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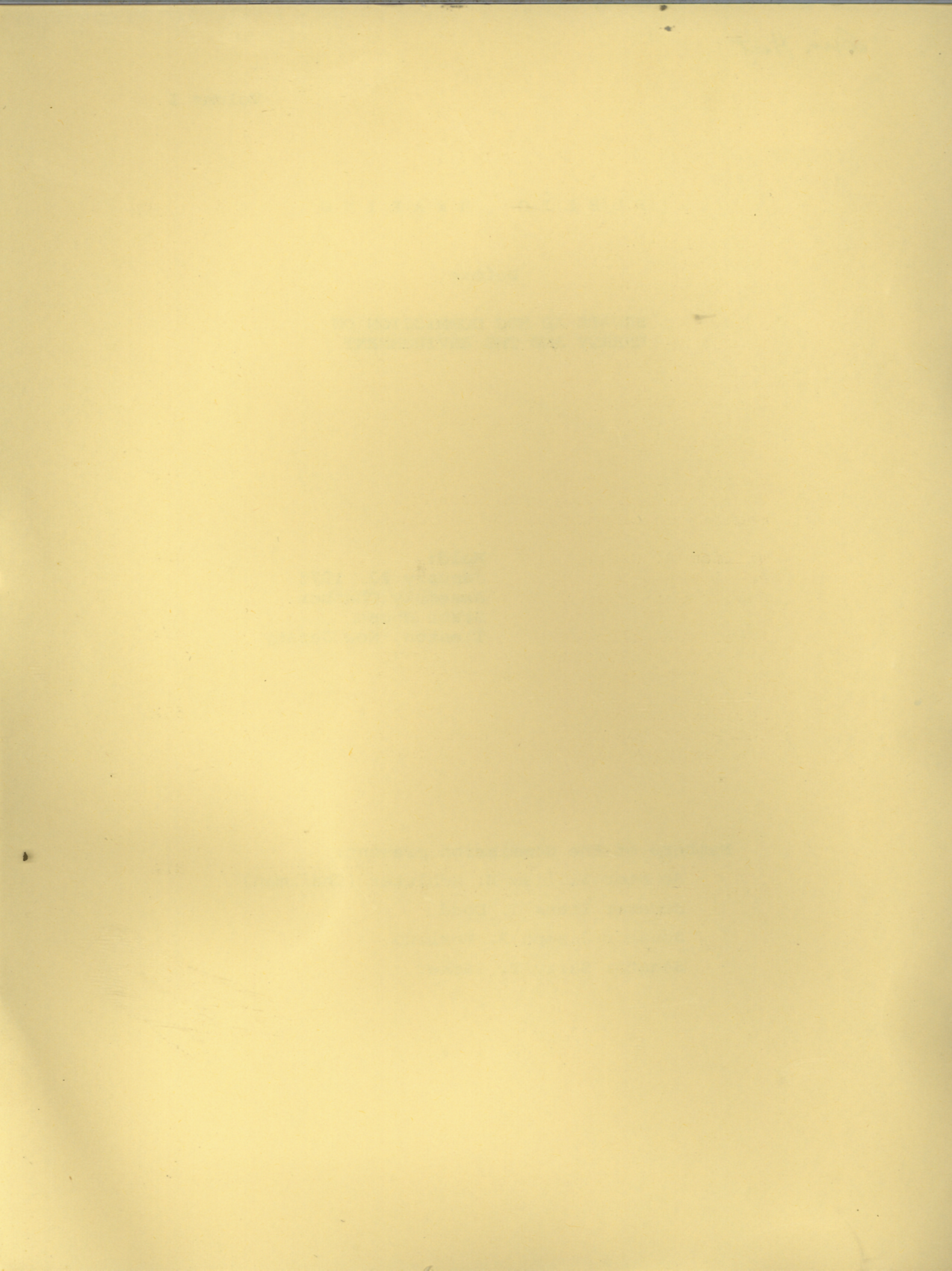
SENATE AD HOC COMMISSION ON
ENERGY AND THE ENVIRONMENT

Held:
January 23, 1973
Assembly Chamber
State House
Trenton, New Jersey

Members of the Commission present:

Senator William E. Schluter (Chairman)
Senator Frank J. Dodd
Senator Joseph P. Merlino
Senator Barry T. Parker

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SENATOR WILLIAM E. SCHLUTER (Chairman): Will the public hearing please come to order. We have a number of witnesses today and I think we should start on time and proceed through this first day of public hearings.

First, let me introduce myself and those who are connected with this Commission. I am Senator William Schluter of District 6A; on my right, your left, is Senator Joseph Merlino, representing District 6B. Also on the Commission is Senator Barry Parker, representing Burlington and Ocean Counties; and Senator Frank Dodd, representing Essex County.

Before calling on the first witness, which is Public Service Electric and Gas Company, followed by Jersey Central Power and Light Company, I would like to briefly describe the mission of this Commission. And if Public Service Electric and Gas is not here, because of being called into another part of the State House complex, perhaps Jersey Central Power and Light will go first.

This Commission, consisting of four members, is an Ad Hoc Commission, constituted by the President of the Senate under his normal powers, to study and report by March 19th on the effect of the energy crisis in New Jersey, not only on the people of New Jersey but also the effect and implications of such a crisis on the environment and on other ecological factors.

This Commission is not the Governor's long-range commission which he proposed in his Annual Message. We do not question at all the need for a long-range continuing procedure to evaluate energy versus environment in the State of New Jersey. But there are several pieces of legislation which will be before the Senate, one being the bill that was passed

in the Assembly yesterday about a deepwater port; we have the bill which is already in the Senate on the ocean sanctuary; and other pieces of legislation which have been introduced and speak to this general issue. We feel that the people of the State of New Jersey, through their elected Legislators, the Senators in this case, want to know as much as we can tell them about this problem. So this is the general nature of this Commission's activity.

We will be having probably three more public hearings. We will be meeting in executive session; we will have work sessions; we will be accepting reports and reviewing them and studying them.

I would also like to introduce our two Committee Secretaries - Mr. Steven Frakt, who is sitting on the aisle, and Mr. David Mattek, who is next to him. They have been assigned to this Commission to assist us.

Before calling on the first witness, Senator Merlino, would you like to comment?

SENATOR MERLINO: No. I just came here to listen today, Bill, and since you like to be punctual, I think we shouldn't delay it any longer and we should get the first witness on.

SENATOR SCHLUTER: The gentleman on Senator Merlino's and my right is Jeff Laurenti, Senator Merlino's Aide.

Do we have the first witness, Public Service Electric and Gas, here at this time? (No response)

All right, then I will call on Jersey Central Power and Light. If you will come forth and take your seat here.

Incidentally, just by way of further elaboration, we will break for lunch at perhaps 12:30 to 1:30, and we do have witnesses scheduled for this afternoon. If we have gaps in the testimony being given, if there

is a little free time, we will try to meet as a Commission to do some of our business. But, as I contemplate it the hearing will go on from now through at least three o'clock this afternoon with a one-hour break between 12:30 and 1:30.

We have, on my left, Senator Barry Parker, who I announced was on the Commission before.

Barry, do you have anything to say?

SENATOR PARKER: Good morning.

SENATOR SCHLUTER: Fine. Jersey Central Power and Light Company, will you identify yourself and proceed.

S H E P A R D B A R T N O F F: Good morning. My name is Shepard Bartnoff. I am President of Jersey Central Power & Light Company and New Jersey Power & Light Company which are subsidiaries of the General Public Utilities Corporation. Together we serve approximately two million people in 43% of the land area of New Jersey. I appreciate the opportunity to appear before this Senate Committee and to make a brief statement on behalf of our Companies.

With me also this morning is Mr. Fred Smith, a Vice President of our two Companies and, incidentally, a member of the Executive Committee of the Governor's Management Committee; also Mr. Ed Ambler, who is on my right, a member of Mr. Smith's staff.

Senate President Alfred N. Beadleston, in announcing the establishment of your Committee, stated that, "One of the most vital questions we will face in 1973 is that of energy and ecology." He went on to ask, "How can we best meet the legitimate power needs of the present and future and at the same time protect our valuable land and water resources from adverse and haphazard development?"

Gentlemen, as a major producer and supplier of

electric power in this State, we are continually facing the same challenges and asking ourselves the same questions. I am here today, not to make a lengthy statement but to offer to your Committee the cooperation and assistance of my Staff in your studies. Whatever data and information we have in our files is available to you. I have already requested our Planning Department to up-date our projections for future electric energy demands for the next ten years. Within a week or so, we shall furnish you with these projections. We shall also furnish you with our plans for the construction of new facilities to meet the projected power demands and of our evaluation of the effects of delay in our construction plans upon our ability to meet the future requirements of the residents in our service territories.

Senator Beadleston, in discussing the energy and ecology crises, stated, "I am convinced that at present we do not have sufficient information on which to make intelligent judgments." If, in any way, we can help to obtain the information you feel you might need, please do not hesitate to call on us. Our goals are similar; namely, to supply the electric power requirements of our citizens with a minimum of adverse effects on the environment. We look forward to cooperating with you in your study in an effort to meet these goals.

Thank you.

SENATOR SCHLUTER: Thank you, Mr. Bartnoff. Does Mr. Ambler want to supply any additional testimony?

MR. AMBLER: No. We would be glad to answer any questions you might have this morning, Senator Schluter.

MR. BARTNOFF: Or to appear at any time that you would want either myself or anyone on our Staff to

discuss subjects of interest to your Committee.

SENATOR SCHLUTER: Thank you. We will have additional hearings, as I indicated before. They will probably zero in on specific areas, such as the supply of energy as well as the environmental impact factors.

Mr. Bartnoff, if I could ask a couple of questions for my general information and understanding.

MR. BARTNOFF: Yes.

SENATOR SCHLUTER: Could you describe the geographical area in general that your Company serves?

MR. BARTNOFF: Yes, I can. We start at the northern boundaries of the State in New Jersey and go down south until we hit the Public Service territory, and Public Service services a strip which runs from the eastern border to the western border of the State and separates the northern regions of our service territory from the southern section which then extends down to the east coast along about Toms River and somewhat south of Toms River, and our boundary then goes across to the western end of the State. What is below south of us in New Jersey is then served by Atlantic City Electric.

SENATOR SCHLUTER: I see. Your firm, you say, is part of the General Public Utilities group?

MR. BARTNOFF: Yes. General Public Utilities is a holding company, and in the General Public Utilities system we have not only our two New Jersey Companies but also two companies of Pennsylvania - Metropolitan Edison, which is headquartered in Reading, and Pennsylvania Electric Company, which is headquartered in Johnstown. The two Pennsylvania companies service an area in Pennsylvania covering roughly 46% of the State.

SENATOR SCHLUTER: I see. Would you then be

prepared, Mr. Bartnoff, to have testimony from the corporate structure on energy for this region in general?

MR. BARTNOFF: I'm sure that any of our corporate people who could help would be willing to do so. Indeed, I would like to leave something with you. I have brought along copies of a statement which the President of General Public Utilities, Mr. William Kuhns, submitted to the Committee on Public Works of the United States House of Representatives. He and other utility executives were requested, last summer, to comment on the energy crisis in the United States, and Mr. Kuhns presented a statement, which is a little bit long for me to read but which I would like to give to you and perhaps you could include it in the formal record of these proceedings, in which he traces the existence and origin of the energy crisis, describes its extent and comments upon what we as a company are doing, and in general, I think, you will find it a very informative piece of literature in your deliberations. We have, I think, enough copies to leave with the Committee and we would like to leave these with you at this time.

SENATOR SCHLUTER: Fine, Mr. Bartnoff.

The purpose, as described earlier, of this first hearing is for all of us to have - on the Commission as well as the public in general - a little bit of understanding of what the problem is and what we are trying to do. So we are being educated, believe me.

MR. BARTNOFF: I am sure, Senator, that you will find this statement by Mr. Kuhns helpful to you.

SENATOR SCHLUTER: Would you leave it with our Secretary, Mr. Frakt, over here.

MR. BARTNOFF: We shall leave a number of copies with him. (See p. 59 A)

SENATOR SCHLUTER: Yes. Now, in general terms, Mr. Bartnoff, do you feel that there will be sufficient energy in New Jersey for the normal demands - and I mean normal without any major expansions in industrial growth or residential construction, but in the normal growth in 1973, '74, '75 and '76?

MR. BARTNOFF: I think, Senator, that for the next few years we will have sufficient reserve capacity to take care of any emergencies that might occur during our peak periods which in New Jersey have now and will for some years continue to be at the height of the summer season. Indeed, within our own service territory, if our own construction plants proceed on the schedule on which we hope that they will proceed, we do not foresee a real emergency occurring even beyond these years which you mention.

I think the information which we will supply to your Committee within the next week or so will indicate to you, however, that should there be a slippage in any of the plant construction in this service territory then, of course, we first would lose our reserve, and the reserve is not something that's there only for emergency, reserve is there also because at any time certain plants are out for maintenance, they don't run 100% of the time, and we do have peaks and valleys in the demand upon our service. If there should be a slippage in our construction program, then we first lose our reserve and you will find that we would, within some finite number of years, be dipping into the essential services which we are called upon to supply.

I will ask our people to try to outline this

point for you with specific emphasis. But for next summer, barring some real unfortunate emergency, such as technical difficulties in all of our plants all at the same time, I do not foresee any real problem.

You will also learn from us, and I am sure from Public Service, who will appear this morning, that we are part of a regional system, the Pennsylvania-Jersey-Maryland interconnection which covers all of New Jersey, a major part of Pennsylvania, all of Maryland, parts of Delaware, the District of Columbia and a little bit of Virginia, and here we can pool our reserves and in this way have, of course, a degree of reliability which a single company, such as ours, could not.

We are faced, as you will learn from the information we will supply you, with projections that call for increases in the power demand that are considerably above the average for the Nation, and in our territory above the average for New Jersey. So that whereas the rate of growth in the Nation, perhaps a doubling of energy demand every ten years, we are finding that in a ten year period we are faced not with a projection for a doubling but with a demand that will be three to four times as great as what we are now producing. And to plan for ten years from now requires the initiation of construction efforts now, and indeed we have such construction efforts under way.

SENATOR SCHLUTER: I have a couple more questions, Mr. Bartnoff. We appreciate your assistance and bearing with us, and I am sure the other Senators have questions.

In the production of energy by Jersey Central Power & Light, can you give us a general breakdown as to the source of the fuel that produces so much, percentagewise, of your power?

MR. BARTNOFF: Yes, I can. I am not going to give you the percentages off the top of my head now because these are numbers I don't always carry around with me. I would like to point out that my present capacity with Jersey Central is still a little bit new. I have been President of the Company for about four months now and I, myself, am learning things about it all the time.

But the bulk of our energy production, our electric energy production still comes from fossil-fired stations. We no longer burn coal in New Jersey. We don't burn coal because of sulphur requirements on the fuel which we do burn. The bulk of it comes from oil-burning stations, and this is low sulphur content oil.

We do have a slight amount of pump storage hydroelectric. We have one such station, which we share on a fifty-fifty basis with Public Service of New Jersey.

The oil burning stations are, for the bulk of the load base-loaded stations, steam-generating stations. Some of them, in fact all of our big ones, converted from previous coal burners to oil burners. We have been adding and are still adding a certain amount of combustion turbines. These are, oh, essentially jet aircraft engines that are used to turn the generators which give the electricity, instead of using steam generation.

The greatest thing that's happened to us in many years has, of course, been the excellent performance of our nuclear station, and that's the Oyster Creek Station which was the first large nuclear station of its kind that went into service. It has been in operation commercially now for somewhat over three years with an excellent record of performance.

It has been reliable, it has had an excellent availability, and it has really been the backbone not only of our Company but also of our General Public Utilities system and, indeed, one of the most reliable stations in the entire Pennsylvania-Jersey-Maryland network. This supplies some 30% of our total capacity but, in terms of actual energy production, since it's been a workhorse, you might say, of our stations, its actual production has been more than that 30% because it's worked harder than some of our other older systems.

So you might say roughly, in terms of capacity, we're about one-third nuclear, two-thirds oil, one station there which is pump storage. And we will give you a complete breakdown as to what this involves in terms of combustion turbines and steam generating stations and the oil fired units.

SENATOR SCHLUTER: Of course, more testimony leads to more questions, so if you can bear with us.

What is the lead time, Mr. Bartnoff, that you have in your plants in New Jersey, the time before a proposal is made to build a plant, then the time needed to have the various studies and hearings, the impact studies and so on, before it gets on line. And I'm talking about a steam generation plant.

MR. BARTNOFF: Yes. There is a slight difference there between a nuclear and a fossil-fired plant. And, of course, you're not talking here about the planning which we're now doing for 1985 and even up to 1990. Let's say from the point where we're serious about it. We're going to start preparing specifications on which to go out to bids for suppliers. A rule of thumb now would be that for a nuclear plant we should allow something in the order of ten years, hopefully a little bit less, but practically we can't gamble on anything less. For an oil-burning plant in

New Jersey, perhaps a year or a year and a half less.

SENATOR SCHLUTER: So maybe 8 to 9 years.

MR. BARTNOFF: Eight to nine years. Though the past couple of years have indicated to us that this time gap between the nuclear and the fossil is decreasing, and it seems to be decreasing not by making the nuclear less but by making the fossil longer in duration for this time between initiation and commercial operation.

SENATOR SCHLUTER: In our future hearings we're going to ask for specific information, I'm sure, about the projections of energy requirements over the next decade, the next 20 years, the next 50 years, and I think we might get into that more appropriately in our future hearings.

That's all the questions I have.

Senator Merlino?

MR. BARTNOFF: In anticipation of this, I will supply you with that information. And also, in our Planning Department we have some experts on this and their time can be made available.

SENATOR SCHLUTER: Fine. Senator Merlino may have some questions.

SENATOR MERLINO: No. You've more or less exhausted most of them, Bill. My concern was - I know we're initially seeking general information on which to plan future hearings but the one thing that concerns me, as a result of your talk here this morning, Mr. Bartnoff, is, can you be more specific as to the plan for construction of new energy producing plants serving your area?

MR. BARTNOFF: Yes. As I say, we're going to supply you with a whole list which will detail location where we're planning and what type. But of major energy producing stations that we have in mind, say through this decade, we have applied for permits and a construction permit from the Atomic Energy Commission

and from all the State authorities where we need those permits for another nuclear generating station to be called the Forked River Unit, to be located in roughly the same site where our present Oyster Creek Plant is. This would be a plant of not quite double but almost double the size of Oyster Creek. Oyster Creek is 640 megawatts, this would be about 1100 megawatts.

There are also plans - and then again we have applied for permits and some preliminary engineering, though no construction work is under way, at Union Beach for a good sized fossil-fired plant.

These are the two big ones in New Jersey.

We also, within our General Public Utilities System, are part owners, 25% owners, of a nuclear complex, two nuclear plants that are being built in Pennsylvania near Harrisburg, Three Mile Island. And these two units are scheduled for operation - one in 1974, the other later than this - and we have 25% ownership of those, and also we will have 25% of the energy.

Later today you will undoubtedly hear from Public Service about some of their plans for the off-shore nuclear plants. We have an agreement with Public Service under which under certain conditions we will have 10% ownership in these plants and also 10% of the power.

These are the major items.

SENATOR MERLINO: Thank you.

SENATOR SCHLUTER: Senator Parker?

SENATOR PARKER: Just a couple of questions at this point.

You indicated that there has been a tremendous increase in the demands for energy which really have outgrown the increase in population. In other words,

there is a much greater need for energy per person now than there was say ten years ago. Now I assume that's caused by the various air conditioning and electrical units used around the home. Do you have any statistics or figures in reference to why that is and what the cause is? Why are the demands so much greater now than they were ten years ago per person?

MR. BARTNOFF: I don't think I said there was a greater need, a greater demand. I don't want to go into the sociological discussion.

SENATOR PARKER: No, but maybe we're going to have to eventually look at that aspect of it.

MR. BARTNOFF: Yes. And we do have some information on the growth of appliances of the type you mention. But even moreso, I think, you would find that the increase in the requirements of us as a public utility - and that requirement is that when the switch is turned on power flows through those wires - has come from a combination of residential, which is not the per capita, that's the one where there's more revenue, commercial and industrial. And we find that as the industrial demand in our service territory, which is predominantly a suburban rather than an urban territory, has increased so has all of this.

I have not as yet requested people on my staff, as I did on projections, to supply this information but I will, when we get back to the office, see if there cannot be given to you a breakdown of the types of customers we serve and of how this has changed over the past five years, plus our projections for the future requirements by categories.

Is this the type of thing you feel would be helpful to you?

SENATOR PARKER: Yes, it would be to me.

MR. BARTNOFF: We will make sure that whatever information we have along these lines is given to you.

SENATOR PARKER: Just one other question on the types of energy. You have answered most of this.

I assume that the number of plants you have now, basically that the fossil fuels vis-a-vis say the atomic don't produce anywhere near as much in total volume of energy. In other words, I know you can't compare megawatts with a fossil fuel plant, or maybe you can, - what is your capacity for generating in a fossil fuel plant as opposed to your capacity for generating in an atomic plant, and how do you measure the differences between the same.

MR. BARTNOFF: Let me make sure I understand your question, Senator. Are you asking not for the total in our Company but for the individual plant?

SENATOR PARKER: Plant. In other words, your Oyster Creek plant puts out 640 megawatts - I don't know what that is in electrical capacity to sustain an area - but your fossil fuel plant puts out X number.

