

P U B L I C H E A R I N G

before

SENATE AD HOC COMMISSION ON
ENERGY AND THE ENVIRONMENT

Held:
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Assembly Chamber
State House
Trenton, New Jersey

Members of Commission present:

Senator William E. Schluter (Chairman)

Senator Joseph P. Merlino

Senator Barry T. Parker

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I N D E X

	<u>Page</u>
Dr. John M. Greene New Jersey Chapter, Sierra Club	2
C. Louis Bassano Assemblyman, Union County	27
John J. Brown, Secretary-Treasurer New Jersey State AFL-CIO	35
Vikram L. Dalal Princeton Chapter Federation of American Scientists	45 & 74 A
Richard J. Sullivan, Commissioner Department of Environmental Protection	1 A
Mrs. Ruth Fisher The Sun People Alternate Energy Advocates	17 A & 76 A
Larry Bogart Citizens Energy Council	19 A
Mrs. Claire Schiff Summit, New Jersey	25 A
Dr. Eleanor J. Lewis Executive Director N. J. Public Interest Research Group	29 A
Dr. Francis J. Haughey Rutgers University	44 A
Dr. Robert Socolow Princeton University	53 A
Robert L. Godell Delaware River Basin Commission	64 A

SENATOR WILLIAM E. SCHLUTER (Chairman): Good morning. I will call the Third Hearing of the Senate Ad Hoc Energy and Environment Study Commission to order.

On my right is Vice Chairman Joseph Merlino, Senator from Mercer County. I am Senator William Schluter. The two other members of the Commission we expect to join us a little later this morning.

This is the last scheduled hearing of this Ad Hoc Commission. I will remind everyone that we have a target reporting date of March 19. The Commission will be meeting and will be making field trips and will have executive sessions hereafter.

The first witness on our schedule today is Assemblyman Louis Bassano, but I don't see him here. So we will have to proceed down the list.

Before we do that, Senator Merlino, do you have any comments?

SENATOR MERLINO: No. Let's get on with the hearing.

SENATOR SCHLUTER: The next witness I have is Mr. John Brown of the New Jersey State AFL-CIO.

If we take the witnesses out of order, what we will do is go back and pick them up later on.

SENATOR MERLINO: It would be easier to ask who is here?

SENATOR SCHLUTER: All right. I think you are right. Who is here who wishes to testify? (No response.) All right. We will just suspend the hearing for 10 or 15 minutes until our witnesses show up.

(Proceedings suspended, as indicated above.)

SENATOR SCHLUTER: Can we proceed with the hearing, please. Have the two gentlemen who have come in and plan to testify registered with our secretary?

We want to proceed and we don't have our early witnesses with us. So, Dr. Dalal, would you care to

testify now?

DR. DALAL: I would rather have Dr. John Greene testify first.

SENATOR SCHLUTER: Dr. Greene, are you prepared to testify now?

DR. GREENE: Yes.

SENATOR SCHLUTER: Fine. Will you please come forward. After you finish your testimony, we will see if anybody else has come in and work you in, Dr. Dalal.

J O H N M. G R E E N E: My name is John Greene. I am representing the Sierra Club today. I work for the Princeton Plasma Physics Laboratory. We work on fusion power, which is one of the alternate power supplies. I should point out though that my friends at work don't know I am down here and my friends at the Sierra Club have authorized me to speak. I am not speaking for the Princeton Plasma Physics Lab or Princeton University in any way. Also I am speaking for the New Jersey Chapter, which is an organization which encompasses the Southern Jersey group, amongst others. When I typed up my statement, I only had group stationery at home. It was late Sunday night and so I used that. But it does represent a Chapter statement.

For introduction, I have two main topics that I wish to discuss today: first, I will treat the relation of the energy crisis to the environment; then I will give a number of constructive suggestions for easing the effects of that crisis.

Before I begin, I want to make one distinction here in use of words between our current energy crisis, which is probably short term and depends on things like the business cycle, etc., and a general trend of increasing restrictions that is likely to last through our entire lifetime or even longer. This last I will call the "Energy Dilemma." So when I speak of the dilemma, I

am speaking of longer term effects in the order of a generation or more. These things are related, since the Dilemma will likely appear as a series of crises, but it is useful to distinguish these two time scales.

It is the fashion to blame environmentalists for the current energy crisis. This is akin to the mediaeval practice of beheading messengers carrying bad news. It is our contention that the current crisis is basically an imbalance between supply and demand, exacerbated by a series of faulty decisions.

In particular, the crisis that brings us together today is a combination of shortages of refined petroleum products, natural gas, and electric generating capacity. With regard to these shortages, I have eight points:

1. From 1971 to 1973 the capital spending rate of the oil industry within the United States actually declined, while other U.S. industries were increasing their capital expenditure rate by 18 per cent. The oil industry has reduced exploration at a time of increased demand. Environmentalists have restricted exploration in only a few small, isolated areas. Note that the most optimistic projections did not predict that Alaskan oil would arrive on the market before 1976, and thus is not related to the current shortages.

2. Environmentalists are not responsible for the present shortage in petroleum refining capacity.

3. Environmentalists did not impose or support the oil import quota system.

4. It is generally agreed that the current shortage of natural gas is a result of reduced exploration which is directly related to a conflict over price regulation.

5. A significant factor in the looming shortage of electric generating capacity is the poor performance of nuclear installations. It has been reported in the press that they have been on-line for only 60 per cent

of the time, as opposed to an 80 per cent design factor. We are not responsible for the recent breakdown at Oyster Creek, or the much-publicized difficulties with Big Alice, etc.

6. A substantial portion of the delay in construction of nuclear generating stations is due to the late delivery of equipment. In particular, Salem is about three years behind schedule and has had practically no local opposition. We object strongly to being blamed for this delay in recent advertisements. Perhaps a year of this delay is due to safety problems, which will be considered next.

7. We are not responsible for the unexpected safety problems of the nuclear generators, such as that associated with the Emergency Core Cooling System, nor are we responsible for the failure of the AEC to conduct adequate safety research. The story of the ECCS, Emergency Core Cooling System, can be briefly and precisely summarized. The system was designed by a computer. A subsequent test showed that the computer model was faulty, and in fact in the test, the system failed. The computer model was completely faulty in this case. No further tests have been made to check improved models. You would not buy a car whose parking brakes had been designed in this fashion. Admitted that it is difficult to test these things, nevertheless we expect our new technology to be tested. Recent testimony has shown that many AEC scientists have grave doubts about the efficacy of the ECCS, and it is they who have brought this situation into the open. Here, indeed, environmentalists are only the spreaders of bad news.

8. Environmentalists are often blamed for the poor performance of 1972 automobiles - that is, the gas mileage. A recent EPA study, "Fuel Economy and Emission Control," shows that 80 per cent of the loss of efficiency is due to increased weight and auxiliary systems, such as air conditioning and automatic transmissions. Only 20 per cent of the loss was due to emission controls.

These eight points cover the nature of the current crisis. That it is related to the larger dilemma can be verified by a little contemplation. Consider the history of the oil industry. It started in Pennsylvania, then moved to Texas. More recently the action has been in Venezuela and western Canada, and now it has moved on to Alaska. At each stage it has moved a little further from the industrial heartland, and into more exotic and difficult regions. Our message today is that the world is round and we are reaching the limit of this progression into more difficult regions. As another example - it may seem quite different, but you can see that it is really the same sort of thing - the nuclear safety squabble shows the dangers associated with the speed-up of applications of new technology. We are now applying technology at a much faster rate compared with its development than we have in the past. Thus the margin of error is being reduced on this side also. These things are signs sent to tell us that the present trend cannot be extrapolated into the next century. On every hand, our margin for error is being reduced by exploring into farther areas and by tightening up the gap between research and application. And as these margins for error are reduced when people make errors - and let's face it - everybody does make errors - the errors become more serious. That is our thesis for a major part of the energy crisis right now.

So what actions can the New Jersey government usefully take? Admittedly, this is only a small state in the whole Union and the whole world. But there are some things that can be done usefully right here in New Jersey. And I am separating these into things that can be done related to the current shortages and those things that are related to the larger dilemma that will help ease the situation over the coming generations.

Firstly, we support the Power Plant Siting Bill,

A 1673, in principle. I have some qualms about the current bill related to restricting certain areas from consideration for power plants. Unfortunately, the power companies seem to have a preference for public park land. We have the case of Sunfish Pond, which is a sore point with me, and now the first of what is probably many offshore power plant sites is adjacent to Brigantine Wildlife Refuge. And I can't believe that that is an accident, that they are moving there next to park land, and presuming to infringe on park land perhaps for some of their on-shore facilities, perhaps power lines. I hope that the Legislature establishes the policy that parks are for people and not for power plants.

Nevertheless, the Power Plant Siting Bill, giving broader social involvement in the siting of power plants, I think is in general a good idea.

Another step - our nation's petroleum refineries are now operating at capacity, and there will be increasing pressure to build new facilities. This is probably an even more sensitive issue than power plants, although we haven't had to face that in this State recently. We urge the Senate and the State to consider a "refinery siting bill," similar to A 1673.

The third recommendation, relating to the importing of oil in tankers, I will delay until later, because I want to discuss a little economics first.

Now I want to point out a number of steps which can be taken to ease the effects of the energy dilemma, that aspect which will likely last for generations or more. These can be described as energy conservation measures because basically the only way we are going to solve our dilemma is to somehow use less energy and use it more efficiently.

First, there are two areas where significant and identifiable savings can be achieved because they are

large users of energy which are essentially all in a lump and can be tackled in a lump.

The first one is transportation, which accounts for about 25 per cent of the United States energy consumption, and the total transportation system, according to the estimates we had, which included equipment manufacture - the energy used in equipment manufacture - the energy used in road manufacture, etc., accounts for more like 40 per cent of the energy budget. The average American automobile, carrying 1.2 passengers, is extraordinarily inefficient. Mass transportation is vastly more energy efficient, that is, gives more passenger miles per gallon of fuel. A bus, operating at capacity, is ten times more efficient. And a train is five to ten times more efficient. It is interesting that the bus is probably more efficient than the train. Part of that comes from the only 50 per cent efficiency you get in electric power generation at the generator. While the trains are probably efficient in themselves, there is that initial 50 or 60 per cent loss which brings them down. These mass transit systems also give some savings in equipment and thus reduce the 15 per cent overhead in the energy supply. By reducing congestion, pollution, and space consumption, this type of saving of energy would actually increase our quality of life. It doesn't represent a decrease of our standard of living necessarily to have mass transportation systems.

So the point here is we must in all ways - local, state and federal - work for mass transportation at the expense of the automobile. And that means in a lot of ways - designing our communities so that they work with mass transportation systems, designing the mass transportation systems so they work with the communities. It is a very complicated problem that needs to be tackled on many fronts and in all ways and at all times. That is one large block of energy.

A second large block of energy, about 25 per cent we estimate, goes into space heating and cooling. The Office of Emergency Preparedness in a report, "The Potential for Energy Conservation," estimates that an expenditure of \$280 above FHA standards could cut thermal losses by 50 per cent in the northeast region. I am not sure whether it includes storm windows, certainly it includes better insulation and perhaps other standards in the building code. Thus large savings could be effected here quite economically. I would venture that the reason that the market has not responded to this fact lies in the ignorance of the buyers. After all, \$280 to cut your fuel bill in half would be something worth buying. I know, myself, that I don't know that much about insulation and what the builders are doing and we buyers are really at some disadvantage in that respect.

We propose two strategies to overcome this ignorance. It could be accomplished by regulation, that is, by upgrading building codes. Or another method that is popular these days is consumer education. It would be reasonable to require a home seller to certify typical heating and cooling costs to every potential buyer.

Since presumably heating costs are proportional to the number of degree days, that can be calibrated according to a typical winter with the number of degree days and typical insulation and all that. I am not sure it would be any more difficult to give official estimates for heating costs of a given house design than it would be to give actual interest charges. Some formulas could be figured out that would be comparable in all cases, comparable throughout the State, and be meaningful.

So those are two large uses of energy where you can get at the problem directly.

Other savings of energy will only come from small items, each insignificant, but adding up to a useful

impact. These small items are perhaps most efficiently handled by indirect methods.

First, consider consumer education. Con Ed has estimated that their "Save a Watt" campaign saved 4 per cent in the peak demand last summer. That is about one-third the estimated capacity of the Sunfish Pond project. Four per cent may sound small, but 4 per cent in peak demand is an important quantity in the total number of power stations that are required and, particularly, the peak power stations, which Sunfish Pond is. So how come our New Jersey companies have not followed suit with a "Save a Watt" campaign of their own?

Along the same line, we strongly recommend that the Legislature ban the practice of including all utility costs in apartment rental rates. Here we are getting into economics a bit. But the decoupling of cause and effect, of turning off lights, of turning down a thermostat, with savings to the person that actually is in charge of turning out the lights and turning down the thermostat -- this decoupling of cause and effect can only lead to abuse. For example, the installation of water meters in Philadelphia led to a 20 per cent reduction of water usage. I am sure we all believe that.

Another policy, going along with consumer education, is recycling. For example there is an 80 per cent energy saving in melting aluminum cans over that required to refine the new material. Similarly there is a 75 per cent energy saving associated with returnable bottles. So the recycling bills that are presented to the Legislature are generally also energy-saving bills.

One aspect of recycling that is particularly urgent and hasn't received its due attention is that of crankcase oil. Recycling of this material has decreased drastically recently, and the result has been a massive incursion of oil into the environment. It is a particularly noxious

way of being wasteful. We recommend that the oil companies be required to pick up all used crankcase oil and figure out what to do with it without dumping it. It is not a difficult problem. They have the refineries. It is just a matter of working out the proper refining methods. The cost they are giving to the environment by just closing their eyes to the fact that it is being dumped into the sewers, dumped into the rivers, dumped into the aquifers, is high and we think that this is not an unreasonable requirement, that they should be required to take care of the oil.

It was also suggested last night after I typed this up that one significant source of crankcase oil, at least in some states, is home-changing of crankcase oil. I understand in California you can buy crankcase oil in the supermarkets. You can buy everything else there. And we think it would be reasonable to require some regulation on this, perhaps the banning of selling crankcase oil in the supermarkets if it is going to mean it is going to be dumped in the sewer or, otherwise, require people to turn in their oil.

The last of the three indirect strategies we suggest - and probably the most effective - involves alterations in the rate and price structures. I will not go in this deeply. Our essential philosophy on this point involves the distinction between internal and external costs. This, I believe, speaking as a sort of mathematician, I would call the fundamental theorem of the environmental movement, at least as far as economics is concerned. The internal costs are those borne by the person or corporation making the financial calculations, and the latter are the costs borne by everyone else. There are a number of examples of this. I have just mentioned the costs to the environment and also to people owning wells and what not, of oil dumped in the ground.

The people that dump this oil in the ground are incurring these costs, in a sense, and other people are paying them. Therefore, the people that dump the stuff don't have any economic incentive to stop their dumping, even though it is costly and wasteful to the economy as a whole.

A most marvelous example of this difference between internal and external costs involves the controversy around the superport. The noise you hear coming up from the shore about the superport may be in the environmental idiom sometimes or it may be in the business idiom other times, but they are all saying that there are tremendous costs involved in a superport that will not be internalized. The shore communities are being asked to pay a bill so that the rest of us back from the shore can buy cheaper oil. That is the essential difference between internal and external costs. A problem involved with a superport that bothers us in the Sierra Club is that we feel they are being asked to pay this price right now, at least potentially, that is, in the form of oil spills, because of current tanker traffic. There is a lot of traffic out there. We know there are even supertankers coming up into the Delaware. They may be coming into the Raritan for all we know, Raritan Bay, that is, off-loading into lighters as they are in the Delaware Bay and then being transported further up.

So in view of the fact that there are these large costs that are not being borne by the people who are in charge of making decisions about how things shall be done, we recommend that the costs of oil transport be fully internalized. This could be accomplished by requiring all imported oil to be fully insured against spillage, and that means insured against all indirect and economic losses as well as the clean-up costs. I think this is a very important point. I believe, but I am not a lawyer, that New Jersey could require all

oil brought into New Jersey by tanker be insured.
This would just be a matter of internal regulation.

To conclude, I hope that I have made clear that we firmly favor a sound energy policy. The only modifications of the market economy we request are those that would more fairly distribute the true costs. There is no free lunch for anyone. We believe that if all costs, including those to future generations- let me emphasize that - are fully internalized and fully considered by the people making the decision, policies that are unsound environmentally will also be unsound economically. Thank you.

SENATOR SCHLUTER: Before we proceed into the questions and answers - Dr. Greene, I want to thank you - but any witnesses who plan to testify, we would appreciate if they would come down and register with our secretary, Mr. Frakt.

Senator Barry Parker has just joined us. He is on my left.

We will, after you finish, Dr. Greene, get back to our schedule, which had Assemblyman Bassano as the first witness and then Mr. John Brown, coming after him.

So now we can proceed into the questions.
I have several.

Dr. Greene, you speak about Big Alice. Could you explain what Big Alice is?

DR. GREENE: Big Alice is in New York City. It was a large kilomegawatt generator in New York City, which had a habit of breaking down. In fact, it has been years and it has never acted quite satisfactorily. Those who read the New York Times and follow it are quite familiar with that, which is why I put it in here.

SENATOR PARKER: It is still not in operation.

DR. GREENE: I sort of lose track when it is not in the New York Times.

SENATOR SCHLUTER: Dr. Greene, on the bottom of

page 5, you say, and I quote, "The Office of Emergency Preparedness in a report, 'The Potential for Energy Conservation' estimates that an expenditure of \$280 above FHA standards could cut thermal losses by 50 per cent in the northeast area." This does not say what the thermal loss is. You just say the thermal losses could be cut 50 per cent. What does this 50 per cent or what does the loss involve in total heating cost?

DR. GREENE: I would assume that the \$280 loss means that that is the fuel cost. No - I mean the 50 per cent saving means that the fuel cost would be cut by 50 per cent.

SENATOR SCHLUTER: But that is not what your statement says.

DR. GREENE: It isn't? It says it would cut thermal losses by 50 per cent. Now what goes through my mind is that the fuel costs are proportional to thermal losses. So I mean that it would save fuel costs - it would save the fuel - by 50 per cent.

SENATOR SCHLUTER: Dr. Greene, could you after this hearing go back to your sources of this and let us know in a letter. Because if, for example - and I want others here to understand this because you don't have the testimony to follow -- for example, if it costs \$700 to heat a housing unit over the period of a year and its thermal losses resulting from the fact it doesn't have this \$280 average weather-proofing might only be \$300 of the \$700 -- Now are you talking ---

DR. GREENE: You would save roughly \$300 out of that \$700.

SENATOR SCHLUTER: Are you talking about the 50 per cent saving being the 50 per cent of the \$700 or 50 per cent of the \$300? If you would clarify this point, I would appreciate it.

DR. GREENE: All right.

SENATOR SCHLUTER: I think you understand what I am requesting. You don't have to do it now.

DR. GREENE: I can work on that.

SENATOR SCHLUTER: Now you say that 40 per cent of the energy consumption is in transportation and other activities involved in transportation, road building, etc.

DR. GREENE: The whole transportation system.

SENATOR SCHLUTER: The whole transportation complex. Is this nationally or is this regionally or in the State?

DR. GREENE: I don't believe that you could calculate that on a smaller unit than nationally.

SENATOR SCHLUTER: Dr. Greene, you go on to say that another 25 per cent of our energy is used for space heating.

DR. GREENE: Yes.

SENATOR SCHLUTER: This leaves 35 per cent. Where does that 35 per cent of our energy go? I don't find it in your testimony.

DR. GREENE: Well, that is in small items. It is illumination in the homes. It is refrigerators and electric irons and things like that in homes. Then a good part of that goes into industrial uses, refining aluminum, smelting iron, and also the manufacturing processes, running mills, etc. So all those sources will be quite diverse. I don't know which the largest of them would be.

SENATOR SCHLUTER: In other words, my mathematics is correct. There is 35 per cent additional ---

DR. GREENE: There is 35 per cent left over, yes, of which perhaps not more than 1 or 2 per cent is in any one particular item.

SENATOR SCHLUTER: It includes industrial, motive power, etc.?

DR. GREENE: That's right.

SENATOR SCHLUTER: You speak about the recycling of crankcase oil. To your knowledge is there anything

that has been developed which allows crankcase oil to be reprocessed either economically or uneconomically?

DR. GREENE: Well, our first argument with regard to the economics of it is that the cost of dumping isn't considered. That's our first argument. The second argument is that in the past there has been a considerable amount of recycling of oil and that this has decreased recently. A number of people have given me a number of different ideas why this is true. I gather if you just go down to the local gas station, the man will say, "Oh, yeah, they used to pick the oil up and now they don't." Whether this has to do with detergents that are put in the oil, whether it has to do with a federal law which changes the labelling on reused oil, whether it has to do with a change in the economy which has changed the other uses to which reused oil is put, I am at a loss to say. But, nevertheless, it seems quite clear that the oil recycling market has gone to pot and that they are considering only their own economics and not considering the economics of the total system.

SENATOR SCHLUTER: Dr. Greene, you talked about energy efficiency in transportation. I wonder if you can define that?

DR. GREENE: Yes. I would define it in passenger miles per gallon. We are used to talking about automobiles and miles per gallon of fuel. We know what that means. If we consider efficiency, it is passenger miles per gallon. So a bus, perhaps, getting 5 miles per gallon, but carrying 20 people, is going to give 100 passenger miles per gallon. And a car at 20 miles per gallon, carrying one person, is giving you 20 passenger miles per gallon. That means that a bus is carrying five times as many passenger miles per gallon as an automobile and, therefore, represents an 80 per cent saving. If it is a bus that is full and carries 40 passengers,

obviously that is even doubled.

SENATOR SCHLUTER: But it is based on the consumption of gasoline.

DR. GREENE: It is based on the consumption of gasoline, that's right. The energy in gasoline and in the cruder oils like diesel oil is about the same. So perhaps as energy sources, if we are really considering this as energy and not particularly as money or -- well, you should probably consider it just as a gallon of fuel. It doesn't matter whether it is diesel fuel or gasoline.

SENATOR SCHLUTER: We had some testimony before this Commission in earlier hearings by electric generating people, which testimony was to the effect that the output in New Jersey would more than double between 1972 and 1982. Would you care to comment on that? Do you think that is a correct projection based on present trends? What are your thoughts on that particular assertion?

