addition to decreasing production of energy raw materials, refineries were running at maximum rates, inventories were being drawn down and overall energy supplies were short. Mandatory allocation programs were already in effect in an attempt to ensure equitable distribution of supplies.

Primary inventories of gasoline, distillates and heavy fuel oil, the three major liquid petroleum fuels, were 71 million barrels below normal as of October 26, 1973. Crude oil stocks were 14 million barrels below normal.

The United States Has Allowed Itself to Become Critically Dependent Upon Foreign Supplies.

The United States has not developed its own abundant natural resources and has allowed itself to become critically dependent upon imports. Domestic crude production continues to decline and natural gas production has peaked out. Nuclear plants are not being completed as rapidly as scheduled or anticipated. The use of coal has been depressed because of environmental and other reasons. Strip mining restrictions contribute to the limitation of coal supplies. Oil and gas reserves discovered on the North Slope of Alaska and offshore California 5 years ago are still untapped as environmental considerations immobilize their development.* Highly prospective offshore acreage on the continental shelves off our coasts have not been made available in a timely manner. Natural gas prices have been depressed to abnormally low levels under FPC regulations. Oil shale development has been delayed by lack of an effective federal leasing policy.

* These reserves total about 10.5 billion barrels of oil and 27 trillion cubic feet of gas.

These and other factors have discouraged the development of U.S. natural resources and caused the country to become critically dependent upon foreign imports of oil and gas. During the first quarter 1973, imports represented 35 percent of U.S. petroleum supplies and were growing rapidly. Had the Arab embargo not occurred, imports would have reached 7.4 million barrels per day, or 39 percent of U.S. petroleum supplies by the first quarter of 1974.

What Has Happended to Foreign Supplies

Following the outbreak of war between Israel and the Arab countries on October 6, 1973, the United States was cut off from crude and product supplies coming from Arab sources. The initial impact will be in the order of 2 million barrels per day and is expected to increase rapidly reaching 3 million barrels per day by year-end.

In addition to direct embargoes against shipments to the United States, the Arab countries have reduced total production by 5 to 6 million barrels per dav resulting in world shortages of petroleum supplies, thus bringing world pressure on the United States to moderate its position of support for Israel.

Timing of the Impact Will Be Delayed

The impact of these denials is delayed because it takes about one month for a tanker, having been loaded in the Middle East, to reach the United States. Secondly, already critically short inventories needed for this winter season are being drawn down to temporarily to meet consumer demand.

What Will Happen If No Emergency Actions Are Taken

Inventories will be depleted early in the first quarter of 1974 and the petroleum industry will no longer be able to provide the supplies needed. Shortages in the three major products, gasoline, distillates and heavy fuel oil, will average 25 percent during the first quarter of 1974. Heavy fuel oil shortages would average 38 percent on a U.S. basis and could reach 49 percent on the East Coast.

The effect of shortages of this magnitude on the economy is difficult to estimate. On a conservative basis, the effect of a 2-million-barrel-per-day cutoff has been estimated to cause an annual loss of 48 billion dollars to the U.S. economy as measured by the Gross National Product. This slow-down in the economy would cause unemployment to increase from the current 4.5 to 5.0 percent level to over 6 percent. The projected 3-million-barrel-per-day cutoff would have an even greater impact and could push unemployment up to the 7.5 to 8.0 percent range.

It Is Critically Important That Emergency Action Be Taken Immediately.

Industry normally draws down inventories at the rate of about 1 million barrels per day to meet consumer needs in the first quarter of the year. If available inventories are depleted before the end of the year, the 1 million barrels per day of supplies from inventory will not be available. When combined with the 3-million-barrel-per-day import cutoff, a 4-million-barrel-per-day shortage would be created and an even more serious situation would develop.

For these reasons, it is imperative that emergency action be taken immediately so that available inventories can be conserved and used over a longer period of time.

What Emergency Actions Can Be Taken to Increase Domestic Supplies

Under emergency conditions, additional domestic energy supplies equivalent to about 700 thousand barrels per day can potentially be provided this winter if immediate actions are taken. Potential supply sources include: (1) producing the Naval Petroleum Reserves at Elk Hills, California, at maximum rates and temporarily increasing crude production above established field MER's (Maximum Efficient Rates), (2) incremental emergency gas sales to industrial customers now burning fuel oil or distillates, (3) increased electric power supplies by accelerating the licensing of already constructed nuclear power plants, and (4) increased use of coal.

To develop these potential emergency supplies will require a widespread commitment on the part of industry, Federal and state governments, and the American people in order to utilize all readily available resources. In some cases, enabling legislation is required. In almost all cases, quick and aggressive action is needed by both state and Federal governments. The respective jurisdictions and authorities of state oil and gas conservation bodies should be continued.

Even if all the above available emergency supply steps are taken, a significant net shortage of oil will remain.

What Can Be Done About the Net Shortage

The remaining net shortage can only be covered by a reduction in energy use. Many voluntary and mandated energy conservation steps are currently being considered (including such items as a reduction of speed limits, encouragement of carpooling, and a reduction in airline flights). While these measures are important, estimates indicate that they will account for only about 50 percent of the net shortage.

Mandatory rationing is therefore necessary to accomplish required reduction in use and should be instituted immediately.

A distinct difference should be drawn between rationing and allocation programs. Allocation programs should serve the basic function of distributing supplies (or distributing the shortage) throughout the market. Rationing, on the other hand, directly addresses and has the primary function of controlling and curtailing consumption in selected products.

Where Should Consumption Be Cut

The Nation must establish priorities and determine where cuts in demand should be made. On the one hand, priority can be given the individual consumer; on the other hand, priority can be given industry.

The Committee believes that the first reductions should take place in noncritical human consumption and less essential industry areas. High priority should be given to providing the fuel needed by those industries most vital to the economy. Critical human needs must, of course, receive high priority. However, the general public would undoubtedly prefer some discomforts and inconveniences to idle plants and high unemployment.

Mandatory rationing of gasoline for private transportation and of home heating oils offer the opportunity for significant reductions in petroleum use with minimum impact on the economy. Possibilities for comparable residential rationing of electricity and natural gas for residential heating should also be considered.

CONCLUSIONS

In view of the findings, the Nation has no other short-term alternative except to take immediate emergency action to reduce its consumption of energy and increase domestic energy supplies. With the goal of minimizing the effects on economic activity and the American consumer, the National Petroleum Council's Committee on Emergency Preparedness submits the following conclusions:

- Immediate and decisive action is needed by Federal and state governments to minimize the detrimental effects occasioned by the current energy crisis. Delay to act will compound the severity of the situation.

- Both the Federal Government and industry should immediately present the facts to the public and commence an educational program through all communications media to assure public awareness and to urge consumer energy conservation at all levels.

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- Government-industry cooperation is needed at all levels. The operations of the energy industries are extremely complex. The expertise available from private industry should be utilized in an advisory and operational capacity.

- National economic health, employment, personal income and the strength of the Nation's defense system depend upon maintaining normal industrial operations. Therefore, every effort should be made to continue the operations of the industrial sector of the U.S. economy as close to normal as possible.

- The extent and endurance of the denial of oil imports to this Nation from the Middle East is beyond the determination of this Committee. However, the United States will experience an actual loss of about 80 million barrels of oil as a result of the embargo to date. Even if the embargo were lifted at an early date, critical shortages will be enacted, and therefore, the Committee emphasizes that programs and policies mentioned in this report should be initiated.

- Any emergency measures enacted during the current denial should be undertaken with the clear provision for their removal at the termination of the denial and its after-effects. The American system should continue to operate on a competitive, free-enterprise basis and increased government intervention for emergency purposes should not be continued upon the cessation of the emergency.

Chapter One

CURRENT SITUATION

PRE-DENIAL OUTLOOK

Prior to the resumption of the Middle East conflict in early October 1973, it had been anticipated that petroleum supply and demand in the United States would be in very tenuous balance during the first quarter of 1974. Despite the forecasted dampening in economic activity, product demands, particularly distillate and residual fuel oils, were expected to continue their vigorous expansion of the past several years. With domestic production of petroleum liquids declining slightly, the pre-denial supply/demand balance required the scheduling of sharply increased imports of crude oil and refined products. A comparison of the principal pre-denial supply/demand components for the first quarters of 1973 and 1974 is shown in Table 1.