MR. BARTNOFF: I do not think we can draw a general conclusion for the industry by looking at our small segment of the overall industry of the United States. It is true that in our Jersey system now the largest single plant we have, in terms of capacity to produce megawatts, is our nuclear plant at Oyster Creek; second behind this is an oil burning plant which is a little bit more than half the size in terms of megawatts. But this is more because, I think, of the time element as to when they were built. We do have in the General Public Utilities system plants that are operating that are in a single unit larger than Oyster Creek. And there are plans to build others. None of them are in New Jersey. We have some of these in

Pennsylvania. But the capability of the plant to produce a given number of megawatts is determined not by whether it is nuclear or oilburning but more by what the requirements are for that plant and what can be put in it.

SENATOR PARKER: Can you make available to us information showing the amount of consumption or fuel oil that your plants demand?

MR. BARTNOFF: Of course. This is information that we have.

SENATOR PARKER: And do you have projections on the capacity for your reserves as to where you are getting your oil? In other words, did you get it from Texaco or buy it from different services.

MR. BARTNOFF: Well, here we can tell you where we have gotten it and we can tell you what kind of long and intermediate term contracts we might have. But I would have to tell you, and this may be a subject of concern to your Committee, that the entire question of availability of oil supply is one that requires serious attention from all of us.

SENATOR PARKER: That's basically what I'm getting at because I think we have to try - not only the socio-economic problems but I think we have to try to get to the problems of atomic energy vis-a-vis other types of energy. In other words, I think we have to look to see what other areas we can derive our sources of energy from as opposed to say solely fossil fuel.

MR. BARTNOFF: I agree with you.

SENATOR PARKER: And I don't see how we can make a report unless we have some idea of the availability and the cost items for fossil fuel, hydro-electric, atomic energy and whatever other types of energy that may be in the foreseeable future.

MR. BARTNOFF: Well, in whatever way we can help. We can tell you how much we burn, what kind of contracts we have, and perhaps some opinion as to the availability of fuel for the next decade.

SENATOR PARKER: Just one further question. Has your Company, any of them that you operate in conjunction with - have any of them done research as far as solar energy or as far as tapping - I don't know what you call - - the core of the earth.

MR. BARTNOFF: The geothermal?

SENATOR PARKER: Right.

MR. BARTNOFF: The geothermal, only indirectly through whatever has been sponsored by the utility companies working through Edison Electric Institute.

We have and are presently engaged in research and development along these lines. We do not do it ourselves. We sponsor it with people who have the competence and who have the interest. For example, close here in Princeton, we have been supporting the program which hopefully at some time in the future will lead to an ability to utilize fusion energy, the energy, if I were to make the comparison, - whereas the energy we now have in our plants comes from the fission, the splitting up of atoms, this would come from a combination of hydrogen or hydrogen-like atoms to form helium or other elements, again with a release of a tremendous amount of energy.

We are also participants with other electric utilities throughout the Nation in the research and development program that is now being formulated and has already been set up through the Edison Electric Institute. You may have read in the papers recently that a head has been appointed for this effort, one of the Professors at California Institute of Technology, and we have a sizeable budget item for the next several years and one which is planned to increase for the next

couple of years, to go into investigations with our sister companies of the type you mention, working on fuel cells, for example, which, if successful, would be a very good source of energy; solar energy. But on your question of geothermal, we haven't done much. And frankly, my own opinion, and I do know something about this, is that the use of geothermal energy is vastly overrated. There was a convention of geothermal experts a couple of weeks ago, so we saw a lot about this in the newspapers. But for one thing, it is not readily available everywhere; and for another, I question its environmental desirability. It is not clean energy. The one power station that is now working in the United States, out on the West Coast, using geothermal energy is one where when you approach it, I am told, you can smell it before you can see it. It has problems also of getting rid of the waste heats, which are quite difficult, and is not environmentally a really desirable source of energy.

SENATOR PARKER: Just one thing further. On your construction sites you indicated your fossil fuels take about eight years to get from your planning stage and you say that's been extended over the time. Why is that? because of the environmental studies?

MR. BARTNOFF: It has been extended up to eight years, and there are two principal causes for this. One is the one you mention. You say environmental, it is not only environmental although the regulations which we now must meet for environmental purposes have placed in the regulatory process so many additional steps that this has been one of the primary factors that have caused the delay. The other has been and continues to be an economic one. We are an industry which is very heavy in its capital investments, where for every dollar of revenue that comes in there is

required a capital investment in plants which is a factor many times greater than the average business in the United States. And we have not had the revenue base to support the capitalization that is required for the expansion that has been demanded of us. It is not that we cannot meet the present requirements of our customers but, if we are to continue to expand to meet projected requirements, we need dollars to plow into plants. And our revenue return has not, in general, been one where these investments have been easily made. This perhaps is also a factor which your Committee should investigate.

SENATOR PARKER: Just to follow through, you said that your costs are so much higher than in other industries. Why is that?

MR. BARTNOFF: I did not say our costs were higher, I said that our capital investments per unit of revenue returned is very much higher. In order to sell a few kilowatts to a customer, we need a plant to produce those kilowatts, and the investment for production of kilowatts is high. As a rule of thumb, I will give you a bit of an example. When I first came into this business with electric utilities it was working for the Westinghouse Electric Corporation and I came there kind of green. I had been a college professor teaching physics and quickly learned some facts of economic life, namely that in making estimates as to what it would cost for a power plant a good rule of thumb was, as a capital investment, \$100 per kilowatt for a nuclear plant, \$60 per kilowatt for a fossil fuel burning plant. Now the ratio is about the same but the dollars we must speak about for an investment in energy producing plants is about \$500 per kilowatt for nuclear, and about \$300 for an oil burning or coal burning plant, an increase in the factor of five over what's less than 17 years.

SENATOR PARKER: Why? What caused that?

MR. BARTNOFF: Well, I mentioned the number of \$60 per kilowatt for a fossil-fired plant in 1955. If we put up a fossil-fired plant now, the cost of the air pollution equipment, the equipment to minimize air pollution, the precipitators and so forth, in itself runs about that sum. When you ask why, though, it is not because of this alone because we were putting in precipitators 17 years ago, not of the same degree of capability but we were putting in precipitators. Indeed, I'm a little bit proud of the fact that our Company, here especially in New Jersey when we were burning coal, had one of the best records of air pollution control in our plants of anyone. But there have been increases in labor costs. And I say, basically the reason has been because of the increase in those costs which go into the fundamentals of erecting a generating station - the cost of equipment and components, the cost of labor, the extra time that it takes to build these plants because of some of these delays, where interest on your construction cost has to be extended over an eight or ten year period instead of over a four or six year period. And there are all these things which added together multiply and amplify each other, so that we now have this actual cost of investment per kilowatt for either nuclear or fossil which is about five times what it was 17 or 20 years ago.

SENATOR PARKER: That would be percentagewise too.

MR. BARTNOFF: When I say five times, these are actual dollars. It's escalating from \$60 to \$300.

SENATOR PARKER: That's for your cost, but your returns have stayed the same?

MR. BARTNOFF: Our returns in New Jersey, our rates in New Jersey, the pennies per kilowatt that we get, had stayed the same - either had stayed the same or

had decreased from the 1920's on until about two years ago, two or three years ago, when, for the first time in the history of one of our New Jersey companies, and for the first time in some twenty or thirty years in the history of the other, we requested and were granted a rate increase from the Public Utilities Commission. We were not granted all of the rate increase we requested, but we were given some rate relief. We are presently toward the end of another application for rate increases. All the hearings have been held and we are now waiting the final decision of the Public Utilities Commission. But the percentages have been nowhere near five times what they were in 1955, nor are we asking that.

SENATOR PARKER: Thank you.

SENATOR SCHLUTER: Is that all, Senator Parker?

SENATOR PARKER: Yes.

SENATOR SCHLUTER: I would like to introduce Senator Frank Dodd, who has arrived, on my far left. Senator Dodd, do you have any questions?

SENATOR DODD: No, not now.

SENATOR SCHLUTER: Senator Merlino, do you have any further questions?

SENATOR MERLINO: No, I have no further questions.

SENATOR SCHLUTER: I have one or two that just came up, Mr. Bartnoff.

Along the lines of Senator Parker's questions, if it takes 8 years to build a fossil fuel generating plant, how many of those eight years, as a rough estimate, are required for actual construction? In other words, from the time you let the contract until the plant comes on line.

MR. BARTNOFF: Well, let me think out loud a little bit, if I may, Senator.

SENATOR SCHLUTER: At the same time, excuse me, maybe you could give us an indication of the time for engineering.

MR. BARTNOFF: Yes. There would be about a six months period from the time we start preparing specifications for bids or suppliers to supply the various components and to do the construction work that we need, and maybe a month or so for evaluation of bids. All in all it might be 8 or 9 months before we're ready to go out with contracts.

There is also a lengthy period where there's an overlap. We don't wait for a contract to be given until we go out with requests for the necessary licenses and permits that we need.

But, all in all, from the date of initiation to the time where we have all of this might take a period of, oh, two to two and one-half years.

Now, we have initiated a policy in our Company, a couple of years ago, which we follow, that we do not begin construction work until we have the necessary licenses. Even though some construction work might not require plant operating licenses and we would have the permits to do the foundation work and whatever else, we are not going to jeopardize our customers' funds by embarking, large scale, on major construction unless we have a reasonable assurance that we're going to have a plant that will be operating.

At one time, when there was a different climate in which we were working we felt that a reasonable assurance was that we would come in and request the permits. Now this is no longer the case. So this is why the lengthy period occurs.

So we might have two and one-half years, or more, before construction at the site actually begins.

Then there might be a period of about four and one-half or five years of actual construction. And I'm giving rough numbers here. If everything goes the way it should, you could conceivably get construction done in four years, three and one-half to four years, but that's quite unlikely.

Then, after the construction is essentially completed, before the plant goes commercial, there's a shakedown period, a testing period; you operate at first at a very low power level, you gradually increase until the day comes when we say we will accept this plant as, what we call, a commercial plant.

So, let me summarize. Two and one-half to three years before any major construction work is done; four and one-half to five years beyond that for the actual construction; and the remainder, which would total up - here I total up perhaps seven years, with the shakedown -- let me say this, when we put in the contingencies, unfortunately our experience over the last several years has been that we have not been putting any on.

SENATOR SCHLUTER: That I think gives us a very good answer to that question, Mr. Bartnoff.

One final question. Yesterday the Assembly passed a bill which would prohibit a deepwater port in a certain section of the State. What is the direct effect or what would be the direct effect of such a prohibition as far as your operations are concerned?

MR. BARTNOFF: I don't really believe that I'm competent to give a meaningful answer to that question. Our concern here is, of course, maintaining a good supply of fuel for our clients. I have not personally studied nor have I followed studies that might have been done in our Company as to the necessity of such a port for a guarantee of a continuity of such supply. I'm not saying that it isn't needed, but

I just don't know whether I can answer your question that it is needed or not. And on questions that I don't know, I'd rather remain silent.

SENATOR SCHLUTER: Any more questions by the Commission members?

Thank you very much, Mr. Bartnoff. We appreciate your and Mr. Ambler's testimony.

The next witness is Public Service Electric and Gas Company. As they are getting ready to give their testimony, I do want to remind other persons who have arrived who wish to give testimony to register, please with our Commission Secretary, Mr. Frakt, who is sitting down here in the front, and to remind everyone that this is the first hearing of a generalized nature. We will have additional hearings. We are going to try to limit our deliberations today to 3 o'clock. We will have an hour for lunch between 12:30 and 1:30 when the Commission will be meeting to handle some of its business.

Mr. McDonald of Public Service.

MR. McDONALD: Senator, may I introduce Mr. Robert A. Baker, Executive Vice President, Public Service Electric & Gas Company.

SENATOR SCHLUTER: Thank you.

Mr. Baker, if you will proceed, and identify yourself first.

R O B E R T A. B A K E R: Thank you, Senator. First, I am embarrassed and sorry to have been late for your first call as I was out of the Chamber.

I am Robert A. Baker, Executive Vice President, Public Service Electric and Gas Company. My responsibilities include planning, design, construction and operation for our Electric and Gas Departments.

Thank you for the opportunity you have given me today to present our viewpoint of the energy crisis in New Jersey. In August 1972, I was afforded the opportunity to testify before a Subcommittee of the House Public Works Committee and presented my views there on the same subject. Since that time, the situation has grown more critical in that we are now being restricted in fuels as well as in our ability to construct new generating facilities.

But before I get into the details of the crisis before us, let me touch on some general background information. The PSE&G service territory is roughly 20 miles wide and 100 miles long, stretching diagonally across the State from New York to Philadelphia. Though relatively small in size, it encompasses over five million people -- roughly 80% of the population of New Jersey -- and more than 75% of the jobs in the State. The high concentration of people and industry in this territory makes Public Service the third largest privately owned electric and gas company in the United States. Our gas service territory is slightly larger, geographically, than the electric service territory.

The Electric Story

In New Jersey, electrical demand has been growing at a rapid rate. The Public Service peak load of 6,201,000 kilowatts in 1972 is expected to more than double to 12,780,000 kilowatts by 1982. To give you an idea of what this growth means, Public Service must build more generating capacity in this period than we have built in the last 70 years or since

the Company was founded. Unless we do this, we will not have enough electricity to go around, and rationing will become a way of life.

Now let's talk about the fuel we use to make electricity. Basically there are two general types of fuel which can be used to produce the electricity that we need in New Jersey. There are the fossil fuels (oil, coal, and gas) and the nuclear fuel.

The shortage of natural gas, to which I shall refer later, has precluded the burning of gas to produce electricity.

State mandated restrictions on the allowable sulfur content of coal which can be burned in New Jersey have greatly reduced our use of coal since coal with a sufficiently low sulfur content is not economically available. Presently, only three New Jersey generating units in the Public Service system, out of a total of 66, still burn coal.

Many of our former coal burning generating units which have been converted to oil for environmental reasons could be reconverted to burn coal within a matter of a few weeks to a few months. These units total over 2 million kilowatts - over 25% of our present capacity. This reversion becomes more difficult and costly as time goes on since much of the coal handling equipment will deteriorate from non-use. The re-introduction of coal, however, would require a relaxation of state air quality standards.

Because of the restrictions on coal and the shortage of gas, Public Service relies on oil as its primary fuel. This makes us very vulnerable to oil shortages and we will

become more and more vulnerable until nuclear capacity can be placed in service. This increasing reliance on oil for the production of electricity not only gobbles up our nation's oil reserves but also clobbers the balance of payments. Since most of our oil is imported, its assured supply is dependent on conditions beyond our domestic control.

Public Service uses primarily two types of oil: No. 6 oil for conventional steam turbine generating units and the higher grade No. 2 oil for "gas" (or combustion) turbines. We, as well as other New Jersey and east coast utilities, are starting to feel the pinch of the current shortage in No. 2 fuel oil. For the first time our oil suppliers are restricting our supplies of No. 2 oil. As a result, we in turn are presently restricting our use of combustion turbines for at least this month and are utilizing instead our older less efficient steam units which use No. 6 oil. The forced use of less efficient units, in turn, causes an excess drain on the nation's total oil reserves.

Nationally, it has been estimated that delays in getting 30,000,000 kilowatts of nuclear capacity into service is forcing the industry to burn nearly one million additional barrels of oil per day.

We are now providing clean and adequate electrical energy for our customers demands. To continue to do this and to reduce our dependence on oil, Public Service is relying heavily on the installation of large nuclear units both during the near term period of the next five years and during the

longer term period of the next ten years. As shown on this chart that we have placed to the right of the Senators -- this chart depicts our planned and installed generating capacity for the next ten years, through 1982. You will see here that the gray areas on each of the bars - recognize that each bar is the capacity entitlement or ability for a given year -- the gray area is the presently installed capacity. Then above each of the gray areas are varied colored strips which, by the key, are illustrative of additional capacity as it's scheduled to come in.

Now there are two curves ascending across that series of our chart. The lower one is the load which we have predicted for the years that lie ahead; the higher one, the red line, represents the load below it plus a 20 to 25% reserve margin which we feel is necessary to keep the lower line a healthy one during periods of emergency or during maintenance periods while the equipment is being overhauled.

Now notice, if you like, that our plans show that the various station units, as they are due to come in, reach up slightly above the upper chart, which represents the capacity which we intend to have, assuming it's possible to get it installed in the time frame that is set up there.

Now on that chart you can see that there are two large nuclear generating stations - Peach Bottom and Salem. Salem is really peach colored, and Peach Bottom is green. You can see those two colors coming in there in the 1974 period, the '75 and '76 periods. They're coming in.

Peach Bottom and Salem are both scheduled within the next five years. Each of these stations will have two units of over 1,000,000 kilowatts each. The stations are jointly owned with other adjoining utilities, primarily these two stations between

Philadelphia Electric and ourselves, plus Atlantic City and the Delmarva Company.

The Peach Bottom units, located in Pennsylvania, are scheduled to be in service in late 1973, this year, and late 1974. Since public hearings for an operating license have not been started, these dates may be optimistic. Of particular concern to Public Service is the delay in obtaining the necessary permits to construct a most important 500-kV transmission line across the Delaware River to Salem County, New Jersey. Without this line, our ability to transport electricity from Peach Bottom and other units in Pennsylvania will be seriously restricted.

The Salem nuclear generating station is presently scheduled for startup in 1975, after having been delayed for four years in the licensing and construction stages. If Salem nuclear generating station had been installed as originally scheduled in 1971, almost 100 million barrels of oil would not have been burned to date and would not be totaling through 1975.

Now let me point out, going back to that chart, if you take the buff and the green colors away from that chart, it doesn't take very long to recognize that the bars no longer reach the top as required in order to have adequate reserve. As a matter of fact by, I think it is, 1977 we don't even have enough capacity to carry the load that's predicted for then.

The seeds of our current problems and our problems for the next five years have been sown over many years. Of paramount importance at this time are the actions which we now take to resolve these problems so that they will not continue to plague us in the longer range period.

Public Service, in conjunction with other New Jersey utilities, is planning to construct two additional major nuclear plants for operation in the late 1970's and early 1980's.

These are Newbold Island and Atlantic. Newbold Island, located about 5 miles south of Trenton on the Delaware River will have two units of over one million kilowatts each. The presently scheduled startup date is 1979, approximately four years behind its originally scheduled service date. Let me tell you about the delays. We applied for a construction permit in February 1970. Public hearings which started in June 1972 were almost immediately suspended. The Atomic Energy Commission staff has recommended that the licensing process be discontinued until the Delaware River Basin Commission allocates an adequate water supply for the operation of the plant. The DRBC is meeting tomorrow to consider action on agreements with respect to water supply requirements for the project.

Now about the Atlantic Generating Station -- Public Service in association with the other New Jersey electric utilities will construct the floating Atlantic Generating Station. This two unit nuclear station located approximately three miles off shore and twelve miles northeast of Atlantic City, will provide 2,300,000 kW. This station will use the plentiful cooling capacity of the ocean instead of the scarce cooling capability of our rivers.

Last year we announced our intentions to construct this plant for service in 1980. The ink was hardly dry on our announcement before opposition arose. There are several bills presently in the New Jersey Legislature which would have

the practical effect of preventing the construction of the plant.

The problems of construction delays are not only limited to nuclear plants -- we have been experiencing delays on almost all types of power plants regardless of whether they are nuclear, fossil-fueled, or hydro.

Here's another example. Two oil-fired steam generating units at Sewaren Generating Station in Woodbridge, New Jersey, on the Arthur Kill, are presently scheduled to provide 800,000 kW in 1977. The units were originally scheduled for 1973. Equipment is on hand. But construction has not been started because of the lack of Federal and State approvals. The equipment has been delivered and is in storage, representing some \$30 million in investment.

Also of vital importance for the future of our State is the proposed Tocks Island Dam. If the Tocks Island Dam is not built, there simply won't be enough water not only for future power plants but, more important, for the people of New Jersey. This is a most important flood control, water storage, and water use project. Without this Dam, billions of gallons of needed water will continue flowing to the sea. It is important to emphasize that if Tocks Island Dam is not built a very substantial amount of electric generating capacity needed in the 1980's will be lost. This capacity is vital to the survival of the Delaware Valley and the related states.

In brief, we believe that we will have adequate electric reserves to meet this summer's peak loads without serious problems. However, any additional construction delays will mean our presently adequate reserve capacity will be quickly lost, resulting in brownouts or blackouts as early as 1974 and

thereafter. These brownouts and blackouts could result in more than mere inconvenience. They would result in service disruptions to the life of New Jersey. Jobs would be lost, vital services would be endangered, and the average citizen would find his whole way of life limited.

The Gas Situation

I would like to turn now to the gas energy crisis which is even more serious in the sense that rationing has already begun. Every gas company in the northeast has restricted, in varying degrees, sales of additional volumes of gas to their customers. Public Service started placing restrictions on additional gas sales as long ago as June 1970.

There exists today a nationwide shortage of natural gas that has now reached crisis proportions. Each year since 1967, more gas has been consumed than has been found. During 1971 for example, the nation consumed about 22 trillion cubic feet of gas while adding only 10 trillion cubic feet to its proved reserves. There is general agreement among those familiar with the industry that reduced gas exploration activity has been caused by a variety of factors such as: the price of gas at the wellhead was held low for too long a period; the Department of the Interior's leasing policy and lease sale timing has been wrong and also aggravated by environmental problems; that tax incentives were reduced at the wrong time; and, of great importance, that the price of crude oil did not encourage exploration.