DR. GREENE: I am not an economist and I don't follow these things. I think it would probably be better if I didn't comment on that. I suspect that they are optimistic, but I really have no knowledge. I mean they are optimistic from their point of view. For instance, we notice that the population of the whole country is not increasing as fast as projections which are typically being used. On the other hand, that doesn't necessarily apply to New Jersey.

SENATOR SCHLUTER: Would you care to expand a little on your idea of a State law for refinery siting. I think I understand the proposal on power plant siting. Power plants, of course, come under the purview of the PUC, whereas refineries do not, and the products of refineries obviously go out of state. Do you have any ideas or any additional thoughts you can give us on that subject?

DR. GREENE: We have the Coastal Protection Act and refineries are likely to be close to the coast. I think that is one reason why they are such a sensitive item. Excuse me. We don't have the act yet; we have the bill. We would say that we had particular interest in the coastal areas. And, as I say, refineries are likely to be the most important things there.

There are going to be terrible squawks when people start building refineries.

I don't know that I can add any more on that point. I can see your point here that some things are controlled more than others.

SENATOR SCHLUTER: It seemed to me to be an extremely difficult, complex concept where you have out-of-state markets.

DR. GREENE: Yes, it is a very difficult concept. I think that was why we thought perhaps the government would want to exercise some influence there as well as the private companies.

SENATOR SCHLUTER: Would or would not?

DR. GREENE: Would. Because when a thing gets that complex, the more people that are involved, I think probably the better the whole thing is going to be. Although again, involving state lines and whether it is put in Pennsylvania or Delaware or New York, becomes a very complicated problem.

SENATOR SCHLUTER: Dr. Greene, one final question: Do you feel that this general problem can be attacked from a statewide basis as opposed to regional or national?

DR. GREENE: No. But I think that the State has a role to play in it.

SENATOR SCHLUTER: Would you expand on that?

DR. GREENE: I think a number of things are given to the State to do. I think, for example, building codes can be handled on the State or even local levels.

What else do I have in here? Well, the Power Plant Siting Bill. There's a question of State policy. I think some things such as recycling crankcase oil at this stage could probably be done as well on the State level as by trying federal regulations of that type. I would like to see the state governments be more involved in what are really minor regulations of that type instead of seeing the federal government involved in everything.

SENATOR SCHLUTER: But where it comes to superports, offshore petroleum exploration, ocean sanctuary, pump storage, refining, etc. ---

DR. GREENE: I think the State should make its position known on these matters. I don't believe that the State can solve all these problems. If it is deemed that the superport is going in, then it is going to go somewhere and somebody is going to get it, and I hope it is gauged more on where it would go in well than who has the most political power and who screams the loudest.

SENATOR SCHLUTER: Thank you, Dr. Greene.

Senator Merlino?

SENATOR MERLINO: Dr. Greene, generally speaking, in the petroleum industry, I notice in your statement, under number one, you mention the decline in capital expenditure as compared to the 18 per cent increase in other industries. From your research, did you find what might be the compelling reason or any reason at all for this fact?

DR. GREENE: No. Well, there is talk about the federal tax structure encouraging overseas exploration at the expense of internal oil exploration. Whether there is also the fact that the oil industry is getting more dispersed, looking for smaller and smaller basins, and they find that it is easier to look for larger basins in foreign areas, I wouldn't know.

SENATOR MERLINO: Have you formed any opinion as

to whether or not the crisis that we are supposedly facing now, particularly in the petroleum industry, is one which is created by the industry or perhaps one which has just evolved as a natural phenomenon?

DR. GREENE: My attitude is that the oil shortage will continue to become more severe for the next hundred years, but the shortage will fluctuate and that the oil industry has been somewhat slow in reacting to a present fluctuation of increased demand and somewhat smaller increasing supplies.

I think it is interesting that in the Suez crisis we read that there is lots of oil - they only have to double the production out of the Texas oil wells and we will be well supplied. Now there is an oil shortage and we read that Texas is producing every drop of oil they can and we still have to import 20 per cent of our oil. This is the trend. On the other hand, within the trend, there are fluctuations and we are also in a bad fluctuation on a trend.

I conclude that they were somewhat shortsighted in not seeing the fluctuation within the trend.

SENATOR MERLINO: As to the refining capacity, you state here -- of course, you enter your plea in eight counts at the outset of your presentation, and number two is that you are not responsible for the shortage in petroleum refining capacity. First of all, I would like to say that I don't really think you have to enter a plea in defense of the environmentalists in order to make the presentation here. You seem to have taken a defensive procedure here. Although you say you are not responsible for the shortage in petroleum refining capacity, you then state further back in your presentation, that our nation's petroleum refineries are operating at capacity and there will be increasing pressures to build new facilities. Would the environmental impact of the

building of new refining facilities meet with strong objections from the environmentalists?

DR. GREENE: It would meet some strong objections from people who talk about the environment. You can bet on that absolutely.

SENATOR MERLINO: You are not a lawyer too, are you, Dr. Greene?

DR. GREENE: No, I am not a lawyer. The environmentalists that are farther from the scene of the refinery might be a little more objective about the need for gasoline. You can probably count on that too. There are an awful lot of words said in the name of the environment and I can't speak for all of them.

SENATOR MERLINO: Dr. Greene, we had some testimony here concerning a possible superport in the Delaware Bay. Of course, the purpose was to bring a continuous and sufficient supply of the crude oil for the existing refineries in the Delaware Bay area. Of course, that led to the question - the bigger the capacity of the tanker, the more oil they bring in, which would then lead to the building of additional refineries. The answer to that was: Of course, that undoubtedly will follow.

Now wouldn't this be the ideal place to build additional refineries where you have some already in existence? It would be merely an expansion of the refining industry in the area. Wouldn't that be a logical conclusion?

DR. GREENE: We probably have friends there too. I would like to see studies on that. I think there is great merit in that suggestion - to expand refineries by putting them to where they are now. Someone says that is going to make New Jersey, at least along Linden there --- What are we going to do with the Turnpike when there are ten more refineries along the Turnpike? But, nevertheless, there is a lot to be said for that.

SENATOR MERLINO: So, with respect to the two recommended locations for superports that we know of, the Army Corps of Engineers' prime recommendation off the coast around Long Branch and the other in the Delaware Bay, to preclude New Jersey becoming one mass refinery, we should strongly object to superports being located in either place?

DR. GREENE: Yes. There is a problem that there are not refineries near the Long Branch superport right now. They are some distance away and there is a lot of nice land in between which I think is probably very interesting land.

There is another problem here too with regard to the superport, that the amount of oil that is brought in is not going to be related to the size of the tankers; it is going to be related to the demand and the supply. To some extent, the question of the superport is the question of how large and how many tankers will there be. That is quite a separate problem. I think you ought to keep those two things distinct. If a ship is 1/10th the size of another, it will take 10 such ships to bring in the same amount of oil. It could be better or it could be worse.

I think the policy of requiring insurance for all oil spills would produce facts on that extremely rapidly and very accurate facts. I have a great admiration for the ability of the insurance industry to estimate the expected hazards.

SENATOR MERLINO: Are you aware the Canadian government has imposed a tariff or tax on the oil companies bringing foreign oil in, which is pumped in through Canada, either by lighter -- I am sure it is all by lighter; I am not aware of a superport up there. But there is such a tariff now or tax being imposed by the Canadian government. Would that be a form of insurance to be used to correct ---

DR. GREENE: It would be a form of insurance. But, on the other hand, if you have private enterprise actually calculate the costs to them, I think you will get a more accurate and faster estimate of what the real risks are.

SENATOR MERLINO: There is considerable lightering of crude oil in the Delaware Bay now and there has been for several years. Are you aware of any spills?

DR. GREENE: They are playing with time - they are playing with time. People make mistakes. It is not going to continue forever through all our lifetime without any spills. I think you can bet on that.

SENATOR MERLINO: If the experience up to now has been that the spills, if any, have been negligible, you mean in your opinion we are just playing with time and that in time we will have a major spill?

DR. GREENE: That is what I am saying. After all, the Philadelphia team beat the Knicks the other night, you know. Anything can happen. If you just go on long enough, it is going to happen.

SENATOR MERLINO: And they did beat Milwaukee too.

DR. GREENE: That's right. They have won three out of four.

SENATOR MERLINO: I'd like to keep this on an even keel.

But the fact of the matter is that the technology and know-how to contain and to clean up the spills is also increasing, is it not?

DR. GREENE: They say it is. The spills are getting bigger too. I was up in Maine last summer. There was this big spill in Portland. We were about a hundred miles from there. We saw a little bit coming down. There was about 100 miles of beach hit there in Maine this summer.

SENATOR MERLINO: Was it cleaned up or was it

contained?

DR. GREENE: We were way outside where any containment efforts were being made. By that time it had broken up into such small pieces that no containment efforts were being made. There were lumps of tar that came up on rocks here and there. You had to be very careful where you stepped. That was 100 miles away.

SENATOR MERLINO: One hundred miles down coast or inland?

DR. GREENE: Down coast.

SENATOR MERLINO: Other than, as you say, perhaps globs of tar-like substance on the rocks, was there any detrimental effect to any marine or wildlife or to the use of the waterfront in Maine?

DR. GREENE: Well, we only read the newspapers as you did. I don't know much more about it than you. The lobster industry got quite a blow that time.

SENATOR MERLINO: As a result of this spill?

DR. GREENE: Well, I probably should be more careful here.

SENATOR MERLINO: Because we lobster eaters weren't apprised that that was the reason for it.

DR. GREENE: There was a lot of trouble up there starting with the floods and winding up with red tide in late fall. How much effect the oil spill had in between there, I am not sure.

SENATOR MERLINO: I have nothing more now.

SENATOR SCHLUTER: Senator Parker?

SENATOR PARKER: Doctor, I understand you are an engineer basically; is that correct?

DR. GREENE: A physicist, I call myself.

SENATOR MERLINO: He still sounds like a lawyer.

SENATOR PARKER: Well, that's not bad, sounding like a lawyer.

In reference to the deep port in the proposal -- Were you here when Mr. Hudson made his proposal?

DR. GREENE: No, I am sorry, I wasn't.

SENATOR PARKER: They made the proposal for a deep port down in Delaware. I thought you were in and out during some of the hearings and knew about it. They proposed a 6-mile port off Stoney Beach in Delaware. Are you familiar with it?

DR. GREENE: We have discussed it. I haven't seen it on the map. I gather it is behind the Cape

SENATOR PARKER: It is in from Cape Henlopen - I think 14 miles in. We went into some detail with him in reference to it. But, as he described it, it was a self-contained port. What objections do the environmentalists have - and I assume the Sierra Club is aimed directly at environmental issues --

DR. GREENE: Yes.

SENATOR PARKER: What are their basic objections to that? As I understand it, it is a self-contained port.

DR. GREENE: Well, we are puzzled by that. What they are doing now, as I indicated just a moment ago, I think is unsafe and is playing with time.

SENATOR PARKER: The lightering?

DR. GREENE: Yes.

SENATOR PARKER: Well, they are lightering now. We were in New York Harbor the other day and there were at least 8 ships that we saw out of 15 that were lightering last Wednesday when we were there.

DR. GREENE: I see. I suspected they were doing that, but we hadn't heard anybody had actually seen it.

SENATOR PARKER: It is apparently a common practice.

DR. GREENE: Yes, it is.

SENATOR PARKER: There were at least 6 or 8 lightering at the time we were there. And we were advised there were as many as 22 ships permitted to light in the Lower New York Bay.

DR. GREENE: That is not a good thing.

SENATOR PARKER: As it was described to us, the supertankers would come in and would be completely encased in a self-contained port that would handle up to as many as eight of these supertankers at a time. The oil would be pumped directly in.

DR. GREENE: On paper, that sounds rather attractive, I would say, compared with the current situation. We are sorry they have to bring in oil this way. But if they have to do it and if they can do it as well as the paper description of it, I think that would be a good thing.

SENATOR PARKER: They also indicated that there would be 180 billion tons of dredging from 20 miles off to bring in it. Maybe it was a million tons - I forget.

DR. GREENE: You have to get biologists to look at things like that.

SENATOR PARKER: I wonder what effect that would have on ---

DR. GREENE: I am sure you would have to examine the bottom to see how much you are stirring up and what the currents are to find out what effect it will have during the dredging and permanently, and how frequently the dredging is going to be done again. That is why we have environmental impact statements. Then you get real biologists out there and not just physicists talking in Assembly Chambers. And I think environmental impact statements are a great thing.

SENATOR PARKER: There is no question about that. We ought to have them on all major developments. Most municipalities now require it even on small developments.

Let me ask you about the offshore monobuoy system. Are you familiar at all with that?

DR. GREENE: No.

SENATOR PARKER: I just wondered what the objections of the environmentalists were to that.

DR. GREENE: As to that enclosed thing, the

troubles that you hear about with tankers are mostly people running into them and they are so large and so unmaneuverable, totally unmaneuverable. If you could get them in an enclosed place and firmly anchored when you are doing sensitive processes, just off the cuff, I would say I am sure it would be much better.

SENATOR MERLINO: I have just one general question. You really don't have to answer it, Doctor, if you don't want to. Assume that we do have this emergency crisis here in New Jersey and the need for a larger production of electrical energy. Given the choice between increasing the number of nuclear-powered plants to be constructed or permitting of either a superport or the drilling for production of oil off the Jersey coast for consumption here to create electrical energy, as an environmentalist, do you have an opinion as to which would be preferred?

DR. GREENE: I don't think I do as an environmentalist. As a physicist, I am puzzled ---

SENATOR MERLINO: As a physicist --

DR. GREENE: Well, these nuclear-power plants seem to offer a lot of advantages if it wasn't for this waste disposal problem which I think is a ghastly problem, which has been very underestimated. We have to dispose of this stuff and we have to keep it disposed for thousands of years. If you could imagine William, the Conqueror, burying his poisoned arrows, and we having to keep guarding these damned arrows or they would get out, and all that has happened since William, the Conqueror - the English Revolution, the French Revolution, the American Revolution - and you still have to put a guard on these damn things - that is a tremendous burden we are asking our descendents to bear.

SENATOR MERLINO: Thank you.

SENATOR PARKER: One further question. You are pushing the Coastal Protection Bill. Doesn't the Wetlands Act cover all the area that you are talking about in

your coastal protection?

DR. GREENE: My friend, Diane Graves - you know her - says we need the Coastal Protection Act as well as the Wetlands Act.

SENATOR PARKER: Why?

DR. GREENE: I never asked.

SENATOR PARKER: That's a good answer.

SENATOR SCHLUTER: Thank you very much, Dr. Greene.

Our next witness, who really is the first one on our schedule, is Assemblyman Bassano.

C. L O U I S B A S S A N O: I am here this morning to testify on behalf of proposed legislation which I introduced on March 13th of last year. That legislation is Assembly Bill 827, which would create an ocean sanctuary off the coast of New Jersey.

Essentially, what Assembly Bill 827 would prohibit would be the building of any structure on the seabed or under the subsoil, removal of any sand, gravel or any minerals, except as hereinafter provided, drilling for subsoil minerals, gasses or oils, commercial advertising, the dumping of any commercial or industrial waste, including sludge from sewage treatment plants.

The New Jersey Ocean Sanctuary shall include the area extending from the New Jersey coastline to the state's seaward territorial jurisdiction, from the northernmost portion of Sandy Hook to the southernmost portion of Cape May.

On May 23rd of last year, a public hearing was held on this bill. I would just like to go into the testimony of one individual who testified on behalf of this bill, and that individual's name is Mr. Henry Lyman. Mr. Lyman is the publisher of the Salt Water Sportsman Magazine, which is a monthly periodical devoted to marine sport fishing. I am quoting now from the public hearing:

"I am also director of the Fund for Preservation of

Wildlife in Natural Areas and I am Vice President in charge of Research for the New England Aquarium Corporation - vice chairman of that Board. And I am a member of the Commission on Ocean Management and the Marine Fisheries Advisory Commission in Massachusetts; a member of the Marine Resources Committee, which is an interstate organization; and a member of the Advisory Committee to the National Marine Fisheries Service in the Department of Commerce in Washington."

His testimony is rather lengthy. So I am going to pick one part out which I think is important. This is on page 38.

"The idea of an ocean sanctuary in the very fragile inshore area, I heartily commend. I testified in favor of a similar bill that came before the present General Court of Massachusetts last year and was passed. That bill is being further revised this year and further expanded to take in even more of our coast.

"The great difficulty is - and this is not true of just New Jersey -- the great difficulty is, we do not know what we have. The amount of research that has been done in these coastal areas is minimal. Some species have been researched to death; other species we know nothing about. The intertwining of the food chains along the entire coast is extremely complicated and nobody today can tell you what is going to tip this food chain over and create a disaster.

"I do not know how many of you are aware of the fact that President Nixon has asked for \$2 million in his present budget to start at this time a program called the Marine Eco System Analysis. * * * I will call it MESA from now on.

"MESA is to be run by the National Marine Fisheries Service, which in turn is part of the National Oceanic and Atmospheric Administration, which in turn is part

of the U. S. Department of Commerce. The MESA program is planned to cover first the New York bight area. This is the area lying between the eastern end of Long Island, New York, and Cape Henlopen in Delaware. It runs to the offshore edge of the Continental Shelf. As you can see, this obviously takes in the entire New Jersey coastline. Of the \$2 million requested by the President to start this MESA program going, \$1,500,000 is earmarked to get going on research in the New York bight area right now. The work has started.

"The program not only will analyze what has been done, but it will fill in the gaps of what needs to be done and will do the job. It is a scientific, ecological and biological essay of this entire area and at the end of a five-year period, a good many million dollars further down the line, hopefully sufficient data will be produced to tell you what you have off the New Jersey shore right now. These data will be turned over to public and private agencies for use in any way they see fit. It is not the idea of the National Marine Fisheries Service to try and spot-plug local projects or speak against projects or speak for projects. But what they are trying to do is determine the facts and then let you draw your own conclusions.

"I submit that before any construction or proposed construction or dredging or drilling off the New Jersey shores is conducted that you wait until you find out what is there. Nobody knows what this will do to the eco system."

I could go on, but I think I have made my point. What we are trying to do is first gather enough information before we wind up making the same type of mistakes that we did with the Delaware River -- with the Raritan River back in the '30's.

If I may, I would like to go into some of the problems that we are now faced with regarding energy.

I don't know how many of you are aware of the fact that I am in the fuel oil business. So I think I

have some knowledge of some of the problems that we are having in our industry.

The problem of the shortage of fuel oil this year is not a new problem. This problem started to creep up on the industry back in 1966. It has grown more severe every year until we are at the stage that we are now.

There are a number of things that can be done to help alleviate the problem. One of the things that I see in my industry is oil-burning equipment that is burning at a 45 or 50 per cent efficiency, while new equipment burns at roughly 80 per cent efficiency. Older equipment is going to have to be upgraded. This is one area that has been neglected.

As far as our shortage of electricity goes, I think that the reason we are having this problem is because of poor planning by our utilities. Two or three years ago, we saw advertisements in the paper - use, use, use - buy, buy, buy - total energy - heat your home with electricity - cool with electricity. Don't use 100 watt bulbs where 200 watt bulbs will do a better job, and so on and so forth right on down the line. Now the same utilities come back to us and tell us they don't have enough energy.

As for our problem with a gas shortage, this is a problem that not only New Jersey is facing but the whole United States and we will continue to face this problem until we start getting more natural gas into our area and start utilizing it in such a manner whereby we are going to get the most from the product. What I mean by the most from the product is that on new dwellings, we should have some type of statewide code whereby every new dwelling would be insulated the same way as we would be insulating a home for electric heat today.

We find the same problem with the gas industry. We go by developments and we find that there are lights in front of the houses burning natural gas day and night, where I feel an electric light which can be turned off is

much more economical.

As far as our problem of electricity goes, we are finding that natural gas and domestic heating oils are now being used to manufacture electricity, if you want to use that term, or generate electricity. I don't know how many of you are aware of the fact that it takes approximately two and one-half times the amount of energy or two and one-half times the amount of BTU's to produce one BTU of electricity; in other words, two and one-half BTU's of gas, to manufacture 1 BTU of electricity. I feel that this is a waste of energy. I am sure the utilities are aware of this. This is one reason they are pushing for more nuclear generating stations.

I have introduced another piece of legislation which I just want to comment on very briefly, and that is Assembly Bill 2008. What that bill would do would be to create an Energy Policy Commission in our State. Obviously what is needed is an Energy Policy Commission in the United States by the federal government. I believe that this is a step in the right direction. This bill, coupled with a bill placed in by Tom Kean, A 1673, which is the Energy Facilities Planning Act, which would establish an Energy Facilities Planning Commission to regulate the location, operation and maintenance of all power-supply facilities, will go a long way toward solving our energy problems in this State and solving some of the questions that the environmentalists are bringing up.

Before I close, I just want to go back to Assembly Bill 827. There are a number of things that Assembly Bill 827 would not prohibit. It would not prohibit the location of a deepwater oil port off the coast of New Jersey, provided that any transmission line from that deepwater port either goes up into the Delaware River or goes around the tip of Sandy Hook and does not go through the sanctuary itself. It would not prohibit the construction

of oil and gas platforms 30 or 40 miles off the beach. I can tell you right now there is natural gas and there is oil that far out. I see no reason why the major companies should not be allowed to explore for a product 30 or 40 miles off the beach. The chances are if there is a spill, it can be contained that far out. My main concern is the first three miles or four miles off our coast. If there is a spill within three or four miles of our coast, it can wipe out a whole industry, namely, the recreation industry.

One thing that A 827 would prohibit at this time is a floating nuclear generating station. Public Service Electric and Gas have decided to locate 2.8 miles off the beach. I am willing to amend ~~that to allow them to come through~~ that sanctuary if they are willing to go beyond the territorial waters of the State, for one very good reason: If any of you are lawyers, you are aware that if they are allowed to build within the territorial waters of the State, it does set a precedent. If someone else wants to develop, it is going to be equal to spot zoning. The Supreme Court has already ruled this is against the law.

If you have any question on anything that I have talked about, I will be glad to try to answer your questions.

SENATOR SCHLUTER: Thank you very much, Assemblyman. I think you described your bill and your position very well and very comprehensively.

Assemblyman, this bill would not cover a deep-water port in Delaware Bay. Is that correct?

ASSEMBLYMAN BASSANO: It would not.

SENATOR SCHLUTER: Would this bill prevent channelization into Delaware Bay below Cape May?

ASSEMBLYMAN BASSANO: No, it would not. It only covers from the tip of Cape May as far out as the territorial waters of the State extend, which is roughly three miles. This bill would not have any jurisdiction over anything

below the tip of Cape May.