TABLE 1

PRE-DENIAL U.S. PETROLEUM DEMAND AND SUPPLY

Item	1st Quarter 1973 Actual MB/D	1st Quarter 1974 Pre-denial MB/D	1st Quarter of 1974/73 MB/D	Percent
Total Demand	18,488	19,774	+1,286	+ 7
Inventory Change	-795	-1,040	-245	+31
Required Supply	17,693	18,734	+1,041	+ 6
Domestic Production	10,957	10,853	-104	- 1
Imports:				
Crude	2,924	3,672	748	+26
Products, etc.	3,325	3,699	374	+11
TOTAL IMPORTS	6,249	7,371	+1,122	+18
Other Supply*	487	510	+ 23	+ 5
Imports as a % of Required Supply	35%	39%		

* Processing gain, other hydrocarbons, etc.

Total demand in the first quarter of 1974, projected at 19.8 million barrels per day, would be 1.3 million barrels per day or 7 percent greater than one year earlier. Inventory drawdown, a seasonal occurrence during the first quarter, was projected to be 245 thousand barrels per day greater than in 1973. With required supply increasing at 1.0 million barrels per day and domestic production declining at 0.1 million barrels per day, total required imports, after accounting for processing gain, were placed at 7.4 million barrels per day, an increase of 1.1 million barrels per day or 18 percent over the 1973 first quarter level. Thus, imports as a percent of total required supply would have reached 39 percent.

SOURCE OF IMPORTS

Crude oil imports into the United States during the first 7 months of 1973 are shown in Table 2. Imports from Organization of Arab Petroleum and Exporting Countries (OAPEC) were in the order of 800 thousand barrels per day during this period, the remaining requirements being made up primarily from Canada, Venezuela, Nigeria, Iran and Indonesia. However, incremental crude oil to accommodate rapidly escalating import requirements during the third quarter had to be scheduled largely from the Persian Gulf. For November 1973 imports from OAPEC nations were originally scheduled to have been about 1.2 million barrels per day.

Product imports during the first half of 1973 are shown in Table 3. During that period, total product imports were in the order of 3.0 million barrels per day, consisting primarily of residual and distillate fuel oil received from Venezuela and the Caribbean area. In the third quarter, product imports likewise expanded very rapidly with increasing amounts, including gasoline, coming from Western Europe refineries. For the first quarter of 1974, required product imports were estimated to reach 3.7 million barrels per day.

OIL IMPORT DENIAL SITUATION

In mid-October 1973, the Arab nations announced a series of cutbacks of oil exports to the United States and to countries supplying refined products to the United States. The initial effect of these denials is expected to be an imports reduction of about 2.0 million barrels per day from pre-denial levels, consisting of 1.2 million barrels per day of crude oil and 0.8 million barrels per day of products. The impact on U.S. import receipts will be delayed about 30 to 35 days from the date of denial, because of the one-way sailing time for tank ships carrying crude oil from Middle East loading ports.

TABLE 2

U.S. IMPORTS OF FOREIGN CRUDE OIL
(MB/D)

Origin of Imports	July 1973	Jan.-July 1973
Canada	959	1,042
Mexico	-	1
TOTAL NORTH AMERICA	959	1,043
Colombia	-	2
Ecuador	39	46
Trinidad	31	57
Venezuela	392	290
TOTAL CENTRAL & SOUTH AMERICA	462	395
TOTAL WESTERN HEMISPHERE	1,421	1,438
OAPEC Nations:		
Libya	116	142
Algeria	149	150
Saudi Arabia	644	392
Abu Dhabi and Dubai	102	76
Other OAPEC	36	59
TOTAL OAPEC	1,047	819
Angola	60	36
Nigeria	481	431
Tunisia	7	17
TOTAL OTHER AFRICA	548	484
Israel	-	2
Iran	229	171
Indonesia	256	195
Malaysia	-	1
TOTAL EASTERN HEMISPHERE	2,080	1,672
TOTAL WORLD	3,501	3,110

Source: U.S. Bureau of Mines

TABLE 3

UNITED STATES IMPORTS OF REFINED PRODUCTS
JANUARY - JUNE 1973
(MB/D)

Area of Origin	Motor Gasoline	Distillate Fuel Oil	Residual Fuel Oil	Other Oils	Total Products
North America	14	10	93	232	349
Central and South America	63	240	1,589	288	2,180
TOTAL WESTERN HEMISPHERE	77	250	1,682	520	2,529
Western Europe	11	122	141	8	282
OAPEC Nations	2	11	45	29	87
Other Middle East	4	-	-	6	10
Other Africa	-	-	17	-	17
Far East, Etc.	-	-	7	29	36
TOTAL EASTERN HEMISPHERE	17	133	210	72	432
TOTAL WORLD	94	383	1,892	592	2,961

Announcements of additional Arab production cutback plus the secondary effects of those cutbacks on the supply situation in other nations lead the Committee to believe that the United States will be denied approximately 3 million barrels per day by the end of the year. This denial is considered to be 1.8 million barrels per day of crude oil and 1.2 million barrels per day of refined products. As noted earlier, the reality of the current denial closely parallels the theoretical denial situation postulated in the Secretary of the Interior's original request to the National Petroleum Council's Committee on Emergency Preparedness.

Chapter Two

IMPACT OF IMPORT INTERRUPTION ON SUPPLY/DEMAND BALANCE

A 2.0 to 3.0 million B/D import disruption imposed upon an already tight supply situation in the United States creates a very difficult situation. Although everyone hopes for a cessation of the Mid-East conflict, with a prompt resumption of petroleum imports, nevertheless forward planning must recognize the possibility of continued oil disruption and the fact that the effects of the disruption will persist for several months after a restoration of some or all pre-denial of foreign oil production.

As indicated above, 30-35 days are required for new crude oil supplies to reach the United States after they are loaded in the Middle East. Furthermore, if the embargo continues for several weeks, U.S. inventories will be drawn down to abnormally low levels and will need to be rebuilt before normal operations are possible. Likewise European inventories must be restored before product imports can be expected from European refineries. Another aggravating factor which will extend the effect of the embargo is the current refining situation in the U.S. Refineries were running at peak capacity prior to the disruption, but many are now operating at less than full capacity, and this problem will be aggravated in the coming months. Reduced refinery runs resulting from the crude shortage is in effect lost output which cannot be made up at a later date.

Considering these factors, it is essential that the U.S. take immediate steps to curtail demand so that crude and product inventories are not excessively drawn down during the next 2 to 3 months. Although there is a great deal of uncertainty as to how long the disruption will continue and what the operating supply situation will be after the embargo is lifted, a review of the supply effects of the current denial illustrates what the impact of the disruption might be and the importance of taking immediate actions to curtail demand and augment supply.

For the purpose of quantifying the impact of the denial, it is assumed that the embargo would last through the first quarter of 1974. The type and volume of imports denied are shown below:

		Volume--Thousand Barrels Per Day
Crude		1,800
Products		
Gasoline	80	
Distillates	370	
Heavy Fuel Oil	750	1,200
TOTAL		3,000

The last actual inventory data available as of October 26, 1973, indicated total U.S. inventory of the three critical product groups, (gasoline, middle distillates, heavy fuel oil) was 515 million barrels (MMB) and crude oil inventory was 246 MMB. This is approximately 71 MMB below normal for products and approximately 14 MMB below normal for crude oil. Other products, such as liquefied petroleum gases (LPG), petrochemical feedstocks, asphalt, lubricating oils and coke, are not included. These other products, including unfinished oils, total approximately 250 MMB of inventory and are not available to meet major product (i.e., gasoline, distillate, or heavy fuel oil) demand. Stocks by major product groups, compared to generally considered "normal" levels for this time of the year, are as follows:

Stock	Inventory (MMB) as of Oct. 26, 1973		
	"Normal"	Actual	Difference
Gasoline	225	214	(11)
Distillates	298	244	(54)
Heavy Fuel Oil	63	57	(6)
TOTAL	586	515	(71)
Crude Oil	260	246	(14)

Minimum operable inventories for each product are not well defined. However, the Committee has estimated minimum inventories considered to be near the minimum under which reasonably uniform operations with only spot shortages can be maintained and before a physical breakdown occurs. Table 4 shows that if demand is not drastically curtailed inventories at the end of the first quarter 1974 will be hopelessly below minimum levels.

The total denial of 355 MMB represents 14% of total demand for the period November 15, 1973, to March 31, 1974, and 20% of demand for the period January 1, 1974, to March 31, 1974.