Meanwhile, the demand for gas, stimulated by environmental regulations requiring the utilization of clean fuels has increased at rates varying between 6% and 8% per year. The resulting difference between available reserves, on one hand, and market requirements on the other has assumed critical proportions.

Public Service purchases its supplies of natural gas under long-term contracts from three interstate pipeline suppliers who in turn purchase their supplies from gas producing companies in the Southwest.

Two of the Company's interstate pipeline suppliers have not been able to meet their contractual delivery obligations since December of 1971, and during 1972 were unable to deliver over 17 billion cubic feet, or approximately 7-1/2% of the gas to which Public Service was contractually entitled. The curtailment rates have been increasing and in fact during January 1973 one supplier was unable to deliver 22% of the gas covered by contract. We expect these curtailments to grow worse in the future.

As a result of a deteriorating gas supply, we have been forced to restrict gas service to the extent that no additional load will be connected unless it is less than 2500 cubic feet per hour. This means the denial of service to new large volume customers such as industry, commercial establishments, hospitals, and schools.

The inability of the New Jersey gas companies, including Public Service, to supply gas to industry has alarmed

the Governor, the Department of Labor and Industry, and the Public Utility Commission. At a public hearing before the Board of Public Utility Commissioners on January 20, 1972, Commissioner Heymann of the Department of Labor and Industry expressed his concern that there be an adequate supply of energy of all types for those industries who are now residents of New Jersey, for those interested in coming to New Jersey and for those who are interested in expanding in the State. It was the Commissioner's view that there are compelling reasons for encouraging industrial development in the State, since there are probably 200,000 people in the State who are unemployed and projections show that 50,000 new jobs a year for the next ten years must be created just to satisfy those residents who are coming into the labor market. It must also be remembered that increasing curtailment rates may place in jeopardy service to existing customers.

Now let me tell you what Public Service is doing to overcome the gas supply shortage and some of the problems we are encountering as we try to bring alternate sources of supply onto our system.

In order to meet our customers' requirements this winter (1972-73), we constructed a liquefied natural gas facility in Burlington Township; we are nearing completion of a synthetic natural gas plant in Harrison, the first such plant in the United States; we have expanded our liquefied petroleum gas facilities at our existing gas manufacturing plants and are constructing a new liquefied petroleum gas

facility in Camden. During the summer, we trucked liquid natural gas from Philadelphia to Norfolk, Virginia and rented storage space for that liquid in another company's LNG tank, and then arranged for delivery of that gas this winter as needed. In addition, we have leased ninety 30,000 gallon railroad tank cars to enable us to move large volumes of propane into our liquefied petroleum plants when needed. (Equivalent volume of gas from one tank car equals approximately 2.7 million cubic feet.)

Now for some of the problems of this winter season. We are completing construction of a synthetic natural gas plant at Harrison, New Jersey. We plan to operate this plant when construction is completed later this month, if required to meet the needs of the public. However, we have not as yet received all of the necessary permits.

We are concerned about the availability of liquid feedstocks that are necessary for the manufacture of gas. For example, last summer we placed under storage contract some 12 million gallons of propane in the Albany, New York area. During the recent cold spell, we attempted to transport a portion of this propane to our plants only to be advised by our supplier that area demand was greater than the supply and he was unable to deliver the product. We have a similar concern about our kerosene contracts. Kerosene, also used as aviation fuel, is needed for the manufacture of gas and if our suppliers cannot live up to the contracts this critical supply of gas will not be available.

During the January cold spell, New Jersey Natural Gas Company, having already cut-off their interruptible customers early in the season, requested assistance in meeting their firm load. Public Service was able to come to their aid, although without absolute confidence that we would be able to meet our own firm load later this winter.

During December we released thirty of our 30,000 gallon railroad tank cars, to which I referred earlier, for a six-week period at the request of the Office of Emergency Preparedness so that propane could be moved from Texas to the midwest section of the country in order to save the grain crop there. As you can see we have been able to assist others to date because of careful planning, but the gas supply situation is growing so critical that we doubt our ability to continue such help in the future.

Service to our interruptible customers has now been interrupted for over 60 days so far this winter in order to assure that the demands of our firm customers can be met. This is the largest period of interruption in our history and is working a tremendous hardship on New Jersey industry. Some of these customers say that they are being forced into bankruptcy because of the gas shortage.

Looking further ahead, Public Service is seeking additional alternate sources of supply. Some of these projects are unique to the industry and represent higher economic risk ventures than would normally be considered by

the managements of utility companies. This is strong evidence of the gas shortage and indicates that we fully recognize our obligations as a utility.

For instance, we formed a new wholly owned subsidiary, Energy Development Corporation, for the purpose of exploring for and developing natural gas reserves. To date, two wells one in Texas and one in Louisiana have discovered significant reserves and we hope to receive this gas prior to the 1973-74 winter if Federal Power Commission (FPC) approval to transport the gas is obtained. We had originally expected quick approval by the FPC. However, we now find that the FPC has set a formal hearing in the case of a similar project undertaken by the Elizabethtown Gas Company. The FPC wants to determine whether it is in the public interest to authorize proposals which encourage natural gas distributors, such as Public Service, to enter the exploration business and deliver whatever gas is produced to their systems. The question of how the gas is to be used is also of primary concern to the FPC.

Late in 1972, construction began on a synthetic natural gas plant in Linden after major obstacles were overcome. Our application for a building permit to construct the plant in a highly industrialized area was originally denied by the City of Linden. Public Service petitioned the PUC for a hearing to determine the need for the plant and following a favorable PUC decision, started construction in October

but over three months of valuable time was lost.

We determined in the Spring of 1971 that the feed-stock for the Linden plant should be imported naphtha because of its availability and lower cost. Over 19 months ago we applied to the President's Oil Policy Committee, Chaired by General George Lincoln, for permission to import the naphtha. No decision has yet been forthcoming.

Public Service and Algonquin Gas Transmission Company have formed a subsidiary, Eascogas LNG, Inc., with the intent of purchasing base load natural gas as a liquid. A contract has been signed with the Algerian National Oil and Gas Agency and initial deliveries are expected to start in late 1975. Transportation by specially designed ships has been arranged and the ships are under construction. This project is on a tight timetable. The Algerian government-owned company insisted on a condition in the gas purchase contract that would allow only about a year and a half to obtain FPC approval to import the gas.

In addition, we intend to purchase, starting late in 1973, a winter season supply of liquefied natural gas from a terminal and storage facility now under construction on Staten Island. The gas will be delivered to us by pipeline under the Arthur Kill. Approval to construct the pipeline

is yet to be obtained from the U.S. Army Corps of Engineers, the Federal Power Commission and other local governmental agencies.

One last example of how gas shortages arise. During 1969, a commitment was made with one of our pipeline suppliers to purchase additional liquefied natural gas service from proposed additional facilities in Carlstadt, New Jersey. The project was approved by the Federal Power Commission in early 1970, but the Hackensack Meadowlands Development Commission, within whose planning area Transcontinental Gas Pipe Line Corporation's land is located, refused to issue a construction permit. This case has gone through the courts and finally approval was given to construct the facility. However instead of Public Service having this critical supply of gas available now, it will not be available before the winter of 1974-75.

Summary

You may have heard some simplified answers to some of these electric and gas supply problems such as solar power, geothermal power, fusion, fuel cells, or the gasification of coal. Unfortunately, these are concepts which have not yet reached the practical application stage, nor are they apt to do so within the next ten years. We are pumping more and more money into research on many of these projects. On others we are keeping abreast of their development.

Going back to that list I just pointed out - fuel cells, we have had operating on our system for three months a set of three, the first three fuel cells ever tied to a utility system. We operated them for three months specifically as a research project. They are now on their way back to the manufacturer with whom we are working jointly. They have given every expectation of a satisfactory approach to this problem. But a number of years of careful research application and more and more study is required before they have any real significance in producing energy on a commercial basis.

In spite of our desire to alleviate and eventually eliminate the energy shortage, the frustrations of trying to bring these projects into being on time is considerable and can be traced to delays in securing the numerous approvals that are needed for each project. The procedures for obtaining approval are ill-defined, they are time-consuming and cumbersome. It is little wonder that there is an energy shortage that may grow into a disastrous situation.

Let me make one thing absolutely clear, New Jersey is in trouble. Energy, both electric and gas, is the life-blood of this State. When its flow slackens or ceases, the effect on the economy and the quality of life for the approximately 7,500,000 people in this State will be catastrophic.

We need your understanding and support so that we can help New Jersey cope with its energy crisis in this decade.

Thank you, gentlemen.

I am happy to tell you, if it is of any use, we will make the records, we will make the work of Public Service available to the Committee in any way that it can be helpful. We will produce, as Dr. Bartnoff has told you for DPU - we will produce such planning records as you are interested in, we will

give you the records of our fuel assemblies, our fuel contracts, our fuel requirements and what we're doing about it. I have told you nothing that isn't available to the Committee in detail. I tried to make it as short as I could.

SENATOR MERLINO: Thank you, Mr. Baker.

Before we go on with some questions perhaps we can take a five minute break.

(Recess)

SENATOR MERLINO: We will reverse the sequence here, Senator Dodd, do you have any questions?

SENATOR DODD: Mr. Baker, you have given us in great detail the next two, three and five year predictions, what is your 20 to 30 year outlook as far as energy needs in the State of New Jersey. And if I could ask you to broaden that, as the third largest utility in the United States, what do you see on the national level?

MR. BAKER: I see a picture where if our demands continue, at it looks to us right now, it will not continue at the same rate but at a lesser rate after about 1990. That's the best judgment we can put on it now. And we don't know enough to say how much less. This doubling in ten years, doubling in eight years, such as we have been going through now, does not appear to be valid after the order of 1990.

SENATOR DODD: Utilizing fossil fuel now, it seems - and with natural gas we have such dwindling supplies globally, is atomic energy going to be the thing of the future completely? Will fossil fuel and natural gas be obsolete within twenty years?

MR. BAKER: So far as power generation is concerned, we think that we can no longer expect to use natural gas or synthetic gas. We think the importance of gas is greater than warrants its use

to generate electricity. We think that nuclear energy will indeed fill this gap and be the predominant supplier by 1980. In the early '80's there should be a breeder reactor which will ease the demand so far as a sufficiency of uranium is concerned.

SENATOR MERLINO: Could you speak louder.

MR. BAKER: Oh, yes. I'm sorry.

Fusion we see coming by the turn of the century as a practicality. As Dr. Bartnoff has mentioned, fusion is in an earnest state of research and development. Princeton is a leader in it. We are all supporting the efforts being made at Princeton but it has a long, long road to hoe before it can be made at all a commercial, useful item.

Geothermal, we don't know that it will catch on to us here at all. The potential is widely debated. You can read almost anywhere that it is a marvelous solution and that there are ample supplies of it, and at the same time you can find articles that are certain of just the opposite, that it has a limited possibility and it is not in itself an environmentally acceptable picture, as again Dr. Bartnoff pointed out to you. We have done nothing with it yet because it just isn't in our territory and we don't think it is useful in New Jersey.

Solar energy has many problems. This again is hardly the geography where solar energy is going to be quickly a useful application. There is, to each of these items and others, a long time ahead - and we're talking and you are here and we are here because of the short-time problem as we see it. We're worried and you are worried about what happens in five years and ten. Ten years is the only real estimate that we concentrate on producing. And we, of course, continually vary them, that is we continually re-edit the whole ten years. We're constantly

at it; we never really stop on a schedule of planning ahead. They change monthly as the needs come out.

SENATOR DODD: Our energy crisis in New Jersey now - is this limited to New Jersey or the northeastern United States, the whole of the United States, or is this a global problem?

MR. BAKER: I can't speak to it being a global problem but it is certainly a national problem so far as we can determine.

I referred in my prepared remarks to you to the inability of the west and the central west to get enough gas just last month after they had a wet spell followed by a very cold spell and they couldn't dry out their grain for storage and they couldn't, at the same time, get enough gas to meet their needs for this purpose.

We know that it was a very serious problem in Texas just a week ago, ten days ago I expect it is now, when areas in Houston and Austin, sitting practically on the gas wells, so to speak, were unable to get enough gas and had to close down schools and commercial institutions where they had firm gas contracts, primarily because of a severe drop in temperature. But, nonetheless, there was no gas in storage to meet this extraordinary demand.

I think this is a countrywide need for it. And information that comes to us from Europe indicates that there is some of the same thing there.

As people find they like to use gas fuel, that's the real spur. Gas is nice to use; it is clean and it's nice to handle if you know how to do it. But the basic problem has been to get rid of a smokestack that is black or otherwise dirty, and the nice thing to do is to move it to gas. So everybody has tried this.

SENATOR DODD: Is that a commercial message?

MR. BAKER: No. Indeed not.

SENATOR MERLINO: Anything more?

Senator Parker.

SENATOR PARKER: Mr. Baker, you indicated on page 6 that one of your problems was the delay in State approvals. Can you elaborate on that?

MR. BAKER: The Sewaren unit.

SENATOR PARKER: You referred to Sewaren but I think you also in your statement generally referred to the problem of getting approvals, cutting your time way down.

MR. BAKER: Well, so far as Sewaren, it's hard to elaborate and at the same time generalize because there was a conflict in the needs for approval. Specific approvals are different between nuclear items and fossil items. In this particular one in Sewaren there is a lengthy problem hanging over the 1899 Rivers Act, federally, which points to not adding to the heat in commercial navigable streams. And here we have been unable to arrive at a clear picture in that the definition of the Act is unclear as to what constitutes an increase in temperature with respect to where you measure. We have a problem on --

SENATOR PARKER: Excuse me. That's a Federal matter.

MR. BAKER: Yes.

SENATOR PARKER: I'm more concerned with what we might be able to do here to speed up approvals in New Jersey. The Federal Government, everybody has problems with them, whether it's sewer money or what-have-you, but what types of approval do you need in New Jersey and who do they come from, the PUC, the Department of Health, Environmental Protection?

MR. BAKER: All right. I'm with you now. The biggest problem that we have here with respect to

the Sewaren picture in the stream is the Department of Environmental Affairs. We're waiting for a permit to recirculate water from the Arthur Kill through the condensers and back into there, which will increase the temperature of that stream, no question about it. But the question is, how can we answer the questions that are the problem to the satisfaction of this Department.

SENATOR PARKER: What are they worried about, the environmental impact study for that particular area?

MR. BAKER: Well, let me see if I cannot get some help here. Behind me is John Betz, who is Vice President in charge of our electric operations and he has been pretty deep in this with Commissioner Sullivan. If you will let me, I will ask him to speak to this point.

SENATOR PARKER: Fine.

MR. BETZ: What Mr. Baker is talking about is located on the Arthur Kill in Woodbridge, Sewaren. The discharge of heat to the Kill, we believe would be permissible in that there is a one and a half to three temperature rise and you can't exceed 85 degrees. The question is, where is the 85 degrees, at the point where you're discharging, upstream, downstream, etc. There has been a discussion and we cannot seem to get clarification of this particular thing with the Department of Environmental Protection who also is working with the Interstate Sanitation Commission which is sort of bi-state - New York-New Jersey. And, of course, then you have the Federal Environmental Protection Agency. All of these people meet and talk with us in groups, together. So what we're trying to achieve is a statement as to what is acceptable and we, so far, have not been able to get to this point. If we could, maybe there is something else that we could do.

SENATOR PARKER: Is it that they don't agree with what you're putting in or is it because you're not getting cooperation from the Department in getting your permit approved? I mean, there is a big difference if you're running into an administrative problem and there's a big difference if you're not meeting the standards that have been set up.

MR. BETZ: I think the problem is interpretation of the standards, as Mr. Baker said.

SENATOR PARKER: Is this the New Jersey standards?

MR. BETZ: Well, in areas where there is Federal control, the State may have more stringent requirements than the Federal but may not have less of a requirement. I think the State and the Federal requirements are about the same. But we have to get a State permit before we can get the Federal permit.

SENATOR PARKER: Well, my concern is, and I think the concern of all of us here - Sen. Dodd and I are on this Committee in the Senate -- we're concerned with whether or not the Department of Environmental Protection has sufficient staff to process these applications, whether they're meeting their demands; and we know they're overworked, especially in some areas, and maybe some arrangements could be made that the approvals could be speeded up, if you will.

MR. BETZ: There is a proliferation of permit requirements. There is quite frequently, at least we seem to experience, the idea that Department A doesn't want to give a release before Department B, who also has to give approval, before Agency C who also has to give approval. So you go looping around in a circle, stalled.

MR. BAKER: We sometimes think of it as a race to see who can be last in the matter of permits. For example, on this Sewaren - to pursue it just a little bit -

we met with the Commissioner in July, I think it was July 1 or July 11, over several problems, to wit, Newbold Island and Sewaren, and in July we were assured, during this particular meeting, that the Sewaren problem could be worked out, it was thought, and we would hear shortly. We have worked with people from the Staff, at their request, from time to time since then, but here we are virtually the 1st of February and we're no closer to it than we were before. And this is adding to this schedule, which I think I pointed out, - this unit was originally scheduled to run this year, and, to us, running in any year means in time for the summer peak load. So here we are in '73 and we have yet to turn a spade on that property. We are now four years late with this particular thing.

While I didn't say it because it didn't seem to speak, at the time, to this question, because ultimately you're bound to ask, what are you doing if you're so late with everything that you planned by that schedule to put in -- what we're doing is installing simple cycle gas turbines. We call them sometimes combustion turbines.

SENATOR PARKER: Jet engines?

MR. BAKER: Jet engines. We have a lot of them. We're the largest airplane company in New Jersey, the chances are. We have well over 100 such engines. These apparently are acceptable, but it is not an acceptable engineering solution to the problem. They are not efficient. They use high grade fuel, which is fuel which shouldn't be wasted. Their maintenance cost is high. They are noisy. And they are inefficient compared with what could be done. They are no substitute for a nuclear plant under any conditions; they're no substitute, really, for anything except as a peaker that doesn't run very often, for fire and emergencies. In short, I call them a fire engine. That's how often

they should be used and not any more than that. They should not be used to carry base loads.

SENATOR PARKER: Mr. Baker and Mr. Betz, I still am not sure that I have gotten what I feel is an adequate answer to the problem of the permits on a State level. You said that you have been working since last July to bring this problem out. Is the problem the approval through the Department, and their procedure, or is it the fact that you are not meeting their standards.

MR. BETZ: Let me try this again. First of all, what we're after is a permit from the Corps of Engineers.

SENATOR PARKER: That's under the Harbors and Rivers Act.

MR. BETZ: That's right, in order to erect this plant. We filed for this permit a long, long time ago, several years ago. At that particular time the 1899 Refuse Act had not really been involved in thermal discharge into streams. Shortly after we filed, all of a sudden it was involved, it was being interpreted that way. The Corps of Engineers did not know, when we went to them asking what should we do about this - didn't know what to do because they didn't believe that the 1899 Refuse Act had any jurisdiction over this particular permit that we were after. So they were sitting on their hands, in effect, saying it's not so. This is the complex nature of this thing.

As time went on, it became apparent - it's like, you can't put me in jail but you're in jail anyway -- it became apparent that it was so and it was being interpreted this way. As a result, the Corps of Engineers said to us, "you will have to develop an environmental impact statement." This was, I would say, about a year ago. We said, "Okay. What

shall we put in the environmental impact statement?" They said, "We'll have to think about this." And they thought. Subsequently, they said, "Here are the standards we think have to be covered in the environmental impact statement."

We worked with them and got out this environmental impact statement. It is then circulated, as you understand, to all of the affected parties, states, municipalities, the Delaware River Basin Commission - if it happened to be the Delaware River Basin - and so forth and so on.

That is how you get to the point of talking to the Interstate Sanitation Commission, the Department of Environmental Protection, and so on.

Now we start trying to again determine just precisely what it is that we have to meet. And I am not an absolute expert on this but it's something of this order - a $1\frac{1}{2}$ degree temperature rise, maximum of 85 in the river. The Interstate Sanitation Commission said if there's anywhere in the Arthur Kill that's above this temperature then you can't add any more heat. You can't find this in the Act. So what is happening is, you're trying to clarify this tone, this instruction, on the spot, working with these several agencies, and it is very, very difficult going.

We can make an adjustment to Sewaren. It is possible for us to do something in order to reduce this temperature if we knew what it was we were supposed to meet. And, unfortunately, at this particular point - well, I don't know, I've been on vacation for eight days -- eight days ago we didn't know what we had to meet.

MR. BAKER: Nothing happened while you were away.

SENATOR PARKER: But our State Department of Environmental Protection - everything you've gone through so far hasn't had anything to do with our Department.

MR. BETZ: Yes, it has. The State Department of Environmental Protection has not said to us and to the Corps of Engineers, "We approve this installation." That has not happened. That's all we want.

SENATOR PARKER: What type of permit is that? Is that wetlands or riparian lands or what is it, just an environmental okay?

MR. BETZ: You would have to okay the environmental impact statement of the pleading agency which is the Corps of Engineers.

SENATOR MERLINO: This you haven't done.

MR. BETZ: I haven't got.

MR. BAKER: We filed it.

MR. BETZ: We filed it. Oh, yes.

SENATOR PARKER: But the Army Corps of Engineers haven't approved it, therefore how can our people?