SENATOR SCHLUTER: Assemblyman, do you feel that there is enough flexibility in the legislative process that if something else comes along which is desirable for New Jersey, that if this bill is passed, the Legislature will be responsive enough to recognize that perhaps another exception has to be made? You refer to the exception of an atomic generating plant and your bill is related to the various possibilities and options which are present today. But if something else comes up, do you feel that there is enough flexibility in the legislative process whereby you would have to get an amendment to the law to make proper allowances for anything that would come up?

ASSEMBLYMAN BASSANO: This is done every day in various areas in our law. I see no reason why it wouldn't be done with regard to an ocean sanctuary law.

SENATOR SCHLUTER: Thank you. That is all the questions I have.

SENATOR MERLINO: Assemblyman, as concerns the construction of oil platforms off the coast, as you say, 30 or 40 miles, would it be your intention then to transmit any oil that they may find there to the refineries in New Jersey and Pennsylvania other than by pipeline?

ASSEMBLYMAN BASANO: That would be up to the industries, themselves. I know the way the bill is written, it would stop them from going through the sanctuary with a pipeline. If they are willing to go around the sanctuary, that's another story. Obviously they are going to have to bring their products ashore somehow; whether they want them to come in by ship or pipeline is an option that should be left up to them.

SENATOR MERLINO: Thank you.

SENATOR PARKER: Assemblyman, I disagree with you. I am just looking at the drafting of this bill, particularly Section 3. I am not sure that it would prohibit a

pipeline laid on the ocean or even immediately under the surface. I am referring to line 2 where it says, "The following activities shall be prohibited in the Ocean Sanctuary: the building of any structure on the seabed. . . ." I am afraid maybe it ought to be amended to include the laying of any pipeline, etc. Because I am not sure that a pipeline or a cable of some kind would in fact be a structure on the seabed or under the subsoil.

ASSEMBLYMAN BASSANO: I see your point and I appreciate your advice. We will take it into consideration.

SENATOR PARKER: Is this before our Committee now, the Environmental Committee?

ASSEMBLYMAN BASSANO: This is before the Labor Committee.

SENATOR PARKER: How did it get in the Labor Committee?

ASSEMBLYMAN BASSANO: I have been questioning that for the last two months.

Are there any other questions?

SENATOR SCHLUTER: Thank you very much, Assemblyman. At this time, we will take a five-minute break.

(Short Recess)

SENATOR SCHLUTER: We will come to order, please. We will resume the hearing now. And anybody who has come in since our last announcement who wishes to testify, please register with Mr. Steve Frakt, who is our Commission secretary. He is up here at the front.

I am Senator William Schluter. On my left is Senator Barry Parker. And approaching the rostrum now is Senator Joseph Merlino, who is Vice Chairman of the Commission.

The next person we will hear from is Mr. John Brown, Secretary-Treasurer of the New Jersey State AFL-CIO.

J O H N J. B R O W N:

Mr. Chairman:

The interest of organized labor in promoting a clean environment and at the same time providing industry and the populace with the energy required to fill society's needs is not a newly found concern. Long before anyone in this room developed an interest in matters of health and safety (and after all, that's what the environmental movement is all about) organized labor in this country was in the forefront in trying to protect against and sound warnings of environmental dangers to both individuals and to general areas of our population.

I would remind this honorable committee and those here assembled that organized labor representatives were branded radicals in speaking out against black lung diseases and its every deadly presence among the miners of our nation. Organized labor representatives were branded trouble-makers when they spoke against brown lung diseases as it affected textile workers and all the many other pulmonary diseases in the asbestos and other unsupervised areas of employment.

For many years the labor movement had to fight on alone against on-the-job environmental dangers and it was labor's role alone that over the years had caused a turnabout among members of government and in the legal and medical professions in the recognition that it was the workers who bore the ravages of unclean air and unclean water which only recently has become the rally cry of both well intended individuals,

and I am sorry to say, political opportunists and the radical publicity-hungry fringes who overlook the basic and real problems and the consequences involved.

I am here today to offer labor's fullest cooperation in establishing a formula which will provide a reasonable approach in fairly aligning the need for new sources of energy and an expansion of present sources with what are the legitimate and necessary demands of those among us who both need and appreciate a cleaner environment.

Among reasonable men, and we in organized labor are reasonable beings, there is no need for an adversary position between environmentalists and energists.

I believe that I should state for the record that New Jersey State AFL-CIO and its more than 750,000 members in New Jersey do applaud and express great confidence in the aims and policies of our State Environment Director, Richard Sullivan.

We feel that he closely follows the goals of organized labor in forming what we feel should be a system of practical ecology in the State of New Jersey which I feel, simply translated, is that we must have clean water and we must have clean air but we must also be able to eat to enjoy clean air and clean water. It's awfully difficult for any worker in New Jersey to appreciate the clean ozone and the purity of water if his belly is hungry. In short, by practical ecology we don't believe that ecology must be practiced at the expense of forced unemployment and planned starvation. I stress practical ecology because I refuse to believe that a few were meant to enjoy better comforts at the

expense of the many. On the other hand, organized labor has also made plain that it will not be a patsy for those elements of industry who would use unemployment as a coverup for running a polluted shop.

We are certainly not going to stand for the blackmailing of workers into fighting against environment on the threat that their jobs will be lost because necessary environmental reforms threatens the future of a plant. It's our policy that workers must not be forced to choose between a job in a polluted environment or no job at all. There is no reason under a sound environmental plan that we should lose either work or plants in New Jersey.

We in organized labor certainly don't look favorably upon extremism of the environmentalists on one hand or the extremism on energy producers and energy users on the other hand. We have the means and I believe the sound approach offered by Environmental Commissioner Sullivan in setting an example for all of us in New Jersey to follow, namely through reasonable goals achieved through reasonable rules, recognizing the right of everyone to enjoy the fruits and benefits of our total society. With this philosophy set forth I do at this time compliment Senator Schluter and the other members of this Committee for holding these hearings on the energy crisis that does exist in our state, and I hope that these hearings will result in the establishment of a permanent commission on energy and environment which will implement the need for a system of practical energy in our state.

Labor feels that the working men and women in our state have a very deep interest and concern because their future employment is at stake and that New Jersey should give every encouragement to the development of new sources of energy to serve our state's needs in the homes, industry, in commerce, in transportation and in recreation.

New Jersey is a growing oil refining state, the most important along the Eastern Seaboard, and while we wish to protect our environment we cannot, if we are to survive economically, afford to lose any basic industry.

I agree that we must exercise every guard against pollution of our air, our waterways and our oceans, but I feel that with reasonable standards and reasonable supervision that we can form practical answers without creating unemployment caused by the lack of energy in our state. We feel through proper zoning and locations of energy producing plants we can form a happy, practical compromise of a clean environment and thriving industry and commerce within our state.

That is why N. J. State AFL-CIO wishes to go on record publicly today supporting the establishment of a permanent Energy and Environmental Commission to set standards and hold jurisdiction in what is a common goal to provide a system of practical ecology for the benefit of all citizens of the State of New Jersey.

Organized labor would be most happy to cooperate with and be included in representation on such a notable commission. We stand ready to serve.

That's all, Mr. Chairman.

SENATOR SCHLUTER: Thank you very much, Mr. Brown.

One comment before any questions, you may be interested to know a bill was just introduced in the Senate either last week or the session before by Senator Wendel of Bergen County, which embodies the principle of a permanent commission, as called for by Governor Cahill in his Annual Message. I don't know the number, but it is a Senate Concurrent Resolution.

MR. BROWN: We know the bill and, of course, we intend to support it. Because regardless of how many of us testify on the left hand or on the right hand - I will use that as a means of expressing myself - and even if we give tons of testimony, until you actually get down to a Commission that can make rules that the environmentalists on one hand can accept and our own people and industry on the other, that will control industry and pollution --- Regardless of what is said, remember one thing, when a carpenter cuts a piece of wood, he has to make sawdust.

SENATOR SCHLUTER: I am advised it is not a Concurrent Resolution, but is Senate Bill 2075. I would presume it is in that form because it perhaps carries an appropriation.

We have a special announcement at this time, if you will hold off for a minute, Mr. Brown.

Senator Merlino, would you like to welcome the persons standing there at the doorway and invite them in.

SENATOR MERLINO: Thank you, Senator. It seems to be a family affair. We have the second-grade class from the Blessed Sacrament School standing in the doorway. Rather than have it appear that there is any conflict of interest in the audience, three of them happen to be Merlino's - Mother and son Joseph, who is in the class, and son James who is acting as a guide or an officer to keep order with the boys. Why don't you come in and

sit around the back of the room, all of you, so you can hear what is going on.

SENATOR PARKER: Senator, Pat Dodd is not here, but he would be interested in knowing that Joe's middle name is McGoughan.

SENATOR MERLINO: And he is the last one behind Molly Merlino.

Thank you, Senator.

SENATOR SCHLUTER: Excuse us for the interruption.

MR. BROWN: No problem - because that's the people we are talking about. Senator, when we are talking about environment and jobs.

SENATOR SCHLUTER: Mr. Brown, I have one question. The New Jersey State AFL-CIO has taken a strong position on the Tocks Island project. I wonder if you might recite that here for the record. Because part of our consideration, energy versus environment, would naturally involve Tocks Island.

MR. BROWN: We supported Tocks Island. Maybe by talking about Tocks Island I can also bring in the fact that in the past, say, three to four years, we have had an unemployment problem here in New Jersey of approximately 180,000 to 200,000 people. Benefits on unemployment, paid for by the workers in New Jersey, only go on for a period of 26 weeks. You know we had the 13 weeks and 13 weeks, but we had unemployment of people for one year. Ten or fifteen years ago if anybody had even attempted to say that you would pay unemployment benefits for a total of a year, they would have been considered very foolish. But even after the year has been up, our people have gone to welfare.

Now when you talk Tocks Island, which we support, and when you talk about the possible drilling of oil, you are talking of employment of roughly 40 to 45 per cent of the unemployed today which takes in a lot of our

hard-core unemployed. When you talk of an industry which can support \$500 million a year in payroll and approximately 50 to 60 thousand workers, I think you recognize its importance.

Yes, protect the land. No one is going to fight you. Who in the heck is going to talk about motherhood. When you get to the point where you say no building can go on, no construction can go on and that things that have been a hundred years ago must remain the same, then I say we have an objection. We do have parks. I spent this weekend up in New York State. A lot of people talk about the bad environment. You get up around Margarettsville, you can walk through hundreds of miles of woods. I didn't do it - don't get me wrong - but I did take a good trip with the family. The environment is there as far as hunting is concerned, as far as enjoying what those mountains are all about.

To get back to you, Senator - I don't want to wander - this is just too important. There are many things that have to be done within the State of New Jersey. We are no longer an agricultural state. We have more people per square mile than any other state in the union and we have to support these people. And in ten or fifteen years, we have to produce at least a million and a half to two million jobs. Where are they going to come from? They may be jobs that you and I don't even know about. They don't even exist today, but they will have to exist in a fifteen-to twenty-year period in order to support a growing economy, in order to support our nation, in order to feed our people. We will maybe have to lean over backwards to keep producing, to keep telling industry, "You have to come in with your technology, with whatever you have. You have to come in and give us a way of keeping people working."

I think that's what it is all about, as far as this great country of ours.

SENATOR SCHLUTER: Mr. Brown, when you speak about additional jobs, do you mean created after Tocks Island is completed?

MR. BROWN: That's right.

SENATOR SCHLUTER: Or in the construction of Tocks Island?

MR. BROWN: Not only the construction, but after - just like your deepwater port. In Louisiana, alone, - and the environmentalists down there have seen no destruction of that area - this one industry alone with the oil refining and the drilling, such as you are talking about 25 or 30 miles off our coast, supports 60,000 people, one industry. As I say, that is 40 per cent of the unemployed in New Jersey today.

SENATOR SCHLUTER: What specific industry - and I am asking this out of ignorance on my part -- what specific industry would the Tocks Island facility support, providing the 70,000 jobs?

MR. BROWN: Offhand, I don't know what developments might be called for by Director Sullivan for that area. I don't know whether it is going to be zoned as light industry or what is going to happen. I would say in the beginning the majority would be construction people. These are key jobs, important jobs, jobs that pay for homes, jobs that pay the taxes, jobs that pay for the public servants.

SENATOR SCHLUTER: You are talking about the industry which would be attracted because of the production of power?

MR. BROWN: I would say so, Senator, yes.

SENATOR SCHLUTER: Thank you.

Senator Parker, do you have any questions of Mr. Brown?

SENATOR PARKER: John, have you or your group taken any particular position on the deepwater port?

MR. BROWN: No, we have not, Senator.

SENATOR PARKER: That includes, I assume, the one in Delaware Bay?

MR. BROWN: Right. What we have done and what we are in the process of doing is talking to many people who are involved, including Director Sullivan and Senators and Assemblymen, to see what their feelings are. We have talked to people in the Department of Labor, to see how it might affect us as far as jobs are concerned. We have more or less left the area of environmental concern to Director Sullivan because we feel he is doing one hell of a job for us in the State of New Jersey. But we haven't taken a definite position as of yet on it.

I think the biggest problem that we are worried about is a water problem down there.

SENATOR MERLINO: Mr. Brown, getting back to the Tocks Island question, primarily, other than the jobs created during the construction of Tocks Island, as I understand it, it will be a major recreation area. I believe this would be a prime source of new jobs in the State in the recreation industry.

MR. BROWN: It's a whole new field. I will go along with you, Senator. It's a whole new field as far as recreation is concerned.

SENATOR MERLINO: I mean, the industrial growth which may result from it is really a secondary goal of the Tocks Island project.

MR. BROWN: Yes. To many, it is a secondary goal. But when you take into account the bad deficit that we see between imports and exports and when you see a plant like Emerson in Jersey City which employed 800 people close down, wiping those people off the book as far as jobs are concerned, then anything that this State can do or this nation can do to bring back 500 or 600 new jobs is good. This is the key. Because a

man stays on unemployment so long and if the jobs are no longer there, then he has to feed into the system of welfare, which I think we are all totally opposed to.

SENATOR MERLINO: It has been suggested by some of the people who have testified here that perhaps the energy crisis is one which was created by the industry for whatever reason they have for it, and there are some who say we should call the bluff of the energy producers and just stand fast and then see who is the first one to give in.

MR. BROWN: Of course, we did that in Pearl Harbor with the Japs on December 7th. I think it is pretty ridiculous for anybody to say to sit tight and call their bluff. Maybe the industry is at fault. But the ones who created the problem were the people. Because we want things - we want a better way of life. Who loads up our highways? Surely not the industry - surely not GM or Ford. It is the cars that the people purchase. As you know, we go out today and buy televisions, radios, irons, air conditioners, mixers, and you buy your hand saws and your electric lawn mowers. The people create the problem. Then we have to have somebody there who is going to say, "Look, let's see what we can do about it." But not to say there is an energy crisis, I think is a bit foolish. But we shouldn't sit back and let the country shut down and then find out whether these people are sincere or not. I don't think the major utilities should be let off the hook.

SENATOR MERLINO: It is a question of whose light goes out first --

MR. BROWN: That's right.

SENATOR MERLINO: (Continuing) -- to see which particular group or industry would begin the hue and cry for increased production or for an over-protection of the environment.

MR. BROWN: Before I went on as Secretary-Treasurer of the New Jersey AFL-CIO, I was a licensed power engineer by the State of New Jersey, and still am. I have worked in power houses and I have seen time and time again in plant industry where we had to cut back, when production could have gone forward and we had to cut back in production because we just didn't have the power to give them. It is easy to say, "Let's call their bluff," but I don't think that's the answer. Because whose bluff are we calling but our own? As you say, Senator, whose light goes out first? As long as it is somebody else's and mine is lit, then we have no problem. But when my light goes out, then I raise a little bit of the devil.

SENATOR MERLINO: Thank you, Mr. Brown.

SENATOR SCHLUTER: Thanks very much, Mr. Brown.

MR. BROWN: Thank you, gentlemen.

SENATOR SCHLUTER: For the members of the Commission, I would like to say we have been advised that Mr. Henwood, the witness scheduled for 12 o'clock, is no longer going to testify.

Is Mrs. Ruth Fisher of the Alternative Energy Advocates here? (No response.)

Is Dr. Dalal here? We have heard from Dr. Dalal before and he gave some very provocative testimony. We want to try and cut this off sharply at 12:30 or before because Commissioner Sullivan can only appear here at 1:30. We want to be here, ready to go, when he arrives.

Dr. Dalal, you are not listed, but will you come up and identify yourself.

V I K R A M L. D A L A L: My name is Vikram Dalal. I am Vice Chairman of the Princeton Chapter of the FAS. While the Princeton Chapter has not taken a formal position on everything I am going to say, the thrust of my testimony is consistent with the position taken by the national body.

I shall discuss today some of the strategies behind energy pricing and energy conservation together with the economic effects of these strategies. The title of my talk is, "Economics of Energy Conservation."

I pointed out at my previous appearance that the energy crisis is composed of three factors - supply, demand and the relationship between the society and energy. Society is broadly defined to include environmental considerations. I also pointed out that it was wrong to focus only on the supply, because this assumes that all energy use is beneficial. This is clearly not the case, as has been demonstrated by several speakers before this committee. This talk will demonstrate ways of eliminating wasteful consumption through a proper application of economic and regulatory strategies. The suggestions mentioned here are things that you, the Legislature, can do to help solve the current and future energy crisis in a responsible way. The strategy is based on two basic principles:

First, it is based on reducing wasteful or excessive demand, and does not seek to penalize responsible energy users.

Two, the strategy is so oriented as to optimize the economic life of the society.

Again, I want to stress that environmental considerations are an integral part of a true economic analysis. In true economics, there are no externalities, and all costs are internalized. A significant part of the present energy and environmental crises facing us today stems from faulty and short-sighted economic analysis which regards human and environmental factors as externalities. This violates the basic law of economics, which says that there is no such thing as a free lunch.

Let me demolish the myth of the energy-affluence argument first. It has often been said that increased

energy consumption is absolutely essential for an affluent society. As evidence of this fact, figures such as Figure 1, which is at the end of the paper, are often shown. In this figure, we plot the energy consumption versus gross national product for several countries of the world. A casual observer would note that richer countries, such as the USA, have significantly higher per capita energy consumption than poorer countries such as India. From this, he would conclude that a higher consumption is absolutely vital for increased affluence. However, a more careful observer would note that there are several countries, for example, France, Australia and Canada, which have the same GNP, but their energy consumption differs by almost a factor of three. France is the lowest and Canada is the highest. This suggests that there must be a lot of waste in the energy systems of many countries. Therefore, it should be possible to reduce energy consumption without sacrificing affluence. This conclusion also follows from the fact that energy is not an end use, but means to an end. Thus, if we can decrease energy consumption without sacrificing convenience and comfort, we shall help the economy of the country and not hurt it.

Let us first look at energy rate structures. Let me concentrate for the moment on electric rate structures.

It is well known that electric rates are so designed as to benefit the larger users. The justification for this is supposed to come from the distribution between fixed and variable costs. In strict economic terms, as the utility sells more energy, their average cost tends to their marginal cost, and the system tends towards an optimum. However, this explanation is only valid so long as the costs of providing additional power are decreasing. What is happening today is quite different. The marginal cost of installing additional capacity tends to increase the average price. Therefore, the larger users, who are responsible for increased usage, are making the system

more expensive. Therefore, on strict economic grounds, not welfare economics, strict economic grounds, the larger users should be penalized by being charged increased rates for increased consumption. And this conclusion applies equally to residential, commercial and industrial users.

With this short discourse in strict economic theory, let me turn to actual redesign of the rate structure. Under the present structure, a typical rate structure shown in Table I tends to increase consumption by charging lesser average rates for higher consumption. Thus, a man using 5000 kilowatt-hours per year, which is below the national average, pays more per unit than a man who uses 10,000 kilowatt-hours per year, which is above the average. The average is about 7,000 per household per year. Now, according to the argument I gave above, the rate structure should reflect an increasing block rate. Such a possible rate is also shown in Table I, under the title "Revised Rate. We note that the higher user would be charged more per unit as the consumption increases.

The effects of the revised rate structure on typical electric bills is shown in Table II.

We note that a man who is using energy wisely, for example, 2500 kilowatt-hours per year, at present pays \$100, whereas under the revised structure he would pay \$87.50. At the other extreme, a man who is using twice as much energy as his household is entitled to, at present pays \$405, but under the revised structure would pay \$468. Thus, the frugal consumers, who are using energy wisely, will benefit, whereas the extravagant consumers, who are wasting energy, will be charged more.

What would be the effect of such a revised structure on the economy of the state? Note that the revised structure actually increases the buying power of

the lowest users, i.e., of the lower economic classes. This, of course, would benefit the economy of the state. The structure also increases the bill of the wealthier consumers, who are more able to reduce wasteful expenditure in the first place, because they are the ones who have many excessively wasteful appliances. Therefore, our rate structure would achieve the twin purposes of benefiting the economy and reducing the consumption of energy.

Next, let us look at the commercial sector. There is a tremendous waste of energy by the larger installations. Witness the World Trade Center in New York. This wastage may be as much as 30 to 40 per cent of the energy consumed by the World Trade Center, mainly through excessive lighting, inability to open windows and poor design and construction in general. This is an estimate by the Chairman of the New York Council of the American Institute of Architects. The present rate structure makes such a wasteful design economical by offering lower rates for increased usage. Again, an increasing block rate structure would help curb the excessive use of energy by imposing economic penalties on bad design, without hurting the Ma and Pa groceries or the neighborhood bars or delicatessens.

Let us turn next to industry. A recent study by EPA points out that between 10 to 20 per cent of the energy used by industry is wasted, mainly by operating old and outdated, low-productivity equipment and also by not choosing the most efficient new design. The present rate structure again makes poor design, which costs less initially, more economical. There is a substantial negative elasticity of electricity and energy consumption by industry. Thus, a 10 per cent increase in energy costs for industry might lower the consumption by 10 to 20 per cent, thus eliminating the waste.