Figure 1 shows that the impact of the denial in the first quarter of 1974 will be significantly reduced if actions commence immediately to spread the required demand curtailment over a longer period of time. As indicated in Chapter Four a denial of petroleum products in the 8-10 percent range will begin to have very serious effects on the economy. This is particularly true for reductions in heavy fuel oil (HFO) which directly impact on industry operations. Where the reductions can be taken in less critical areas such as motor gasoline, the economic impact can be softened.

Table 4
Major Product Inventories
(Million Barrels)

	Normal	Without Denial	Effect of * Denial	With Denial	Memo Operable † Minimum
December 31, 1973					
Gasoline	247	225	(28)	197	195
Distillates	253	204	(30)	174	100
Heavy Fuel Oil	55	50	(31)	19	40
Total	555	479	(89)	390	335
April 1, 1974					
Gasoline	265	243	(111)	132	195
Distillates	149	125	(120)	5	100
Heavy Fuel Oil	46	42	(124)	(82)	40
Total	460	410	(355)	55	335

* Assumes 1.2MMB/D crude oil and .8MMB/D products denial from mid November through year end 1973; 1.8MMB/D crude and 1.2MMB/D products denial during first quarter 1974. Crude denials were converted to product effects based on the following yields for typical Middle East crudes: (Gasoline - 47%, Middle Distillates - 35%, HFO (less refining fuel consumed) - 16%).

†Operable minimum inventory results in spot shortages, but can meet required demand.

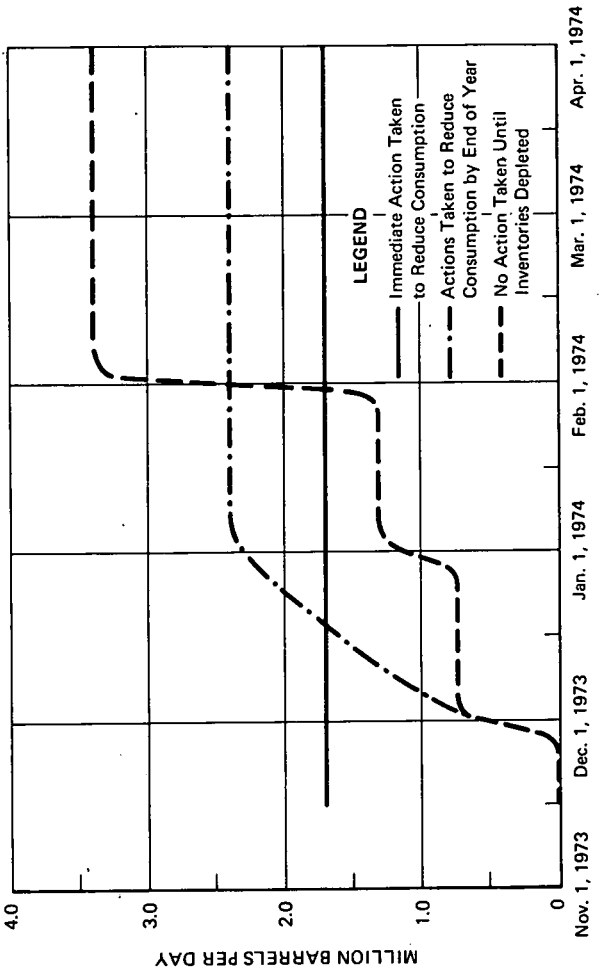

Figure 1. Net Impact of Import Interruption on Supply Availability Under Different Inventory Management Programs.

The seriousness of this situation can be better appreciated when the denial effects on specific product groups are examined. These data for the total U.S. are as shown below:

Product	Total Demand--Million Barrels		Denial		
	4-1/2 Months 11/15-3/31	3 Months 1/1-3/31	4-1/2 Months (MMB)	Percent Demand* 11/15-3/31	1/1-3/31
Gasoline	1,052	698	111	11%	16%
Distillates	589	417	120	20%	29%
Heavy Fuel Oil	464	327	124	27%	38%
Total	2,105	1,442	355	17%	25%

*Based on demand for the major product groups only. As a percent of total demand the denial percentage figures are 14% and 20% for the 4-1/2 and 3 month cases respectively.

There is no doubt that substantial curtailments of HFO and distillate consumption will be required. These effects will be heavily concentrated on the East Coast where imports of these products have been historically concentrated.

Although a complete analysis of geographical effects has not been performed, the potential impact on the East Coast is illustrated by the following:

PAD District I

Product	Total Demand--Million Barrels		Denial		
	4-1/2 Months 11/15-3/31	3 Months 1/1-3/31	4-1/2 Months (MMB)	Percent Demand 11/15-3/31	1/1-3/31
Distillates	357	253	80	22%	32%
Heavy Fuel Oil	324	217	106	33%	49%

Another way an import denial must be considered is to estimate the point of impact of the denial and the demand by location and then determine the necessary logistic response to equitably distribute the denial geographically.

Table 5 shows a distribution of a 3.0 MMB/D denial based on demand and historical import patterns for the first quarter of 1974. Reductions to the gross denial are included for additional emergency oil and gas production and conversion from oil to coal, and increase operation of nuclear plants. The net denial then may require geographical reallocation to give equitable distribution of the shortfalls. The illustrative balance assumes a pro rata allocation of the net denial based on demand. An analysis of specific inter- and intra-district movements required by this allocation was not possibl

TABLE 5

TOTAL U.S. IMPORT DENIAL AND SUPPLY/DEMAND BALANCE
FIRST QUARTER 1974
(Thousands Barrels Per Day)

PAD DISTRICTS	I	II	III	IV	V	Total
		BASE SUPPLY/DEMAND BALANCE				
LOCAL DEMAND FOR PRODUCTS	8205	5117	3433	445	2574	19774
Interdistrict Shipments - Products	171	139	4057	88	30	
TOTAL REQUIRED SUPPLY	8376	5256	7490	533	2604	19774
SUPPLY						
Interdistrict Receipts - Products	3253	964	78	62	128	
Interdistrict Receipts - Crude	130	1884	110	-	30	
Interdistrict Shipments - Crude	(90)	(40)	(1674)	(350)	-	
Crude Production	117	942	6277	672	1120	9128
NGL Production	22	245	1376	46	36	1725
Processing Gain and Other	50	126	227	10	97	510
Inventory Draw	460	185	395	(40)	40	1040
Sub-Total	3942	4306	6789	400	1451	12403
Imports: Crude (Offshore	1237	200	595	-	590	2622
Crude (Canada)	145	570	-	75	260	1050
NGL (Canada)	5	75	-	35	10	125
Unfinished (Offshore)	90	-	6	-	26	122
Products (Canada, Offshore)	2957	105	100	23	267	3452
Sub-Total	4434	950	701	133	1153	7371
TOTAL SUPPLY AVAILABLE	8376	5256	7490	533	2604	19774
		DENIAL				
GROSS DENIAL						
1,800 Crude (Prorated on historical)	(846)	(135)	(516)	-	(303)	(1800)
1,200 Products	(1200)	-	-	-	-	(1200)
	(2046)	(135)	(516)	-	(303)	(3000)
EMERGENCY MEASURES*						
Additional Crude Production	-	-	281	-	12	293
Additional Gas Production	-	-	150	-	-	150
Conversion Oil to Coal	95	130	-	25	-	250
Adjust Processing Gain	(6)	(15)	(21)	(2)	(10)	(54)
NET DENIAL	(1957)	(20)	(106)	23	(301)	(2361)
Adjustment to Base Interdistrict Shipments to Equate Denial Across Nation: Crude	633	(358)	(220)	(55)	-	-
Products	344	(235)	(88)	(21)	-	-
ADJUSTED NET DENIAL Proportionate to Local Demand PAD I-IV	(980)	(613)	(414)	(53)	(301)	(2361)

* These offsetting measures require governmental action such as:

- Approval of emergency MER increase
- Approval of certain third party gas sales
- Relaxation of sulfur restriction on plant emissions.

in the limited time frame of this report. The allocation of crude and products to eliminate logistic bottlenecks and meet demand equitably will be a function of the demand resulting after all conversions and curtailments, the available sources of product, and the intervening refining and transportation systems. The detailed logistic analysis must include all affected parties and can be started only after the level of demand to be satisfied and crude and import product availability are established.

In summary, the impact of the Arab embargo on petroleum shipments to the U.S. will have a substantial impact and it will last for a long period of time after the embargo is lifted. The effects of the embargo can be significantly reduced if substantial reductions in demand are made immediately. The seriousness of the situation is not now apparent to the general public, but deferral of action until the situation becomes apparent will lead to very disruptive shortages by early in the first quarter of 1974.