MR. BETZ: No, the Corps of Engineers can't approve it until all of the agencies to whom it has sent the environmental impact statement come back and say that they agree that this is a viable project. So The Corps of Engineers can't do anything at this point.

MR. McDONALD: They're the primary agency, the Corps of Engineers. They submit it to the other agencies and they are supposed to report back.

SENATOR PARKER: At this point, as I understand it, our Department of Environmental Protection is holding it up.

MR. BETZ: That's right. That is not to say there won't be another department after that to hold this up. But right now they are.

SENATOR PARKER: And as I gather, the reason is over exactly what the temperature should be in the discharge.

MR. BETZ: That's right.

MR. BAKER: Senator, I have something here I would like to offer you. I don't have multiple copies of it but it is an as yet not complete four page diary of specifics that I think has something on your question as to what permit problems we're up against. I have these pages which represent the record between June 12, 1970 and August 22, 1972, all simply tied to the two fossil plant units we want to build at Sewaren. It is not updated but I am having it updated. It came a little too fast for me. It's the only copy I have but I will get more for you. I think you should have it. It has more to do, I believe, with answering your question than we can do orally.

SENATOR PARKER: Back and forth.

MR. BAKER: Yes.

SENATOR PARKER: All right.

On the following page, page 7, you refer to brownouts and blackouts, and I just wonder how much of our tie-in goes into the Metropolitan New York area. In other words, if you serviced, without a backup, just the New Jersey residents, would you have any difficulty during the peak summer loads with all the air conditioning? Or is it only in our reserve that we have to back up the City of New York and the City of Philadelphia? Can you give us some references or base points?

MR. BAKER: The best references that I can give you are that the power flow records, which are a permanent record, would show that at the times of such high peak loads when New York City problems were very acute, we were not helping them so far as generation was concerned. There have been times when we have wheeled power from

the West through the PJM system into New York through the interconnections that we have. But there is no reserve capacity for the Pennsylvania-New Jersey-Maryland interconnection companies, in their agreement, to help New York City. There are instances when we have helped them and there are instances when they have helped Public Service. But there is no calculation and there is no agreement, implied nor specific, that provides for help in terms of peak loads.

John (Mr. McDonald) asked whether that chart has anything at all to do with carrying reserves for anybody else. I see now there is a lack of clarity. Each of the companies who make up the PJM system - Pennsylvania-Jersey-Maryland - has this type of calculation in its planning by itself and for itself. That reserve capability, which is 20% up to about 1977 or '78 and then becomes 25% because at that point we expect a predominance of larger turbines which require more reserve capability - but that reserve capacity is strictly and solely calculated for the Public Service Company and its own customers. There is no reserve provision for anybody else in there nor have we any understanding with them.

SENATOR PARKER: You also made mention of Tocks Island and the waterflow. And I know there has been a position taken by the Governor and we hope to get his - or the Department of Environmental Protection. We would like to have available your studies on that because it does affect Newbold Island and I understand you have already done substantial amounts of site preparation at Newbold Island.

MR. BAKER: We have. We've done as much as we're legally allowed to do and then filled the excavation to keep it stable and also to keep from spending the pumping money that was involved until we should get back on the track again. Our picture on

Newbold Island has been, for a long period, the understanding that we had to maintain 3,000 feet per second at the so-called Trenton Gauging Station at all times, and we have suggested that we would do this. We would not allow Newbold Island to conflict with that standard should that be the one to be let go, so to be held on to solidly we would cut back on the station operation of the river flow to get to the point where its free flow would be less than 3,000 feet per second.

SENATOR PARKER: I have some difficulty in understanding this, and I have discussed it with Jack and some of the others, especially where you have a deep channel which is tidewater. It's somewhat difficult for me to conceive that the flow coming down from Tocks would seriously affect what you're taking in. But that's one of the reasons why we would like to know your position.

MR. BAKER: I think I can ease that problem. The flow of fresh water coming down the Delaware from its headwaters maintains a line of demarcation far south of Newbold Island but at a point where the water which is taken in at Torresdale for the City of Philadelphia water supply becomes too salty to be palatable, and it's the integrity of that line --

SENATOR PARKER: You're encroaching on the salinity up river.

MR. BAKER: Right.

SENATOR PARKER: All right. I didn't realize that was the problem. I know in periods of low rainfall it does create a problem and we do have many salt water fishes coming up, bass and all, - coming right up in the Rancocas. Fishing off your place is good.

MR. BAKER: I'm glad.

SENATOR MERLINO: Would the building of the Newbold project be dependent on the development of

the Tocks Island Dam.

MR. BAKER: It has been so stated. Earlier in our plan for Tocks Island we were met with a demand that we had to put in cooling towers and we agreed to.

SENATOR PARKER: That's at Newbold, you mean.

MR. BAKER: Newbold, yes.

SENATOR PARKER: Well they're already scheduled for there, aren't they? tentatively scheduled for there? Didn't you tell us you had four cooling towers scheduled for there?

MR. BAKER: Four cooling towers, right, two per unit. Originally we thought we should not need to do this, that the heating effect on the river would not be so noticeable as to require this. We agreed to do this because the overwhelming sentiment was toward maintaining an integrity of not heating the river. At that point when we agreed to put the cooling towers in we get to the need for drawing water from the river which itself will be evaporated and not go back into the stream. So that's where we come into the problem of requiring water all the time. Of course, we understand the Governor's position on Tocks Island and it may be a long time before Tocks Island is built, if it is ever built. But, meanwhile, we have offered to operate the plant in accord with the minimum flow requirements as the Department of Environmental Affairs has presently set it out, or rather the DRBC has presently set it out to be, and we're willing to stay with that as a proper rule, recognizing that problem.

SENATOR MERLINO: You stated the problem with the proposed Linden plant, the use of naptha. Is the problem with the naptha because it's being imported or is it because it's an inferior fuel?

MR. BAKER: Oh, I don't think getting the naptha is a problem at Linden anymore than a synthetic natural gas plant is anywhere. Here we have a problem which is not State. So far as I know, the State has no concern yet, has evidenced no concern about whether naptha shall be imported into New Jersey or not. This is the Office of Emergency Defense worrying about importing a fuel which might be deprived to us in times of a national emergency. And the OEP has simply not said anything about it. They just haven't answered it. We have traveled to Washington frequently and asked for a status of it and it's regularly going to be solved in a few months. But this has been several years.

There isn't enough naptha. There is no provision for enough naptha to operate all of the synthetic natural gas plants that are planned, as the only way to meet this fuel shortage. There isn't enough domestic naptha. So there is a problem down the street which is just one part of the fuel crisis, as we see it.

SENATOR MERLINO: And what is the life expectancy of one of the generating plants, the nuclear plants?

MR. BAKER: Well, no one knows yet because they are not old enough to have been retired for obsolescence. The fossil plants that we are using have a life expectancy of the order of 45 years. We doubt very much that there is anything in the design of a nuclear plant which will shorten that. We don't know yet, but it might. We suspect that the duty on it is going to be no greater than the duty on a fossil-fired boiler, and that really determines what the life expectancy of the entire group is. We have numbers of times changed boilers and continued to run turbine generators and associate electric equipment. So that

the mechanical portion of a nuclear plant should have no different a life than the mechanical portion of a fossil-fired plant, that is the boiler. How this will work out depends - history will tell us. But, personally, I think the nuclear plant will last just as long as any other one.

SENATOR MERLINO: And I presume that the fuel to operate the nuclear plant - I believe you say uranium in some form or other?

MR. BAKER: It is indeed.

SENATOR MERLINO: And what is the prospects of a supply of uranium sufficient to operate these plants?

MR. BAKER: We think that there is a supply of uranium, domestically, sufficient to carry the planned nuclear units of this country until the breeder reactor becomes a reality. And the breeder reactor, by its original design, produces more nuclear fuel than it consumes. So it will, in addition, not only do what it is supposed to do in its generation but in its production of nuclear fuel for other use will alleviate any fear about the shortage of uranium, as we see it, in this country. I think this is one way to keep the fuel production facilities in this country.

SENATOR MERLINO: But to meet the present crisis, would the demand for peak season electricity be reduced with perhaps a raise or a surcharge in the rate during the peak periods in the summertime?

MR. BAKER: I'm not sure I'm competent to answer that, that is if the rates went higher seasonally would this cut down the demand. I'm sure it would have some affect on it. I don't think I'm competent to say how much. I know the cost of water, as a utility, potable water, is a lot higher than it used to be and yet I hear no conversation that indicates

people are using less water than they were before just because it's costing more.

SENATOR MERLINO: Senator Dodd?

SENATOR DODD: I just have one further question, Mr. Baker.

What process do you use now or would you use in the future for the disposal of atomic waste generated from the plant?

MR. BAKER: Well, we return this waste to the Atomic Energy Commission's control and their present proposal is burial for the ultimate waste. That is, we turn back an amount of spent fuel which can be reprocessed and worked down to recover whatever is left in it, but the ultimate total waste is scheduled for burial in a location yet to be determined, as far as I can see.

SENATOR PARKER: Talking about these various other energy processes, has anybody done anything with laser? I know that generates tremendous heat.

MR. BAKER: We have not. I can promise this, I think that any work with laser - laser work is being done over in Princeton right now in connection with the studies on the fusion plant, and it's quite possible that ultimately we will transmit electricity along a laser beam. We are not doing anything. We think this is too far away for us to handle. We're trying to stay more practical.

SENATOR MERLINO: You're trying to hit July of 1973.

SENATOR PARKER: Well assuming from what I gather, you're trying to get away from fossil fuels, moving from them because not only don't they generate as much but I would assume their supply is limited.

MR. BAKER: Getting away from, you mean in favor of nuclear?

SENATOR PARKER: Nuclear or some other type.

MR. BAKER: We certainly are. One of the main reasons is, as you heard Dr. Bartnoff point out this morning, there is a considerable improvement in reliability in the generation of steam from nuclear fuel than there is in generating steam from fossil fuel. The deterioration effect on the boiler is greater than the deterioration of the nuclear reactor.

Now the other reason which we haven't mentioned, it's hardly in place here, is that it produces a kilowatt hour of electricity cheaper than you can produce with a fossil-fueled plant. And while we've almost in this crisis gotten away from worry about how much does it cost, because when you don't have something then the acceptable price goes pretty high against what you're willing to spend if there is competition for a commodity, the main reason why all of us are involved in nuclear efforts has been, and continues to be, the fact that you can do it cheaper, you can produce electricity cheaper than in any other way. And we get into this now because of the environment. That was not the original premise that brought us into this. John (Mr. McDonald) wants to be sure that I recognize that cheaper production means cheaper rates, lower rates, to the customers. You understand, I am sure, that we're all in agreement with this.

SENATOR PARKER: Just one thing further. In the selection of your sites for your nuclear plants, you apparently have set up criteria which you use in selecting particular sites, do you not?

MR. BAKER: Yes.

SENATOR PARKER: Would you make that available to the Committee?

MR. BAKER: Indeed we will. We have quite a treatise on this one.

SENATOR MERLINO: Thank you, Mr. Baker.

Is there anyone else from Public Service Electric and Gas, other than Mr. Baker?

MR. McDONALD: No. Mr. Baker testified for both gas and electric.

May I just add, Senator, you asked a question and I am going to see if I can get the information for you. I think it will be a purely theoretical answer. But did I understand you to say, would seasonal surcharges cause a lessening of demand on electricity? Is that what you wanted?

SENATOR MERLINO: Yes.

MR. McDONALD: I will see if I can get an answer for you. I am sure it will be theoretical in nature but we will get it.

SENATOR MERLINO: Thank you very much.

MR. BAKER: Thank you.

SENATOR MERLINO: I think this would be a good time to break for lunch. We will be back here in one hour.

(Recess for lunch)

Afternoon Session

SENATOR SCHLUTER: Can I have your attention, please. I wonder if we could come to order for the afternoon session.

For those of you who arrived late, this is the public hearing of the Senate Ad Hoc Commission on Energy and the Environment. We have a reporting date of March 19. For those of you who wish to testify, please register with our Secretary, Mr. Frakt, who is down here in the front row.

The Commission members are: on my left, Senator Dodd; the gentleman who will be sitting here will be Senator Parker; I am Senator Schluter; and on my right is Senator Merlino.

We did have a meeting of our Commission and we have scheduled two additional hearings. The next hearing will be February 6 - we hope in these chambers - and it will deal primarily with energy and energy sources. The hearing after that will be on February 20, again on a Tuesday, at ten o'clock. And we are not sure whether it will be here or in another auditorium in the State House Complex. If a fourth hearing is needed, we have tentatively indicated that we would hold one on March 2. That is on a Friday.

The Commission will be making field trips in the intervening weeks and will be meeting in executive session to study the various reports and the testimony which is given.

Senator Merlino reminds me that basically the February 20 hearing will be in the environmental area. But we are not excluding in those two hearings testimony from other groups, other than those that have spoken out.

Does any Commission member have anything to say at this time?

We have as our next witness a representative of

the Sierra Club.

This afternoon we are going to try to complete our work if we can by three o'clock. We don't want to cut anybody short, but we would appreciate the direct testimony to be given as rapidly as possible and we will keep our questions to ones that are pertinent and relevant.

D R. R. S T O C K T O N G A I N E S: Good afternoon, Senator. My name is Stockton Gaines. I am Chairman of the New Jersey Chapter of the Sierra Club.

I have given you all a copy of my statement. I would prefer actually to make some informal remarks rather than reading through this statement if that would be satisfactory with you. I will cover some of the same points.

SENATOR SCHLUTER: If you will, Mr. Gaines, cover the major points so that the others in the audience as well as the Commission members can have a general idea of the thrust of your presentation.

DR. GAINES: I will do that.

First, I think I should comment about whether we think there is an energy crisis or not. That question seems to come up repeatedly. We definitely do believe that there is such a crisis. It has been coming for quite a while and we believe that it is going to be quite a severe one. It is hard to say how to characterize just how bad it is going to be, but one way to look at is perhaps to consider the difference between having a fire in your house and having an explosion in your house. It is going to be, I think, fairly severe before we find ways of solving all of the various demands that are coming upon us for energy. It is kind of a question of whether we will see major blackouts or brownouts or whether we will see smaller kinds of reduction in satisfaction of energy demands such as we have seen in the schools that couldn't get gas for heating.

Why is this coming about? A lot of blame has

been placed, shall we say, on environmental factors and that perhaps is a correct thing to say, except that the term "blame" might be rather transcribed into an area of realization of the importance of environmental factors. For a long time we have had energy cheap and the reason it has been cheap is that certain kinds of costs associated with production or transmission or whatever of energy have not properly been taken into account in the cost that we see for that energy to the consumer. He pays for it in other ways, of course. If a stream is messed up and he would have gotten some advantage of it, it is messed up. If we have to strip-mine large sections of our country in order to extract the coal from it ---

SENATOR SCHLUTER: Pardon me. I wonder if you could speak more directly into the microphone and more slowly.

DR. GAINES: All right.

Having stated that I think that there are environmentally associated factors to this energy crisis, I also would try to make it clear that those are now important factors. Really they come about because we are more aware of the world we live in in some sense and have shifted perhaps our priorities, our sense of values, within this country within our culture.

There is not much to be done about that. I can tell from the group that I represent that we are the leaders to try to see this change come about.

This does mean, for instance, as far as the power companies are concerned -- they have described some of the problems they have with licensing and that sort of thing. These problems come about because of the fundamental change in our society. The ground rules for them are changing and this is causing them licensing problems and other kinds of problems. But there is a

reason for it and, we think, a legitimate reason for it.

We have new things to take into account. The licensing requirements place new requirements on these companies - new demands that they must meet. We think that these demands are legitimate ones and that there is no easy solution to the problems that are raised by the kinds of questions that these licensing demands are addressing themselves to.

Let me look at some of the different kinds of energy problems within the State. Basically we get energy in three forms: natural gas, oil and other refined petroleum products, and a little bit now, and more in the future, of nuclear energy. Natural gas is in very limited supply. I don't want to say much more about that right now. In any event, it seems to be outside of State control whatever happens in this regard.

Oil and petroleum products -- well, we have problems in how we get it and how we use it. I guess a good part of the reason for these hearings is the concern over the supertanker deepwater ports that have been coming up. This concern is quite legitimate, of course; the Sierra Club, among others, has been making a big fuss about the amount of damage that occurs because of oil spills. It is worth pointing out at the present time the oil is coming in by sea anyhow and there are large numbers of ships that come up to the Delaware Bay or to the Raritan-New York Bay and lie to and lighter. Then these lighters come up into the river or into the port facilities and when the ships themselves are light enough, they come in also. This is completely unregulated and imposes just as great a hazard, perhaps greater, for oil spills and other kinds of damage than the supertanker ports will and yet we don't seem to know about it or pay any attention to it. It certainly ought to be considered.

The next question has to do with what we do with the oil when we get it. Well, generally, we refine it.

In the past in this country, there has been satisfactory excess in refining capacity, but that is nearly gone. We haven't been building new refineries throughout this country in recent years at the rate we used to and we are beginning to see the shortages of refined petroleum products now and we are going to see pressures to build new ones, to put in pipelines some place to supply them, to get the oil to them.

We need, as a state, to be very careful about the kind of controls that we have on what happens to this refining capacity so it doesn't grow in a helter-skelter and environmentally very damaging way as it has in the past.

You have before the Assembly now - I think it is A 1429 - which is the Coastal Area Facilities Review Act that addresses itself to this problem. It provides the State with the kind of planning and licensing procedures necessary to make sure that we can have a handle on what happens here and don't have to accept what is economically in the companies' best interest when this comes along.

Another area that affects this greatly is how we use energy and in petroleum, the biggest one, it has to do with the relationship between the use of the automobile and mass transit. We can save a lot of energy, a lot of petroleum products, if we can put more emphasis on mass transit and reduce the dependency - I would say overdependency - on the automobile in this state.

Electric power. Well, we have heard a lot already today about the problems associated with production and increasing production capacity for electric power and they seem to me to be accurate. The power companies have their problems. I am glad I am not a power company executive right now. But those problems come about from a belated realization of certain kinds of environmental problems.

Let us look at some of those problems that are really facing the State right now. Power plant siting is one. There is a bill coming up, A 1673, that addresses itself to this question. It gives the citizens some input and those environmentally concerned some input on where power plants go before we are presented with the fait accompli by the power companies. I would hope that gets serious consideration by everybody concerned about this power crisis.

Electric power turns out to be one of the major users of water in this State. Power plants operate very inefficiently. A nuclear plant today runs somewhere between 30 and 32 percent efficiency. It means more than two-thirds of the energy that it generates, conversion of fossil fuels or nuclear fuels, is wasted. It goes into heating the environment. In the case of Newbold Island, for instance, it is going to evaporate the Delaware water into the air and that causes the concerns you have heard about. So we need to think about that kind of thing and think about what ways there are of solving this heating problem.

Let me address myself to one other area now and then I will stop and it has to do with how energy grows and how much more capacity we are going to need. The power companies make certain projections which are pretty much based on what has happened in the past, tied in with projections of production to population, etc. You saw a chart this morning that had a projection on it. Of course, the truth is that there are a range of projections. They picked what they think is the most likely projection, depending on what they thought were the factors that would influence that. But there are other influences and the Legislature of New Jersey can exercise an influence on that. For instance, if we go to a rate structure which more properly reflects the

costs of electric power, in particular, it is going to have some effect on that demand curve and probably a substantial one. At the present time we have a rate structure which actually encourages the use of energy, in that the big user pays less than the small user. So we put the emphasis wrong for a period of time when we have a crisis, for a period of time when that accelerated economic growth, because we thought energy was cheap, was appropriate. I think it is time to rethink that one.

I think I have said enough of the things that are on my mind at the moment to stop now and let you ask some questions.

(Dr. Gaines' written statement can be found beginning on page 75 A.)

SENATOR SCHLUTER: Thank you, Dr. Gaines. Keep in mind that there will be a public hearing later for environmental groups, so to speak, to give us their views.

You ended up on a very provocative point and that is the rate structure and high initial costs for consumption of electricity and how it tapers off. Do you have any suggestions on how that might be structured differently?

DR. GAINES: This is going to be a very sensitive and difficult problem because an economy and really a whole culture depends on energy and when the price of that changes in any drastic way, that is going to be a major shock to our society.

An initial, fairly obvious thing to do - but you have to decide what its impact is - is to make the rate uniform; that is, everybody pay the same amount. Or, if you are going to allow for some fluctuation, have that depend on the time of day so that you can get some smoothing of the load. So it is more expensive when everybody wants to use it and you hope that some of the users will go to off period. But, at least, I would say, a flat structure seems reasonable right now.

SENATOR SCHLUTER: With respect to atomic energy - we heard this morning that the cost was perhaps 67 percent more than the cost to generate electric energy from the regular oil-fired systems.

DR. GAINES: Excuse me. That is capital cost?

SENATOR SCHLUTER: Yes, capital costs.

We have the situation of Newbold Island where there is an atomic energy plant proposed. Can you relate your views with respect to the Tocks Island Dam and its effect on the water flow in the Delaware for cooling of the Newbold facility and why in your opinion it is either desirable or undesirable?