It is often claimed that an increase in energy costs would hurt the economy of the state. Let us examine

this argument. First of all, as long as we have waste in the economy, and if an increase in costs tends to eliminate this waste, then we have not increased the total costs at all. What is more, the energy budget of typical industries is less than 2 per cent of the gross national product. Therefore, an increase in cost, and a small increase in cost, of this insignificant fraction of the total is not going to make any product uncompetitive. What is more, it might actually help. Consider the following: A significant amount of energy is produced from petroleum. The more energy we use, the more the burden on the petroleum sector. Since the resources of petroleum are finite, the less is available for other, essential, non-energy uses of petroleum. Therefore, the chemical and petrochemical industries, which have to rely on petroleum - they have no other choice - as their basic raw material, will have to pay more for their raw material, which will increase their costs significantly. Therefore, encouraging wasteful use of energy would be bad for the economy of New Jersey, and a decrease in energy consumption through the price mechanism might actually benefit the economy.

Let me turn next to tax policy. A sensible tax policy would be based on the optimal welfare of the society. Since there are many wasteful energy uses, and since waste hurts the society, a tax policy should seek to penalize the inefficient user and reward the efficient user. Consider the following suggestions.

1. Air Conditioners: Today, there are two kinds of air conditioners on the market, efficient units and inefficient units. Consider, for example, two units sold by Sears, both of which have the exact same cooling capacity, 8000 BTU's per hour. Their prices are listed in Table III rounded out to the nearest dollar.

We note that Unit 1 costs \$195, whereas Unit 2, which is more efficient, consumes 37 per cent less electricity than Unit 1 and costs \$217. Under the present

tax structure, both units are charged roughly the same amount of tax. And, as a result, Unit 1 when a buyer goes into the market place becomes on the first-price basis more competitive than Unit 2. However, because of its efficiency, Unit 2 would probably pay back its owner within a couple of years. But most people are unaware of this, so, incidentally, are the salesmen who sell them.

So, it is up to us, the state, to penalize the less efficient unit. An obvious way is to charge an increased tax on the less efficient unit, and pass this increase along to the more efficient unit as a tax subsidy, i.e., charge no or less tax on the more efficient unit. Thus, for example, if we have a 10 per cent tax on Unit 1 and none on Unit 2, we would equalize the purchase price and we would save the buyer of the air conditioner a significant amount in reduced electric bills.

2. Home heating: Since the better insulated homes cost more to build than poorly insulated homes, the builder has no incentive whatever to build a better home. Therefore, it may be appropriate for the state to impose a surcharge on poorly insulated homes, and pass it along to the better insulated homes as a subsidy. This would also benefit the home buyer through reduced heating and cooling bills. Again, since an all-electric home is cheaper to build than a home with an oil or a gas furnace - you don't require a chimney - many builders tend to build electrically heated homes. An electrically heated home is at least twice as inefficient as a fuel-heated home, and is also about twice as expensive to run. It would really be three times as expensive to run if the rate structure were not screwed up. Again, to equalize the first costs, it may be necessary to impose a surcharge on electric heating and pass it along to the purchaser of fuel-heated homes.

3. Automobiles: Since a smaller car, such as a Vega or a Pinto, uses only about half the fuel that a large

V8 does, we should encourage people to buy more efficient automobiles. Even a Pinto station-wagon, which has a pretty good seating capacity and looks very attractive too, is far more efficient than, say, for example, a Buick V8. An obvious way is to impose a vehicle use tax based on efficiency. We already have a vehicle use tax based on weight. Why not on efficiency? Thus, a Pinto should not be charged any tax at all, whereas we could charge a large Buick, say, \$100 a year in taxation.

These are only a few of the ways in which we can reduce the excessive demand through a tax policy.

Next, let me turn to regulatory policy. It is well known that electric power plants tend to waste a lot of energy, about 2/3 of the energy input, as waste heat. It is also true that many industries, such as chemical and refining industries, need steam and waste heat for process heating. Therefore, why not encourage the marriage of these two uses through regulatory and tax incentive policies? This is no wild idea, but has actually been reduced to practice in the United States today. Thus, for example, Dow Chemical Company in Midland, Michigan, is going to use waste heat from a nuclear power plant. A commercial company, Zurn Industries of Erie, Pennsylvania, offers such total energy systems, providing both power and steam. It should be the policy of the state to encourage such systems by offering tax incentives to both power companies and chemical or other manufacturing industries. We should also require the power companies to get together with appropriate industries and submit a master plan for total energy systems. We must not continue to treat the location of power plants and refineries, to take an example, as separate problems, but take an integrated viewpoint.

I hope I have shown that a sensible energy policy which would discourage wasteful use is good for the economy and the society. It is also patriotic to be conservation

mind. It is estimated that if we continue our current rate of energy growth, we shall be importing nearly \$20 billion worth of oil by 1980. This would lead to a terrible strain on our balance of payments and also make us overly dependent on foreign sources. Therefore, if we can reduce our demand by conservation, we can help our country and our economy.

Finally, I want to warn you about the false economic theory advocated by some zealots of exponential growth. They want to sacrifice the environment to the altar of unrestricted growth. This is simply bad economics. Since we operate in a finite world with finite land and air and water resources, we have to consider these resources as ultimate limits set by nature. Let me give you two examples of false economics and bad economics. It is claimed that the environmental movement increases costs and thereby causes unemployment. First of all, this is utter nonsense, as was demonstrated only last Saturday by an article in the New York Times, quoting figures compiled by EPA. But, even if it were true that a certain class of industry would be forced out by, say, for example, air pollution restrictions, this might actually benefit the economy. New Jersey, for example, is a state that has a highly-educated and highly-specialized work force. The kinds of people that electronics, research industries and pharmaceuticals, to take a few examples, employ are highly trained and they demand a certain working environment. If we make all of New Jersey ugly and urbanized, these people will simply leave and go elsewhere. They have special skills and the industries will follow them. This would be a crippling blow to New Jersey.

Second, consider what would happen if we ignored the environmental costs of, say, oil usage. An exponentially increasing demand would in turn demand an exponential increase in refineries. Pretty soon, we shall run out

of Rahways and Lindens, because the people in Rahway and Linden might complain, saying, "Why are we being made the scapegoats for the rest of the state?" And we shall have to start locating these plants in Ocean City and Wildwood. Would tourists continue to flock to the shore if it too becomes clogged with air pollution? Therefore, does it not make economic sense to restrict the exponential growth in energy and to control air pollution from energy sources now?

Very simply stated, good environment is good economics, which is necessary for a good life.

To summarize:

We need to reduce the exponential and particularly wasteful energy demand in order to achieve a better economy and a better environment. We, therefore, recommend:

1. A revised tax policy which would give incentives to efficient industries and better design, and would penalize wasteful and bad design.
2. A revised rate structure for energy that would reduce the waste of energy by large users.
3. A new approach to regulation of power and manufacturing industries that would encourage joint pooling of resources to reduce overall energy demand. Suitable tax incentives may be necessary to achieve this purpose.

Thank you for this opportunity to appear before you. I shall be happy to participate in any further study or discussion in these matters.

(Exhibits submitted by Dr. Dalal can be found, beginning on page 74 A.)

SENATOR SCHLUTER: Thank you, Dr. Dalal. Before going into questions and answers, are you going to be with us this afternoon?

DR. DALAL: OK, I will be for a while.

SENATOR SCHLUTER: Well, there are an awful lot of them. Maybe we can go on for about five or ten minutes and then cut it off because we do have to get back, as

I said, by 1:30.

I do want to make a comment before asking you a couple of questions and, that is, you make a very good case for the energy crisis, and we are aware of this, also you point out something which I think Governor Cahill has taken cognizance of and that is that we have to do better planning on a state basis and he, by administrative order, is implementing a State Planning Council which will be delving into many of the areas that you are speaking of. They are not really in the realm of this Commission. I think Governor Cahill's far-sighted action will be helpful, although maybe not with the immediate problem.

I have a couple of questions. Your proposal for changing the rate structure of electrical power - has this ever been presented to the PUC?

DR. DALAL: I don't know whether it has been presented before the New Jersey PUC. I do know the New York PUC is conducting precisely this kind of study right now. Joe Swidler has ordered the New York PUC to find out if a rate structure, such as I am proposing, would not actually benefit the economy of the State of New York.

SENATOR SCHLUTER: Who is that individual you mentioned?

DR. DALAL: Joe Swidler, who is the Chairman of the New York PUC.

SENATOR SCHLUTER: Chairman of the New York PUC - I see.

You spoke of changing the economics of power costs, Doctor. You also spoke about the power costs nationally being 2 per cent of gross national product, being small. How could you give assurances, however, that industry would not flee from New Jersey if they were faced with doubling power costs? Now as a total of GNP, it is small, but as a total of the production costs or total of industry costs, it would be much, much greater, in the realm of 10 or 20 per cent. And when industry is considering

expansion or location, how could you prevent a flight of industry?

DR. DALAL: Precisely to answer a question such as that, I looked at the statistics of New Jersey industries. If you look at how many people are employed in different industries in New Jersey, you, first of all, find that the major industries in New Jersey are petrochemicals, chemical industry, drugs, research and professional industries, farming and manufacturing industries, such as electrical machinery and building products. There is only one industry in New Jersey which is energy intensive and that is petroleum.

On the national scale, the industries which are energy intensive, that require a lot of energy for manufacture, such as aluminum production - we have none - bauxite is somewhere out West - aluminum from ore. Iron and steel, the major centers are out in the Midwest. Mostly what we do in New Jersey is take the steel products and make them into final stampings. The other industry which is energy intensive, I believe, is mining - primary mining.

Of the industries in New Jersey, one which is intensive in energy is petroleum. And by present policy, this is precisely the industry that we are hurting. In a typical petroleum plant, only 10 per cent of the energy it uses is electricity; the rest of it is gas and oil. Because the rest of us are demanding much more, there is that much less gas available for them, that much less, for example, napha available to them. I know the petroleum industry is very upset about the fact that napha is being converted into natural gas so that we can have more electrical power. It is really substantially increasing their costs.

The rest of us by our waste are really hurting the industries which need the basic energy for their products.

Again I am not suggesting that we should increase the cost of industry overnight by a factor of 2. That

would be irresponsible. All that I am suggesting is that we increase it so as to decrease the waste, so as to cut out the waste, not to hurt them.

SENATOR SCHLUTER: Thank you, Doctor.

Senator Merlino?

SENATOR MERLINO: I just want to thank the Doctor. I see in your statement the answers to the questions that I asked you the last time you were here.

DR. DALAL: That was the motivation for the study. I want to thank you for it.

SENATOR MERLINO: Thank you.

SENATOR PARKER: I have just a couple of questions, Doctor. Unfortunately, I am not going to be able to stick around too late this afternoon.

You make three recommendations basically. One is a revised tax policy which would give incentives to efficient industries and/or appliances. Who is going to determine what is or is not an efficient appliance or an efficient industry?

DR. DALAL: It would have to be determined by the State. Let's take air conditioners. That's the subject I know best. On air conditioners, we can make a survey of the current market. We can write to manufacturers and find out what the efficiency of different air conditioners is.

SENATOR PARKER: In other words, this is information that is readily available?

DR. DALAL: Readily available. All you have to do is go to your nearest appliance dealer and ask to see the name plate of the appliance. The salesman has no idea of what is on the name plate. But if you look at the name plate, the data is right there.

SENATOR PARKER: And it would be merely a mathematical problem for the Department of Environmental Protection or Consumer Affairs to get this information?

DR. DALAL: For most appliances, I would say, yes.

Because the manufacturers are careful enough to include this requirement.

SENATOR PARKER: Now how would you do it in a commercial or manufacturing industry?

DR. DALAL: Let me turn to commercial first. We could appoint a committee of architects who, after all, know what they are talking about. They design those buildings.

SENATOR PARKER: They did a good job with the Trade Center. It is dumping raw sewage now. They have those towers and they don't have any sewer plant.

DR. DALAL: That's right. The architect who designed that was severely criticized by Richard Stein, who is the Chairman of the IA.

We could appoint a Committee of Architects who would be leading figures in architecture and we could require that all large installations, say, employing beyond 500 people, or office buildings which would employ more than 300, 400 or 500 people, be evaluated by these architects for efficiency of design. They know that a 100,000 square-foot office building will consume x amount of electricity. If this building consumes more than x, then the architects will say, "This building is inefficient." Therefore, his rate should be higher or his tax rate should be different. This may be one way.

I personally feel that the best way is through internalizing the cost. If a man knows that as he consumes more, he is not going to pay less, but more, he will have an incentive to design better.

SENATOR PARKER: Take the fellow who has an old plant in a small town and he is just making it marginally. You have to give him some incentive taxwise so in purchasing the new equipment, he doesn't go out of business because of the additional cost.

DR. DALAL: I agree wholeheartedly.

SENATOR PARKER: You know, Doctor, we have no ability in New Jersey to do that. We have no State law that permits that, except for air pollution equipment for personal property. But we can't do it for real estate.

DR. DALAL: Maybe we should have a law.

SENATOR PARKER: I take it the same would be true in your approach toward the automobile. You would have a group that would rate the automobiles.

DR. DALAL: That is relatively easy to rate. All you have to look at is Consumers Report, for example. It tells you exactly what the carrying capacity of each automobile is, how many cubic feet of space, and what the design factors are. There is a long table after each automobile which tells you all kinds of data which is relevant if you look at it.

Again the DEP could be empowered to make such a determination based on easily available data.

SENATOR SCHLUTER: Thank you very much, Dr. Dalal, for your testimony.

We will recess now until 1:30 sharp.

(Recess for Lunch)

Afternoon Session

SENATOR SCHLUTER: If we can come to order - just to touch base before we have our first afternoon witness, on my right is Senator Merlino, on my left is Senator Parker who will be back here in a second, and I am Senator Schluter. Steve Frakt, our Commission's secretary, is in the front at this desk and anybody who wishes to register for testifying, please sign in with him.

We have a list of witnesses for this afternoon which should carry us through to 3:00 or 3:30. We will try to move right along.

Senator Merlino, do you have anything to say?

SENATOR MERLINO: Let's get on with the show.

SENATOR SCHLUTER: Our first witness this afternoon is Commissioner Richard Sullivan. Will you proceed, please.

R I C H A R D J. S U L L I V A N: Thank you, Senator Schluter.

Actually I am going to make a brief statement on the issue that brought about the formation of this inquiry, but beyond that there may be other areas that we don't touch upon today that will be of interest to you. So I would make the offer at the outset that if there are specific questions or areas where you think we have information that would be helpful to you, I am perfectly prepared to go back home and put it together.

The term that is usually used is an energy crisis, a representation of a shortness of supply of energy in all forms, particularly fuel and electricity. In some places I have seen it described in terms of, "We are running out of fuel." Well, that is obviously true since fuel like all other finite resources will not last forever.

I think though that there is a quote from of all places a stock advisory in Wall Street which more correctly puts it in perspective. This is a quote from Matthews, Mitchell and Company, with whom I have no affiliation.

"The current energy problems are not truly the result of energy shortages, but rather energy dislocation or imbalance or, even prosaically, delivery problems. We are not running out of domestic energy sources; rather our demand is running ahead of our cheap, convenient and clean domestic energy supplies."

So the cosmic question of at what point in what century will we run out of fuel, I think is not the one that is before us today for discussion. Because of the shortness of supply, however, we have before us the big push for superports, supertankers, for off-shore drilling for gas and oil, for the Alaskan pipeline and for a number of proposed new facilities for substitute natural gas and liquefied natural gas.

I find it a little difficult to associate the word "crisis" with the circumstance in which we still seem to have enough fuel to run snowmobiles and mini-bikes and power boats and snow throwers. When I think of the nation in the grips of a crisis, I think of it as being worse off than this.

We do have a problem, however, and there are risks that there will be shortages in the near term, in the middle term and the long term that could be severe dislocations for us. Some think elements of the process have been contrived by industry in order to deal to their interest with the pricing structure, particularly as it applies to natural gas. I don't have evidence that that is the case. I think to a considerable extent, however, industry has allowed this to happen for a variety of market-place reasons, including some of the recent price controls.

We have looked at this in several time frames. We have had an immediate, so-called imminent shortage to deal with, which has brought us directly into contact with the fuel industry this winter when there was announced to the press the likelihood that there would not be enough heating oil to heat our schools, homes, factories, etc.,

this winter. The announcement went on further to say that the reason for this is that the Price Commission in Washington had set the price of heating oil for homes, number two oil, so low that it was simply not profitable for the refining industry to devote its attention to this. And instead of refining predictably adequate quantities, they instead turned to other more profitable cuts of crude oil.

They have begun to make up the difference now by putting more of their facilities into the refining of heating oil and are now raising the question that because they are doing this at this time, there may be gasoline shortages this coming summer.

I think after about 200 telephone calls with suppliers and customers, etc., we dealt with the specific question raised to us by the Texaco Company. That question was: Won't you reduce the standards of your fuel code governing the sulfur content of oil so that our company can meet its commitments to customers because we at Texaco have a lot of nonconforming oil on hand and not enough of conforming oil? In effect, that was a request for us to make an emergency determination that would allow an emergency suspension of the rule. We canvassed the market place. We talked to all the suppliers. It is very difficult at any point in time to find out if New Jersey has enough oil or it doesn't have enough oil. I don't think there is any one person who knows.

But we also got in touch with a considerable number of Texaco's customers who had been cut back by Texaco because of its inability to supply lawful fuel. In every one of the cases, the customer was able, when he got to the point of putting money on the table for the contract, to get the oil that he needed for this winter from other suppliers.

So we simply concluded on this very short-term basis that evidence does not exist that there is an

emergency in the supply of domestic heating oil or in residual oil and that, therefore, no emergency suspension of the rules is justified.

I think, however, we go into a different kind of an issue if we talk of the middle-term energy problem. Here in our judgment the difficulties are most likely to be manifest in shortages of electricity as oil imports make up the difference between our supply and our demand here at home.

It seems to me that much of what happens to the fuel problems of the future will be tied to whether or not we can safely and successfully put nuclear generating stations on the line in a reasonable schedule. I think we have to be responsible in addressing these, although many people who are concerned about the environment would just as soon we don't build any of them anywhere. And we have three proposals before us now which we have not opposed, nor yet have we approved them.

We have the proposed off-shore nuclear generating station. We have a second unit in Ocean County near the Oyster Creek facility that now exists. And we have Public Service's proposal for Newbold Island. In the off-shore case, contrary to considerable advice from environmentalists, we have given permits for them to make the exploration that we think they need before they will have enough facts to be able to tell us and every other interested agency just what it is they are proposing to build and how. And we ought to make a judgment on whether that should be built and in what form, having facts and not just artists' renditions of these plants.

We have intervened as a neutral party in the Oyster Creek facility and hearings are being held on that in about two weeks.

We have also intervened as a neutral party in the Newbold Island case and we are trying our best now to cause the Atomic Energy Commission review of that

facility to be resumed and, in my capacity as a representative on the Delaware River Basin Commission, to try to make tentative commitments to allow that process to go forward. It is now at a dead halt.

Actually, environmental considerations have gotten a lot of credit for the slow-down of construction of nuclear and other power facilities throughout the country. But our information indicates that this is not the problem, that most of the slow-downs have been caused by labor problems, delinquency in the delivery of equipment, and things of this kind. As an illustration of this, in the Salem generating station which is under construction, the State not only didn't oppose the facility, it intervened in support of it before the Atomic Energy Commission. Yet that facility is five years off schedule.

We haven't automatically opposed any of these power plants and we won't in the future. We will attempt, as much as we can, to make them as safe as possible and to have the least environmental impact. Some of those who come to our hearings on these issues say they want everybody to stop. They don't want more power plants. They feel we have too much electricity now and all of these facilities are damaging. And I wonder in some moments of private wickedness whether they don't leave those hearings and go back to their all-electric homes and whether or not there isn't a case of the "haves" and the "have-nots" involved in some of the testimony given against these facilities.

My sense of the community is that it regards the availability of electricity as a crucial element in its standard of living. With limitations, it is our obligation to see to it that they get it, safely and with minimum environmental harm.

Still, most of what I see in the so-called energy crisis deals with the question of supply, that there is not enough to meet our needs. I would like to raise a

question about demand. If you look at the curves, especially for electricity, for the next decade and see the shape of it, where to meet the demands, the supply will have to be more than doubled, it is real scary. I think there are opportunities and obligations for those in responsible positions in government to take a look at the demand curve and not just assume that it is an inevitable projection of future needs. And there are opportunities, in my opinion, to make that curve less steep than it is.

We get into areas, which are too specific really to take up your time with today, of maximum energy efficiency, which is not really dealt with by the present system. The market place controls now. But if we look at some of the elements - I have made notes of a couple of examples - an electric water heater requires more than twice the amount of BTU's to raise a given amount of water a certain temperature as does a gas heater. It just seems to me to be a most unwise, a profligate use, of limited BTU's in whatever form, whether it is electricity or fuel, whatever, if we have more efficient ways of doing the same job.

We have also discovered in some of our reviews that to convert nonferrous scrap metals into usable products takes only one-fifth as much energy as it takes to convert the original ore into those usable products. So we advocate to the Legislature favorable action on Assembly Bill 1435 which would cause bottles and cans to be returned to use. We are dealing essentially with this large garbage pile in New Jersey and questions of solid waste disposal. But as an extra bonus, we could end up with new cans made out of old cans at a considerable saving of energy.

We got from the State Library a recent Consumers Report on air conditioners and have run down the specifications for the ones that are on the market place now. We find for a given sized air conditioner, it varies from 7 1/2

BTU's per watt to 10 1/2 BTU's per watt. The more efficient machine is 40 per cent more efficient - consumes 40 per cent less electricity - but it is a little more expensive because it is made with quality products. It doesn't seem to be entering into the purchasers' decisions right now that we should buy the efficient appliance if the same job gets done by a cheaper one.

A federal study was done on this same issue that got into small things, such as the ones I have mentioned, and also such things as requiring minimum standards for building construction in terms of insulation, which can make remarkable differences in the amount of fuel burned, tying those into FHA mortgages or perhaps, here in New Jersey, tying it into Assembly 1419, which would set up a standard building code.

We also advocate a remarkably increased use of mass transportation, which not only avoids the pollution of the motor vehicle, but avoids pollution again by requiring much less fuel to carry people a mile. The study that I mentioned here is called, "The Potential for Energy Conservation," published in October 1972 by the White House Office of Emergency Preparedness. It is very well done with a collection of difficult in some cases but realistic changes that can be made to affect the demand curve, such that they conclude that if all of these changes were made, they could reduce by 1980 30 per cent of the projected power need. I would recommend this for the consideration of the Commission and can get copies for you if you wish.

In our judgment, the use of electricity, as any other commodity, is affected by its price. The quantity discount system that we have in New Jersey and in many other places I think encourages profligate use of this commodity. An indication of how we do quantity discount throughout the nation shows us just as one statistic: While residences and small commercial enterprises use 21 per cent of the nation's natural gas, they pay 46 per cent of the cost, the

reason being that large users are charged at a lower unit price.