Chapter Three

AVAILABLE ALTERNATIVES FOR RESPONSE TO SHORTAGE

EMERGENCY OIL PRODUCTION

The Interim Report of the Emergency Preparedness Committee published estimates of the U.S. emergency oil production capacity. These estimates indicated that an average of 292 MB/D could be produced and delivered to refineries during a 90 day emergency, 331 MB/D could be delivered during a 6 month emergency. This emergency capacity builds up from an initial rate of 275 MB/D to a peak rate of 359 MB/D after about 3 to 4 months.

The emergency capacity consists primarily of production from NPR-1 (Elk Hills) and production in excess of the maximum efficient rate (MER) from several large Texas fields, such as East Texas, Yates, West Hastings, etc. The Texas fields are currently producing at their MER as established by the Texas Railroad Commission (RRC). Although these represent the maximum production rate which can be *sustained* without loss of recovery, the RRC does not establish emergency rates which could be produced for temporary periods. It is possible to exceed current rates in the high quality fields for short periods without significant reservoir damage. The precise volume and time period which production in excess of MER can be *sustained* depends on the individual field. This study has not considered producing in excess of MER for more than six months. Any production in excess of current MER would require recognition of an emergency situation by the appropriate regulatory agencies and a specific determination that the temporary production could not cause waste or reservoir damage. Also, any production of Elk Hills will require action by both the Executive and the Legislative branches of government.

Attainment of the estimated production volumes will require 2-3 months lead time and some investments in field oil and gas handling facilities. Also, in some cases gas flaring will be required. It should be emphasized that numerous legal problems can be encountered since there are substantial differences of opinion among operators regarding the effect of producing some of these fields at higher rates.

CONVERSION FROM OIL TO GAS

Gas reserves in the United States which can be economically produced and delivered to market are fully committed to gas sales contracts, with the exception of uneconomic reserves or recently discovered reserves where time has not been sufficient to conclude sales and install necessary facilities to commence deliveries.

In an emergency situation, gas can be substituted for oil by many consumers who have dual oil/gas burning facilities. It has been estimated that capacity is available to burn in excess of 4 billion cubic feet per day (BCF/D) of gas in lieu of oil provided the emergency gas can be made available where needed.

The multitude of gas contracts and number of gas producers make it extremely difficult to estimate volumes of gas which might be made available under emergency conditions. Available data indicate the spare capacity to deliver gas is small. Nevertheless, even a small volume of additional gas could play a significant role in alleviating the East Coast supply situation discussed in the preceding chapter.

It is estimated that perhaps as much as 1 BCF/D of gas could be produced under emergency conditions and delivered to customers currently burning oil. This would be equivalent to 150 MB/D of oil.

Under emergency conditions, mechanisms and incentives should be provided to release additional gas supplies by taking the following steps:

- The FPC should be authorized to allow, for a temporary period, emergency third-party sales of available interstate gas in excess of that now being taken under existing contracts.
- The FPC's current 6-month emergency gas sales program, wherein gas is allowed to be sold at market clearing prices, should apply to these incremental volumes.
- Gas transmission companies should be encouraged to transport and exchange gas to load all trunk lines to full capacity and deliver available gas to industrial customers after the essential needs of its residential customers are satisfied.

CONVERSION TO COAL

Estimates based on FPC and other data indicate that oil and gas fired boilers and furnaces could be converted to coal burning to the extent of about 250,000 B/D over a three-month period. Sulfur restrictions would have to be relaxed to accomplish this. This consumption rate is equivalent to 23 million tons of coal per year. Reaching this rate of additional coal use is believed realistic as there is an inventory of about 12 million tons of coal available for boilers not yet converted.

Based on the assumption that during the first 90 days of an interruption the rate of conversion would be 150 MB/D converted to coal in the first month and the remaining 100 MB/D converted over the second and third months, it would be possible to maintain operation at the full 250 MB/D rate for approximately 120 days without replenishment of supplies.

If coal production and transportation were not expanded, however, at the end of 7 months from the beginning of conversion, the stocks at the above plants would have fallen to 2 weeks' supply and operation of these boilers would have to be progressively curtailed.

The coal industry is unable to increase production to supply plants burning fuel oil and natural gas on the East Coast without building new capacity which would require at least three years; however, a coal allocation program could be implemented that would divert a portion of current production to convertible plants. The logistic problem with respect to coal is critical, especially in the large eastern metropolitan areas. The supply of open-top hopper cars is tight, facilities for distributing coal to alongside plants in the east must be repaired, and delivery to these plants is uncertain due to a shortage of barges and towboats. Emergency measures such as a coal allocation program and diverting some transportation equipment to critical areas offers some short-term relief, but the distribution system will be cumbersome, inefficient and expensive.

Coal mining capacity is critical throughout the eastern coalfields. An allocation program offers only temporary relief. Railroad repair facilities have deteriorated in the same degree as the inventory of rolling stock. Permanent long-term solutions are needed.

An additional contribution coal could make would be by increasing load factors on coal fired utility plants and thus reducing the oil/gas requirement of an electric power system. While this possibility has not been fully explored, it appears that existing transmission facilities are limited in their ability to distribute the added electricity to oil or gas consuming areas.

NUCLEAR POWER

Another potential means of assuring a degree of supply continuity during an import interruption is the expediting of nuclear plants already scheduled for operation. Conversely, slippages in operating schedules or deratings of existing plants would only serve to aggravate the crisis.

During the last quarter of 1973 and first 6 months of 1974, 12 nuclear power units are scheduled for commercial operation. These units total 9,800 megawatts (MW) of capacity equivalent to 300 MB/D of energy supply. Bringing these plants on stream promptly and at full capacity (instead of being derated) could make an additional 50 to 100 MB/D oil equivalent available during the first

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quarter of 1974. Three of the units with a total capacity of 2,800 MW (84 MB/D equivalent) are located in PAD I. In addition, as of November 5, the AEC reported 5 nuclear plants derated by a total of 381 MW, equivalent to 12 MB/D of lost energy supply. Nearly 320 MW of this total were in PAD I. Thus, a temporary lifting of the derating measures (reasonable safely standard permitting) would provide PAD I with 10 MB/D of incremental supply.

ENERGY USE CURTAILMENT

Table 6 summarizes the net shortages resulting from a sustained 3 MMB/D loss of petroleum imports consisting of 1.8 MMB/D of crude oil and 1.2 MMB/D of refined products during the first quarter of 1974.

TABLE 6

NET SHORTAGE CALCULATIONS
(MB/D)

	Gasoline & Naphtha	Total Middle Distillates	Heavy Fuel Oil & Other
Crude Loss - 1.8 MMB/D			
Total Naphtha - 47%	846	-	-
Total Middle Distillate - 35%	-	630	-
Heavy Fuel Oil & Other - 22%	-	-	396
Product Loss - 1.2 MMB/D	80	370	750
Total Loss	926	1,000	1,146
Offsetting Measures*			
Additional Domestic Oil Production (293 MB/D)	(138)	(102)	(64)
Oil to Gas Conversion		(75)	(75)
Oil to Coal Conversion in Electric Utility Sector†	-	-	(250)
Gasoline Deconversion to Distillate‡	100	(100)	
Refinery Fuel & Process Gain	28	18	(98)
Net Shortage	916	741	661
Percent Demand	13.5%	13%	16.8%

* These offsetting measures require government actions to be fully effective.

† Attainment of these savings would require relaxation of sulfur in fuel standards.

‡ The figures shown are somewhat arbitrary--additional deconversion capacity probably exists at the lower crude runs if further use of this option is deemed desirable/acceptable.

The loss of crude and product imports results in total product losses of 926 MB/D motor gasoline, 1,000 MB/D total middle distillates, and 1,146 MB/D of heavy fuel oil and other products. After fully utilizing available emergency measures such as additional oil and gas production, maximum conversion of electric utilities from oil to coal and increased operation of nuclear plants, and adjustment of refinery yields, substantial shortages remain. These shortages are 916 MB/D of motor gasoline (13.5% of demand), 741 MB/D of middle distillates (13% of demand), and 659 MB/D of heavy fuel oil (16.8% of demand).

It should be emphasized that the denial offsets have been somewhat arbitrarily assigned to the major product groups. The U.S. refining system will have added flexibility when running at the reduced rates to make additional adjustments to product yields as required.