DR. GAINES: Yes. We have a water resource problem throughout the State of New Jersey and within the Delaware Basin, itself, this is quite a critical thing. If we don't need to use too much water to satisfy our electric power demands for evaporative cooling -- we can't go to once-through cooling. The amount of power they want to build along the Delaware simply won't permit that much heating of the river. So they would have to go to evaporative cooling if they didn't go to some other form of cooling. For instance, there has been some discussion of dry-cooling towers rather than wet-cooling towers. This means that the waste heat heats the air directly instead of essentially evaporating water to carry that away.

If we build Newbold Island, it is probable that we have to find some way of supplying more water. I might say in this connection you have heard already there is a hearing tomorrow by the DRBC which includes a proposal that would require the power companies -- There are two of them really that are asking for more water from the DRBC and are held up in licensing by the AEC until the DRBC tells them what they can do in this regard. The proposal there is that the power companies state that

they will construct off-river storage of water and pay for it and let the DRBC regulate its use so as to maintain flow in the Delaware if Tocks Island doesn't go through.

So here we have the DRBC, itself, suggesting that there is a viable alternative to Tocks which would supply the water for Newbold Island, if the power companies can afford it.

Another thing to point out is that if we build Tocks Island and the power companies get to use that water but don't pay any differently, that amounts to some sort of a subsidy of private power companies by public funds.

In the Corps of Engineers' projections, they assign a definite cost benefit to public utilities for that water but there is no present notion of corresponding charge to them.

SENATOR SCHLUTER: I don't want to carry this on too long, Dr. Gaines. Does your organization have a position with respect to the Ocean Sanctuary contemplated by the present Assembly Bill which is in the Senate?

DR. GAINES: The Sierra Club supports that bill.

SENATOR SCHLUTER: You support that bill?

DR. GAINES: We certainly do.

SENATOR SCHLUTER: Do you have information or documentation on what would be the damaging effects with off-shore drilling or with off-shore pipelines?

DR. GAINES: I believe that most of the off-shore drilling being proposed is going to be outside the three-mile limit that that Sanctuary provides. So I think drilling is out of bounds there.

The bill, as it now stands, would prohibit pipelines. If it is at all possible to do that and have our culture and economy survive, we certainly want to do that.

SENATOR PARKER: Can you go back to Newbold Island for just a minute? You are suggesting that maybe the

power company build a lake in which to store water and then use that in the cycling program rather than taking it out of the Delaware itself?

DR. GAINES: The proposal that is going to be considered tomorrow by the DRBC at its special hearing involves as an alternative to Tocks the construction of a lake, a dammed body of water off river, with water to be taken from there during high-flow periods of the Delaware and released back into the Delaware during periods of low flow, sufficient to compensate for the water that would be taken by the power companies. A power company, for instance, at Newbold Island, would take the water out of the river right there and compensating water would be released some place else.

SENATOR PARKER: How big a lake would be necessary just on the evaporating, assuming millions of tons of water evaporate in those cooling towers a day?

DR. GAINES: Seventy percent of the energy of that plant will be going into evaporating that water. It is an enormous quantity of water.

SENATOR PARKER: If you had the lake, would you need the cooling tower?

DR. GAINES: The lake will be somewhere far removed. It will simply supply flow in the Delaware to make up for the lost flow at the site of the plant. You can't take this heat from the plant and carry it across the country some place and dissipate it there.

SENATOR PARKER: I am just trying to get some idea of how big the lake is going to have to be no matter where it is.

DR. GAINES: I have seen the figures, but I wouldn't want to guess at them. I'm sorry. I can't answer that right now. But I can get some information about it for you.

SENATOR PARKER: Let me ask you this: Assuming they didn't have cooling towers and it raises the water

in the Delaware five degrees - I don't know - I'm just saying that -- I know basically the conservationists feel that a rise in temperature in the water is deleterious --

DR. GAINES: It is an ecological fact as the water temperature changes there are substantial ecological effects on animal and marine life.

SENATOR PARKER: Are they detrimental though?

DR. GAINES: In general, they are.

SENATOR PARKER: In what way?

DR. GAINES: They generally prove fatal to the kinds of marine life that are found in those bodies of water.

SENATOR PARKER: Is that really so? Take Oyster Creek; is that so in Oyster Creek?

DR. GAINES: Well, you have heard about the menhaden problem in Oyster Creek.

SENATOR PARKER: The water stopped and the temperature went down 20 degrees in two hours. It happened last winter when the bay was frozen.

DR. GAINES: They had an enormous fish kill of menhaden at the time.

SENATOR PARKER: Menhaden is nothing but a trash fish anyway in the sense that it is only used for oil production and fertilizer.

DR. GAINES: There were a lot of people making money out of them. They were very disappointed about what happened.

SENATOR PARKER: Not anymore, they are not.

DR. GAINES: That's right.

SENATOR PARKER: Not on the Jersey coast.

DR. GAINES: That is an industry that is gone now.

SENATOR PARKER: You can go down to Fish Island and take a look at the plant that is still there.

DR. GAINES: It is hard to make too general a statement about this because it is specific instances

that you have to look at. In the case of a plant as large as Newbold Island, the amount of heating that would go on ---

SENATOR PARKER: Doctor, let's go back to Oyster Creek for a minute.

DR. GAINES: O.K.

SENATOR PARKER: What deleterious effect has that had on the ecology of Barnegat Bay?

DR. GAINES: I am sorry I cannot give you a specific answer. I have heard some tales, for instance, of the increase in -- What's that worm -- shipworm?

SENATOR PARKER: Warm water brings the shipworm. In southern waters, you can't have a boat in the water more than a year or it eats your boat right out.

DR. GAINES: We have a Florida problem that was never around here before because of it.

I haven't done a study myself.

SENATOR PARKER: That may be true for a very limited area. But what other real deleterious effect has it had? The shipworm is only deleterious to certain types of wood.

DR. GAINES: Right. The wood that they build piers and docks out of and boats.

SENATOR PARKER: Maybe they ought to be stopped from building the piers and docks in our wetlands, but that is another problem.

DR. GAINES: True enough.

My answer is that I have no personal information about what has happened to Barnegat because of Oyster Creek.

SENATOR PARKER: The reason I asked that is because generally speaking -- you were here this morning -- the fishing generally in the Delaware, even striped bass come up on the sandy island at a point right below the Burlington Generating Station. As for the fishing at Oyster Creek, you can't get across the Parkway or Route 9

for the people standing shoulder to shoulder fishing off there. Down in Fort Lauderdale at the generating plant there, the tarpon fishing is the best right under the out-fall.

I want to know why an increase in the water temperature is so deleterious. Maybe I should ask you first your expertise - what your doctorate is in.

DR. GAINES: Electrical engineering.

SENATOR PARKER: O.K. I just wanted to know so I wouldn't embarrass you.

DR. GAINES: This is not an area that I am particularly expert in and I kind of think you would have to be. In any case, there are going to be trade-offs. I have heard people argue that a sewage treatment plant isn't so bad because the fish love to come and feed right by the discharge of the sewage treatment plant.

SENATOR PARKER: I never caught any fish there.

DR. GAINES: I have heard that argument made. It is just where are you going to look for the damage? Well, you have to look over-all and see what the effects are.

SENATOR PARKER: This is what I am trying to equate or evaluate or at least get some information to evaluate, whether the increase in water temperature is more deleterious to us than two great big cooling towers, 400-feet wide, that could keep Bordentown under snow for the winter months and under fog in the summer months. Is it more deleterious to have that going on in our environment right next to Fairless where you have the iron oxides and everything oxidizing and making acids that eat the paint off every house around? Maybe it is more advantageous to increase the water temperature a little bit in that area.

DR. GAINES: There are questions. For instance, is the water temperature going to be increased, as you

mentioned, only a little bit, or is going to be that the temperature of the Delaware would be up over 90 during some hot times in the summer? If the water temperature got to that point, I think that would have a major impact on all marine life. I don't know. Public Service can answer you better than I can. But I know with once-through cooling, heating problems would result.

SENATOR MERLINO: If the choice were given the public as between some detrimental effect on the environment or not having any energy, what do you think the choice would be?

DR. GAINES: That, of course, depends on what you mean by no energy. If we say we are going to stop all generation of electric power in New Jersey in deference to the environment, you guys would be out of office in short order. We wouldn't stand for it. But trade-off of it isn't that clear cut. People now consider that environmental values are worth something. They are willing to put some money into it now; they are willing to see some rise in cost, for instance, in electric prices, if it means a noticeable improvement in the quality of our environment.

SENATOR MERLINO: That is a nice statement for you sitting on that side of the bench to make and I don't necessarily disagree with you. But for any of us to propose such a thing would be rather hazardous for those who seek public office.

DR. GAINES: If, as I believe, a majority of the public go along with it, then it is not hazardous for you.

SENATOR MERLINO: Well, too, I guess until we can define the trade-offs, we would be just engaging in conversation.

DR. GAINES: I think that is the case. To my mind, it is not such a clear-cut alternative that either there is no more power or else there is severe environmental

damage. There is a shift and give in there. But we are now at least giving some more than lip-service credence to environmental values which in the past have been entirely ignored.

SENATOR MERLINO: I would be the last to disagree with that. But we have to find some happy ground.

DR. GAINES: I agree it is a hard problem.

SENATOR MERLINO: Hopefully we will get some of that from these hearings.

SENATOR PARKER: You refer to the rate structure and I think there may be some need for regulation on our society. Maybe we can do this with legislation. By that I mean maybe we should regulate heavy users during peak time. Maybe they should be required to have ancillary generating stations of their own.

DR. GAINES: For the short run that is not really likely to help because they all have the same problem - where do you get the fuel?

SENATOR PARKER: Diesel generators can run a long while during peak loads. Maybe there should be some tax or some restriction on those who use large amounts, such as the big buildings in the summertime with their air conditioners. That is what, I guess, makes the drain.

DR. GAINES: That is one of the big factors, the summertime load, and there are things that can be done about that.

SENATOR PARKER: Do you have any recommendations or does the Sierra Club have any recommendations on some type of restrictions that we could impose upon our users or upon our society in general that may assist the power companies with their demands?

Let me rephrase this. I am sure that the power companies want to generate their maximum and they want to sell their maximum. They are in the business, although regulated by the PUC, of providing and selling as much

energy as they can, because they are in a profit structure. But it may be unrealistic to go at them and say, "You can't do this." But it may also be more realistic for us to impose some reasonable restriction on the members of our society to require them to assist in some small way. Do you have any ideas or recommendations?

DR. GAINES: Our society is based on certain types of economic motivations, in which we think price and supply and demand play an important part. So using a pricing mechanism to shift electrical demands in the direction you wish seems to be an appropriate way of doing it and well within the normal traditions of the way we do things in this country. As cost gets to be a significant factor --and so often it is and the person who buys an air conditioner doesn't worry about how much electricity it is going to take.

SENATOR PARKER: They let it run all day long.

DR. GAINES: They let it run all day long. They don't have any incentive to buy an air conditioner that uses less power instead of one that uses more. For instance, it would be reasonable to require sort of a "truth in energy" kind of bill which would say how much electricity for a given amount of BTU cooling an air conditioner has when it is sold in this State; and, in conjunction with that, to raise the price of electricity to the point where somebody was willing to take a note of that and buy the cheaper one to operate. This could apply to other appliances as well. We certainly don't do that.

By pricing alone, you can encourage people to use energy in off-peak periods without any other kinds of direct regulation, and this kind of economic incentive is what we feel to be the best thing, the best way of approaching this, rather than more restrictive kinds of things or limiting the power company to generate so

much power during a given time or something like that.

SENATOR PARKER: If you have specific recommendations or your group has, we would like to have them.

DR. GAINES: We have given this some thought. This is receiving attention throughout the country, but such thinking is in the preliminary stage.

SENATOR PARKER: This question of electric power is right down your alley inasmuch as you have a doctorate in electrical engineering.

DR. GAINES: We will do what we can.

SENATOR PARKER: If you could, we would like to have it.

SENATOR DODD: Doctor, you were here this morning when Public Service presented their projection for energy needs. Do you agree with their projection?

DR. GAINES: Their projections have some probability of being true, but I think they are too high. Whether power will double in 8 years or 10 years or 12 or 15 years is really a big and unanswered question. But, as I tried to point out earlier, what you do will have some effect on that. If you can provide legislation whereby prices can be raised, for instance, that will in itself slow down the rate of growth so we won't need in the same period of time that much generating capacity.

SENATOR DODD: That would help to a degree. But you must agree that there is a need for more power --

DR. GAINES: I agree.

SENATOR DODD: (Continuing) -- and that there will be as we go on?

DR. GAINES: It is certainly apparent that in some period of time which is not too great, the generating capacity required in this State will double. I would hope it would be closer to 15 years than 8.

SENATOR DODD: Doctor, can we have your comments on the proposed atomic energy plant to be placed in

the Atlantic off-shore from Atlantic City? We have discussed the proposed plant in the Delaware River. What would be the environmental impact, the difference, between that one and the one proposed for the Atlantic?

DR. GAINES: I am giving you kind of a personal reaction to this now. The Sierra Club people have talked about it, but have not arrived at a final position. Take my remarks in that light, that I am saying what I think at the moment, but I have an open mind on it and may change my opinion.

At the moment, it looks to me as if the plants in the ocean are less damaging than any other kind.

SENATOR DODD: You would think that atomic energy would be more realistic from an ecological standpoint than fossil ---

DR. GAINES: I am being speculative and evidence might come to light which would make me disagree with what I am about to say. For instance, we operate submarines with nuclear plants aboard and have for a long time. I have some confidence in our ability to engineer and construct things that work right. If we don't adequately inspect these things, require safety regulations, etc., -- and we aren't sure that we are doing the job we need to do to protect ourselves when somebody who has a financial stake in it says it is OK; somebody else who doesn't ought to be doing the necessary checking. But given the proper procedures for constructing and inspecting and operating such plants, I am not at all convinced that it would be -- well, I am inclined at the moment to think it might be slightly better than ---

SENATOR DODD: If we gave you a choice of that or Tocks Island, which would it be?

DR. GAINES: At the moment, I am certainly leaning towards an off-shore plant.

SENATOR DODD: One final question: In your

opening remarks, you cited the proposed off-shore oil port as compared to our present system of using lighters to unload oil. Would this be better perhaps, a better process, to have an off-shore port, less handling, less chance of a spill? Of course, that would be our greatest fear with that.

DR. GAINES: We would certainly have to consider it. It is one of those cases where we have looked at one thing that has some potential serious dangers very carefully and have not looked at all in another way. Until we have looked at the other one and weighed the two, we shouldn't make a decision.

SENATOR DODD: We have been using the lighter system for as long as people have been sailing ships and transporting oil.

DR. GAINES: And we have been having oil spills for that long.

SENATOR DODD: Yes, we have been having oil spills. Of course, New Jersey's first reaction has been a complete "no" and I believe we passed a bill yesterday in this very chamber outlawing that, without looking further at the ramifications. You mentioned this, and coming from you as a member of the Sierra Club, I think we as members of the Senate should take another good hard look at that.

DR. GAINES: I would think so. You see, one of the things involved here is that people notice the big oil spills, but don't recognize that the small oil spills account in toto for far more oil.

SENATOR DODD: That is because we have written off our harbors and bays and rivers automatically for the past 20 years. Now we just notice the places where we bathe.

DR. GAINES: Don't misunderstand me, and think I am recommending in any sense a deepwater port.

SENATOR DODD: No.

DR. GAINES: But what is going on now is bad and certainly should be compared with it.

SENATOR PARKER: If you have any recommendations on rules and regulations for lightering or handling these ships in the Delaware Bay before they come on up, we would appreciate it.

DR. GAINES: The process, at the very least, should be inspected. Nobody looks at it now; nobody knows if there is a small spill there.

SENATOR PARKER: In that same regard, if you have anything concerning ways to limit oil spills and ways to dissipate it ---

DR. GAINES: This is an area of, I think, study -- I won't call it research and development -- that is going on now. We can only watch it and encourage it and perhaps even fund it.

SENATOR SCHLUTER: I have one more question, Dr. Gaines.

The cleaning out of tankers, which does take place after they have discharged their loads, obviously adds to the oil slicks in a particular area, as well as the process of lightering that Senator Dodd and Senator Parker alluded to. Are there any other procedures to control that that you know of by other state governments throughout the United States?

DR. GAINES: This is an area that I don't know anything about, the cleaning of oil tankers.

SENATOR MERLINO: The one area that you have discussed concerning how to discourage the use of electric energy in the peak periods in the summertime - and I think we have all mentioned air conditioning - it was suggested the rates be increased for the big industrial user or that he should pay perhaps the same rate as the small user rather than get the discount. Do you think this would have an impact on the economy of our State as far as jobs are concerned that rely on the use of electrical

energy?

DR. GAINES: It is going to have an impact, no question about it.

SENATOR MERLINO: Again, where do these things balance off? Of course, the people who would be affected by that in the greater majority would be the low- and middle-income people, most of whom reside in the urban areas.

DR. GAINES: It is not entirely clear what all the effects of such a thing would be. For instance, I have mentioned in the statement that I gave you that a possible effect, at least nationwide, of increasing the cost of power would be to see a shift away from, say, aluminum containers to glass containers. There are jobs related to both industries and I can't tell you which involves more. As those things which are particularly costly in terms of energy have to pay more, there are often ways we can find solutions to do the same thing which aren't so energy intensive, that don't use so much energy. It would have many ramifications, changing the price structure, which you should look at very carefully and I certainly can't comment.

SENATOR MERLINO: That couldn't be confined to, say, the State of New Jersey where the industry then couldn't be competitive with industry in the surrounding states and would result in a loss of employment for some of the people of the State of New Jersey.

DR. GAINES: I would like to look at this recommendation as an initial suggestion whose consequences should be explored and I haven't explored all of them. We know in terms of what it might do to demand. Very often it has some consequences there. What it does to other aspects of our society does need to be considered, of course, before you move to such a thing. I am not perhaps the best one to comment on that.

SENATOR SCHLUTER: Thank you, Dr. Gaines.

Our next witness is from the Federation of American Scientists. Is that individual here? Will you identify yourself and tell us exactly what your group includes?

V I K R A M D A L A L: Senator Schluter and members of the Ad Hoc Committee on Energy: My name is Vikram Dalal. I am a research scientist in Princeton engaged in physical research. I am also the Vice Chairman of the Federation of American Scientists, Princeton Chapter. The Federation of American Scientists consists of a body of scientists, mainly physicists, but also sociologists, economists, biologists and engineers. It is a national organization with a national membership of somewhere in the neighborhood of 6,000, I believe. I might add George Kistiakowsky and Jerome Wiesner and other people who have served as science advisors to the President are on the Board of this organization.

The Princeton Chapter is mainly engaged in research on environmental activities and it is primarily research which is individual research. In other words, we may set up a task force of 3 or 4 or 5 scientists and then we look at one subject. We did this for Tocks Island, for example.

I have been particularly concerned with energy for a couple of years now and as a physicist, it is sort of the obvious thing for me to concern myself with since it is a physical science.

If I may, I would like to proceed with my statement.

Scarcely anyone today is unaware of the energy crisis. In a civilization such as ours, which is based on an energy-intensive economy, the scarcity of energy supply is rightly regarded as a serious situation. However, it is a mistake to worry only about the supply of energy. What we have to recognize is that energy is not an end

product in itself, but a means to an end. As an example, we burn oil in our furnaces, not for the sake of burning it, but for heating our homes. Thus, when we worry about whether or not we have enough oil, we should also consider how best to heat our homes so as to minimize oil consumption. Thus, energy crisis has three components:

1. Supply of energy.
 2. Demand and use of energy.
 3. Impact of energy on society and the environment.
- I would like to discuss each one of these briefly.

1. Supply. It is clear that in the short run, over the next decade, most of our energy supply will come from oil, natural or synthetic gas and nuclear power. A significant proportion of our oil will be imported via oil tankers. It is also clear that the additional demand for oil would require increased refining capacity. We feel that it is imperative to regulate carefully both the means of importation of oil and its refining, so as to minimize their impact on the environment. This is particularly necessary because the northern New Jersey region around New York City, which would be a prime location for any additional refineries, will not meet the 1977 Federal air quality standards. Therefore, the Department of Environmental Protection should be given the necessary authority to regulate the location and operation of such refining facilities.

I turn next to electric power plants and transmission lines. Since electricity is the fastest growing component of the energy budget, more plants will have to be built. It is very important for us to formulate the master plans for power plant location and for transmission-line corridors in advance, so as to choose the optimum site by including environmental factors at the outset. It is also important to have a mechanism to put such an environmental input into the planning process. Therefore, we

highly recommend the passage of the power plant siting bill, I believe it is Assembly 1673, as a very necessary first step. We also feel that the structure and scope of the Public Utilities Commission be revised so as to make sure that the PUC, which up to now has functioned mainly as a rate-setting organization, has recognized environmentalists as part of its membership, and also considers environmental input as an integral factor in decision-making. This is somewhat similar to what Mr. Swidler and the New York PUC have started to do.

2. Demand. Let me turn next to the demand for energy. It has been blithely assumed that the demand for energy is inelastic, and that all energy use is necessarily beneficial. This is not so. Thus, for example, nuclear plants waste two-thirds of the energy that comes from a nuclear field. Ultimately, it is the demand which we have to regulate because an ever-increasing demand would not only cause future supply crises, but also affect our environment. We recognize that energy is a necessary component of our economy, but there are many energy uses which are wasteful and there is a lot we can do to reduce our energy consumption without harming our standard of living.