The Governor in his Message recommended consideration of a pricing arrangement for electricity that could bear upon its conservation in the form of a surcharge that would apply to those in each category of use that use more than the average amount, in the hope and expectation that the price of power will lead to improved efficiencies in industrial processes and other improvements that would lower the steepness of that consumption curve.

Power is also dependent on the rate and on the extent of growth that we will have in New Jersey - where it is - what its intensity is. This leads me to make an additional recommendation with respect to legislation and, that is, that instead of allowing each municipality, without review from anywhere in government, exclusively to determine its destiny, making all land-use decisions itself without regard in many cases to whether there are adequate resources, including fuel and electricity, to meet the eventual development that comes, there ought by legislative intervention be a sharing with State government of some of these decisions. The most important area here is in the coastal zone and we recommend favorable consideration of Assembly 1429 which was the subject of a public hearing in this room a month or two ago. And we will shortly be delivering to the Governor's Office, with a recommendation for introduction, bills dealing with lands referred to in his Annual Message, the northwest quadrant of New Jersey, which will be the impact area for Tocks Island recreation facility, and a wilderness area called Skylands up in the northern part of the State. Now land use is not the subject of the hearing today, but land use has a bearing upon where we are going and how we are going to meet our needs.

As a matter of fact, I would say that land use is probably the crucial environmental issue before us right now and will be in the Legislature for some time

to come. But even it is all a part of where we think we are going in the future and if we just let it happen to us instead of trying to make determinations and influence it, then I think our environment will be a mess no matter what we do about the more popular pollution control programs.

Energy resource is one element of the same considerations to be applied to air and water, etc. I think there are legislative enactments that we can cause to be made here in New Jersey that will reverse some of these trends, along with sensible pricing techniques, so that if we have a crisis, it can be eliminated.

SENATOR SCHLUTER: Thank you very much, Commissioner. Are you limited on time, sir?

COMM'R. SULLIVAN: Well, I can stay another 15 minutes if you want.

SENATOR SCHLUTER: Fine. We do have a few questions.

Commissioner, in your testimony, you talked about the fuel shortage in New Jersey or the possible fuel shortage as of last fall and you talked about customers of Texaco being told that they would get no more fuel and they had to go out and make other contracts. You made reference to putting money on the table, which I presume meant agreeing to contracts with other suppliers. Were the contracts that they signed in substitution for the ones they would have gotten from Texaco at competitive prices or were they at premium prices?

COMM'R. SULLIVAN: I know of one case where the premium was 61 cents a barrel on a commodity that cost about \$5. I frankly don't know what the premiums were in other cases. What happened is that Texaco cut back by 58 per cent in some cases the allocation it would make available to its customer for the next month following, which Texaco is allowed to do under certain stipulations in its contract without violating the contract. People

who received notice of this reduction in allocation shopped around to different fuel dealers and said, "you know, if this is the way it goes, can you help me out?" The fuel suppliers said in effect, "when you aren't going to have enough oil and you want to buy some, come see us." When it got up to that point and when it was known that the State was not going to change the air pollution rule, they in fact went back and saw the supplier and were able to purchase the oil they needed.

SENATOR SCHLUTER: But some of those purchases were at premium?

COMM'R. SULLIVAN: At least one that I know of as a matter of fact was.

SENATOR SCHLUTER: Commissioner, I know you spoke of a number of things that could be done by the State of New Jersey to cut down on the energy demands, but talking about the problem in its over-all aspects, would you comment on the State's role versus the Federal role in attacking this basic problem?

COMM'R. SULLIVAN: In my judgment, the larger issue of which we are just a part, part of a major distribution system, etc., will not be dealt with satisfactorily unless there is an appropriate policy decision at the Federal level. There is so much influence in what happens here in terms of oil import quotas and federally-established price for natural gas that in turn have secondary and tertiary effects, that I don't think we are going to deal effectively without this precariousness that we have now, with the fuel issue unless sensible decisions are made in Washington. There are things that we can do to help us here, but they won't be enough.

SENATOR SCHLUTER: Commissioner, has your department taken a position on the Power Plant Siting Bill, which is Assembly 1643?

COMM'R. SULLIVAN: I will take one now if you want though.

SENATOR SCHLUTER: If you have not, I would appreciate any comments that you would care to make.

COMM'R. SULLIVAN: The single most important comment I think I could make is that I am nervous about the State being the one that would acquire the site and thereby be the proponent in effect of a facility rather than the regulator of a facility. To some extent, I think, for the State actually to go out and pick the site, buy the land, - and this has been recommended in a number of states - would put us in an interest-conflict situation, which I think would minimize our regulatory authority. Even if you go down to the personal level, the people who have made the decision to buy or the administration that has made the decision to buy has in effect said, "We think this is a good thing and it is in the public interest." Then to go back later on through the environmental impact review as the regulator and try to decide whether it is a good idea or not puts us in a compromise position.

SENATOR SCHLUTER: Do you have any answer for that?

COMM'R. SULLIVAN: I think we should certainly have regulatory control over site selection. I think that is preferable to actually going out and buying the land itself or saying the decisions of the utilities to build here will be subject to State review and approval before any building is done. That has not been the case often in the past.

SENATOR SCHLUTER: Commissioner, if we were to increase the flow of crude oil into the State, if we were to increase our refining capacity, if we were to increase our tank storage facilities, we might presume that we would get a greater supply of oil, of fossil fuel, for the State of New Jersey relatively speaking. What can you see as the environmental problems which we would encounter with increases in refining capacity, increases in tank storage capacity?

COMM'R. SULLIVAN: Certainly there will be an impact with the addition of these industrial facilities. At the moment, New Jersey refines more fuel than it uses. So we are net exporters of the finished product. We have no basic production; there is no mining of any fuel here in New Jersey. But in terms of processing, we process more than we use.

I think your observation is correct, that if the expectations of foreign imports are carried forward, we will be relying more and more on foreign oil. But the oil will come and it will come here. And we will have to contend with the hazards of shipping greater quantities of oil, with the contribution that the refineries and the tank storage and all the rest will have. In my opinion, however, this will be less of a problem than the over-all issue of fuel use and its effect upon the environment. It is quite possible these days to build an oil refinery that is not an offensive neighbor.

SENATOR SCHLUTER: Thank you.

Senator Merlino?

SENATOR MERLINO: Has your department gotten into the question concerning the building of a superport either in the Delaware Bay area or offshore off of Long Branch?

COMM'R. SULLIVAN: It was our recommendation to Governor Cahill that he oppose the four sites selected, which he has publicly done.

SENATOR MERLINO: One of those four sites was the Delaware Bay area?

COMM'R. SULLIVAN: Yes.

SENATOR MERLINO: And for what reason?

COMM'R. SULLIVAN: Well, partly for the reason that is usually announced, of the hazard of oil spillage, particularly in the one that is 13 miles off Long Branch, with a potentially devastating effect on the beaches. But it may turn out that over the longer term that would be of less importance to the environment than the secondary

effect of one of these facilities. For example, if we take the Army Corps of Engineers' document and take at face value their predictions of what would occur following the location of one of these ports, I think we would be confronted with an unacceptable change in the character of much of our land, as they say, of 31 miles of waterfront in Cumberland County, which is elbow to elbow refineries, petro-chemical facilities and large power-consuming plants. I don't think we ought to let that happen, particularly if all the decisions on what goes into all those communities will rest with the communities alone. So the secondary effects, we think are very important.

SENATOR MERLINO: Thank you.

SENATOR PARKER: Commissioner, following through on that, you originally, in commenting on the bill selecting the sites for power facilities, indicated a review procedure, with which I agree. I think it probably should be that way. Why could it not include, as well as power facilities, oil facilities, such as storage, and broaden that concept and require in your local zoning a requirement that it be submitted for approval like you do to your county planning board now for drainage? Couldn't we work something out in that way so that the State or your department or maybe even a separate arm of the government, including, say, Labor, you and PUC, would make a determination as to the impact, reviewing all the figures, as to what will be able to go into a particular municipality rather than, as I understand the Coastal Bill, saying that within a certain area you can't permit anything unless you approve?

COMM'R. SULLIVAN: Even in that case, we would be reviewing after the municipality has decided it is a good idea.

SENATOR PARKER: Maybe we should give you the primary responsibility or give this other group the

primary responsibility of locating all of these facilities, such as utilities and power plants, as well as the refineries and petro-chemical plants.

COMM'R. SULLIVAN: I regard that as a possibility, although our recommendation to the Governor for his Annual Message went short of that. We said, the environmental impact statement, if properly used, is a helpful process. It raises questions and makes people answer them that wouldn't be raised otherwise. And if something is built, it is built better as a result of this process in general. So our recommendation was that at least State government should submit all its own projects and those that it funds to this same kind of review process.

It would simply be a question of added workload and the capacity of the bureaucracy to cope with it, to extend that in turn to other major projects - airports or super-ports or whatever. That in turn though goes beyond the siting bill because there what you are looking at is the whole thing that is to be built and not just the location at which it would be placed.

There are several bills in the Legislature now to expand this environmental impact statement review system. I think it is a good idea. Some judgments will have to be made on how fast we want to get into that area.

SENATOR PARKER: I am thinking particularly of the Coastal Bill. As you well know, it creates some major problems in most of our counties and some violent objections. I am thinking of maybe some amendments that would make it more palatable where you would still give the municipality some determination as to what they are going to do or, at least in these other areas, in your Siting Bill, expand it so that it covers some of these major industries that would come in, such as major port facilities.

COMM'R. SULLIVAN: We can draw the line in various places. I don't regard where it is drawn in 1429 to be

totally inflexible. It is possible to inch a community to death too. You know Brick Township didn't get all its problems because somebody came in and all of a sudden developed it. It just went one house after another. It is a matter of one's judgment as to where to draw the line, what we would call a major project. I think there is room for adjustment there.

But again, what we are seeking through that bill and through environmental impact statements in general is a review by the State of a decision made by a municipality to allow something to be built so that we have a broader base upon which we can decide whether what they want to build and where they want to build it and how they want to build it is in the total public interest.

SENATOR PARKER: I couldn't help but notice during the course of the hearings that it appears that the North Jersey section around the Arthur Kill and, of course, the Delaware on both sides, Marcus Hook, the Schuylkill River and Paulsboro, Texaco, etc. -- that New Jersey and/or the immediately contiguous shoreline to New Jersey right across the river in Philadelphia have all the refineries in the northeast. Is there any particular reason other than they are the two major ports that are there?

COMM'R. SULLIVAN: It is their geographic location. That is why I say we refine more than we use. The refineries didn't come here to serve New Jersey's needs, but to serve large regional needs. It is also what has given New Jersey the largest chemical industry in the nation because of our location with available labor and with available transportation, etc.

Interestingly, down to the south of you - and you may be thoroughly familiar with it - on the Pennsylvania side with a proximity to Philadelphia, we have a lot of industry development but because there hasn't been transportation

across the river, on the other side most of it is still farmland. When the Chester Bridge is finished, that is not going to be the case very long.

SENATOR PARKER: Unfortunately the prevailing winds are all westerly too.

Just one thing further, on the Coastal Bill - and I haven't really studied it because it hasn't come in over at our house yet - but the Wetlands Act covers, does it not, pretty much the same area that your Coastal Bill does, or at least ---

COMM'R. SULLIVAN: The wetlands are included in the coastal zone.

SENATOR PARKER: Right. In other words, the coastal zone extends beyond the wetlands as it comes around and up the Delaware.

COMM'R. SULLIVAN: That's right. What the Coastal Zone Bill - although we don't call it that anymore - says is that those lands which are regulated under the Wetlands Act will not be subject to this proposed bill.

There are degrees of regulation, in my opinion, which should obtain for wetlands which are important because of their physical character and this other larger, more difficult question of the character of the whole region being one of shore-type economy and quality.

The line that has been drawn here follows various cultural boundaries, like highways and railroads, etc., so that people will know where the zone stops and ends. But generally it has been drawn so as to embrace the headwaters of the major streams draining into the ocean and the bay. That is the reason for that jagged line.

SENATOR SCHLUTER: Thank you very much, Commissioner. We appreciate your coming.

COMM'R. SULLIVAN: Thank you, gentlemen.

SENATOR SCHLUTER: Is Mrs. Fisher here?
Mrs. Fisher of the Alternate Energy Advocates.

Before we start with Mrs. Fisher, we at the table here received a sheet which has no source. It's called The Proposal for New Jersey Offshore Terminal Committee. Now, as far as I'm concerned, I'm not even going to look at this unless whoever offered it will advise us.

SENATOR PARKER: That was handed to us by a representative of Humble. He handed it to me this morning because he had to leave. He's not here.

SENATOR SCHLUTER: Oh, all right.

M R S. R U T H F I S H E R: My name is Mrs. Ruth Fisher. I'm one of the Sun People, Alternate Energy Advocates. I'm sorry I was late and not here this morning, as expected.

I want to first invite you to an energy conference we're having in Cape May, New Jersey. Already accepted are Buckminster Fuller, David Brower, and Senator Mike Gravel. I think the fact that these men have accepted an invitation to be a part of this indicates the national concern about energy, especially in the State of New Jersey.

Since I am late, I promised Mr. Frakt that I wouldn't take too long and I will attempt to summarize my remarks.

Our organization sprung forth because we were threatened in South Jersey. We are threatened with a deepwater port and we are threatened with many nuclear plants. There is one already built, but not fully licensed, in Salem, and the offshore plant is in the offing. When these threats occur to a people they look very swiftly for alternatives. And I think that's why we've gained so many members, so much following and so much attention.

We have promoted primarily solar energy. And

it doesn't seem to be all that unreasonable.

Just this morning - I'm sorry I didn't receive it earlier - I received from the National Science Foundation and NASA a solar energy report which is just, I guess, off the press, as I had written the President of the United States for this. I can't leave it because it's the only one I have, and perhaps I'll quote from that again.

I think that this State cannot go in two directions. You can't promote, license and permit the building of all these nuclear plants and seriously consider alternatives such as solar energy.

Our primary recommendation is that you stop all permits for these plants, on the offshore one near Brigantine - this has already received certain riparian grants. And Commissioner Sullivan's Department does have a way to halt these buildings because they can stop, until they are absolutely proven safe, all permits, even the test borings and that sort of thing, if they choose.

Again, it's just common sense, that all the pollution around us blocking out the only continuing life-sustaining source of energy that we must have, the sun, must be stopped.

And you are probably familiar with the arguments in this little book, **The Case For A Nuclear Moratorium**, and perhaps it has been left with you before, but we fully support all of those and the work of Senator Gravel in attempting to get Federal monies for research and development. But the only way that it's ever going to happen is if you don't have any other way.

Thanks very much.

SENATOR SCHLUTER: Thank you, Mrs. Fisher. If you will wait there, we may have some questions.

Have you left with our Secretary the names of the publications that you have there?

MRS. FISHER: No, I haven't, but I can leave them with you.

SENATOR SCHLUTER: Would you be sure to give them to Mr. Frakt or Mr. Mattek, before you leave.

MRS. FISHER: Just one other thing. I think that we really are willing, as a people, to even begin rationing electricity in this State. You know, I personally support this. A lot of people will give up traveling, they'll give up -- it's just ridiculous the amount of lights on in Trenton today. All these things we don't have to have, really don't want, and if we knew that we were saving ourselves, we would find joy in giving them up. Sorry, I didn't mean to digress.

SENATOR SCHLUTER: I think you've talked very generally on your subject and very eloquently. I don't have any questions. Senator Merlino?

SENATOR MERLINO: I have none.

SENATOR SCHLUTER: Thank you very much.

MRS. FISHER: Thank you.

SENATOR SCHLUTER: We have the New Jersey Public Interest Research Group. Is there any representative of PIRG here? Hearing none, they can always go on later, I will call on the Citizens Energy Council, Larry Bogart.

L A R R Y B O G A R T: Members of the Committee: In listening to the previous witnesses, I am struck with the fact that they are saying substantially the same thing. They're saying that there has to be a limit placed on the amount of energy, particularly electric power, we use; they're saying that if we continue with our present course we're going to invite

a variety of environmental disasters which, in the end, will cost more than the supposed benefits.

We're often told that the American public has a voracious and never-ending appetite for energy. But I think the truth of the matter is that the public hasn't been told in what directions we can adjust our use of energy without any loss of social benefits.

I was privileged on February 8th to hear Dr. Barry Commoner of the Center for the Biology of Natural Systems, Washington University, St. Louis, Missouri, tell Senator Hollings, Senate Commerce Committee, holding hearings on S.70, that it would be possible with certain very simple changes in our national policy to get along for at least a decade with the presently available electric energy. And I think that that position is coming to be more commonly recognized.

There has been growing opposition to nuclear power plants all over the country. It reminds me of what Dr. James Bryan Conant, former President of Harvard, a distinguished Scientist, who with Vannevar Bush ran the Manhattan Project that gave us the atom bomb. Back in 1951, Dr. Conant said, "In practice we will find that nuclear energy is too expensive and too dangerous for any general use. If we begin now to develop methods of harnessing the energy of the sun, I predict that by the year 2,000 most of our factories will be powered by this clean, renewable source of energy."

There comes a point where we simply have to say, we've had enough. I think New Jersey has long since past the point where we can afford any more of the type of growth that already is getting us into bad trouble.

Some of the Scientists, like Dr. Rene Dubos of

Rockefeller University, have suggested that our electric power needs can plateau in the 1980's. Just as we are learning that we can live and prosper without an endless ribbon of superhighways and jumbo jetports, so we can see the common sense of getting along with the enormous electric power capacity we already have by using it more intelligently and cutting out the obscene waste. Technology is going to show us better ways of generating this power, cleaner in terms of the environment, and with more efficiency. Engineers are setting their sights now on getting 50% of the heat from fuels turned into power instead of only 40% now with the best plants and 30% with nuclear reactors.

There is no need whatever for nuclear power with its hazards, if we are not going to have an exponentially growing power requirement.

In recent years the public has been balking at nuclear power. Everywhere in the country nuclear power is in bad repute. Minnesota, Wisconsin, Oregon and Illinois have all taken steps to curb proliferation of nuclear plants and groups are meeting today with Governor Shapp in Pennsylvania to plead for a nuclear moratorium.

Such action is overdue in New Jersey. As the nation's most densely populated and urbanized state, the consequences of introducing radioactive pollution to the chemical broth of already excessive pollutants in air and water is too much of a risk.

Senator Clinton Anderson of New Mexico, for years warned states and cities not to trust the AEC to safeguard the public. He said the states must get their own expertise or give the nuclear plants a wide berth. Few states, until recently, paid any attention, but just as Senator Anderson warned, we have seen that big government is not to be trusted -

especially when industry profits hang in the balance.

New Jersey needs some legislation to curb nuclear power. The single plant now operating here does not give assurance that this is an acceptable technology. Until it is, there should be no nuclear power plants operated here.

The nuclear industry and the utilities propose to get out of their embarrassing predicament by going to a more advanced type of nuclear reactor, the fast-breeder. This is infinitely more hazardous and costly than the present type. They propose to finance it according to a plan of the Edison Electric Institute by a surcharge on your electric bill. Public Utility Commissions in other states have turned this program down. I hope the same thing happens in New Jersey, but I am sure that we need immediate hearings on the need to bar nuclear plants in this State and accelerate ways of reducing pollution from existing fossil fuel stations. One of the surest ways to make a quick start on this is to stimulate saving electricity, something that every home owner and plant manager can make a high priority.

It is time the franchises of the six electric utilities that operate within the state were examined to see if a more integrated network could be achieved, with consequent savings to the public. The utilities need to be more closely regulated and a way has to be found to finance independent scrutiny of all proposed rate increases. Finally, efforts should be made to encourage the creation of small publicly owned power districts - so that there is less dependence on large central power stations, which are so vulnerable to sabotage and which, in the event of major accidents, could blackout and paralyze large sections of the state for long periods of time. The added hazards and

lure of nuclear plants in times of unrest, whether located on Delaware Bay or floating off Brigantine Wildlife Refuge, are the kind of trouble New Jersey doesn't need.

Thank you.

SENATOR MERLINO: Thank you, Mr. Bogart.

As I understand, the thrust of your presentation is one, as you say, which we've heard here for the most part today - the conservation and better use of the electric energy which we now have. Of course, I recognize that this, of course, would be the ideal, but there are many areas in this State which apparently don't have the full utilization of all the energy that they need for basic things. How would we overcome that?

MR. BOGART: As Commissioner Sullivan pointed out, I don't think it can be done effectively by any state without a governing Federal policy implemented by regional use. But certainly since we now have grids that tie together great numbers of utilities, it is not necessary to erect new capacity, whether nuclear or fossil fuel, in a state that has the population and industry that New Jersey has. There are many places in the northeast where, upon proper determination whether power was actually needed, new facilities could be put with minimal environmental impact. Since we are all tied together in a northeast grid, there is no need to feel that the power has to be generated here.

SENATOR MERLINO: Then this would not be, as you say, strictly a problem for the State of New Jersey --

MR. BOGART: No.

SENATOR MERLINO: -- it would have to be on the Federal level.

MR. BOGART: A great deal of the power New

Jersey now uses at certain times of the year comes from as far away as Western Pennsylvania.

SENATOR MERLINO: That's part of the Northeast Grid, isn't it?

MR. BOGART: Yes.

SENATOR MERLINO: Pennsylvania-Delaware-New Jersey.

MR. BOGART: PJM - Pennsylvania-Jersey-Maryland.

SENATOR MERLINO: Then we are now trying to foist upon the rest of the country that which we are now complaining about - the petroleum industry's use of New Jersey in the refining of the petroleum - and having it distributed outside of the State.

MR. BOGART: I don't think it's possible without a rational national energy policy to make any sense out of anything we do on a short-term, expedient basis. And yet, you see, we have no national energy policy so everything we're doing, in a sense, adds to the chaos.

SENATOR MERLINO: Well, the purpose of this Commission, as you know, is to gather all the information that we can, particularly as it affects the so-called energy crisis here in the State of New Jersey.

MR. BOGART: Yes.

SENATOR MERLINO: And, of course, we can do nothing which would be binding, other than by way of suggestion to the Federal authorities. But to meet the present problem here in the State of New Jersey, - if we alone in New Jersey began a more equitable or more reasonable distribution and use of energy - how can we do that here on a statewide basis?