Steps which have been identified for conserving gasoline short of rationing are shown in Table 7. The 614 MB/D figure should be viewed as an optimistic assessment of what could be accomplished by these measures. Insofar as this is equivalent to only two-thirds of the reduction needed, it is obvious that additional stringent controls must be implemented to reduce demand as soon as possible.

Temporary restrictive measures which can be implemented immediately should be taken to dampen demand prior to the time formal controls can be effected. Examples of this type of measure include instructing suppliers to reduce motor gasoline allocations to all stations they supply by a certain percentage of a recent prior period sales level. Mandated efficiency measures which can also be implemented quickly such as reducing speed limits should be aggressively promoted to not only reduce demand prior to controls, but also to "force" more efficient usage after controls are established.

Similarly, the total distillate shortfall of 741 MB/D (13% of demand) is beyond the level of 601 MB/D shown in Table 8 that might be obtained by such steps as increasing airline load factors, reducing thermostat settings, reducing residential and commercial lighting, etc.

The situation is even more severe in the case of HFO where the shortfall is 659 MB/D or 16.8 percent of demand. Again, conservation steps such as reducing thermostat settings (330 MB/D), reducing residential and commercial lighting (35 MB/D), leaves a supply gap approaching 300 MB/D.

The voluntary and mandatory conservation measures outlined above may be optimistic as to the level of compliance and the time required to achieve these levels. They are to be viewed as a *maximum achievable volume* with a high level of Government leadership at all levels and a high degree of public acceptance. These

conservation measures are considered as being the maximum realistic/ acceptable curtailment which could be achieved without formal rationing. Figure 2 compares the cumulative denial and the offsets available through increased supplies and voluntary actions.

In view of the above, it becomes obvious that some form of mandatory regulations be placed on the use of these fuels. In the case of motor gasoline, and perhaps home heating oil, the most effective and equitable method appears to be a coupon-rationing system. A procedure already exists to allocate middle distillates (including No. 4 fuel oil) in the form of the Mandatory Allocation Program which went into effect November 1, 1973. This allocation program should be expanded to cover HFO in such a way as to best assure energy supply to industry.

It should also be modified to incorporate a philosophy or priority for demand reductions. Inherent in the data and findings of this report is the following order of use priorities.

1. Uses related to protection of the public health and welfare and National defense.

2. Uses related to the maintenance of employment, and a healthy domestic economy.

3. Uses related to public comfort and convenience.

Obviously, services related to public health and welfare such as police and fire protection, etc., must be maintained. This area also would include maintaining a minimum acceptable level of home heating.

Uses related to the maintenance of jobs and economic activity consist primarily of industrial activity. Business and industry must be encouraged by every available means to use energy more efficiently. However, it is considered imperative by this Committee that the basic industrial activities which provide the bulk of U.S. employment and economic strength be maintained at the highest possible level.

It is also imperative that these procedures be implemented as soon as possible in order to avoid even more severe problems later in the season if inventories and working stocks are depleted. Since it will take some 4 to 6 weeks to implement these formal curtailment procedures, it is absolutely necessary that we take maximum advantage of all conservation measures available to us in the interim.

SUMMARY

To summarize the analyses presented in Chapters Two and Three. it is evident that:

TABLE 7

Gasoline Conservation Measures--1974
(First Quarter 1974)

	Thousand Barrels per Day
1. Reduce speed limits to 50 M.P.H. (75% compliance).	190
2. Encourage car pools--	316
• 34% of automotive travel is commuting	
• Assumes voluntary increase in average car occupancy from 1.3 to 1.8 people	
• Reduces total motor gasoline demand by 4.5%	
3. Reduce recreational driving	108
• 1/3 of passenger car travel is social/recreational (i.e., 27% of total motor gasoline demand)	
• Assumes 50% reduction results in 108 MB/D reduction in winter, 315 MB/D in summer	
4. Other voluntary/mandated measures	*
• Regular tune-ups	
• Keep tires inflated	
• Minimize use of air conditioner	
• Good driving habits	
• 4-day work week	
TOTAL	614

* Have not been able to quantify.

TABLE 8

Distillate Conservation Measures

	Thousand Barrels per Day
Voluntary/mandated measures--	
1. Reduce speed limits to 50 M.P.H. (diesel powered vehicles)--75% compliance	19
2. Reduce R/C lighting	60
• 10% reduction in residential sector where lighting is 16% of electrical consumption	
• 20% reduction in commercial sector where lighting is 42% of electrical consumption	
• Assumes 50% of KWH savings will be reflected as reduced oil consumption (60 MB/D distillate, 35 MB/D HFO)	
3. Increase airline load factors from 50 to 65% (90% effective)--results in 20% fuel demand reduction	207
4. Reduce commercial airline speeds assumes 5% fuel savings by reducing speed and/or increasing ceilings	50
5. Reduce space heating thermostat settings 5°F	265
TOTAL	601

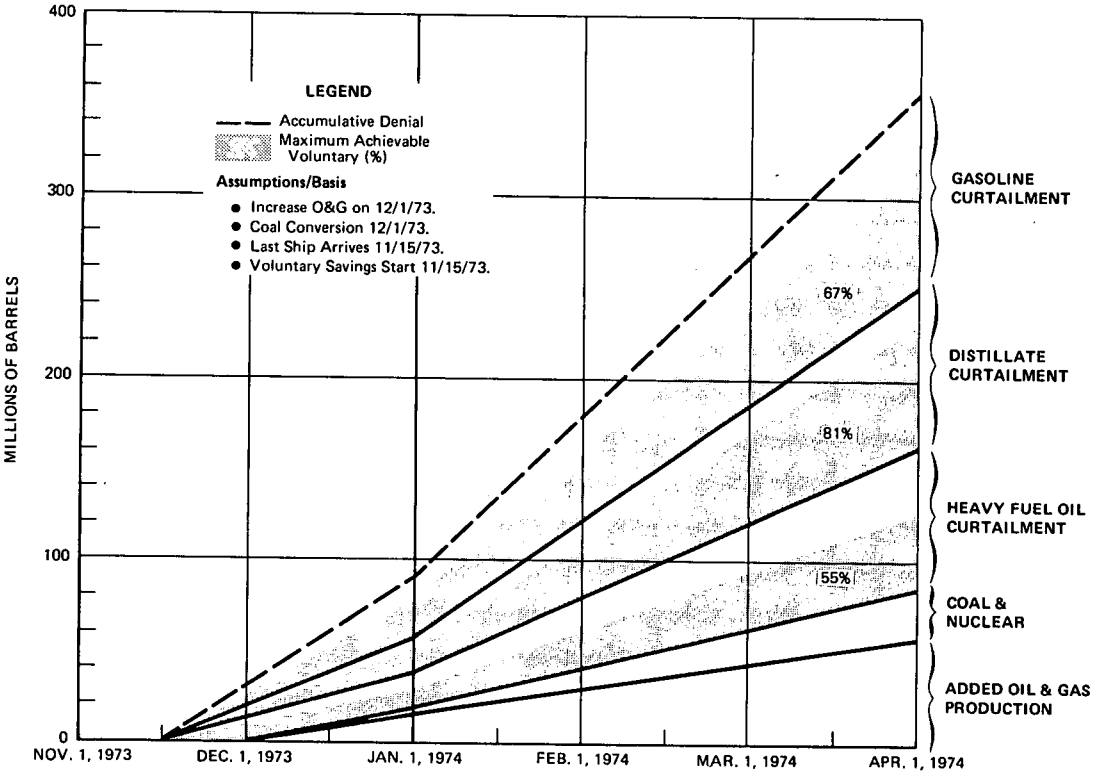

Figure 2. Comparison of Accumulative Denial and Available Alternatives for Response to Shortfall.

- Added domestic supplies of oil and gas, conversion to coal and acceleration of nuclear generation capacity can only make up about 24 percent of the expected denial through the first quarter of 1974.
- Curtailment of use of distillate and heavy fuel oil saves about 45 percent of the denial. Only about 2/3 of the reduction could be achieved voluntarily.
- The remainder of the denial, about 31 percent, must come from reduction in use of motor gasoline. Only about 2/3 of that reduction could be achieved by voluntary means.
- Since the necessary savings cannot be achieved by voluntary means, rationing seems to be essential.
- The rate of inventory drawdown is so high that rapid action is essential. Delay in taking any of the available actions could rapidly create truly critical supply runouts.