The tragedy is that today, we encourage wasteful demand by giving a price advantage to larger consumers. This has the effect of subsidizing the larger consumer at the expense of the smaller consumer. In effect, the poor people are subsidizing the rich. This is a very illogical structure. It exists only because the environment has been regarded as a free commodity. Logically, the man who pollutes more should pay more. Today he pays less.

It is time we included the true cost of energy in the price of energy. Thus, if we have to have an oil spill or emit sulfur dioxide into the air, the price of this emission or oil spill must be computed and included

in the cost of electricity.

It is appropriate to point out ways of reducing demand. If we had more mass transit, for example, be it buses or trains, we would save a significant amount of energy and reduce air pollution at the same time. In this connection, Governor Cahill's proposal to integrate our transportation systems into one unit and perhaps subsidize mass transit from tolls on the highways deserves praise and action. Another way of reducing wasteful energy use would be to upgrade our housing insulation standards. A recent study by Oak Ridge National Laboratories shows that a well-insulated house uses only about half the energy for space heating that a poorly insulated house uses. We should encourage the use of solar heat, particularly for hot water heaters. Since a significant proportion of power needs arises during peak-load periods, we should use a premium peak-pricing policy to reduce demand during peak periods. This is being done in Scandinavia, France, and England. This would serve to reduce the need for peaking power plants. We should also encourage the use of more efficient appliances, such as air conditioners, by an appropriate pricing or tax policy, so that an inefficient air conditioner is taxed higher than an efficient unit. Right now, exactly the opposite happens. For example, an air conditioner which costs about \$170 may be far more efficient than the one that costs \$140. But we give it the same sales tax. So we price out the higher-priced air conditioner which uses electricity more efficiently and we encourage the manufacture of shoddy and inefficient appliances. Similar principles should be applied to automobiles. An automobile which consumes more fuel should be taxed more than one which consumes less fuel. This is precisely the principle of the progressive income tax.

3. Environmental Considerations. It is no

exaggeration to say that a significant proportion of environmental damage comes from misuse of energy. Among the more obvious effects are oil spills, air pollution and the destruction of precious open space for power lines and power plants. But there are more subtle effects, such as thermal pollution, the heating of our rivers. Thermal pollution from nuclear plants is particularly serious. To avoid the immediate effects on the river, we build cooling towers, which in turn evaporate precious fresh water. For example, if all the power plants planned for the Delaware River - and Newbold Island is only the tip of the iceberg - over the next 15 years are built, they will consume by evaporation almost 500 million gallons of fresh water every day. This represents about 25 percent of the water in the river during low flow. In effect, it will run the river dry. This is also the water required for about 3 million people. This is more than the water that will be transported to Northern New Jersey by a Tocks Island project. It is to subsidize such wasteful use of water that the Tocks Island dam is being pushed by the utilities.

I will come to your question about thermal pollution in a minute.

In summary, in a densely populated state such as New Jersey, the problems associated with power plant and power line siting and highway building are particularly serious. Again, so long as we keep encouraging demand, invariably we shall use up more of our precious open space. As we get more and more automobiles, our air pollution will only get worse, at least until completely new technologies are developed. We should encourage, through tax incentives, pricing policy and regulatory mechanisms, a new ethic -- it is not really a new ethic at all - it is the old Puritan ethic on which this country was founded -- which will be against waste and for careful and frugal use of energy. Only then can we live in an affluent society which will be in a stable

and harmonious relationship with nature. Thank you.

Now, if I may, I would like to answer your question about thermal pollution. You are quite right, there are times when thermal pollution is not pollution at all, but it is beneficial. This is the idea of the new power plexus, whereby you would have a nuclear power plant and the waste heat from the power plant would go into heating up the water. You might have a fish aquiculture right near it or even an aquicultural farm and increase the output.

Therefore, when you speak about thermal pollution, you are also probably right in saying in an open ocean there is not much of a problem of thermal pollution from power plants. But consider the following case: Let's assume that we locate the power plant at Salem. We already have a nuclear power plant at Salem. If I am right, Salem is about where the oysters propagate in the spring. Now the population of oysters is controlled by two factors. One is the food supply and the other is the amount of oyster drills around. Oyster drills feed upon the oysters. Now, when you heat the water, which species do you encourage? Do you encourage the oysters or do you encourage the oyster drills? If the oyster drills speed up faster than the oysters do, then your oyster industry is going to be wiped out. This may not be the case - I don't know. But this is the kind of trade-off - this is the kind of question that you have to answer day by day, plant by plant.

Now you asked, in Newbold Island why can't we use once-through, fresh-water cooling. The answer is there simply isn't enough water in the Delaware to do it. You would not heat up the Delaware by 5 or 10 degrees; you might heat it up by 20 degrees. When you realize Newbold Island is only one of about seven or eight plants that the power companies want to locate between Tocks Island and Trenton, you realize the amount of heating there would be.

This is why we want a comprehensive plan - we want a master plan siting study in advance - so we can say, "All right, you can build a plant here because we don't think it will do any harm. But you can't build it here." It is no use fighting them once they have laid out their plans. It is kind of wasteful to fight them once they have laid out their plans and they are already through the hearing process. All you do then is delay and make everybody mad and make the price of the plant go up. If you said ten years ago, "You can't build there," then they won't build there. They will build somewhere else designated as a proper site.

I would also like to answer, if I may, Senator Merlino's question: When the electric rates go up, what is the effect going to be on the State's economy? I think it is a very relevant question. But, as Dr. Gaines indicated, it is a complex question. Consider the following which might very well happen. It depends on exactly what the structure of the New Jersey economy is and for that you will have to do an input-output analysis and find out. The electricity rates are going to go up. I don't think anybody can prevent that if for no other reason than because the power plants are becoming more and more expensive and because the capital is becoming more and more expensive. What is happening now is that the persons who are the poorer ones, the ones who consume less energy, are the ones who are bearing the brunt of the rate increases. The industry's rate goes up, but it is lopsided. It goes up a little bit here and it goes up a tremendous amount here. Now a man who is earning \$10,000 a year with a family of four to support, if his prices go up from \$300 to, say, \$400, it is going to hurt him - it is going to reduce his buying power. In other words, he will start buying less and any time you reduce the buying power, it will have a detrimental

effect on the economy. That detrimental effect on the economy may more than outweigh the effect that you would get by the big industry or the big power consumers' rates going up just a little bit.

So long as you have this inverted rate structure, you always have this problem built in. You could design a rate structure so that you would have a minimum rate up to a certain limit. You would say a man needs the first 5,000 kilowatt hours, per year, in order to satisfy his basic need. But after that you could apply the principle of the progressive income tax. And the man using 20,000 kilowatt hours where he should only be using 5,000 kilowatt hours, right now would only pay 2 cents per kilowatt hour as opposed to 3 cents for the lower guy. Maybe we should ask a man who is using more energy to pay 5 cents per kilowatt hour. By doing this, the poor will not be subsidizing the rich, which is what they are doing today.

SENATOR SCHLUTER: Thank you very much, sir. There is certainly a lot of substance in what you have said. I know I would like to study it very carefully. I know it speaks to the importance of the Governor's new State Planning Council which he is implementing right now and the need to have some over-all State plans.

I don't have any questions, sir.

Senator Parker?

SENATOR PARKER: If you could provide us with some of your thoughts as to why these plants, the fossil fuel and atomic plants, are so inefficient, it would be appreciated. You don't need to do it today because I am sure it probably would be lengthy.

MR. DALAL: Can I just comment on it for a few minutes?

SENATOR PARKER: It concerns me that they are dissipating so much.

MR. DALAL: I agree with you. In a nuclear power plant, you are boxed in. The efficiency of the plant depends on the maximum temperature. You can't operate a nuclear plant at a high temperature because of safety problems; that is, the present nuclear plants. That certainly is not going to be true 20 years from now. But presently those reactors are high-density gas fuel reactors, which are commercial reactors. And I believe Philadelphia Electric is building a plant at Peach Bottom, on the border of Delaware and Maryland, which is far more efficient than a plant like the Newbold Island plant. It is a new technology and the utilities are conservative. They don't like to take risks for a good reason - they can't afford a power failure.

We may need a Federal structure, something like a NASA, a National Energy Agency, which could devote a billion dollars a year. Then, by God, we will crack this problem. We will increase the efficiency to 50 percent. The engineering designs already exist on paper. We know that it will work. The question is: Can we make it do in practice? And we can't do it unless we have the money. The utilities aren't spending a damn cent on it. Public Service might spend \$80,000 a year supporting the plasma physics reactor. That is a very small fraction of its income. If they were spending, say, 1 per cent of their budget like American Telephone and Telegraph does -- that's why our telephone service is good and keeps improving. If the utilities were doing that instead of spending money in advertising, maybe we will get some action.

SENATOR SCHLUTER: Any further questions? (No response.)

I would consider it helpful to the Commission if you or other members of the Federation of American Scientists of the local chapter could attend these meetings and monitor them. And if you have additional

reports to give us, you can give them to us without going through the process of public hearings. I am sure you might be able, with the expertise you can draw on, to comment on power needs in the future and other data. It would be a tremendous help to us if you would.

MR. DALA: I shall do that, Senator.

SENATOR SCHLUTER: Before you leave, would you please present to the Secretary your report on Tocks Island?

With the approval of the Chamber of Commerce and the Manufacturers' Association, I would like to go a little out of order, if you gentlemen don't mind, because we have the President of the Public Utility Commission here. He was scheduled to go on at 2:30. We are going a little bit behind the schedule. I would like to call him if it is all right with the Chamber of Commerce and the New Jersey Manufacturers.

While Commissioner Ozzard is approaching the witness chair, I would like to announce that Commissioner Ronald Heymann of the Department of Labor and Industry has left a statement with us. We will have copies of his statement left with Mr. Frakt, our Secretary here, for the press or for anybody else who might want to get a copy. We will not read it at this time, but we will make it a part of the Commission's records. If any of the news media or any other groups want a copy, they can get it from Mr. Frakt.

(Statement of Ronald M. Heymann, Commissioner,
New Jersey Department of Labor and Industry,
can be found beginning on page 81 A.)
At this time we will take a short recess.

(Short Recess)

SENATOR SCHLUTER: Shall we proceed? The next witness will identify himself.

W I L L I A M E. O Z Z A R D: Senator Schluter, Senator Parker and Senator Merlino: I am Bill Ozzard, President of the Public Utilities Commission and a member of the Governor's cabinet. I came at the invitation of the Commission to testify. I have no prepared statement because I thought I could serve you best by making a brief statement of the position of the industry in the State as we, the regulatory agency, see it, and then respond to some questions from you, which I would suspect at this point, having heard a number of persons testify, you are ready to direct to us; that is, my Commission through me.

I would like to give you two brief examples of the energy crisis in New Jersey because it is talked about in general terms and I am not sure that the people of this State are yet quite aware of exactly where they are in the crisis situation.

There are four principal gas companies in New Jersey, one of them being New Jersey Natural, which serves a large portion of the southern part of the State, extending over into Ocean and Monmouth Counties. About 90 per cent of the gas supply - it generates none of its own - is obtained from Texas Eastern. Early in the fall we were advised that Texas Eastern was going to up last year's 7 per cent cut-back to about 14 per cent. Then in November we were contacted by company officials who came to our offices in Newark for a conference and they advised that the Texas Eastern Company had told them that the cut-back would probably reach 19 per cent. The reason they came to talk to us - as you know, the statute says that the PUC is charged with seeing that safe, adequate and proper service is maintained by all of the utilities - is they wanted us to know that with a 19 per cent cut-back,

they could not provide adequate service in New Jersey, at least in their territory. The cut-back was made, by the way, but the warning was simply this in November, that if Texas cut to 19 per cent and if we reached a 3-degree design day, it would be necessary for New Jersey Natural to cut off areas of their territory in order to at least keep most of their customers satisfied. As you know, they have very little in the way of industrial and only small commercial. Most of it is residential.

They presented to us a sketch of their territory, the franchised area, and there were three sections that were within three controlled points and it was proposed that, if the 19 per cent cut back and the 3-degree design day was reached in combination, that all three of these territories would have to be shut off at the main control points.

The number of residential customers in the three areas totalled 11,500. As we rechecked the figures and sent our engineers to find out what their capacities were and what the flow was, there was no question that New Jersey Natural Gas was telling us a total truth.

What we did and they cooperated in doing was, we immediately set about anticipating a cold winter and made contacts with Public Service Electric and Gas. We contacted Brooklyn Union. We, of course, went to work, for the 30th time, I think, in the last two or three years, on the Federal Power Commission. It was fortunate that we did, because Texas Eastern not only cut to 19 per cent, but here - I don't remember the exact date - right before this cold spell, they cut to 23 per cent, which changed the 3-degree day considerably. It was at that time that our efforts and the company's efforts paid off because we drew 6 million on January 13th from South Jersey Gas, a neighbor; on January 12th, we were able to draw 10 million cubic feet from Public Service plus 100,000 gallons of liquefied petroleum gas from Public

Service, and we also had a further commitment from South Jersey for another 18 million cubic feet of gas.

Without that availability in the other companies and without the early effort by both the PUC and New Jersey Natural, the 23 per cent cut-back, even with the cold spell we had, would have meant a lot of customers in Ocean and Monmouth Counties would have had their gas deliberately shut off, out in the streets, because there wasn't enough fuel for them.

You sit in your homes and in this room with lights burning and your air conditioners going and when I came on the PUC 5 1/2 years ago, we had a very tight reserve situation in the generation of electricity. As you know, we don't store electricity. It is generated as it is needed and put over the lines and used. So reserve capacity of generation is the point that we work toward and our goal by 1974 or '75 was 20 per cent reserve. Because when I came on the Commission 5 1/2 years ago, we were running reserves of about 11 and 12 per cent. We were able to get them up to about 17 per cent - I say "we" - I mean the companies in cooperation with the government - at the beginning of last summer. We consider it close to critical when we reach a 5 per cent reserve. The cutting down of reserves comes about by two things: one, your increased usage at given times, and, what we call outages. Some of them are forced outages where you have a breakdown and others are selected outages where you pull down for repairs.

As I said, we went into last summer with about 17 per cent reserve capacity in generation in the district that New Jersey is a part of. In August during a hot spell, we were down on several occasions to just below 3 per cent. One medium-sized generation breakdown would have caused a sectional blackout in New Jersey. Actually at that point - and the public was not aware of it - we

had authorized in cooperation with the electric companies of New Jersey voltage reductions; and at the worst point, we were also calling upon some selective load-shedding. That is where given industries have already been selected and notified in advance when we get down below certain percentages they will be called upon to shut down major types of equipment, which means some temporary lay-offs, in order to conserve electricity, mostly for the residences and the operation of such places as hospitals and schools that need it.

What I am trying to tell you is this, that whether it be the utilities or the environmentalists making arguments at both ends of the problem of energy and environment, I will tell you as a governmental agency that we have gone further afield in the past three years than our regulatory responsibilities to try to keep this State, at least, from having what we would consider a catastrophic situation in short supply of energy.

I have to relate this immediately to the problem today and the question of environment. And I relate it in this manner, that the growth of use, which is related to the growth of the communities and the growth of industry in New Jersey, is moving ahead a little faster than we had anticipated three years ago as to our capabilities of bringing in new supplies. The supply of gas, as you know, is well off and the supply of electricity is beginning to fall because of lack of generation.

By the middle of 1974, if we do not have some new generation in operation in the State of New Jersey, we will have some sectional blackouts or worse in the electric field at least unless some early planning is done, and that means restrictions.

PUC has proposed and is planning to hold this spring a series of informal hearings in Newark with the electric companies and with others, such as basic

suppliers of fuels to the electric companies, to see what can be done in working out a system of priorities. You can call it something else. You can call it rationing of electricity. Because any period of slowdown in the construction of present plants, which includes the two atomic plants on the Delaware, for a period of longer than six months, perhaps eight months in our estimate, will put us in a position where we can't meet the normal increased need of electricity in the State. I am not talking now about major new plants that use great quantities of electricity; I am talking about the natural growth of electrical use within the facilities we have and expecting a normal growth of residential and commercial users.

The electric user is difficult to control. We are controlling gas, as you know. No unit bigger than 250 cubic feet is allowed to be installed on a gas line in the State of New Jersey where we have shortages, such as South Jersey Gas and New Jersey Natural, and to a degree in the Elizabethtown territory. But electric users don't need anybody to connect. They can buy a window air conditioner down at the local store, take it home, plug it in and they have a new load. They can go buy a toaster oven, they can buy a new vacuum cleaner, they can buy just about anything they want in the electrical field and take it home or have it delivered and then plug it in and increase the load.

We had a few brownouts last year. I mention that because people will quickly say, "What do you mean, no sectional blackouts?" We had a few brownouts in sections where two, three and four hundred homes were affected for a couple of hours. This is an example of why I say you can't control electric growth and electric use. We found what was happening was that the transformers couldn't carry the increased load. And you don't

know from summer to summer, for example, how many people are putting in air conditioners. They put them in in the spring and they turn them on the first hot day and the transformer that was designed with a plus factor to take care of x number of homes suddenly has a load beyond its capacity. You have a breakdown and the end result is an area brownout.

The gas supply is beyond our control at the moment. So all we can do there is do what we have been doing and that is continue to direct the companies themselves to refuse to take house heating, to refuse to put on major units, to refuse to take on new developments, etc.

In the field of electric, I think that you are going to have to ask the environmentalists to be a little more realistic than to object the moment a new proposal is made. This is what has been happening. I was informed of the off-shore nuclear plant proposal a year ago last August in Atlantic City. There was a pre-showing of this. The moment it was publicly announced, it was only a matter of 24 hours and there were groups and individuals and members of the Legislature, for that matter, who said, "We don't want it out there." My staff had been reviewing those plans from September for a period of almost six months and we weren't totally sure of all the effects. So we didn't know whether we were for it or against it environmentally, and you know we are charged with the environmental aspect of utilities under a special statute in the PUC.

I couldn't understand how anyone hearing it for the first time could declare an opposition merely because it was out in the water and because it was nuclear.

The problems in the Delaware aren't solved because - I'm not sure which way they are going, up or out - but the point is, to be just against is not enough. So the PUC being charged with charging the utilities with producing enough electricity, and particularly producing

enough to meet current demands, is in this undesirable position at the moment.

We are suggesting that the environmentalists come off of being absolute and find out where that meeting place is between total stagnation of industry in New Jersey, a serious cutback in present use by present users, including homeowners in the State of New Jersey, of electricity, and the ultimate in environmental ideal. There has to be a middle ground. And the middle ground has to be, I think, approached possibly through the legislative body, but certainly by the organizations that are most involved, and that is the environmental groups and the utilities.

Utilities can live pretty well without any further growth. But I am not sure the State of New Jersey can.

I heard propositions made, and I have heard them before today, of course, about what we call reverse rate schedules. Now at the present time we have authorized and allowed for years all over the country the heavier user to be in a lower bracket. This is rather standard in gas, electric, fuel oil and everything else. I would suggest a caution, even if it is functional, and the caution is this, that the State of New Jersey has a number of major industries that depend upon large volume use of electricity. One that quickly comes to mind is any major activity in the field of aluminum where electricity is a very basic part of the manufacturing operation. I suggest that the Department of Labor and Industry be called upon before any restrictions are directed to us and through us to the industry to go into a reverse rate structure as to what this will mean in the way of jobs, what this will mean in the cut-back of moneys that are spent in local stores, what this will mean in persons having to relocate from New Jersey to other states because of the loss of jobs.

I say this because what information we have so far in our own department - and, of course, it is a lot less than Labor and Industry should have - is that it would be a major cut-back in many major industries in the State of New Jersey, with a resultant dip of employment in the State, and we are not one of the best in the United States, as you know, as far as employment is concerned.

That is a very brief statement. We are proposing to continue to prepare plans for increased electric generation and we are also proposing to go forward with increased efforts to get other types of gas, such as the liquefied naturals, the liquefied synthetics, the liquefied petroleums, into the State to make up for the pipeline gas that we are not going to be getting. But it is only to keep New Jersey alive with its present usage. A good example is the interrelationship -- I'll give you a couple of figures and then quit and then perhaps you will have some questions.

The cut-back of gas into New Jersey, as it relates to the generation of electricity -- We had encouraged them a few years ago to go into extensive gas fueling in order to meet the environmentalists' request for very low emission. The gas cut-back is dramatically shown, I think, by what the major electric utilities in New Jersey have had to do in switching over to number-two fuel oil. In 1971-72, the period of September 1 to January 15, the electric utilities for generation in this State used 1,488,000 barrels of number-two fuel oil. In 1972-73, a year later, with the drastic cut-backs in gas as a fuel, same period, September 1 to January 15, the 1,488,000 was increased to 3,541,000 barrels. It is a less desirable fuel, but a necessary one if we are going to even meet the present generation needs. I think of equal importance is the fact that the electric utilities at a time when

the Federal government announced that the inventory nationally was down 31 million barrels -- our utilities were using 2,100,000 more than they used the year before, which meant you contributed to the shortage in other industries and, of course, in the homes themselves.

Briefly, gentlemen, that is my statement. There has to be some give and take. I trust the utilities understand that and I certainly trust that the environmentalists understand that.

SENATOR SCHLUTER: Thank you very much, Commissioner. I think you gave us a very concise overview of this entire problem.

We do have a couple of questions and I will start off.

You mentioned 3-degree design day or 3-degree day design. What were you referring to specifically?