MR. BOGART: I think next month, when the Ford Foundation's preliminary report on energy is available, it will set down certain simple recommendations that states can use immediately to bring about a correction of the present disorder. There is no need, in a sense, for New Jersey to initiate its own studies. The studies that have been done, the information that's already available is ample for properly constituted committees and the Legislature to begin to achieve some reduction in this artificially stimulated demand. And by examining rate structures, so that we discourage wasteful use, it's possible to postpone decisions as to whether new capacity will be needed.

SENATOR MERLINO: Thank you very much.

Mrs. Shiff, please.

C L A I R E S C H I F F: My name is Claire Schiff and I live in Summit, New Jersey. I am appearing on my own behalf, although I am environmentally concerned and active in a local organization - KEEP. KEEP has recently submitted a statement to the Public Utilities Commission in regard to the hearings on the rate increase, electrical rates for Public Service. And we consider the current rate structure one of the worst factors that causes the projection of energy consumption to be as high as it is.

An Architect by the name of Richard Stein has written an article in Environment Magazine in which he contends that our conception of the energy crisis is being exaggerated, and it seems that there is a crisis because they're using the figures that the electrical industry is projecting. For instance, according to Electrical World the preference for electric heating, which is a most inefficient use of fuel, has increased from 22% to 36% during the last six years. The average consumption of electricity for heating a house

is about 15,000 kilowatts per year. If the rate of 2 million new housing a year were maintained, of which 36% continued to be electrically heated, 720,000 all electric homes, consuming an additional 10,800 million kilowatt hours, would be added every year, or 108,000 million kilowatt hours in a decade. In ten years there would be a total of more than 11 million electrically heated residential units.

The rate structure as it is currently used actually makes this kind of building very economically attractive. The kinds of shopping plazas and malls that take up acres of ground, have artificial air circulation, all-weather shopping plazas, seem to be very good for commerce but I don't know what they do to the local stores in small cities and towns.

On the other hand, they really are a very, very bad thing in terms of the environment. We have to really change our policy in regard to rate structures.

What disturbs me, really, you know we're having hearings now discussing energy, and people have been discussing this for years and years. Suggestions have been made by scientists and economists. Last year, the House Committee on Insular Affairs heard eminent scientists. Admiral Rickover made some very specific suggestions. And the Doctor from Princeton today made some very constructive suggestions.

I don't think it's a question of what should we do, I think we know what we should do, the question is do we have the will to do it.

New York City is contemplating taxing inefficient air conditioners, for instance. Why should they have to contemplate taxing it? If there is a shortage of power, that the power companies claim we have, why do we hesitate to take the steps to make wasteful use of electricity something for which one is penalized, for example economically unattractive? The measures are

known and I feel that we just lack the will to do it.

In the State of New Jersey, which Mr. Bogart and I am sure others have pointed out, which is the most urbanized state in the nation and the population is most dense, environmental problems are magnified and compounded. And where the production of energy does not involve the danger to the health of the population, I don't think there is any need for regulation other than economic. But there is ample evidence that nuclear power cannot be produced without several kinds of danger.

The first is, the immediate population, close to a nuclear plant, is exposed to low level radiation in the course of routine operation of these plants. And every time one shuts down, an unknown quantity of radioactive emission occurs which no one can monitor.

There is enough disturbing information on the kinds of effect of such low level radiation. Even Dr. William Norwood, an Atomic Energy Commission Scientist, has written that there is no proof that the human body is not affected by low level radiation. The Atomic Energy Commission continues on the assumption that the body can adjust or develop immunizing mechanisms to protect itself if the dose is small and over a long period of time. I wonder if the assumptions are justified.

Private studies done by scientists indicated definite correlation between low level radiation exposure and still birth. What the relation is to the incidence of cancer and leukemia, no properly funded independent scientific group is now studying.

Highly disturbing to me is that the only monitoring of nuclear plants is done by the utility itself. And that's the only kind of monitoring of the actual radioactivity being emitted and where it is coming from. But the kind of long range studies of correlation between incidence and death in populations

near nuclear plants, compared to populations located elsewhere, is simply not being done.

The second kind of hazard in connection with nuclear plants is the vulnerability to sabotage and catastrophic accident.

We are aware of the recent threat of an airplane hijacker to crash into the Oak Ridge installation. I don't know if ~~any~~ people heard, as I did, the news reports during the intensive bombing of North Vietnam that there was a threat to blow up the entire northwestern grid, power grid, during that time. So we know that if there were any kind of sabotage to an atomic installation it would result in a catastrophic accident. And the Union of Concerned Scientists has testified that in the event of such a catastrophic accident the population living within a seven mile strip, within 100 miles downward of the plant would suffer lethal effects.

I wonder what kind of rationalization they are engaging in to use the same kind of logic of acceptable risks which we apply to the ~~space~~ program and to war. How can we use these when we talk about people populations? Are we really expecting the public to be martyrs as soldiers and astronauts are prepared to be?

Then the final hazard regarding nuclear plants is the hazard to the health of the employees working in these plants. If this were the only reason to rule out atomic plants, it would be sufficient.

There are indications, such as those mentioned by Dr. Rappaport in his article in March, 1972 issue of Ramparts Magazine where he quoted the experience of a safety officer working for Pacific Gas and Electric Company. He found many violations which he constantly reported to the company, which were hushed up. He finally quit in disgust after the situation was made

unpleasant for him because of this conscientious attitude.

So here in the State of New Jersey, first of all, I would recommend a ban on any new construction of atomic plants. The one already working is not really being properly studied, in my opinion. Before going ahead with others, long range studies of population health must be undertaken in the vicinity of operating nuclear plants. And this would help to affect: First, it is a health protection measure for the population of New Jersey. And, second, it would be one of the signals to power companies who would see the handwriting on the wall, who are now beset by economic losses and doubts as to whether to go nuclear or not. It would facilitate their decisions to cancel any contracts they may have undertaken, and, secondly, a determined unequivocal decision to use any and all regulatory authorities to curb energy consumption in the State of New Jersey should be supported by the Legislators. The Department of Environmental Protection, the Public Utilities Commission should be asked to use their agencies to take the steps necessary to achieve this, and the steps are well known. The public's interest is clear. Further study is only time delaying. Let us act upon the studies and suggestions already made.

Thank you.

SENATOR MERLINO: Thank you.

The New Jersey Public Interest Research Group.

E L E A N O R J. L E W I S: Good afternoon. I am Dr. Eleanor J. Lewis, Executive Director, New Jersey Public Interest Research Group.

NJPIRG is a non-partisan, non-profit student-funded and student-directed corporation. Twenty-five thousand college students on nine New Jersey campuses support NJPIRG. Students receive academic credit for

working on NJPIRG projects, all of which are approved by the all-student NJPIRG Board of Directors. NJPIRG's major areas of concern are land use and transportation, health care, environmental protection, consumer action, race and sex discrimination, corporate responsibility and government operations.

NJPIRG's position on the energy crisis: It is the position of NJPIRG that talk about an energy crisis can be dangerous and irresponsible unless an equal amount of time is spent talking about energy conservation, for unless we actively conserve energy, America will always be experiencing an energy crisis. Why? Because the current American life style has unconsciously developed into an energy intensive life style. Americans burn six times as much per capita energy as the world average. Our entire nation of 200 million Americans burns more energy than the 500 million of Japan, Great Britain, Germany, and the Soviet Union combined. During the last 40 years the American population has grown 70% but our energy consumption has grown 310%. In just the next 30 years, between now and the year 2000, the U. S. will consume more energy than it has in its entire history.

No less than 61 Washington offices are now being staffed by petroleum lobbyists to be sure that legislation affecting them gets a favorable treatment in Congress. What is the situation in New Jersey, in Trenton to be exact? How many offices convenient to this very chamber are supported and staffed by energy lobbyists intent on obtaining preferential treatment from the people who usually occupy these seats?

In an attempt to balance the usual presentation the Legislature receives, I present the following information on energy development and use.

Significant end uses of energy: There are probably over 100 separate uses for energy. However, only a few of the applications are a significant proportion of the total energy consumption, i.e., over 1%, and those are indicated in the table summarized below for the year 1968. The figures come from a study done by the Office of Science and Technology, Executive Office of the President, Washington, D. C., 1972:

Transportation accounts for 24.9% of the total; space heating in residential and commercial buildings is 17.9%; process heating in industry is 16.7%; direct heat in industry is 11.5%; electric drive in industrial usage is 7.9%; feedstocks and raw materials account for 5.5%; water heating, 4%; air conditioning, 2.5%; refrigeration, 2.2%; lighting 1.5%; cooking, 1.3%; and electrolytic processes, 1.2%; making a total of 97.1%.

The 12 applications mentioned account for all but about 3% of the nation's total energy consumption, and this remaining 3% is spread over a host of large and small appliances, elevators and other commercial installations, and many other uses.

In general, market shares are changing very gradually. None of the end uses have exhibited any decline between 1960 and 1968, and the largest uses are growing almost as rapidly as the national total. Applications with extremely rapid growth are still small in relation to the total. As a result, the shifts are gradual and the basic applications that have been predominant for a long time - transportation, space heating, and various industrial processes - continue to account for most of the energy consumption: the top four applications account for 71% of the total, and the top six for 84%.

For the same year, according to the same study, electricity accounted for the following percentages in the energy use section: residential, 15.1%; commercial, 15.7%; industrial, 9.6%; transportation, .1%.

Comparison of these two tables indicates that, aside from transportation and industrial uses of energy, the largest single energy use in the residential and commercial sectors is low grade thermal energy for space conditioning commercial buildings and homes, which will be discussed in detail later in this report.

Let us first talk about nuclear power. Today, less than 4% of U. S. electricity consumption is provided by nuclear reactors, yet this means of producing electrical power is the fastest growing in the U. S. There are only 20 nuclear power plants operating in the U. S. today, but 200 have been projected for 1980 and 400 may be operating by 1990. Nuclear power plants operate somewhat like conventional fossil fueled power plants, the major difference being the use of specially processed uranium as fuel for nuclear fission. This "burning" of uranium produces electrical power as well as deadly radioactive residue.

The safety record is vague. Although no deaths among members of the general public can be directly related to malfunctions of reactors or emissions of radioactive materials, there have been a number of deaths of workers in nuclear installations from accidents. In addition, no one knows how many deaths have been caused by the slow dispersion of radioactivity in the environment, including such diversified events as weapons tests and reactor emissions. But we do know that deaths due to cancer are increasing.

Therefore, before any more nuclear power plants are built in or near New Jersey, the burden of proof for showing that this system is safe rests on the industrial developer. State officials must not be misled by the

glowing but unsubstantiated endorsements given nuclear reactors by most AEC staffers. The citizens of New Jersey are already subject to numerous daily health hazards as they breathe in polluted air, drink water of questionable quality and swim in ocean beaches with questionable chloroform counts. Let us not expose our fellow New Jerseyans to yet another health hazard by cavalierly placing nuclear reactors throughout New Jersey.

A major problem of nuclear power is controlling radioactive wastes. Nuclear wastes remain highly dangerous, in some cases for hundreds of thousands of years. No method to store these wastes safely is yet known. The recently completed Rand Corporation Study for the California Legislature stressed the nuclear waste problem and advised against California's building any more nuclear generators. Therefore, let's not develop any more nuclear reactors before we thoroughly explore the development of clear energy sources, such as solar energy, fuel cells, MHD, energy storage systems, geothermal power and wind power, many of which will be discussed in this paper.

Electricity use. Why is it increasing? According to the 1970 National Power Survey, released in April, 1972, by the Federal Power Commission, the use of electricity for space conditioning in the residential sector will increase substantially in the coming decades. According to the Survey, one-third of U.S. dwellings constructed in 1970 used electricity for heating and cooling; 40 percent of the dwellings constructed in the 1971-1980 decade will be all-electric; and 50 percent of the dwellings constructed in the 1981-1990 decade will be all-electric, including half as many conversions to electricity as new installations. The overall increase in substitution of electricity for direct fuel is expected to amount to 40% of the country's energy consumption in 1990, based on present trends.

The use of central station electricity to supply this lower grade thermal energy involves substantial energy conversion losses. In the case of electricity conversion, it is clear that the end use energy - for space conditioning and water heating - is not matched to the energy source.

The extent to which this mismatching of energy sources to end use has contributed to the nation's energy dilemma was noted by the Bureau of Mines in 1968 and by the National Economic Research Associates in 1971.

The NERA study points out a long decline in the ratio of aggregate energy consumption to the U. S. Gross National Product in the years 1947-1966, followed by a sharp reversal in the trend in the ensuing years. The study notes that if the trend prior to 1966 had persisted, "energy consumption in 1970 would have been lower by an amount greater than the total electric utility consumption of coal in that year."

Three major reasons are given by NERA to explain the energy/GNP ratio reversal: (1) The increasing relative importance of non-energy uses of fuel; (2) a gradual tapering off of yearly improvement in central power stations' thermal efficiency; and (3) the increasing relative importance of air conditioning and electric heating.

The Bureau of Mines report, as well as the NERA document, point out the increasing substitution of electricity for direct fuel use as a significant factor in the changing energy/GNP ratio. The NERA study underscores the point: "It is clear, in any event, that electric heating in toto is a significant factor in the reversal in the trend of the energy/GNP ratio, especially in view of the rapid growth of electrically heated buildings in the past few years."

Obviously, the substitution of electricity for direct fuel use has aggravated America's "energy crisis" and the present continuation of the trend will further exacerbate the deteriorating situation.

Alternative sources of energy: A number of technologies which supply energy on-site to homes and commercial buildings are available now either commercially or in prototypes. They include "total energy" plants, fuel cell plants, and "natural energy" plants - utilizing solar and wind power.

Total energy plant. The total energy plant consists of a single system for on-site electricity generation, air conditioning using absorption chilling equipment, hot water heating, steam generation, and other energy re-use functions. Total energy plants have been installed in shopping centers, hospitals, schools, buildings and building complexes, industrial plants, etc.

Total energy plants can be tailored to the individual requirements of users to maximize power output through use of energy normally lost. According to Mr. Fred Dubin, Senior Partner of the mechanical/electrical engineering firm, Dubin-Mindell-Bloome Associates, New York City, such uses have included specially designed water-to-air heat pump systems for high-rise buildings, heat-of-light recovery systems; refrigerator rejected-heat recovery systems in supermarkets; special heat exchangers in exhaust air ducts to preheat incoming outside air; and systems to use air conditioner condensate for heating domestic hot water, etc.

Total energy plants have a higher through-put energy conversion efficiency than central station plants, due to their unique capability for using varying thermal grades of energy. As opposed to the 25-35 percent ultimate efficiency of central station power plants, total energy plants operate in the range of 65-85 percent efficiency. As the OEP report on energy conservation has pointed out, "the limited success of total energy plant systems is due

to a variety of causes, including poor design, maintenance problems and overselling, and inability to use economies of scale in electrical generation; but the single biggest problem is that the user's heat and electricity requirements must be well-balanced both in quantity and time, in order for an investment in a total energy system to pay off." However, the report adds that additional experience has ameliorated some of these problems. Total energy systems are being carefully tested by the National Bureau of Standards, and at least one electric utility, the Southern California Edison Company, has installed several units. The utility approach has solved both maintenance and balance problems, and have paved the way for wide application of the total energy concept.

Fuel cells. Assuming the continued development of fuel cells for commercial applications by Pratt and Whitney and others, fuel cells might be emplaced as either individual modules for buildings or as small power plants within the utility system, as is the case with gas turbines today. The higher operating efficiencies of fuel cells - 50% plus - and compact size offer substantial benefits to ultimate users.

Solar Energy. A recent study prepared for the Federal Office of Science and Technology by a panel of leading scientists and engineers in the solar energy conversion field estimated that, for low grade energy application in the space conditioning area, solar energy systems for building heating would be commercially available in five years, and building cooling in 6 to 10 years. The panel concluded that there are now "no technical barriers to wide application of solar energy to meet U.S. needs." And I would like to reiterate that point. I think the utilities in New Jersey would do well to pay attention to this.

Wind Power Systems. Wind power systems have operated in the United States on both a central and local power level. Small high-efficiency wind generators can be combined with dispersed power systems, eliminating the need for central station power.

How to reduce electricity demand. Let us consider possible legal measures to reduce the demand for electricity. A basic review of such measures can be found in the recent, October, 1972, report of the President's Office of Emergency Preparedness, The Potential for Energy Conservation. The suggestions of this report are:

1. To smooth out the daily demand cycle of an electric utility, and reduce the use of inefficient peaking generation equipment, the report suggests the application of a demand charge penalizing heavy demand during peak load hours.

2. In addition, regulatory means other than rate restructuring might be enacted. Although rate restructuring will also be useful. The report suggests the promotion of interruptible sales to reduce peak demand, which may be hastened by the actions of a regulatory agency.

3. The report suggests that regulatory measures might be implemented to facilitate new construction and reduce maintenance on new plants and equipment.

Now let us discuss the Rand Corporation recent report to the California State Assembly, which has suggested a number of possible legal measures to reduce the rate of electricity growth in California. I think many of these measures are very relevant for New Jersey and we could benefit greatly without paying the cost of a Rand Corporation study. The proposals include the following:

1. Electric and gas utilities would be required to finance an extensive consumer education program on

energy conservation. Measures would be taken to ensure the labeling of consumer appliances to indicate operating efficiencies.

2. The promotional expenses of utilities - advertising, rebates, customer services - would be disallowed as legitimate business expenses.

3. Minimum efficiency standards for appliances would be established by the state. Appliances not meeting the standard would be banned.

4. Stringent state building code standards on insulation and glazing would be applied to all new structures.

5. Utilities would be required to introduce interruptible load service and off-peak rates for industrial customers and approximate peak load pricing for all customers, adjusted seasonally.

The Rand study concludes that the electricity growth rate can be significantly slowed in California, with application of the above basic legal measures and implementation of new technologies and building design standards. They suggest that energy conservation measures would slow the electricity growth rate in California to 3% per year, eliminating the need for 100 new power plants projected in the Conventional Utility Projection for that state. And this certainly also bears on New Jersey where we are told that we need many new power plants very quickly to avoid a statewide energy crisis.

Improvements in building design should be considered systematically, and the Rand study asks for this in their suggestion number 4. Such a study should take into account the materials utilized in all phases of construction. Improvements in thermal insulation provide great energy savings, as has been recognized by the Federal Housing Administration in its

1971 revision of standards for one and two living units. Greater energy savings, as well as economic savings, can be affected by better insulation in structures in all sectors - commercial, residential and industrial. John Moyers of the Oak Ridge National Laboratory, has proposed a model for upgrading the FHA standards which would effect energy-economic savings for gas-and electrically-heated homes in the Minneapolis, New York, and Atlanta areas. We are probably part of the New York area, so the State of New Jersey should pay special attention to the FHA recommendations.

Both the OEP energy conservation study and the Rand California study indicate that savings at least on the order of 50% are possible in the residential and commercial areas. From the use of "energy husbandry" in the home to the development of better insulation and solar heating/cooling systems, energy consumption can be significantly reduced without major "life style" changes. The essential measures involve engineering shifts to better, more efficient equipment and more rational design in homes and buildings.

Let us consider the rising sales of mobile homes, which now account for one out of every four new dwellings in the United States, and which may have an increasingly important influence on residential energy use. Because of their thin walls, limited insulation, and boxlike construction, mobile homes are high users of energy, often requiring inefficient space heaters in winter and several window air-conditioning units in summer, although as you well know they are actually a very small living space to require several air conditioners. Existing standards for these relatively inexpensive, factory-built homes were not written with energy conservation in mind.

Architectural practices often promote excess energy use, according to Richard Stein, of Richard G. Stein and Associates in New York City. He points out that poor design often results in the overuse of steel, concrete, and other energy intensive building materials by as much as 50%. And I think if we look around the State at new office buildings, look over at the DEP building, that is an energy intensive building and it could have been changed by having a different architectural design that took into account energy conservation.

Furthermore, nearly a quarter of all electricity is used for lighting. The illumination levels recommended in commercial buildings have more than tripled in the last 15 years and there is now considerable disagreement as to whether such high illumination in many office applications - or uniform intensity of lighting - is necessary or desirable. Stein believes that a 4% savings in total electricity use could be achieved immediately by reducing excess lighting in existing buildings and by more effective use of lighting in new buildings.

On the issue of electric lighting, I refer you to NJPIRG's report "Lighting Standards and the Energy Crisis," issued on February 19, 1973, which calls attention to the New Jersey State Department of Education's minimum schoolhouse lighting standards. New Jersey is one of six states having minimum lighting standards for new and renovated schools. While the idea is good, unfortunately, it is corrupted by the fact that the standards used by the State are those recommended by the Illuminating Engineering Society, an association of lighting industry employees whose employers profit from selling more electricity. If the Illuminating Engineering Society was really

interested in lighting standards, they could call in medical doctors who could also testify as to what lighting standards we need to do the job well, but they do not.

Between 1961 and 1972, the IES recommended minimum standards for classrooms, locker rooms, drafting and typing rooms has doubled. If the trend continues, in 1981 we will need twice as much light to type by as we did in 1961. Why we need this additional light isn't clear, especially when we consider that leading doctors and medical texts say bright lights do not help you complete a task better, and you don't do it better if you keep adding more light to the room. Though this topic may seem trivial, lighting uses 1.5% of all energy generated, and in the always-lighted government and corporate offices, it is probably more.

I don't know if you have noticed but in most of the government offices the lights are only turned out on three-day weekends or on Saturday nights, but, otherwise, the lights are kept on 24 hours a day. And a perfect example of this is the World Trade Center where supposedly there is only one light switch for all the structures there and the lights are always burning.

Transportation is the single largest-end use of energy, 24.9% of all energy. In this regard, the State of New Jersey can help to reduce this energy demand by developing more efficient transportation methods. What is needed is a \$1 billion bond issue for high speed public transit throughout the State instead of more highway construction bond issues.

Consider the following figures on energy expended per passenger or freight mile by each transportation method. I will just summarize these tables. Basically, bicycle and walking use the least amount of energy per passenger mile; buses are next;

railroads are next; then autos and airplanes using the two largest amounts of energy per passenger mile.

Per freight mile, the most efficient method for transporting freight is a pipeline, then a railroad, then a waterway, then a truck, and then an airplane, the airplane being the least most efficient.

It is clear that the State Department of Transportation spends the most time and money advocating the most energy intensive transportation method, namely trucks and then autos. In fact, the State Department of Transportation projects and priorities alone probably increase the threat of energy crisis more than the actions of all other state agencies combined.