Chapter Four

IMPACT OF OIL IMPORT INTERRUPTIONS ON THE NATIONAL ECONOMY

Determination of oil import interruption effects on the national economy is extremely complex: however, since substantial oil supply shortages are certain for the 1973-1974 heating season, some quantification of the economic impact was considered essential for this report. While rigorous quantitative analysis of GNP/energy relationships was not possible on short notice, application of some simplifying assumptions permitted estimation of the economic impact that may result from various levels of oil supply shortfall.

The following table summarizes the estimated direct economic effects associated with the oil shortage levels noted. These estimates do not include secondary effects which could increase the magnitude of economic impact if the shortage were long lasting.

TABLE 9

	Reduced Oil Supplies		GNP Decrease	
	Thousand Barrels Per Day	Percent of Energy	$Billion Per Year	Percent
Case I	2000	5.6	48	3.6
Case II	1500	4.1	27	2.0
Case III	500	1.4	1	0.1

Figure 3 compares the estimates of GNP effects of fuel supply curtailments made by the NPC with other published and unpublished measurements by private econometric forecasting services.* It should be noted that the NPC assessment corresponds to a consensus judgment, e.g., it does not overstate the potential magnitude of an unmanaged energy crisis.

As shown in Chapter Two, logistical considerations concentrate the shortage effects in the coastal areas of the country. This is due to severely limited ability in the short run to transport domestically refined products from other regions into Districts I and V. However, the primary reasons why the fuel shortage situation will be most critical on the East and West Coasts this winter

* The Chase Econometric estimates are preliminary only and not based upon a complete model run.

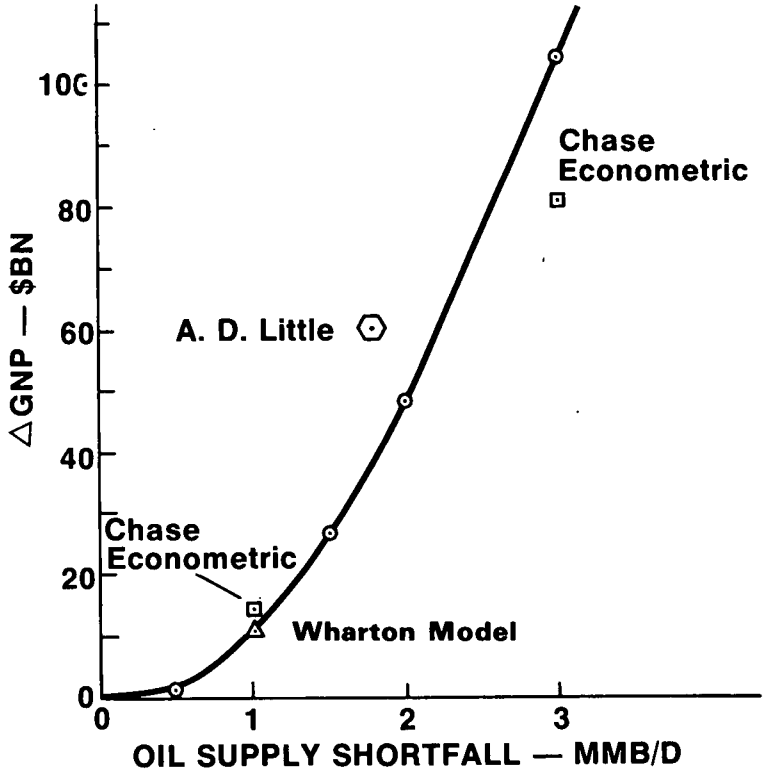

Figure 3. Comparison of Estimated Effects of Oil Supply Shortage on GNP.

is that those areas have been highly dependent upon imports of both refined products and crude oil from overseas. Thus, a cutoff of these supplies will bear most directly and immediately upon consumers of imports.

It should be noted that the GNP figures shown are annual rates and that if the oil shortfall did not persist for a full year, GNP actually lost would be reduced accordingly. However, it now appears that the shortfall during the current heating season will exceed the Case I level of 2 MMB/D and may reach 3 MMB/D by the first quarter. Thus, the short-term impact of energy shortages on economic activity and employment could be substantial, particularly in PAD's I and V. It is estimated that a 3 MMB/D petroleum shortage during the first quarter of 1974 alone could decrease 1974 GNP by up to $26 billion, with specific effects highly dependent upon alterations in consumption patterns and secondary economic effects resulting from fuel supply dislocations. Unemployment rates could well increase from current rates of less than 5 percent to levels exceeding 6 percent, in the 2.0 MMB/D curtailment case, and to nearly 8 percent if a sustained shortage of 3.0 MMB/D were experienced:

TABLE 10

Reduced Oil Supplies (Thousand Barrels Per Day)	Employment Effects	
	Rise In Unemployment (000)	Unemployment Rate (Percent)
3000	2500	7.7
2000	1200	6.2
1500	700	5.7
500	-	5.0*

* Base 1974 forecast.

The above estimated effects, of course, could be made less visable by eliminating overtime, reducing normal working days, etc. Moreover, the economic impact of a supply shortage is very dependent upon consuming areas affected. If the shortage can be absorbed by curtailment of the less essential areas of activity, the economic costs would be minimized. Generally, public consumption could be reduced with comparatively small impact on the economy. Significant reduction of industrial energy supply would likely cause plant shutdowns and high levels of unemployment. Allocation or rationing programs must recognize these factors.

The table below illustrates in summary form the economic incentives to channel available energy supplies to industry under severe shortage conditions. This table notes the GNP dollar decrements corresponding to a dollar reduction in energy supplies. For example, in the industrial sector, if the overall energy supply deficiency is 5 percent, approximately $22 in goods and services production would be lost for each dollar of energy "saved." Small reductions in energy supplies are less costly because they can often be offset by conservation measures, but substantial denials of energy to industry are prohibitively costly. It should also be noted that this table does not highlight the full range of cost consequences. The GNP multiplier cost of reduced home heating or recreational driving is much lower than the averages noted in the transportation and residential/commercial sectors because a large share of energy applications in those sectors are linked to the production of commerical services, e.g., truck transportation, dry cleaning, etc. Thus, the economic cost of withholding energy supplies from some industries could be fifty or more times the cost of fuel denials to many non-industrial activities.

TABLE 11

GNP Reduction Per Dollar Due To Energy Denial By Sector

Sector	Energy Supply Reduction 1%	3%	5%
Transportation	3	6	10
Household/Commercial	4	8	17
Industrial	3	9	22

The previously mentioned economic effects assume only a moderately effective allocation of the shortages. However, the Committee's opinion is that well-conceived and effectively implemented management of the shortage could further soften the impact. On the other hand, failure to take effective action in a timely manner could result in more severe economic impacts.

Across the board mandatory reductions in energy supply allocations such as those advocated by President Nixon will not minimize the adverse economic costs of reduced energy usage unless the value of energy in each use is the same. Voluntary personal energy use curtailments, while appealing, are not likely to be very successful in limiting economic disruptions.

Ideally, the economic costs of the energy shortfall would be minimized by maximum reliance on free market mechanisms which would tend to insure that those uses of scarce fuels which could support the highest fuel costs would be the last to be eliminated. While

it is recognized that short-term disruptions may require statutory allocations approaches, timely return to free market mechanisms is considered essential. During the present emergency, a combination of maximum reliance on the price system supplemented by demand curtailment and mandatory rationing procedures is needed to achieve efficient distribution of existing energy supplies with minimum impact on the economy.

Fuel supply policies which are intended to minimize economic costs of supply disruptions must concentrate on the immediate problem of optimally distributing fuel oils. It appears that roughly two-thirds of the shortage of refined products this winter will be fuel oils (No. 2 through No. 6), and one-third will be gasoline and related materials. This condition indicates that the most pressing immediate energy problem is that of balancing fuel oil supplies with priority requirements. Unfortunately, the economic cost of failure to meet the needs of fuel oil users is much greater than in the case of gasoline, because a large portion of fuel oil is consumed in the production of vital goods and services. Thus, the economic burden of the fuel oil versus the gasoline supply problem is much greater than comparative volumes would indicate.

Appendices

Appendix A--Request Letters

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

DEC 5 - 1972

Dear Mr. True:

The United States is in a period of rapidly increasing dependence on imported petroleum. Associated with this dependency is the high risk involved to the Nation's economic well-being and security in the event these needed, imported energy supplies are interrupted for any reason. With such an alarming trend it becomes mandatory that the Nation's emergency preparedness program to insure supply of petroleum be improved without delay.