COMM'R. OZZARD: This is a day in which you would have a mean temperature of 3 degrees. You might go as low as 4 and 5 and jump up to 7 and 8, etc., depending on the number of hours. You have a 24-hour period that had a 3-degree mean temperature.

SENATOR SCHLUTER: Three degrees Fahrenheit?

COMM'R OZZARD: That's right.

SENATOR SCHLUTER: Somebody has mentioned that the use of air conditioners is one of the real drains on power in the summertime. Would it serve any purpose to conduct a survey and have a census of air conditioners, for example, with respect to power company needs?

COMM'R OZZARD: I think it might, Senator. But its great purpose would be, if we could cause customers to not only declare how many units they have, but advise before they make future purchases and connections. We have given some consideration, by the way, to working up with companies a form of penalty provision where there is a failure to report. If there is some load comes on,

the companies can pretty well isolate where the extra load is and could through meter readers make a check out. We considered a penalty approach. We haven't quite worked that one out where we could stand the heat and still get away from the stove.

SENATOR SCHLUTER: And the heat of customer resistance.

COMM'R OZZARD: That's correct.

SENATOR SCHLUTER: Commissioner, it has been proposed that there be an off-shore oil port. Of course, the Assembly rejected that by passing a bill yesterday. In this whole matter of an off-shore oil port would this increase the quantity of petroleum products that comes into New Jersey or would this just be another way to get them into the State?

COMM'R OZZARD: As you know, fuel oil is not our field. We don't regulate it yet. You have been giving us a lot of things. But our interest in it is because of the utility need and from that angle our fellows have looked into it. Our understanding is sort of a two-pronged one. Our understanding is that New Jersey might be in large measure, at least, used as a conduit because of its coastal location. Second, though import oil is most necessary, I am not sure that the off-shore deepwater port should be viewed in the current shortage situation. Because the current shortage situation is one that isn't just a wellhead problem, but it is a problem created by the refineries.

OEP put out a report that just came to my desk the other day which points out that the refineries have been operating below capacity and also with a lower proportion of their production devoted to distillates. In other words, they find it is a little less profitable to go into the number two and to go into other forms of oil, which means there is a partly unnatural shortage

here.

I would respectfully submit that the environment problem of off-shore ought to be related to New Jersey's needs, and the fuel-oil field I don't know that fully yet.

SENATOR SCHLUTER: Thank you.

Senator Merlino?

SENATOR MERLINO: Commissioner, are you aware of any particular problem that the electric utilities are having with any other department within the State, particularly the environmentalists, in obtaining permits to site and construct plants?

COMM'R OZZARD: When you say problems with another department, let me respond to that by saying that siting starts out by being a problem and then it's a matter of what agency and agencies you have to deal with. For siting in New Jersey at the present moment, you have a number of agencies you must go through - the Department of Environmental Protection ---

SENATOR MERLINO: That is the agency I am concerned with.

COMM'R OZZARD: You have the Atomic Energy Board, of which I am a member. You have the AEC in Washington. I am talking now principally about your atomic plants which are the ones that are currently in the news and the ones that we are trying to go forward with.

What you really have here is a question of whether or not there ought to be some additional committee, commission or something that has full authority to look to siting. That might very well be composed of the Department of Environmental Protection, the Public Utilities, representing the public and the utilities to meet both needs, and Labor and Industry to look at the industrial side of this.

The one thing you must remember, however, in the field of electric generation is that we are not an

island. We don't operate by ourselves. I think you are aware that we are part of the PJM system, which carries the name of Pennsylvania, Jersey and Maryland, but includes Delaware and Washington, D. C. This is the oldest grid system set up in the United States. It is a total interchange with sort of a debit-credit arrangement, depending on the amount of generation. But within that system because it has developed so well from its early years, we have plants that are owned by a number of companies, both in and out of the state. The best example is the Keystone operations of Pennsylvania. These are the mine-mouth plants that are right at the mine areas and coal brought out and generation is done there and then it is transmitted over the high voltage KV lines into New Jersey.

So the location of a plant might very well have to be more than a state selection. It might very well have to be an area or grid selection. You might have to set up something that works with the other states in this combination.

This is very important, by the way, because the length of transmission, as you know, is critical. We have been having a lot of complaints, that is environmental complaints, as to the overhead transmission lines. There is no way available at this time to put a 500 KV line under ground. But the 345's and 320's, etc., can go under ground. They say at terrible cost. But the point is this, that when we go from mine mouth in Pennsylvania, from Keystone all the way into New Jersey, you can't afford anyway to use anything less than a 500 KV line. So location would have to be somewhere related to the centers of service and that could be anywhere in this district. It might be something servicing from New Jersey into Pennsylvania or from Upper Pennsylvania into New Jersey with the idea of getting to the lower

KV lines and maybe going underground with a lot of them and enviromentally meeting that problem also.

SENATOR MERLINO: Well, the PUC does or does not get involved in the siting of these plants?

COMM'R OZZARD: We do get involved in the siting to this extent: If it does not involve an environmental problem or if it is a plant that does not involve atomic energy, then they can apply to us. They apply first to the municipality and if the municipality denies the application for the location of a plant or any utilities facility, they may then under the statute apply to the PUC and then, after hearings, we have a right to approve or disapprove. But if environmental aspects are involved, DEP can override any decision we can make.

SENATOR MERLINO: Thank you.

SENATOR PARKER: Commissioner, I think you have answered most of my questions.

You were talking about imposing some kind of restrictions on the user - rationing. Are there any realistic rules or regulations that we can put on the public in general or on the big users or any of the users that we can, say, legislate or that you can put in by your rule-making power?

COMM'R OZZARD: Legislation might be a little difficult because you would be dealing, as in most administrative fields, with a multiple of situations that might be beyond description in a normal statutory approach. It may very well be that after our hearings this spring that we will be back to you for some additional authorities. We exercised under the safe, adequate, proper approach authority in the gas field, but it came a little late. The companies had already begun to put restrictions on, as you know.

In the electric field, we would like to be in advance of that. And when I talk about rationing, I am

talking, in the first instance, about finding a schedule whereby certain types of users, if we get closer to the minimum reserve that we think we are going to reach by early summer, would no longer be allowed to come into the lines. One that quickly comes to mind, of course, is house-heating by electricity, electric heating of homes. That might very well be one of the first fatalities. Then certain types of industrial uses and commercial uses might very well be ruled out when we reach the reserve area that says no more new accounts of this type or no more new uses of this type within present accounts. This is what I am talking about in the first stage.

True rationing is going to be difficult in electricity unless you get to the point where you have to go beyond voltage reductions and you start shutting off.

SENATOR PARKER: Let me ask you this: In the case of New Jersey Natural Gas, servicing, you say, the shore area -- I got caught in that problem last year myself, personally. My house was damaged really by water. But is there any way that the utilities can put in these shore areas when the people leave, instead of leaving their heat on all winter -- they may use it on weekends -- but is there any realistic way they could shut it off for the week -- in other words, some valve that they could throw rather than call the companies. Say, they leave and are going to be gone for a month. Is there any way that they could shut it off realistically? Is there some device that they could use? They can drain their pipes. Is there anything that could be done that way?

COMM'R OZZARD: All gas appliances are supposed, within a reasonable distance of the appliance itself, to have a shut-off control for each appliance. This is the only way at the present time it could be done. The general shutting off of an entire unit has not been

proposed and we have not gone into it. It is a possibility.

You might be interested in knowing the shore people particularly and many other summer residents in the lake areas, etc., where gas is available, as part of this cut-back program for the use of gas, are being subjected to what I call our vulture program. We are picking bones. In order to make available to those people who really need gas as much as there is available, any user who discontinues for over a year, who shuts off and doesn't occupy and doesn't use, is considered no longer a customer and he cannot get back in the lines. That customer load is then allowed to somebody else. This is the only way that some sections of some of the companies' service territories are being serviced for new accounts. It is that tight a situation in New Jersey at the moment.

SENATOR PARKER: Basically what you are saying is that any type of regulation that we could put on the people is very difficult and practically impossible.

COMM'R OZZARD: And that is particularly true, Senator Parker, in the field of electricity because of the multitude of appliances that can be brought into a house and plugged in. Once you have your service, the only thing that dictates what you have is whether your fuse box will carry the load. From there on, you just keep plugging in and out and using as you see fit.

I know of what I speak because though some are away from home now, with eight kids who never learned how to turn off the lights, I can tell you that you can run up some healthy light bills just by a lot of lights on in the house. It is that easy.

SENATOR PARKER: One thing further - there was a recommendation made that some controls should be exercised over the importing and shipping of oil and the lightering of oil in and around our bays. Do you have any thoughts in that regard?

SENATOR OZZARD: Again it is a little out of my field, but what we have seen of it so far, I think your Commission might very well take a look at the probable problems of lightering versus deepwater. I think the first may have more oil slick dangers than the second. This, at least, is what we have been told in our engineering approaches so far.

SENATOR PARKER: That is all I have. Thank you.

SENATOR SCHLUTER: Thank you very much, Commissioner.

I have one question. We have another hearing on the 6th of February and this will be mainly devoted to energy. If you could be so good as to get anybody on your staff who is so qualified to give us your projections on the energy requirements, we would appreciate it. We are going to get them from the electrical companies, etc. But we would appreciate your comments on that if you have them.

COMM'R OZZARD: Senator Schluter, I would be glad to do that. As you know, we reorganized our department last summer and in that reorganization we built within the Division of Engineering a Bureau of Energy Resources because of this growing problem. The Director will be instructed to get materials together and I will see that he is available to help all he can.

SENATOR SCHLUTER: Fine. Thank you.

Senator Parker has to leave now. We do have two more witnesses to come up. If they would prefer to wait until the 6th, they would certainly have that privilege and we will put them on first. But if they want to go on today, we will certainly respect that too.

(Discussion off the record.)

Mr. Applegate, please proceed.

L E W I S R. A P P L E G A T E: Senator Schluter and Senator Merlino, my name is Lewis R. Applegate. I am a resident of Princeton. I am Director of Governmental Relations for the New Jersey State Chamber of Commerce. Our office is located in Trenton and the Chamber's

headquarters office is in Newark.

The issue before this committee is emerging rapidly as a major problem of our times: Where to find the proper balance between considerations of New Jersey's socio-economy, on the one hand, and the newer, popular and highly emotional appeal for protection of the environment on the other? The answer is not an easy one to find. We believe that it will become a matter of numerous lesser decisions rather than a single large one. The complexities of what's involved hardly allow any other pathway.

The State Chamber is pretty well on the public record for its concern that this presently popular cause of environmental protection not be allowed to overrun the very real need to meet the daily - and mounting - needs for energy of all types in New Jersey. Because our use of energy is so common, it has become virtually an unconscious act and we must sound a reminder that it includes the heating of homes, offices and factories, the lighting of these facilities and, often, their ventilation. It includes the cooking of our food, the operation of virtually all machinery used in manufacturing and in office work, as well as every form of transportation we use. And it also includes the operation of pollution control devices and effluent treatment facilities. Just about everything we do and everything we need requires a base of energy.

Even if New Jersey's population growth could be halted today, and even if there were no further growth of our economy, the demands for energy would continue to rise simply because people are continuously finding new ways of using it that add both convenience and enrichment to their lives.

The Chamber's concern here stems from the fact that far too many of the efforts of our energy industries - petroleum, coal gas and electric - to expand their

facilities and thus their capabilities of meeting the needs of the people, have been halted or subjected to serious delays because of environmental considerations. Some of these halting actions have taken place within the Legislature. Some have been the result of administrative rulings. And others have occurred out of local reaction in different parts of the state. But we note that almost every type of facility - hydro-electric, nuclear-electric, gas import terminals and petroleum import terminals - proposed by our energy industries has been affected.

The Chamber recognizes - and to a considerable degree is sympathetic to - environmental considerations. But the over-all interests of the public require that such controls as may arise out of these considerations provide standards that are reasonable and not arbitrarily restrictive. Judgments in this area must be on the basis of facts, not emotions.

Actions to curtail the construction of energy industry facilities that the public needs cannot readily be reversed. Even a superficial study of the lengthy process involved in the development of such facilities will show that virtually all of them require many, many years before the idea finally becomes a facility and in operation.

New Jersey's population is growing and its economy is growing. These two factors, coupled with the growing per capita consumption of energy cited earlier, make it mandatory that the construction of new energy facilities be subject to no avoidable delays. Brownouts, blackouts and shortages of fuel are already a factor in our lives and their increase constitutes a very real threat to the welfare of the people of New Jersey.

Because so many years of lead time are required for the completion of any new facility, we feel that the Legislature must recognize what is in the balance and

deal forthrightly with measures that seek to delay or curtail their construction. Such action would be clearly in the interests of the well-being of the more than seven million people who call New Jersey their home.

To help you in your study, we submit herewith several documents - and these will be delivered to you within a short time - which the Chamber has produced during the past year which relate, in one way or another, with this over-all energy problem.

Included in these documents is the research information and the stand of the State Chamber in favor of the off-shore nuclear facility and also in favor of the off-shore deepwater port, as well as support for the Tock's Island dam. We have additional backup information on A 1429 which, of course, has implications as far as the energy supply is concerned.

If we can be of any further help to you by obtaining additional information from any of the sources that are available to us, we will be pleased to do so.

We appreciate this opportunity to make our views known to you and we wish you well in your difficult endeavor. We would be very pleased if we could meet with you in some of your future sessions.

SENATOR SCHLUTER: Thank you, Mr. Applegate. I guess you heard that we are going to have two additional hearings.

MR. APPLEGATE: Yes, sir.

SENATOR SCHLUTER: And the hearing on February 6th will be mainly concerned with energy.

Mr. Applegate, would it be possible through you or through other agencies with whom you might be connected to develop information for this Commission to show the indicated growth of industrial activity, say, in this century really, but basically from 1950 forward and the projected growth of industrial and commercial activity in the State by capital investment or whatever

other index you might choose, and also if it would be possible to give us a curve showing growth of housing starts and projected housing starts.

I am sure our Commission secretary can get the same curve with respect to projected population and that source.

The thing that concerns me is the fact that we received from the Public Service Electric and Gas officials who were here earlier a projection that in ten years between 1972 and 1982, the electrical generating capacity is going to increase by over 100 per cent; whereas it took 70 years to get to the present level or the 1972 level. I am just wondering how much of this excess demand really is because of true population growth or is it just because of self-induced demand or extra uses of electricity? If you can give us that, we would certainly appreciate it.

MR. APPLEGATE: We will use our resources to get you whatever we possibly can.

Could I comment very briefly on the question you asked Mr. Ozzard because it bears on the off-shore oil port? I believe you asked him a question whether that would be helpful or not.

SENATOR SCHLUTER: I was going to ask you that question - not whether it would be helpful, but is this going to add to New Jersey's supply of petroleum products?

MR. APPLEGATE: In our opinion the deepwater oil terminal is needed to meet the anticipated refinery demands of New Jersey refineries in the immediate future and will represent an environmental improvement as well as an improved method for handling large volumes of crude oil and possibly heavy fuel.

It wouldn't serve as a conduit through New Jersey since the refineries that would be served are already

in New Jersey as well as in the Philadelphia area and these refineries supply products to New Jersey.

In Commissioner Heymann's statement, he points out that the chemical industry is our number one industry in this State and that, backing that up, the source of really the chemical industry is the oil industry. So we more than any other state need the oil sources for our own industry as well as for heating our homes and supplying smaller manufacturers as well as larger manufacturers. We are a large industrial manufacturing state.

SENATOR SCHLUTER: Are you saying, Mr. Applegate, that if we don't have a deepwater port --

MR. APPLEGATE: -- we are going to be in trouble.

SENATOR SCHLUTER: (Continuing) -- we might be in trouble in supplying our refineries? We can't get the raw materials any other way?

MR. APPLEGATE: Not enough - and not enough to meet the competitive market.

SENATOR SCHLUTER: Would a deepwater port in any way allow the refineries to cut the cost of their raw materials so that the consumer could expect a reduction in price?

MR. APPLEGATE: In the studies and the deliberations that I have seen before we took a stand in favor of it, very definitely it would reduce the costs from what they are now, the use of a deepwater port. That hinges on such things as the tankers carrying much more and, therefore, reducing the cost of transportation per barrel over the smaller tankers for which you have to supply the same crews and everything else.

SENATOR SCHLUTER: That is all the questions that I have, but we would appreciate your being available when we have other hearings.

Senator Merlino?

SENATOR MERLINO: Have the studies which reflect

the cut in the cost of production been projected to show any reduction in the charge to the ultimate consumer?

MR. APPLEGATE: That would be the end result. The cost of production goes into the cost factor of selling any product and certainly it would have to be reflected there.

Certainly the reverse is true. As the cost of the oil has gone up, the cost of gasoline to the customer has gone up.

SENATOR MERLINO: That I think we can all accept as a statement of fact. My question is: Would that same philosophy or policy hold true that with the cost of production being lowered it would be reflected in the cost to the consumer?

MR. APPLEGATE: My presumption is that it would.

SENATOR MERLINO: In addition to the studies of which we will be the beneficiaries, what has the Chamber done by way of studies on the effects of increased production of energy on the ecology of the State?

MR. APPLEGATE: I think the Chamber has shown leadership with its members, to point out that we can't ignore the importance of environmental controls. And we have done a great deal by way of holding conferences, by way of a committee operating in this area, to study how industry can work into environmental controls. We are not adverse. What our problem is - and it has been cited here today a number of times - that we are almost getting completely overrun by the environmental controls, so much so that the Chamber is behind a bill, A 2100, that has been introduced in the Assembly with 37 sponsors, which calls for an economic impact statement to go along with any legislation that is very likely to involve serious sacrifice on the economy level. We hope that the members of the Legislature will be able to have before them before they pass an environmental

controlbill or any other similar bill, not only what it is going to do to the environment, but what the impact is going to be on such things as future industrial development or even current industry, employment and even the tax base, as far as local and State taxes are concerned.

We are pushing this very strongly. And our purpose - you brought up the environmental issue - is to get a balance into the picture. We think it is absolutely essential and it is something if we don't do now, ten years from now it is going to be too late to reverse the destruction of industry in the State, you might say.

SENATOR MERLINO: Maybe we should also have an environment impact study made on bills.

MR. APPLEGATE: I am sure the environmentalists are taking care of that.

SENATOR MERLINO: They may have attempted to do this, but I don't know that they have the same resources, both human resources and financial resources, to do the same thorough job in their area as the Chamber has in its area. Since we are going to have to reach the middle road where both are concerned, I would think that the Chamber in conducting the numerous conferences that you have mentioned here would have some information available to this Commission as to just what did come out of those conferences and what was accomplished, if anything, along environmental lines.

MR. APPLEGATE: One of the conferences involved having Commissioner Sullivan and his staff there with leaders of industry to try to better understand what they are driving at. This is the kind of an educational program that we have been conducting.

SENATOR MERLINO: Could you make that available to us, whatever the results were?

MR. APPELEGATE: What reports we have - yes, surely.

SENATOR MERLINO: I have nothing further.

SENATOR SCHLUTER: Thank you very much, Mr.

Applegate.

The last witness for today is a representative of the New Jersey Manufacturers Association. We apologize for putting you after Commissioner Ozzard and we appreciate your patience.

D A V I D W. L L O Y D: Mr. Chairman and members of the Senate Ad Hoc Commission to study Energy and the Environment: My name is David W. Lloyd. I serve as Secretary to the Committee for Environmental Quality of the New Jersey Manufacturers Association. Our Committee appreciates this opportunity to express its views.

The cold wave of the past few weeks may have accomplished what countless individuals and organizations uttering perhaps millions of words hadn't been able to before, namely, force a recognition of the fact that we are close to experiencing a dangerous energy situation. It is a situation to which we alluded as recently as February of 1971 in our comments to the Department of Environmental Protection regarding proposed amendments to Chapter 5 of the State's Air Pollution Control Code. At that time we urged caution in further tightening of the fly ash code since it might help to bring about a shortage of power in the future.

Well, the future is here. We certainly hope that the work of this Ad Hoc Commission can be instrumental in focusing the proper attention on the complex question of how to balance our energy requirements with a safe and healthy environment.

The availability of energy is and should be of major concern to all. A major portion of this energy is needed to provide jobs through industrial production, which through the income generated provides tax support for government at all levels.

Industry consumes approximately one-third of all the primary energy produced and is the ultimate consumer of a major portion of electricity generated by the electric utilities. In all, industrial and commercial consumers account for two-thirds of all energy consumed in the entire United States.

Should industry in New Jersey be unable to rely upon an adequate supply of energy, the consequences could be serious. The results of the current shortage are already available: utilities in certain areas of the State are unable to take on new customers, which means new industrial and commercial facilities may have to go elsewhere. The lost job opportunities (and the Department of Labor and Industry estimates that we need some 50,000 new job opportunities each year just to stay even) and tax rates can't be good for the people in this State.

Our Committee is not in a position at this time to suggest specific remedies to meet current and future energy needs. Our prime purpose in appearing today is to lend urgency to the situation and to state our concern for the industrial energy needs of the future. We respectfully submit that because of the great need for energy:

1. Serious consideration should be given to such proposals as offshore exploration for oil and gas, utilization of deepwater fuel transfer facilities and proper location of nuclear generating stations. We strongly urge that no potential source of energy be written off without first having been subjected to the most extensive, objective, in-depth study possible. If modern methods of construction and energy production can include technology which reduces the threat of ecological damage to a minimum, then such methods should be given the opportunity to prove their worth for the

benefit of the citizens of this State.