The recommendations of NJPIRG to this Senate Committee are:

1. That there be a ban on nuclear power plants until their safety and necessity is proven. Currently there is no safe way of disposing of nuclear wastes; but this is only one of the major problems confronting their operation. The others are operating accidents, nuclear leaks, the effect of the reactor's heating and cooling operations on the environment.

We are all well aware of the recent fish kills which I don't think occurred in the 1930's and '40's before we had these nuclear power plants.

2. A commitment of funds and formation of an objective scientific committee to study and propose use of clean energy sources, such as solar energy, fuel cells, MHD, energy storage systems, geothermal power and wind power. The committee will also recommend how, starting immediately, significant savings in energy use can be instituted. Until the committee reports, the recent Rand Corporation report to California's Legislature, and cited earlier in this testimony, should be New Jersey's guide for saving energy. Most of the statements made about California hold true for

New Jersey.

3. Place a clear priority on the development of energy conserving methods of doing any job. State employees who devise such methods should receive promotion and large pay bonuses. Corporations should receive tax benefits, awards, and extensive publicity. The significant energy conserver in New Jersey should become a public hero. Extensive energy savings are now easily available in building construction and operation and transportation. All it requires is the motivation to institute the available technology.

4. Investigation of placing the State on Daylight Savings Time throughout the year. According to today's New York Times, this would result in an energy savings of 4% annually.

5. Abolition of State required minimum school lighting standards prescribed by the lighting lobby. The State would do better to have minimum insulation standards for all buildings if it wants to save energy.

SENATOR MERLINO: Thank you very much, Doctor. That was a lengthy and detailed presentation and I hesitate to start asking you questions since we do have several other people we would like to hear today. I would say that I have already responded to one of your suggestions that you sent to all of us in the mail.

DR. LEWIS: Thank you.

SENATOR SCHLUTER: I'm sorry I couldn't be here for your entire testimony. You refer, in your second recommendation, to MHD as a fuel source. What is that?

DR. LEWIS: That's a good question. I don't know exactly what that is. That's the one I don't understand fully, but it's highly recommended by those who know.

SENATOR SCHLUTER: I'm sure you'll let us know.

DR. LEWIS: Yes.

SENATOR SCHLUTER: Thank you.

SENATOR SCHLUTER: Dr. Haughey, if you would proceed.

F R A N C I S J. H A U G H E Y: Fine. May I answer a previous questions?

SENATOR SCHLUTER: Yes.

DR. HAUGHEY: MHD is Magnetohydrodynamics. It's the expansion of a plasma, that is, particles of matter, through a magnetic field and extracting an electric current.

SENATOR SCHLUTER: Thank you.

DR. HAUGHEY: Mr. Chairman and members of the Commission, it's a pleasure to have this opportunity to present my views. I am an Environmentalist, having received two advanced degrees in this area, which you will find on my resume, from Rutgers University. I have also worked in the nuclear field for 21 years. I do not find the two incompatible; as a matter of fact, I find it to be quite the contrary.

I understand the purpose of the Ad Hoc Commission on Energy and the Environment to be an examination of the State's legitimate present and future energy needs and a determination of how these needs can best be met while affording maximum protection to the State's air, land and water resources.

I shall be glad to present testimony on this purpose. However, I will primarily address myself to broader issues.

I have had an interest in this area for about five years. Incidentally, I've taught a course at Rutgers entitled The Environmental Impact of Generating Electric Power now for two years.

The issue, as I see it, was precipitated, in my case, by a trip I made in December of 1972 as a

quest of the New Jersey Petroleum Council to the Gulf of Mexico. In that group that went on the trip there were two scientists - I'm including myself as one of the scientists. Our purpose was to observe offshore exploration and drilling for oil and gas. I had the opportunity to view this at four different levels - first, what they wanted us to see; secondly, what they didn't want us to see; thirdly, the effect of the operation, both environmentally and economically; and, fourth, the total implications.

Now, as you can imagine, it took some time to sort out impressions, ideas, and what-have-you. But I want to deal primarily with the fourth point, that is the total implications. I would be glad to discuss the other matters at your pleasure.

The oil companies, now energy companies, are telling the total energy story. They're telling about the energy crisis as it exists today. I do not mean fuel oil crisis, that Commissioner Sullivan addressed himself to. I'm talking about an energy crisis.

Before going to the Gulf, I knew by the year 1985 we would have to import as much as 57% of our oil needs. But, like so many other things that occur, I had to re-learn that lesson. The purpose of the trip, obviously, was to press for additional exploration and drilling sites to "help close the energy gap". However, they're not telling the whole story.

The oil companies have been pressing the Federal Government since 1963 for the right to explore off the East Coast of the United States. Exploration off the East Coast of the United States, however, will not close the energy gap.

Let me dwell for a minute on the meaning of "offshore" because it is an important consideration

in the consideration of this Commission.

Those as old as I am can recall the Tidelands issue of the Eisenhower Administration. It led to the passage, in 1958, of the Sea Bed Act which restricted the State's jurisdictional boundary for the States of Louisiana, Alabama and Mississippi to the 200 meter depth, approximately $3\frac{1}{2}$ miles. At the same time, the States of Texas and Florida have state jurisdictional boundaries of ten miles. The reason for this is the manner in which those two states joined the Union.

It's interesting to point out, however, that some of the oil rigs in the Gulf of Mexico are 125 miles out in the Gulf, which is an interesting dichotomy in terms of our national territorial orders. The question of whether the State's jurisdiction is the 200 meter depth or the Federal Government's jurisdiction bears on a very interesting point as to who conducts lease sales, collects royalties and collects the taxes.

Several years ago, the State of Maine leased a site 100 miles off its coast. The U. S. Government took the State of Maine to the Supreme Court. That matter is still under consideration. A decision is expected sometime this summer, the summer of 1973. And it has been necessary, as part of that decision, to re-examine the Charter of the Original Thirteen States.

New Jersey may not have any say at all if the Supreme Court rules in favor of the United States Government, in terms of whether we will have drilling rigs and oil exploration beyond the 200 meter depth off the New Jersey Coast. I do recognize the importance of riparian rights, but I'm talking about the question of lease sales under Federal jurisdiction.

And, of course, in terms of the energy crisis

and in terms of our present deficit balance of payments, the question of import of oil, it seems to me pretty clear that the Federal Government will lease these lands if the Supreme Court rules in that manner. However, I would like to leave that for just a moment.

I mentioned earlier that the group contained two scientists. There were ten other individuals included in the group - union leaders, industrial leaders, newspaper men - and what I learned with these gentlemen on the trip was that the coin had another side.

The oil industry along the Gulf of Mexico, I indicated, had both an economic and an environmental effect. Well, the economic effect of the oil industry along the Gulf Coast, which I had observed in the early 1950's, was to put between seventy and one hundred thousand men to work. I have some estimates of the total value of the oil industry to the States of Texas and Louisiana, as well as the Federal Government, which I would be glad to leave with this Commission, if you would so like. The point is, I just don't know what the economic impact of the oil industry will be to the State of New Jersey.

Let me make several points from the trip.

I. Oil is getting harder to get. As we move offshore, the cost of safety, the economics become less desirable, including the East Coast and the North Slope of Alaska. However, exploration in both areas will not close the energy gap; we will still have to import. And it seems almost ridiculous to point out that we're talking about a finite resource anyway, a resource that's estimated to last maybe a hundred years. Does the economics of the oil

industry justify the effort? I can't answer the question.

Secondly, depending on a Supreme Court decision, we may have the oil industry whether we want it or not, but it may be beneficial to the State of New Jersey, if you look at the other side of the coin. In any event, I personally believe we will need deep seaports, and I mean many deep seaports, for imports. Which brings me back to the purpose of the Commission.

In the case of oil, there is clearly an energy environmental dilemma. However, there is another part which should also be considered, and that is the economic and social impact upon the entire State of New Jersey.

Let me make another case in point, the question of electricity. Let's take Con Ed, since Con Ed is everybody's kicking boy. Nine years ago, Con Ed proposed the Stormking project to produce electric power by pumping water up on a hill when they had excess power and letting it flow back down the hill when they needed power. They were taken to court and that was held up until just very recently when it was finally approved in the U. S. Supreme Court. It took them a total of nine years.

Con Ed attempts to build a nuclear plant at Indian Point. They're held up. Legally, they're held up for various reasons. Con Ed proposes fossil fuel plants in Astoria and the public dismay, the public upset over the issue literally prevented them from constructing the plant. What alternatives do they have now?

In the case of New Jersey, we have in front of us, at this moment, Newbold Island, Salem, Atlantic, all nuclear plants but also seawater, fossil fuel plants. If the electric power is truly needed, we

are hurting only ourselves. And the ones hardest hit are those least able to sustain the injury. There is a very clear, social implication to not having the electric power when it's necessary. The people that are going to be hurt the worst are the people with the highest expectations.

I only have to point to the need for electric power to manufacture and operate devices to help clean up the environment.

With all due respect, gentlemen, I believe your Commission is a good starting point but it is clearly not enough. On major issues like the electric quandry or the possibility of the oil industry - all major sides of the issue with apparent conflicting objectives must be examined before the fact. The reason I propose this is to avoid such things as we've heard this afternoon - but let me add to the list.

The Rand Report, referred to by the previous speaker, talks about the question of glass recycling, where one uses between 7 and 8% more primary energy sources to recycle the glass than to dispose of it directly. To go back to the old system of deposits would save up to 80% of our primary energy resources.

The use of cooling towers - I correct the previous speaker - we do not need cooling towers just for nuclear plants, we need cooling towers for any type of electric generating plant. But the use of the cooling tower requires energy. In a sense that the plant is less efficient, we have to burn more primary energy sources to overcome the effect of the cooling tower.

Thirdly, as we remove sulfur from our fuel, we remove the SO₂ in the effluent from the plant. As the SO₂ is decreased in the effluent, the electro-

static precipitators become less efficient.

I am, therefore, proposing a commission on energy and the environment to assist the State of New Jersey in maintaining its economy and environment at healthy levels, by soliciting and accepting testimony from all segments of the economy and all sides of the energy-environmental conflicts. The commission will consider and study major issues of apparent conflicting objectives. The careful analysis of the environmental, economic and social effects of an issue such as requires the specialties of economists, planners, environmental scientists, social scientists, geologists, systems analysts, ecologists, health physicists, etc., as well as members of the general public, should permit a rational step to be taken in the direction of integral management of the environment. All proceedings of the commission should be open to public scrutiny by placing the entire transcript in public document rooms around the State.

The types of energy and environmental issues which should be studied include:

A. The total energy requirements of the State including household heating, cooling and lighting; transportation and the need for primary energy resources of coal, oil and gas as raw materials in the manufacturing industry, where they cannot be replaced.

B. The electricity quandry, including methods of forecasting future demand, the effect of altered growth rates on demand, the siting of power plants and multiple use of power plants.

C. The impact of the oil industry on New Jersey, including the economic and environmental effects of offshore drilling, deepwater seaports, and the effect of oil and gas collection pipes on the sea bed, ocean front, and salt marshes.

D. Land use, including residential, commercial, industrial and recreational.

E. Water use, including residential, commercial,

industrial and recreational.

I am presently seeing the various councils and commissions which are advisory to the Department of Environmental Protection. I have appeared before the Clean Air Council, the Commission on Radiation Protection, the Solid Waste Management Council, and I will shortly see the Clean Water Council. I am asking each of these peer groups to support my proposal and forward a recommendation, through Commissioner Sullivan, to Governor Cahill that a body be established for the purposes described.

Thank you.

SENATOR SCHLUTER: Thank you very much, Dr. Haughey.

Could you please explain for us, as well as the Press, the nature of your commentary here, this seven page commentary?

DR. HAUGHEY: The document that I prepared, sir, was prepared to leave with the various councils and commissions that I indicated, to give them some background information, the present issue as I saw it, and a proposal in written form. I felt at this particular time that I should follow through with the Legislative side with exactly the same document.

SENATOR SCHLUTER: All right. Dr. Haughey, you said that you have figures about the economic impact on the Gulf Coast of the oil industries.

DR. HAUGHEY: Yes.

SENATOR SCHLUTER: I wonder if you could leave them with Mr. Frakt.

DR. HAUGHEY: I'll be glad to.

SENATOR SCHLUTER: Thank you.

Now, one specific question. In the court case involving the offshore drilling off the Maine Coast, which you say is in the United States Supreme Court at this time, does this involve the issue of laying the pipes or

the transmission system to get the oil back to the mainland off the coast of the State? Does this involve that issue within the State's jurisdiction?

DR. HAUGHEY: No, sir, it does not. It involves simply the question of the State's jurisdictional boundary toward the open sea.

SENATOR SCHLUTER: But conceivably then, where we have the three-mile jurisdiction, that would be a completely separate issue. If there were drilling off the Coast of New Jersey, even if it were subject to Federal lease, if it were offshore by ten, fifteen or twenty miles they still would have the problem of dealing with the State of getting it across the --

DR. HAUGHEY: Yes. I referred to riparian rights but common sense dictates, may I also point out, sir, that should the States of Delaware and New York agree to drilling rights and lease sales in the State's jurisdictional boundary that New Jersey is going to be forced to do this anyway. And all I have to simply point to is the refinery industry in the State of New Jersey. It's a prime target. We're going to be pressured in that sense from the Federal Government as well as the oil companies, should the Supreme Court rule in favor of the U. S. Government.

SENATOR SCHLUTER: How would New Jersey be pressured into it if they had the Ocean Sanctuary Law or if it required legislation --

DR. HAUGHEY: Because the refineries are in the State of New Jersey, sir.

SENATOR SCHLUTER: But the pressure would be economic from the refineries, is that correct?

DR. HAUGHEY: Yes.

SENATOR SCHLUTER: But even if New York State or Delaware had offshore drilling, they would have to get that product to the New Jersey refineries.

DR. HAUGHEY: Right. But I also point out, Senator, that it may be to our benefit. We don't know that.

SENATOR SCHLUTER: Yes. That's all the questions I have.

Senator Merlino?

SENATOR MERLINO: No, I have none.

SENATOR SCHLUTER: Thank you very much.

Incidentally, you might be interested to know - I don't know if you picked this up earlier, but there is a proposal which was mentioned in the Governor's Annual Message for a permanent commission. This is Senate Bill 2075. It carries an appropriation. It's for a 13 member commission and it should be acted upon, I imagine, fairly soon by the Legislature.

DR. HAUGHEY: Well, I was aware of that proposal, Senator, but the only thing that's wrong with it is that this is an election year and the commission will just get started. A task like this is going to require the efforts of many people over a long period of time.

SENATOR SCHLUTER: True.

Thank you, Dr. Haughey.

Is Dr. Socolow here? Do you have a prepared statement?

DR. ROBERT SOCOLOW: I do not. I was asked to come only two or three days ago by Ted Stein, one of your Assistants in this hearing, who is a student of mine and, of course, is at Princeton University. I told him he was giving me quite an assignment and he said that was only fair since I gave him assignments most of the time.

SENATOR SCHLUTER: Thank you. You may proceed.

DR. SOCOLOW: I am at the Center for Environmental Studies which is a faculty research group within the

School of Engineering at Princeton University. It's an interdisciplinary program involving social scientists and architects, as well as engineers and scientists. My own background is in physics and I have been interested in environmental questions related to energy use for two or three years. I'm the author of a book called Patient Earth, which is not a bad introduction to some of the subjects at hand today.

You've had quite a few extremely cogent presentations and I will try to keep my remarks short because certainly in the PIRG presentation, a little while ago, you got many of the major facts and there is very little in that with which I would disagree.

Let me make a few general remarks first. It is true that energy use has been closely correlated with gross national products in this country for quite a few years. The small deviations are interesting but the main fact is that we are used to the idea that more energy means more wealth. It seems worth emphasizing, however, that no physical law is operating in that correlation. There are many ways in which we can economize on energy without sacrificing material wellbeing. So we are probably entering into a period where that correlation will start breaking down. At least we could choose that; we may be forced into that.

Unlike many areas of environmental improvement, many of the ways of economizing on energy will not cost money. In a strange sense, everybody wins. But what makes the subject complicated is that there is no single economy measure that I can think of which will make a major change by itself. And, second of all, there is a major question of the uncertainty of many of the effects that we might attempt to implement. We have not been very active, in scientific and engineering communities, in developing data which removes the uncertainty on many of the policy recommendations that

we've heard discussed here.

I, myself, am a Co-Investigator in a major research project at Princeton being sponsored by the National Science Foundation, which is looking at energy utilization in housing, with the primary purpose of improving our quantitative understanding of how energy is used in housing today. We're studying the Town of Twin Rivers, New Jersey, near Exit 8 of the Turnpike, and it's the first time that a sample of houses that large, relatively identical units, has been examined for the purpose of understanding the relation of housing construction to energy use. Our first results are now coming out. And one of the striking things is that there is a great deal of variability within identical units, even when the technological variables are controlled for - when the obvious technological variables are controlled for - and one of the questions then is, what is the residual variability due to? and is it due to quality control or is it due to people having very different habits, opening windows and closing windows, and this kind of question.

There is clearly a very large component of energy use which is amenable to technological change, and another which is not going to be amenable to anything except change in life style.

At the risk of being elementary and pedantic for a minute, let me suggest a couple of ways of thinking about energy that permit the more specific discussions of earlier in the afternoon to make somewhat more sense.

Energy is used, in physical terms, with very few purposes. The major distinction is between organized energy and disorganized energy, the latter being heat. Organized energy is needed to move things and overcome friction. Disorganized energy is sufficient

to maintain temperature differences across surfaces. There are very few laws that ~~dis~~energy satisfies. All organized energy eventually becomes heat. All heat eventually winds up at ambient temperatures. So it is difficult and requires energy to maintain large temperature differences across the surface. And organized energy, in turn, can be obtained from heat only with partial efficiency. So that choosing the energy source to match the use is an important way of thinking of obtaining effective energy use. If you need heat, you don't need organized energy to produce electricity first and then go from there back to heat. It has intrinsic inefficiencies in it.

When you think about a car and figure out what are the energies doing, it's really overcoming the friction of the wheels on the road and is overcoming the resistance of the wind against the side of the car. The second term becomes more important than the first at about 40 miles an hour. So we think about what we're actually accomplishing with energy and make ourselves focus on that. It's a rather specific and a fairly small set of functions.

If I had to extract some general technological principles, I would suggest three R's for energy conservation - recycle, repair and redesign.

Recycling is an important concept because a very large fraction of the energy use in this country is to produce primary materials. A very careful study of the energy required to produce the automobile has come up with the result that more than two-thirds of the energy to produce an automobile goes into the production of the primary materials for the automobile - steel, glass, primarily the steel and the aluminum. And the recycling greatly reduces the need for that first step. This study was done at the University

of Chicago by Steven Berry and Margaret Fells, and I could get a copy of that for the Commission. Margaret Fells is now working with us at the Princeton Center for Environmental Studies.

Another issue which is often raised - I'm sorry, let me go on. The issue of repair is, of course, terribly important in energy conservation. If we can prolong the use, the lifetime of our commercial property and our appliances, we all gain. Repair, as a way of life, is less important in this country than it used to be, and it's surely an increase in attention to repair, attention to the lifetime of appliances and other material goods, which is in the offing as we deal with the energy problems of the next decades.

The slogan "Spend, don't mend" was part of the 1984 future that Aldous Huxley wrote - I'm sorry, *The Great New World Future* of Aldous Huxley, and it's surely something we don't want to fall totally into.

Redesign is probably the hardest of the three kinds of reorientations of society. The redesign of houses we heard a great deal about here, and there is much even deeper in the basic industries where redesign is possible, such as in the aluminum industry where the aluminum industry on its own initiative is announcing a new kind of aluminum processing, something like one-third more efficient, for future aluminum plants.

I think it's very important, and I emphasize this, to remember that there are technological aspects to improving energy use. There is a tendency among my colleagues in the technical community in regard to energy generation as a technical problem and energy conservation as a social problem, and somehow to assume that they have not much to say on the technological issues. They need encouragement and specifically that

usually takes the form of a research contract to get seriously thinking about the technological opportunities they can suggest.

Another place for energy conservation attack - utilities often say this - what about the poor in the State, in the Country? If you stop growing, then the poor lose out. This is a difficult question, but it seems to me that the way to deal with equity issues is to face them headon. If we are worried about air conditioning in the ghetto, let's put air conditioning in the ghetto. Let's not assume some kind of accidental longterm trickle down kind of approach to that problem.

I think that no one has required the utilities, to my knowledge, to produce data about the relative growth of energy use in poor and more affluent parts of the community. To the extent that I've seen any data of this sort, it indicates that the poorer sections of the community are growing less quickly in energy consumption than the more affluent sections. It's extremely important to get better information about this. One of the groups that will probably be producing data of this kind will be the Ford Foundation Energy Policy study which is in progress right now.

Now let me pass immediately to some specific suggestions where the State could have some impact on energy generation, energy consumption which is the main topic of my presentation.

Probably the most obvious way, but one that's hardly been spoken of here, is by direct example, through its own purchasing and its own recycling of materials, its own construction of buildings; doing something about on this sunny afternoon I sat and counted 116 light bulbs burning all through the meeting with shades drawn which produces the solar heating of this building. And then through things like the

staggering of hours. One of the things which has not been said on the transportation issue is that the automobile is less efficient when it's caught in a traffic jam than when it's going smoothly. And it's also less efficient in energy terms when it has only one person in it. How the State can do something about that isn't altogether clear to me, although there is at least one suggestion which has been tried in California - I don't know the results, but the Golden Gate tolls depend on how many people you have in the car, and they're lower when you have more people in the car. I see no reason why that kind of an approach to increasing the number of passengers carried per automobile couldn't be tried in New Jersey. There is both a faster effect and a more sure effect of this type of policy than of a major construction program for mass transportation.

Then the State can surely do more in the studying of standards, standards dealing with air conditioning efficiency; with a minimum temperature of public facilities in summer time, for example. If the State can restrict the number of people who can occupy a restaurant for the purpose of fire control, for the purpose of energy control they might say that in summer you can't have a restaurant at 55 degrees Fahrenheit.

For tax incentives, one thing that comes to mind is sales tax exclusions for certain types of homeowner investments which are related to energy conservation, like storm windows, thermopane glass, weatherstripping, insulation.

One of the preliminary results of our study of the Twin Rivers community is that the energy savings from Thermopane, which is a double glass with a vacuum section in between, are not large, and they are not large especially viewed in dollar terms for the home-

owner. To turn that around, thermopane seems extremely expensive. And one of the questions is why some of these materials have to be as expensive as they are, and if the State can do something to reduce their cost because the savings are larger than the customer himself realizes if the energy consumption is reduced, it would seem to be worth considerable attention.