Over the past years, the Council has provided the Department of Interior with many outstanding studies which have contributed directly to preparedness for a national emergency. The Council's recent comprehensive energy outlook study indicates national policy options which will minimize dependence on imported petroleum over the long term. However, the study does not examine and evaluate alternatives, possible emergency actions and the results of such actions in the event of a temporary denial or marked reduction in the volume of imported petroleum available to the Nation during the next few years ahead.

The Council is therefore requested to make a comprehensive study and analysis of possible emergency supplements to or alternatives for imported oil, natural gas liquids and products in the event of interruptions to current levels of imports of these energy supplies. Where possible, the results of emergency measures or actions that could be taken before or during an emergency under present conditions should be quantified. For the purpose of this study only, assume that current levels of petroleum imports to the United States are reduced by denial of (a) 1.5 million barrels per day for a 60-day period, and (b) 2.0 million barrels per day for a 90-day period.

Of particular interest are supplements to normal domestic supply such as: the capability for emergency increases in production, processing, transportation and related storage; the ability to provide and maintain an emergency storage capability and inventories; interfuel substitution

or convertibility of primary fuels in the major fuel consuming sectors; side effects of abnormal emergency operations; gains in supply from varying levels of curtailments, rationing and conservation measures; gains from temporary relaxation of environmental restrictions; as well as the constraints, if any, imposed by deficient support capability if an extraordinary demand occurs for manpower, materials, associated capital requirements and operating expenses due to emergency measures.

Such studies should be completed as soon as practicable, with at least a preliminary report presented to me by July 1973.

Sincerely yours,

Hollis M. Dole

Assistant Secretary of the Interior

Mr. H. A. True, Jr.
Chairman
National Petroleum Council
1625 K Street, N. W.
Washington, D. C. 20006

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer to:
MOG

JAN 22 1973

Dear Mr. True:

In our letter to you of December 5, 1972, we asked that the National Petroleum Council make a comprehensive study and analysis of possible emergency supplements to or alternatives for imported oil, natural gas liquids and products in the event of interruptions to current levels of imports of these energy supplies. We are pleased that the Council has agreed to undertake this study.

Our request letter set out several assumptions regarding petroleum supply levels which we now believe require clarification. Rather than assuming a reduction in petroleum imports to the United States of (a) 1.5 million barrels per day for a 60-day period, and (b) 2.0 million barrels per day for a 90-day period, it would be more useful to assume a denial of (a) 1.5 million barrels per day for 90 days, and (b) 3.0 million barrels per day for a period of 6 months. It is anticipated that the Committee will consider the current and predicted mix between crude and product imports in determining the impact of the assumed denials.

We wish to reaffirm that a preliminary report should be submitted by July 1973.

Sincerely yours,

Secretary of the Interior

Mr. H. A. True, Jr.
Chairman
National Petroleum Council
1625 K Street, N.W.
Washington, D. C. 20006

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer To:
EOG

OCT 26 1973

Dear Mr. True:

One of the scenarios in the National Petroleum Council's Emergency Preparedness Study considers a major interruption in foreign oil supplies to the United States as of January 1, 1974.

Though this phase of your Study is nearing completion, recent events have added new urgency to this scenario. Therefore, I ask that you quickly draw together the work which you have accomplished regarding a January 1, 1974 supply interruption and submit it to the Department of the Interior at the earliest possible date.

Sincerely yours,

Assistant Secretary of the Interior

Mr. H. A. True, Jr.
Chairman, National Petroleum Council
1625 K Street, N.W., Suite 601
Washington, D.C. 20006

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Appendix C

AUTHORITIES AND ACTIONS TO COPE WITH THE CURRENT SITUATION

ADMINISTRATIVE AND LEGAL AUTHORITIES

Summary

The President appears to have adequate authority under the Economic Stabilization Act Amendments of 1973 to redirect available petroleum supplies in the Nation's priority interests, including consumer rationing. This authority does not cover other mandatory use curtailment. Mandatory allocation regulations for propane and middle distillates have been promulgated by the Energy Policy Office under this Act.

Federal authority is available under the Defense Production Act of 1950 Voluntary Agreement Provisions for the President to consult with representatives of industry and other groups to encourage the development of voluntary agreements and programs to further the objectives of the Act. The Secretary of the Interior has under this Act recently activated the Foreign Petroleum Supply Committee and the Emergency Petroleum Supply Committee. The Voluntary Agreement authorizing the plans under which these Committees function applies only to emergencies in which deprivation of petroleum supply occurs in friendly foreign nations. A new and different Voluntary Agreement would be necessary for an industry advisory group to address domestic supply problems.

Also under authority of the Defense Production Act of 1950 and other statutes, the Emergency Petroleum and Gas Administration can be activated by the Secretary of the Interior to coordinate and direct the operation of the petroleum industry in mobilizing the oil and gas resources of the United States. Except in the case of an attack upon the United States when activation would be automatic, the Secretary cannot mobilize the EPGA until a National Defense Emergency is declared by the President or Congress.

Except for oil reserves under public lands and the Outer Continental Shelf controlled by the Federal Government, all oil and gas production in the United States is under statutory authority of the respective states. Production from Naval Petroleum Reserves is restricted by law to those situations when it is needed in the national defense and is approved by the President and a joint resolution of the Congress.

Statutes of oil-producing states forbid the production of any oil or gas field in an inefficient manner or in a way that would reduce ultimate recovery. Therefore, state regulatory agencies cannot legally allow production rates above currently established

maximum efficient rates (MER's) unless there is technical evidence to show that the field MER's on a field-by-field basis can be increased in the short-term without affecting ultimate recovery.

Economic Stabilization Act Amendments of 1973

The Economic Stabilization Act Amendments of 1973, Section 203(a)(3) give the President authority: "...for the establishment of priorities of use and for allocation of supplies of petroleum products, including crude oil, in order to meet the essential needs of various sections of the Nation."

Action has already been taken by the Energy Policy Office for mandatory allocation of propane and middle distillates by suppliers to wholesalers. Priority users were specified for propane, but all middle distillate users were considered essential.

The broad authority of the President under the Economic Stabilization Act Amendments of 1973 appears adequate to initiate consumer rationing of any type of petroleum products.

Energy conservation and use curtailment measures are outside the President's existing peacetime authority except for agencies in the Federal Executive Department. Cooperation of state and local governments is essential to a use-curtailment program, such as highway speed limits and outdoor lighting.

Voluntary Agreements

The Defense Production Act of 1950 contained specific titles authorizing priorities and allocations, requisitioning and condemnation, expansion of productive capacity and supply, stabilization of wages and prices, settlement of labor disputes, and control of real estate credit. The Section on general provisions authorized the President to consult with representatives of industry and other groups to encourage such persons to develop voluntary agreements and programs to further the objectives of the Act. Such agreements and programs were required to be approved by the President and the Department of Justice. The Act exempted certain actions taken pursuant to an authorized voluntary agreement or program from the antitrust laws or the Federal Trade Commission Act of the United States.

The first "Voluntary Agreement Relating to Foreign Petroleum Supply" was approved in 1951 with 19 oil companies participating. That Voluntary Agreement established the procedure under which participating companies could take cooperative action to prevent, eliminate or alleviate shortages of petroleum supplies from friendly foreign nations which threaten the defense interests or programs of the United States. The procedure prescribed in the Voluntary Agreement included an emergency plan of action and established the Foreign Petroleum Supply Committee to assist in carrying out the objectives of the Agreement.

The Voluntary Agreement has been amended several times, the most recent being in 1967. The emergency provisions have been used in three serious petroleum crises (1951, 1956 and 1967) when interruption of oil supplies have occurred in one or more of the principal oil-exporting nations.

In June of 1967, at the time of the Arab-Israeli confrontation, the Foreign Petroleum Supply Committee was convened and subcommittees established. A plan of action was developed which provided for the establishment of the Emergency Petroleum Supply Committee. Schedules were developed and approved but were not utilized as the supply situation was eased by individual company action.

The Foreign Petroleum Supply Committee was called into closed session by the Secretary of the Interior on October 30, 1973, to address the present situation. The Emergency Petroleum Supply Committee was also activated by the Secretary on November 8, 1973.

The Department of Justice has pointed out that the Voluntary Agreement Relating to Foreign Petroleum Supply is very explicitly limited in scope both by its terms and historical practices to emergencies in which deprivation of petroleum supply occurs in friendly foreign nations. For the President to utilize the Voluntary Agreement provisions of the Defense Production Act to consult with representatives of industry on domestic oil supply problems, an entirely new and separate Voluntary Agreement would have to be developed and approved.