The State can truly do something about an issue related to power plant siting that has not been mentioned, at least this afternoon, which is the utilization of the waste heat associated with an electric power plant. An electric power plant necessarily produces a great deal of heat, in the form of hot water usually. That was the consequence of the law I mentioned before that you have to produce organized energy through disorganized energy in an inefficient form. There's nothing you can do about that. What you can do though is attempt to locate alongside a power plant a user of heat. And this has eluded our own capacity to organize at the State level in this country. There are very few examples today of chemical plants or other plants requiring heat locating in a symbiotic fashion alongside a new power plant. It seems to me that one needs to examine the new power plants scheduled for New Jersey and also attempt to find out what new major industrial plants are scheduled that would have the ability to make use of the heat. If you can get them to plan together, you can avoid the energy costs for heat, or most of them, for the industrial plant.

One of the examples where this kind of symbiotic planning does take place is in desalination plants where the hot water produced in the power plant - in the electric power plant is used for the desalination of sea water. And in that instance it requires a complicated optimization to deliberately -- which usually means that the electric plant is functioning

less efficiently than it would if electricity were the only product - you deliberately produce somewhat hotter water than you otherwise might because it is economically sensible to trade some of the electricity for a more high quality hot water or steam. This kind of planning is technologically sensible. It's politically difficult. It's exactly the kind of idea that requires a great deal of thought to figure out how to implement. But I think that the utilities would respond to pressure to do that kind of planning if it was suggested to them.

On a smaller scale, the total energy system that was mentioned in the PIRG presentation. It's the same idea. You produce electricity locally, you have the hot water available for heating and also for cooling, incidentally, through absorption, air conditioning.

Now the utilities also object to total energy systems, largely because they aren't doing them themselves. There is no reason why they couldn't get into the total energy business. They would need encouragement to do so.

Incidentally, one of the first total energy systems being studied, being highly instrumented, is in New Jersey, in Jersey City. The National Bureau of Standards is implementing a total energy system being built by the Housing and Urban Development Department as part of its project Breakthrough. It is the only total energy system in that study and I think the New Jersey Legislators ought to know that it's in their State where this is in fact going on. It will be providing very useful, precise data. And I understand the construction is nearly completed, it's been going on this past year.

In addition to that, the State can do a great deal in the way of public education, the way in which

it uses its State Museums to emphasize energy and energy utilization. It has almost entirely been the case that energy has been played up as a problem of production, a problem of energy sources. I would bet that the Trenton Museum's Science Display emphasizes the energy production problem almost to the exclusion of the energy utilization problem. But the State, of course, can do more with sponsoring contests and prizes and demonstrations. Demonstrations, of course, can take the form of their own office buildings.

As an example of that, the General Accounting Office in Washington has announced that a post office being built in Saginaw, Michigan, is to be the site of all kinds of new technologies in building to be suggested and then chosen from the set of suggestions from various parts of the country, widely solicited, and as many as possible will be implemented in this building to try them out. The State truly could do something in the same spirit, some of its own future planning.

Finally, I am struck, as the previous speaker was, - although I've done less specific thinking about it - with the opportunities this kind of hearing presents for the first thinking about improving the science advisory system for the State Legislature. We are seeing more and more technological problems coming to the State Legislature for decision. And I don't think we have the science advisory capability now established. We're at a time where the young people in science and engineering are increasingly interested in the kind of relationship with policy that science advisory processes would permit. This can be both at the level of the individual staff assistants but I think, even more importantly, in

the form of definite ad hoc advisory committees. And I would be happy to help think that through because I've done some thinking about it on my own.

That's all I have to say.

SENATOR SCHLUTER: Thank you very much, Dr. Socolow. You indicated earlier in your discussion that we could have more efficient utilization of energy if we were more selective. Do you have any suggestions on how a governmental process can be more selective?

DR. SOCOLOW: More selective?

SENATOR SCHLUTER: Well, in other words, because of the ways that we produce - and I think you used the term "disorganized energy" but the way we produce energy is not always the most efficient, and there are better ways to produce energy other than some of the ways in which we do. And I would presume that --

DR. SOCOLOW: Well, I think I made the point there of trying to make the energy source match the energy use. And what I had in mind - I've given some examples since then -- if heat is what is needed, then try to use heat where you find it, such as in the condensers of a power plant. Don't go through the extra step of producing electricity, which is a highly organized form of energy and then converting it back to heat, unless it turns out to be particularly convenient as it is, for example, in a toaster.

SENATOR SCHLUTER: This is completely hypothetical. If it's more efficient to use steam to drive a transportation vehicle rather than fossil fuel, and yet all of our transportation vehicles are based on internal combustion engines, how do you go about getting that change effected

DR. SOCOLOW: Changes in the automobile engine are not my specialty and they're very difficult to bring about in detail. I would like to emphasize some of the suggestions I made of making the automobile more effectively utilized, driving more often at the speed at which it was most efficient, which is about 40 miles an hour and not five; having something like the number of people in the car that the number of seats are there for. These seem to me to be desirable directions. We used to have something called the car pool. There are an awful lot of cars in the back in this parking lot here and it would be very interesting to stay there at five o'clock and count the number of people per car. I think that would be a worthwhile exercise for some staff member. It would probably be less than two. It probably was a good deal above two not too many years ago.

SENATOR SCHLUTER: Senator Merlino?

SENATOR MERLINO: No questions.

SENATOR SCHLUTER: Thank you very much, Dr. Socolow.

Do we have a representative of the Delaware River Basin Commission here?

If you will identify yourself, sir, and proceed.

R O B E R T L. G O O D E L L: Thank you, Mr. Chairman and members of the Commission.

The Delaware River Basin Commission is pleased to comply with the request of the Senate Energy Commission to discuss the relationship between the proposed Newbold Island nuclear power station and the long-authorized Tocks Island Reservoir on the upper Delaware near the Water Gap.

I am Robert L. Goodell, head of DRBC's Operations Branch, whose responsibilities include matters dealing with water supply, reservoir development and power plant siting.

To orient the Commission, I would like briefly to describe the responsibilities of our agency as they relate to the two projects and to give their current status.

DRBC was set up a decade ago by New Jersey, its three neighboring states in the Delaware Valley and the United States Government as their mechanism to protect, develop and manage the river's resources on a single regional scale.

The five-party Compact under which we operate charges us with maintaining a Comprehensive Plan that, among other things, contains the facilities needed to service the water demands of the basin, with its seven million citizens, and larger service area. All of New Jersey falls into either the basin or service area.

DRBC's Involvement

Our direct involvement in these two projects is as follows: As the central water resource coordinating agency for the valley, all water developments such as Tocks Island, whether state, federal or otherwise sponsored, must be planned in consultation with DRBC under the Compact. In our role as protector of the water resources from impairment, or incompatibility with the Comprehensive Plan, we must pass on any water-related plan, public or private, such as a water-using power plant. And as the agency charged with meeting the basin and service area's water demands, we must judge whether the request for water for, say, a power plant, is prudent, in the public interest and can reasonably be met without an over-drain on the resources.

Among the facilities in our Comprehensive Plan for years has been the federal Tocks Island reservoir, which Congress authorized in 1962 and which is ready to go into construction if and when it receives necessary clearances from Governor Cahill, who is our New Jersey member, and from federal environmental authorities. As you know, Governor Cahill's position is that the state needs the project but that he is withholding clearance until resolution of seven conditions relating to impact that are now in analysis and negotiation.

Within these bounds, we may not, under the equitable apportionment obligations imposed by the Compact, arbitrarily deny the right to a share of the river's resources to a segment of society such as agriculture, residential population, oil refineries, power companies, or even fisheries.

Our job in reviewing a nuclear power plant operation is primarily to rule on the large matter of water resources impact and availability and stream pollution from either thermal or radioactive discharges. We have neither the authority nor competence to judge non-water-related issues such as plant safety, air contamination and rival means of generating energy.

Although we have yet to rule on any of these Newbold matters formally, DRBC already has heavily influenced the Newbold Island project. The sponsor long ago shifted its plans to include cooling towers rather than operate on the widely used once-through cooling process because it was apparent that the latter would not comply with our then-new water quality standards for the river as to protection against heat pollution.

Tocks Island

While Tocks Island is a multiple-purpose reservoir project with facilities for providing flood protection, recreation through a companion National Park, flow augmentation for general river health and salinity control, and electrical power, its significance to Newbold Island is as a water supply lake.

More than half the water supply in the dozen reservoir projects in our entire Comprehensive Plan would be provided by Tocks Island -- some 630 million gallons a day (mgd), and nearly half of this is requested for diversion from the basin to meet the future demands of urbanized Northeast Jersey. Large volumes of water supply in addition to those already being used along the Delaware will be needed soon also in Bucks County, Greater Trenton and other communities, and by the valley's new and expanding industries.

Also, the drought of the mid-1960s, during which DRBC invoked emergency water supply powers to effect fair distribution of the available short supplies, demonstrated the need for substantial additional water supply storage in the basin.

Power Plant Cooling

Development and use of the wet cooling tower method of power plant cooling avoids the detrimental environmental effect of significant thermal releases to the river, but at the same time, about doubles the evaporative (consumptive) water loss compared to once-through cooling.

A power plant siting study completed just over a year ago by the major electric utility companies with franchise areas in the

Delaware Basin indicates a consumptive (or evaporative) water requirement in the 15-year period ending in 1986 of about 362 mgd. This results from the companies' desire to expand 10 existing plants and build 16 new ones. This would mean operation of a total of 43 plants in 15 years, 11 of them nuclear.

Since Tocks Island water supply was planned and justified on the basis of municipal and industrial projections in the absence of these recently emerged consumptive needs for generator cooling water, the demands for added water supply from Tocks and/or other sources are even greater than a decade ago. Of course, even with availability of Tocks Island storage, it appears most doubtful that enough water supply could be developed to accommodate all the power company desires, assuming they were otherwise acceptable.

Newbold Island

Among the specific industries in need of a large quantity of water, if it receives the approval of the Atomic Energy Commission, is the Newbold Island nuclear plant planned in Burlington County by Public Service Electric & Gas Co. This plant would draw about 150 mgd from the river for reactor cooling. Some three-fourths of this water use would be non-consumptive, meaning it will be discharged back to the river basically unimpaired in quality. However, 35 mgd, or nearly a fourth, would be evaporated and thereby lost to the stream. This loss is about the same as the City of Trenton draws for use by its citizens and industries as well as the three neighboring townships that it serves, and a

tenth of all the projected 15-year consumptive power needs for the entire basin. However, about 90 percent of the Trenton water gets back to the stream, though in substantially poorer quality than withdrawn.

The AEC recently suspended its hearings on the Newbold Island application and notified Public Service that they would not be resumed until the issue of water supply availability for the plant is resolved by DRBC. As a result, we recently have conducted a public hearing on a possible means of resolving the impasse despite the current standstill on Tocks Island. The proposal, on which analysis of the hearing record and the decision are still pending, would allow conditional use of the river for cooling water unless the streamflow at Trenton falls below what we regard the critical level (3,000 cubic feet per second), in which case plant operation would have to be reduced or shut down. The company has agreed to the condition. This allowance would continue to prevail until 1980, by which time the company would be required to provide cooling water from storage facilities it would have to develop itself in the event Tocks Island or other comparable public storage facilities are not then available. Our action would deal exclusively at this time with the water supply issue, leaving for a later DRBC decision the larger permit application decision that also involves water quality issues. It appears that DRBC will not be prepared to act on the water supply conditions before its meeting of late March.

Conclusions

Tocks Island project was originally justified for water supply without consideration of recently-developed substantial consumptive water requirements of new nuclear and fossil-fueled power plant proposals. With these additional requirements, Tocks Island, or comparable storage facilities, now appears even more essential if basin water supply demands are to be accommodated. No more economically or environmentally feasible project alternative to Tocks Island has been identified.

Although DRBC is exploring interim solutions for allowing the AEC review of Newbold Island to proceed, it seems clear that the final solution to the basin's water supply needs is the Tocks Island project, or some alternative not yet identified. Further, the multiple small dam alternative to Tocks Island for the portion of the project needed for water supply due to power demands would be more environmentally disruptive. It also would prejudice systematic and optimum development of the region's water resources.

Thank you.

SENATOR SCHLUTER: Thank you, Mr. Goodell. We appreciate very much your very concise overview on such short notice. I have a question which refers to the Tocks Island facility itself.

The pump storage operation is still a part of the consideration of Tocks Island, is it not?

MR. GOODELL: Yes, sir, it is.

SENATOR SCHLUTER: What will the pump storage, if it ever gets final approval - what additional capacity will that provide?

MR. GOODELL: It will provide about 1300 megawatts.

SENATOR SCHLUTER: 1300 megawatts per --

MR. GOODELL: Capacity.

SENATOR SCHLUTER: Of capacity, electric power capacity.

MR. GOODELL: That's correct.

SENATOR SCHLUTER: And could you compare that, as far as the consumption for a particular area? In other words, for the City of Newark, what does that compare to? or for the Northeast of New Jersey or the Northwest.

MR. GOODELL: Well, it's a little difficult to make a direct comparison because of the fact that the pump storage at Tocks Island is a peaking capacity installation, thereby it clips off the top of the load curve rather than what compares to, say, a nuclear plant such as Newbold Island which would operate in the base load, or essentially continuously. So that the pump storage is really important for clipping off the peak of the load but does not operate anywhere near continuously - maybe say on the average of four or five hours a day.

SENATOR SCHLUTER: I understand that but it is part of the total capacity picture --

MR. GOODELL: That's correct.

SENATOR SCHLUTER: -- for supplying the peak periods.

MR. GOODELL: That's correct.

SENATOR SCHLUTER: And I just wondered, for example, well, what is the capacity of Newbold Island?

MR. GOODELL: The capacity of Newbold Island is approximately 2200 megawatts - two 1100 megawatt units. I think it's exactly 1082 apiece.

SENATOR SCHLUTER: 2200 megawatts.

MR. GOODELL: Right.

SENATOR SCHLUTER: And what again was the pumped storage?

MR. GOODELL: 1300.

SENATOR SCHLUTER: So pumped storage could be half - I realize at peak times - half of the Newbold Island total power source.

MR. GOODELL: That's correct.

SENATOR SCHLUTER: What is the status of the pumped storage facility at this time?

MR. GOODELL: Well, the status is pretty much tied in with the status of the overall Tocks Island project. In other words, until the overall project is given the go-ahead, the pumped storage is not moving at this time.

SENATOR SCHLUTER: But is it not the case then, Mr. Goodell, that if the recreation area and the dam do go forward that that does not necessarily mean that the pumped storage would go forward?

MR. GOODELL: Well, Congress authorized the addition of the utility, pumped storage project, as a part of the overall development. So I would assume that if the main project goes ahead the pumped storage will also go ahead.

SENATOR SCHLUTER: Thank you.

Senator Merlino?

SENATOR MERLINO: I have no questions.

SENATOR SCHLUTER: Thank you very much. We appreciate your comments.

Is there anyone else - this is the end of our formal list but is there anybody else here who is prepared to testify?

Thank you very much. This will conclude the present hearings. We have no further hearings scheduled and we don't anticipate any unless something unusual comes up.

Thank you very much.

(Hearing concluded)

EXHIBITS SUBMITTED
by
DR. VIKRAM L. DALAL

Table I
Typical Residential Rate Structure

	<u>Present</u>	<u>Revised</u>
Fixed charge \$ 25/yr.		\$ 25/year
1st. 2500 kWh	3.0 ¢/kWh	2.5 ¢/kWh
Next 2500 kWh	2.75	2.75
Next 5000 kWh	2.5	3.0
Next 10000	2.25	3.25

The effects of the revised structure on typical electric bills is shown in Table II.

Table II
Typical Electric Bills/Year

	<u>Present</u>	<u>Revised</u>
2500 KWh	\$ 100.00	87.50
5000	168.50	156.00
10000	293.50	306.00
15000	405.00	468.00

Table III

Comparisons of Air Conditioners							
	<u>Price</u>	<u>Tax</u>	<u>Total</u>		<u>Price</u>	<u>Revised Tax</u>	<u>Revised Total</u>
Unit 1	\$ 195	10	205		\$ 195	20	215
Unit 2	217	11	228		217	0	217

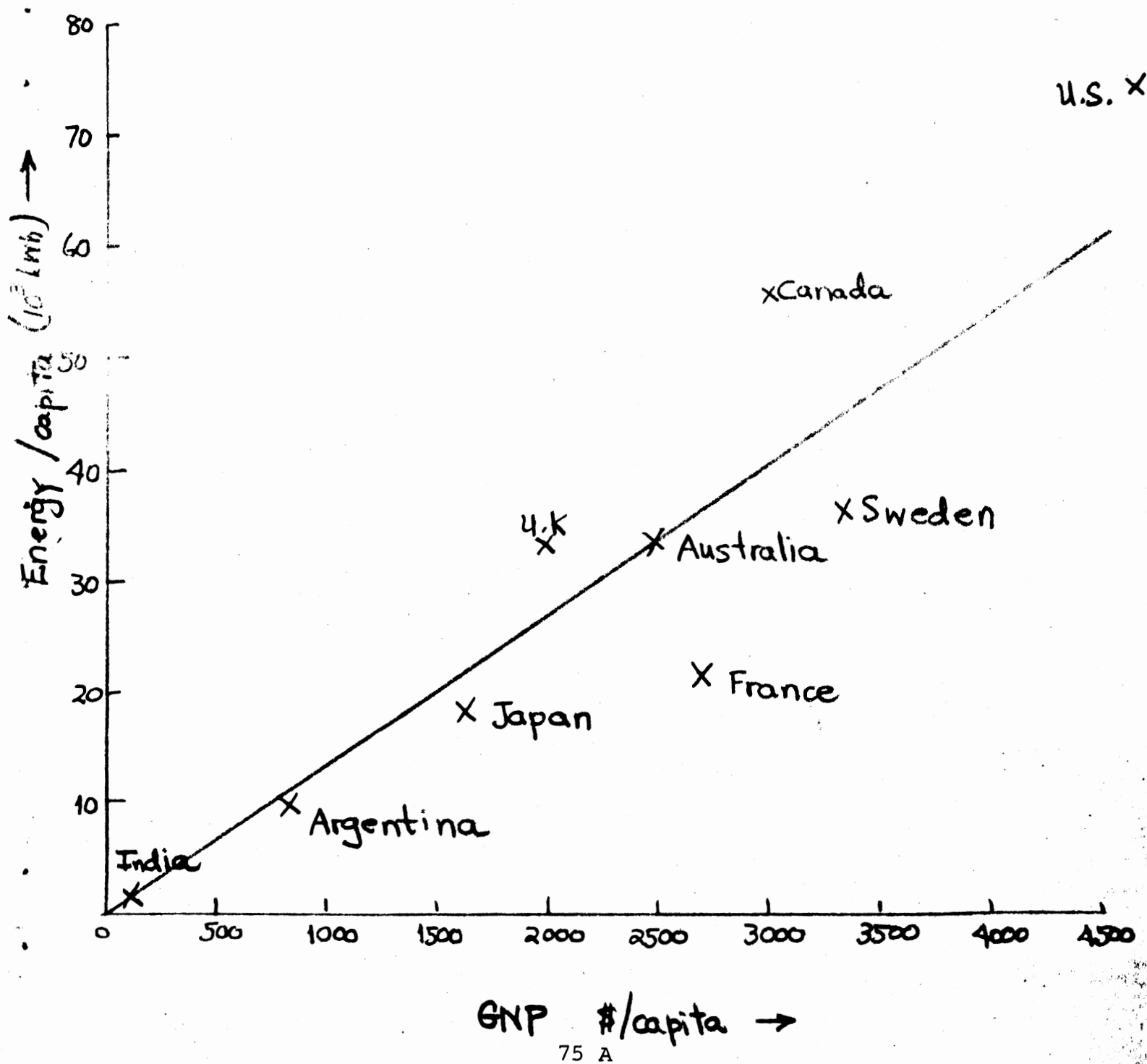
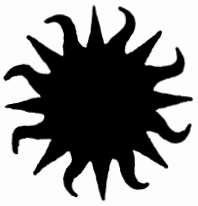


Fig. 1



"THE SUN PEOPLE" - ALTERNATE ENERGY ADVOCATES

SOUTH DENNIS, NEW JERSEY 08245

Testimony Before the Senate Subcommittee on
Energy and Environment, February 20, 1973
State House, Trenton, N.J.

The biggest issue today is energy. Energy is power and power can make or break us. It can be used for creation or destruction. It remains all about us; stored beneath the land, within the sea, and coming directly to our planet from our star--the sun.

In our state of New Jersey, the most densely populated in the country, the problems of producing energy in the ways we are presently doing show the most profound effects. Nearly all the pollution we talk about and the land destruction we abhor appear as an indirect result of our continued uses of present day energy systems.

In Southern New Jersey, where there are fewer voices to call for help, are the easiest places for siting nuclear plants and the most ideal geographically for oil terminals. But what we have left here is the most valuable for all our physical and aesthetic salvation.

Therefore it is here that the desire to find solutions and alternatives is strongest. The search for clean non-destructive energy has given rise to our group, The Sun People--Alternative Energy Advocates. While we examine and make available alternatives we will continue to support every effort to halt the speedy and thoughtless efforts to cover the area with nuclear plants and will continue to attempt to block oil ports from the Delaware. We urge the state to withhold any further permits, no matter how simple, for the continual proliferation of nuclear plants. We as a nation cannot support two directions at once. While we as a state must support national funding of research into alternatives, especially solar energy, we as a state must stop (through the permit system) that which cannot be proven safe. The only way we can force the utility companies to take seriously demands for investigation of all available methods of non-polluting energy producing is to block continuation of conventional nuclear plants.

In the interim: We can ration electricity until changes in its production makes it safer. We can stand and enjoy cooler buildings. We can travel less. We can consume less in all the trappings of our reckless society. And we will enjoy doing so, especially if we know it means our survival. We as a people are ready for this kind of commitment and it is starting here where we are most threatened. Commercial interest keep telling us that we must have so much but common sense tells us that the pollution around us everywhere is blocking out the only continuing life-sustaining source of energy we must have--the sun.

*Many thanks
Rick Fisher*

76 A

*Please add "An International Solar Energy Development Decade"
Mar, 1972 Bulletin of Atomic Scientists. By your record.*

JUN 21 1985