The Emergency Petroleum and Gas Administration

The President promulgated a National Plan for Emergency Preparedness in 1964 under authority of the Defense Production Act of 1950, the National Security Act of 1947, the Federal Civil Defense Act of 1950, and the Strategic and Critical Materials Stockpiling Act. The plan recognizes that a future emergency might range in seriousness from international tension to limited conventional warfare or even to a nuclear attack.

Chapter 10 of the National Plan for Emergency Preparedness entitled "Fuel and Energy," deals with oil and gas, solid fuels and electric power. In oil and gas, the most important planning effort has gone into the establishment, staffing and training of the Emergency Petroleum and Gas Administration (EPGA). The EPGA is a standby organization designed to meet the need for an agency which is ready and authorized to coordinate and direct the operation of the petroleum industry in mobilizing the oil and gas resources of the United States in the event of a national emergency.

Depending upon the severity, EPGA may be partially or fully activated by the Secretary of the Interior upon declaration of a national defense emergency by the President or the Congress. EPGA's primary function in a declared national emergency is to

assist, coordinate and direct, where necessary, activities of the oil and gas industry, in order to assure that domestic and foreign supplies of oil and gas meet essential military and civilian requirements of the Nation and Allies. This includes formulation and coordination of oil and gas supply programs and acting as claimant for the oil and gas industry before other government agencies to obtain supporting resources.

By Executive Order 10480 and Defense Mobilization Order 8400.1, the Secretary of the Interior has the authority to impose priorities and allocations over petroleum and gas upon the declaration of a national emergency. This authority has been predelegated to EPGA.

The EPGA, on activation, would be an independent government agency headed by a National Administrator who would be the Secretary of the Interior. Other key positions would be filled primarily by personnel drawn from the petroleum and gas industry who are immediately available and trained because they are members of the Petroleum and Gas Unit of the National Defense Executive Reserve with specific responsibilities in the EPGA.

The EPGA cannot be activated by the Secretary of the Interior unless there has been a declaration by the Congress or the President of a National Defense Emergency. If the United States is attacked, activation would be automatic.

The Defense Production Act of 1950 says: "The term 'National Defense' means programs for military and atomic energy production or construction, military assistance to any foreign nation, stockpiling and directly related activity." It thus appears that since denial of petroleum supplies would affect military programs, a serious denial could be considered as affecting National Defense and justify the President or the Congress declaring a National Defense Emergency which would authorize activation of the EPGA.

Naval Petroleum Reserves

Naval Petroleum Reserve 1 (Elk Hills Field) located about 20 miles west of Bakersfield, California, is by far the largest petroleum reserve in the United States from the standpoint of short-term additional production potential. Naval Petroleum Reserves are controlled and operated by the U.S. Navy's Office of Naval Petroleum Reserves and under existing laws can only be produced when "...the Secretary, with approval of the President, finds it is needed for national defense and the production is authorized by a joint resolution of Congress." The production of the reserves for national defense has been permitted once before when NPR-1 was authorized to produce 65,000 barrels per day during World War II.

The law here is clear. Authority to produce NPR-1 during the present emergency will require a resolution of Congress, approved by the President.

State Authority for Oil and Gas Production

With the exception of production from federal public lands and the Outer Continental Shelf, all oil and gas production in the United States is under the authority of the respective state laws. Therefore, any additional production from fields not under federally controlled lands must be in compliance with state laws.

Some additional short-term productive capacity may be made available from five major fields in Texas and a number of other scattered smaller fields. All are now producing at their maximum efficient rate as has been determined by state regulatory agencies, based upon technical data on individual fields. These maximum efficient rates (MER's) are for long-term continuous production without reservoir damage. State statutes forbid the production of any oil or gas field in an inefficient manner or in a way that would reduce ultimate recovery. Therefore, state regulatory agencies, such as the Texas Railroad Commission, cannot legally allow production rates above MER.

Since current field MER's are for sustained rates, the state regulatory agencies could make a technical determination of possible short-term higher MER's on a field-by-field basis where there is spare productive capacity. Setting up temporary higher allowables should be permissible for this procedure under the state laws.

To obtain this potential additional production for the duration of the present supply emergency will require the cooperation of the state regulatory agencies in establishing temporary higher MER's. Since oil production "allowables" are not mandatory producing rates, producers in the fields involved would have to voluntarily make whatever facility additions as are necessary to produce at the higher but temporary rates.

EXECUTIVE ACTIONS

On November 7, 1973, the President proposed to the Nation his recommendations for countering the domestic energy crisis. The President ordered the following actions:

- Industries which currently use coal will be prevented from converting to oil in the immediate future. Power plants using oil which are able to convert to coal will be encouraged to do so.

- Fuel allocations to commercial and other jet fuel users will be reduced, leading to schedule changes and a 10 percent cutback in the number of flights.

- Heating oil for homes, offices and other establishments will be reduced approximately 15 percent.

- In addition to the previously ordered 7 percent reduction in the Federal Government's consumption of energy, further steps will be taken. Daytime temperatures in federal offices will be maintained at 65-68°. In addition, the 500,000 federal vehicles will be ordered to travel no faster than 50 miles per hour, emergencies excepted.

The Atomic Energy Commission was requested to speed the licensing and construction of nuclear plants in order to reduce lead times for construction from 10 years to 6.

The President directed Governor John A. Love, Assistant to the President for Energy, to work closely with Congress to develop an emergency energy act. The proposed legislation would grant the executive branch the authority to:

- Order an immediate return to daylight savings time year-round

- Relax environmental regulations on a temporary, case-by-case basis

- Impose special energy conservation measures, i.e., reduction of commercial operating hours

- Increase the production of the Naval Petroleum Reserves

- Use the proceeds from the sale or exchange of the Navy-owned oil to fund further development and production from Elk Hills, California, and for exploration and proving the Naval Petroleum Reserves

- Reduce highway speed limits nationwide.

The President also requested that Governors and Mayors reinforce his actions on the state and local levels.

The following actions are currently being taken by the Administration, primarily under the authority of the Economic Stabilization Act of 1970 and the Defense Production Act of 1950:

- The President directed the Secretary of Transportation to give priority to grant applications for the purchase of buses for mass transit under the authority of the Federal Aid Highway Act of 1973 and the Urban Mass Transportation Act.

- The Office of Management and Budget has been directed to establish an interagency task force to monitor the allocation and rationing programs and develop plans in anticipation of a shortage.

- The Secretary of the Interior has been directed to establish a fuel allocation administration to administer all programs and to activate the Emergency Petroleum Supply Committee.
- The establishment of a National Industrial Energy Conservation Council has been directed of the Secretary of Commerce.
- Governors and Mayors are being asked to determine the supply/demand situation in their areas, develop programs to reduce energy consumption, coordinate with federal agencies that are allocating fuel. Steps requested of the Governors and Mayors to reduce gasoline demand include:
  - greater use of mass transit and car pools
  - 50 miles-per-hour speed limits on highways
  - special bus lanes
  - higher parking taxes
  - blocking off certain sectors to cars with only one passenger
  - preferential parking for car pools
  - staggering of working hours in state and local governments.
- Contingency plans are currently being developed which include programs for the rationing of gasoline. A proposed plan to ration heating oil will be published in the Federal Register in mid-December.
- Administration legislative proposals awaiting Congressional action during this session include:
  - Alaska Pipeline
  - Natural Gas Supply Act
  - Mined Area Protection Act
  - Deepwater Port Facilities
  - Energy Research and Development Administration/ National Energy Commission Reorganization.

Chairman HUMPHREY. I have just been informed that we have 10 rollcalls back to back, and I have to go to the floor and answer the rollcalls.

With that, I will go on to beg off and apologize to you for keeping you all this time for this limited appearance. But we do thank you for your cooperation. Your company is a very large company, and it could be very helpful with its worldwide interests and knowledge. And we are going to look to you for guidance.

Mr. MOSELY. Thank you.

Chairman HUMPHREY. And if you will excuse me, I have to leave. And I want to thank you and your associates.

We will include your entire statement and submissions as part of the record.

Mr. MOSELY. Thank you, Mr. Chairman.

Senator HUMPHREY. Thank you so much, Mr. Mosely.

The subcommittee is adjourned.

[Whereupon, at 1:10 p.m., the subcommittee adjourned, subject to the call of the Chair.]

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