2. Government decisions in response to questions of either ecology or energy should consider both in relation to each other and to the benefits likely to be derived by the public. While energy problems cannot be resolved without due consideration for environmental needs, by the same token, ecological considerations cannot be permitted to choke off our energy supply.

Thank you very much for this opportunity to present our views.

SENATOR SCHLUTER: Thank you, Mr. Lloyd.

A quick question: I see where you serve as secretary to the Committee for Environmental Quality of New Jersey Manufacturers Association.

MR. LLOYD: Right.

SENATOR SCHLUTER: Is this an active committee?

MR. LLOYD: Yes. This committee has been in existence now for about ten years.

SENATOR SCHLUTER: How often do you meet?

MR. LLOYD: Well, we meet anywheres from four to six, maybe to ten times a year, as often really as is necessary.

SENATOR SCHLUTER: And what is the purpose of the committee?

MR. LLOYD: The purpose of the committee is, number one, to acquaint the members of the committee and the members of the Association with the various rules and regulations which are being proposed; and, two, to use this committee as a sounding board and almost a policy-making body for the Manufacturers Association. It is more of an advisory committee really to the Association.

SENATOR SCHLUTER: I see. Thank you. I don't have any more questions. How about you, Senator Merlino?

SENATOR MERLINO: No.

SENATOR SCHLUTER: Thank you very much.

MR. LLOYD: Thank you.

SENATOR SCHLUTER: This will conclude the first hearing of the Ad Hoc Commission of the Senate on Energy and the Environment.

Let me remind everyone that the next hearing is going to be on February 6th. This will be concerned mainly with energy. There will be another hearing on February 20th, which will be concerned mainly with environmental impact. We have set aside March 2nd as a possible date for another hearing if needed.

We will stand adjourned as of now. Thank you.

(Hearing Adjourned)

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I would regard the starting point for the development of the current energy crisis as the period immediately following World War II. With the shortage of materials and rationing experienced during World War II, technological developments in the generation, transmission and distribution of electric energy had been in large part suppressed during the World War II period and electric utilization appliances were in short supply. With the end of rationing after World War II (except for a short period during the Korean crisis) the electrical equipment industry and the electric utility industry took gigantic leaps. The size, temperature, pressure and thermal efficiency of electric generating units increased rapidly and other technological improvements cutting across the whole process of generating, transmitting and distributing electric energy were realized. As a result, notwithstanding inflationary pressures and cost increases in the general economy, electric utilities were generally able to avoid increasing their rates and, in many instances, actually decreased their rates.

During the same period, the automation of many industrial processes and the general reduction in the labor component of industrial products was rapidly increasing industrial utilization of electric energy. This was also true for commercial applications such as shopping centers. Residential usage was also increasing, largely because of increased consumption per customer with almost all households, regardless of income level, acquiring new appliances, although the increase in population was also having an effect.

There was also a recognition that our international trade situation called for increased automation and the substitution of electricity and other energy for human labor. Consequently, for almost two decades following World War II, the National emphasis, virtually without dissent, was on increased use of energy to promote employment, higher living standards and our international trade position.

The Federal Power Commission's original National Power Survey which was initiated in 1961 and completed in 1964 reflects the well-nigh universal attitude of the period and

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the preceding two decades. The Survey utilized the talents and experience of the entire electric utility industry, including governmental power agencies such as TVA, municipal power agencies both large and small, REA Cooperatives, and investor-owned companies. It also had inputs from many other agencies and groups, although it was primarily power oriented.

The 1964 Survey assumed, without really critically examining the assumption, that the rate of increase in electric power consumption which had been experienced in the past decade would essentially continue and that it was the responsibility of the power industry to find means for meeting such increased power requirements economically and efficiently. There was no suggestion worth mentioning that the industry or governmental agencies involved with the industry should seek to curtail this growth in electric load; indeed, it was viewed as the responsibility of the industry and governmental agencies concerned with it to assure that the industry met its statutory responsibility to provide an abundant supply of power at an ever-decreasing price (in terms of a stable monetary unit).

During the decade of the 1950's, the rate of increase in the cost of labor and materials involved in the construction of electric utility facilities was relatively gradual and, as noted, was offset by technological improvements, so that, by the time the 1964 Survey was completed, the rapid rise in such costs experienced in the past 10 years had not been reflected in the costs with which the 1964 Survey was concerned. It was assumed generally in the Survey that continued technological improvements and continued economies of scale would tend to offset increases in the costs of labor and materials. It was also assumed that, with increases in the interconnection capacity between power pools, it would be feasible to reduce generating reserve requirements and thereby achieve economies. There was also inadequate recognition of the fact that the electric utility equipment manufacturers were having increasing difficulties in maintaining quality control of their product and that there had been substantial extrapolation from proven and tested designs into unproven technology which would have a significant impact on costs.

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In this same period, there was continued expansion of natural gas pipelines and aggressive merchandising of natural gas for a variety of uses, including, of course, residential space heating. The Nation had lived so long with a condition in which proven natural gas reserves were limited but were replenished by continued exploration that there was inadequate recognition of the fact that natural gas reserves might not be adequate for the indefinite future. Similarly, the consumption of oil and oil products was rapidly outpacing domestic production and causing dependence upon overseas supplies, but this again was not generally appreciated.

It was only in the middle 1960's that the emphasis on environmental concerns began to emerge. Some believe that those concerns were sparked by the massive interstate highway and Corps of Engineers construction programs, as well as the programs of the utilities, but it is fruitless to seek to identify the origin of such concerns. What is relevant is that, within the space of about five years, (a) major uncertainties have been created with respect to the construction of all types of power generating facilities and (b) even assuming ultimate success in obtaining the necessary governmental authorizations for such facilities, the period required for the planning, design and construction of such facilities has been doubled - e.g., for major base load facilities we now require 6-10 years (depending upon the type of facility) rather than the 3-5 years previously required. Since, in order to avoid burdening consumers with the costs of higher reserves, the industry economics and rate policies had been traditionally predicated upon maintaining average generating reserves of 10%-15%, the industry had no real spare capacity when these delays in the ability to complete construction began to hit the industry. As a Nation we have been fortunate that the past two summers have been generally cool so that the summer loads have not hit the anticipated peaks. But the fact is that, in many parts of the Nation, it is doubtful that the industry will be able to meet the full load of the area residents during the next half-dozen years, unless substantial progress is achieved in accelerating the rate of governmental authorization of the construction and placing in service of generating facilities.

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Generally, those who would block or delay the installation of major power supply facilities have no responsibility for meeting power needs and blithely and firmly refuse to acknowledge the consequences of their actions. There are, however, some who recognize and face these consequences and who would impose the rationing of electricity or at least limit the taking on of new loads. This has been necessary for some parts of the natural gas industry. We have not seen any signs that it would be acceptable to the Nation for electricity.

There have been suggestions that the substantial increases in electric load during the past quarter century were attributable in significant part to the aggressive promotion of the use of electricity and that this growth can be slowed by changes in rate structure design which would penalize disproportionately (in terms of cost) increases in consumption. Unquestionably, there are some industries that are heavy users of electric energy and which are affected by the price of that energy. This fact, however, seems to be correlated primarily with the location selected by them for their plants - i.e., they do not refrain from entering or expanding their business activities, but, instead, tend to place their facilities in areas where they can anticipate favorable electric rates for their particular use.

The GPU system, for example, has not been a supplier to the aluminum industry and our costs have not been such as to give us reason to believe that we could be such a supplier, even if we desired to be - which we do not. Similarly, we have not been a major supplier of electric energy to other industries in which electric power is an important component of product cost. Nevertheless, our load growth in the past decade has been substantially above the average of neighboring companies, and we believe that the largest single factor has been the movement of individuals, commercial establishments and industries from the central cities, which we do not generally serve, to the suburban and rural areas that we do serve.

Given these circumstances, we do not believe that the promotion of electric energy usage or existing rate structures have been a major factor in the growth of electric load and the resulting crises or that a change in electric rate structures will significantly affect the rate of growth of load in the future.

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II. Extent of Shortage Expected

I am unable to predict accurately the probable extent of the energy shortage we will experience in the next few years since it will largely depend upon governmental action or inaction. My best guess is that the Nation will not reach the point in which it will be necessary to ration electric energy, but that we will be plagued with frequent voltage reductions and requests for "voluntary" load curtailments in most regions of the country. I regard this as a somewhat optimistic assessment, and it is predicated on the assumption that the AEC will make progress in the licensing of nuclear plants and that the Corps of Engineers and other permit-granting agencies will somehow be freed from the morass in which they are now entangled. I do not anticipate that the natural gas supply situation will be eased materially, even with massive imports of liquified gas, and consequently I expect that more and more natural gas companies will find it necessary to curtail or ration their deliveries.

With the continuing rate of growth of electric load, any margin of supply quickly evaporates if construction and operation of new facilities is arrested. Consequently, if my optimism about continued grants of licenses and permits by the AEC and others proves to be unfounded, we could, within a year or two, be in a position in which the rationing of electric power is mandatory. If and when we ever reach that point, it will be extremely difficult to dig our way out of it because it will call for the installation of new facilities at a rate that the industry probably would have extreme difficulty in achieving.

III. Efforts to Deal with the Shortages

We have attempted to deal with the impending shortage in a variety of ways:

- (a) We have ceased all promotional advertising and redirected our efforts into service assistance channels;

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I do not know whether this has really affected significantly the rate of growth of load, but it has placed emphasis on energy conservation.

(b) We have lengthened our period for the planning of design and construction of facilities in an effort to take into account the additional delay experienced under current conditions. Thus, we are getting an earlier start on some new facilities than would have been the case if we had continued our past practices.

(c) We have installed facilities requiring shorter design and construction periods but higher operating costs, such as combustion turbines. We are also installing combined cycle facilities to permit us to get load-carrying generating capacity in service in a relatively short period, but with economic ultimate costs that are somewhat more favorable than combustion turbines.

(d) We are doing our best to mount an effective educational campaign to demonstrate to the communities we serve and affected agencies that we are highly interested in environmental factors and that our interest long antedates the current emphasis on such matters; we are seeking to have them understand that the objectives of improved air and water quality cannot be achieved overnight and require, instead, logical and systematic developments taking due cognizance of the practical day-by-day and step-by-step method of achieving technological progress. Many communities and agencies have found this information helpful and are urging us to expand such efforts, but some agencies and individuals regard realistic evaluation of the facts as foreclosed by their statutory mandates or individual frames of reference and discussions with them are fruitless.

IV. The Impact on the Public

Up to this time, the overall shortage of energy which is rapidly developing has had little impact on the public. There

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have been voltage reductions in some areas from time to time over the past few years, and there have been curtailment programs invoked for relatively short intervals. Likewise there have been some local area problems, such as those experienced this year in parts of Brooklyn and Queens when Con Edison experienced failures in its power distribution grids, but no area has yet had to face the suspension of construction of new homes and businesses nor limitations on appliance purchases and usage by reason of existing or anticipated shortages of electricity.

There have been periodic reports in the media of the impending energy shortage, but it is my impression that there has been no real public appreciation of the potential dimensions of the energy shortage and its consequences. I believe that it is unlikely that the public realizes that it might be necessary to ration the use of electricity, preclude the installation of new appliances, and foreclose the construction of new residences, stores and factories. My own estimate is that the public would find this well-nigh intolerable and that there would soon emerge a much more realistic comparison of the benefits resulting from such environmental restraints and the costs to the Nation in terms of employment and well-being. I am hopeful that the Nation will not be driven to the point where there is this kind of a direct confrontation, but it should be realized that it is a distinct possibility.

V. Steps taken during the past five years to avert this crisis.

The Federal and State governmental agencies concerned with regulation of electric utility companies have seen this crisis coming and have labored diligently to stimulate the planning and installation of new facilities and the most effective use of existing facilities. For example, the Public Utility Commissions of the States of New Jersey, Pennsylvania, Maryland, Delaware and the District of Columbia have frequently reviewed the load and capacity of forecasts of the 12 inter-

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connected companies that constitute the "P-J-M Power Pool" and have sought vigorously to stimulate higher reserve margins, the installation of new generating facilities capable of being constructed in a short period, and the like. This also has been true in the case of the Federal Power Commission which has been very active in reviewing regional and national electric utility facility planning.

Many of the governmental agencies concerned with licensing, such as the AEC and the Federal Power Commission, have sought to find means and procedures to keep licensing proceedings moving. The fact is, however, that Federal and State statutes involving environmental matters - at least as construed by the courts - have interposed serious stumbling blocks. No one could seriously question the objectives of the National Environmental Policy Act of 1969, namely, to provide a reasoned and balanced analysis of the environmental impact of major Federal agency actions. On the other hand, one may seriously question whether that objective is being achieved when the administration of the Act has resulted in the delay in the licensing of major generation and transmission facilities for substantial periods in order to produce torrents and avalanches of documents which do not contribute to decision-making but which provide magnificent vehicles for delay of projects by opponents of such projects.

The potential energy crisis is largely the product of legislative action during the past five years. At all levels of government, legislators have become enamored of sweeping endorsement of environmental objectives and the broadest grants of authority and responsibility to enforcement agencies. Given the legislative history of such enactments, it is not surprising that the enforcement agencies and the courts have gone as far as they have and that the electric utility companies and the governmental agencies concerned with supervision have been unable to keep pace with this flood.

VI. Forecasts

(a) Next year.

We do not have any major generating or trans-

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mission facilities scheduled for completion next year. We do have arrangements to purchase capacity from a neighboring utility out of units under construction and, if such units are not completed on schedule, we would not be able to achieve our desired reserve margin.

Of even more immediate concern, however, are proposals of the Environmental Protection Agency that could force the shut-down of our Oyster Creek nuclear generating station by reason of heated water discharges into Raritan Bay. We believe such action would be inconsistent with the whole basis upon which the Oyster Creek station has been developed and with the studies that are now in process. The New Jersey Board of Public Utility Commissioners has, by a letter to EPA, a copy of which is attached, urged EPA not to take such action.

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With the interconnections existing among electric utilities and the cooperative patterns of assistance that they have developed, the reserve capacity situation of any single utility is less important, even to its own customers, than that of the regional power pool within which it operates. We are a part of the Pennsylvania-New Jersey-Maryland ("PJM") pool - which also includes the District of Columbia and Delaware - and we assume that the PJM pool load and capacity forecasts have been furnished to you. In the absence of major unexpected developments, the PJM pool should be able to meet the load of its customers next year.

(b) Ten years hence.

We and our neighboring utilities in PJM have all submitted our ten year load and capacity forecasts to various agencies of government. The forecasts of loads draw upon past experience and trends and, if there should be a major development requiring a departure from past trends, the load forecasts could prove to be in error. However, based upon the information now available, the load forecasts appear reasonable.

The capacity forecasts are much more of a question mark. The electric utilities plan very substantial generating capacity and transmission facilities for installation in this

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period. Many nuclear units are involved, but there are also oil-burning, coal-burning and pumped storage units that are a part of the plan. If the requisite governmental authorizations can be obtained in timely fashion - and some stations require approximately 70 governmental authorizations of one type or another - it should be feasible to install the required facilities in time to meet the load growth. If, however, it requires the actual experience of frequent load curtailment in order for the legislative bodies and electorate to evaluate the extent to which they wish a headlong rush to environmental improvement regardless of consequences, we should see substantial shortages of electricity and the need for rationing within the next ten years.

(c) Three hundred years hence.

I have no question that, if the instrumentalities through which men govern themselves - or are governed - prove adequate to cope with the problems of population growth and war, there will be adequate means to limit energy demands or to find substitute sources of energy. Without solutions to population growth and war, the fact that we will have exhausted the major existing sources of energy is almost an irrelevancy.

VII. Nuclear Power

In terms of the consumption of energy sources and minimum environmental disturbance, we believe that nuclear power offers many demonstrated advantages to the Nation. The safety record of civilian nuclear power reactors is impeccable, their dependability record unmatched, and the economic record beyond real question. Yet, we find a relative handful of opponents of nuclear power plants have been successful in converting administrative proceedings into instruments of protracted delay and uncertainty so that the immediate energy crisis is particularly a product of the delays and uncertainties in the licensing of nuclear power plants.

The AEC is now making determined efforts on a variety of fronts to expedite the licensing process. Substantive rule making proceedings, proposals for generic design and facility

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licensing and the like are all useful in this respect. But the primary responsibility for the AEC's limited ability in this regard lies with Congress. We could avoid the prospect of a serious energy shortage in the next 3-5 years if Congress would seriously examine the current status of licensing proceedings and evaluate the public benefits being achieved by the inflexible application of the various environmental enactments without an orderly transitional period.

Apart from the licensing delay and uncertainty problem, the generation of electric power by the light water reactors that constitute almost the entire U. S. present commercial product is subject to the potential limitations of inadequate enrichment facilities. This could be a serious bottleneck unless prompt action is taken to construct additional enrichment capacity.

For the longer run, we believe that the breeder reactor will provide a long-term abundant source of energy. We have been participants in detailed studies of breeder technology, and we believe that the technology is quite well developed. We are convinced that the demonstration project now being undertaken jointly by the AEC and industry will identify the practical problems of hardware and operational procedures necessary to take the breeder from laboratory concepts to commercial applications.

The most difficult long-range problem for nuclear power that I foresee is that of disposal of nuclear waste. I do not believe the problem is critical today, nor do I think we must have a solution to it in order to go forward with our civilian power program. I do feel that the problem should continue to receive substantial attention but I hope that such attention will accord greater emphasis to technical considerations than has been the case in the past few months.

VIII. Alternative power sources.

It is not surprising that some of those who have been responsible for creating the potential energy crisis should seek

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to avoid being saddled with responsibility for their action by the suggestion that there are readily available a series of alternative power sources which can meet the Nation's needs. I believe that such suggestions are essentially irresponsible and deceptive.

The use of the earth's heat for the generation of small amounts of electric energy is feasible under particularly favorable circumstances. Pacific Gas and Electric Company has a very small geothermal installation and is planning on another one. But, to the best of my knowledge, there is no reason to believe that it is technically possible, let alone economically feasible, to look to the earth's heat as a source of any noticeable, let alone significant, part of our current energy needs.

Ultimately, solar energy is the major source of other forms of energy and substantial efforts have been made and are continuing to find means for direct use of solar energy. I am optimistic that in the long run the technical and economic breakthrough will be achieved. But the fact is that it is not here. We can't meet today's needs with tomorrow's dreams.

The fusion reactor offers real prospects of becoming a technically and economically acceptable source of electric energy and serious efforts are being made to make progress on this front, but it is at least two to three decades away.

The notion of using windmills to solve our current energy crisis has an almost child-like appeal. It arouses memories of the Dutch windmills in grade school texts, of Cretan windmills in modern travel guides and even reminds one of how long mankind used the force of the wind as the principal means of nautical propulsion. But to suggest that we can use windmills as a major source of energy to meet the present needs is more far fetched than to suggest that we can use gliders as a substitute for airplanes, automobiles, and railroads as transportation.

There is no question, also, that the rise and fall of the ocean's tides is a potential source of energy that could be tapped. The Passamaquoddy project of the early New Deal was a project designed to do just that. But, even under the particularly favorable physical conditions of that site and the

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distorted economics under which the project was advanced, the project was not a sound use of resources then and it has become less so with the passage of time.

The problem with all these and other potential sources of energy is that, while there are potential energy sources, there are also costs involved in the development of these sources which outweigh (in terms of utilization of resources as well as economic costs) the benefits of such resources. This will not always be the case; improved solar energy technology, for example, is likely to make it possible to achieve direct realization of the energy resources involved. But, like virtually all human endeavors, the process is the slow one of experiment, improvement, consolidation and confirmation.

This is true, for example, of proposals to conserve some energy by burning garbage. The concept is attractive and is not beyond known technology. But, to the best of my knowledge, the energy required to compact and dehydrate garbage so as to make it feasible to use it as a fuel is, at present, greater than energy realizable therefrom, and there is today no substantial prospect of an ecological gain in going through this intermediate process.

IX. Interim measures.

There is no question that the energy crisis could be postponed for some period if the rate of increase in energy demands were slowed by reductions in the waste of energy. Efforts to achieve such reductions in waste are worthwhile not only for the direct results they will achieve but also because they will focus more directly for all concerned the real nature of the decisions that must be made. It would, however, be an unrealistic indulgence in optimism to assume that the consumers of energy will be induced, on a long-term and continuing basis, to reduce their energy consumption. The unvarnished truth is that ours is a wasteful society and the waste of energy is one of the less conspicuous forms of such waste. I do not believe it would be sensible to fashion any long-range policy on the expectation that our Nation can be restrained into habits of avoiding waste.

X. Recommendations for action to prepare for energy demands of the 24th Century.

I find myself unable to respond in a meaningful way

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to the request for suggestions on this score. After all, it was only about 300 years ago that the industrial revolution began; it was slightly less than 200 years ago that the United States became a separate Nation, and it was less than 100 years ago that the electric utility industry had its commercial beginning.

In the past 300 years we have tapped resources that were unknown at the beginning of the period and found means to produce, utilize and, unfortunately, also to waste energy that were undreamed of in this short part of human history. I do not doubt that we and our successors over the next three centuries can find technological solutions to the known and unknown problems. I believe we can find such solutions most effectively and in most timely fashion if we follow the practice of ascertaining and evaluating realistically the consequences of following a particular course of action. I do not believe our governmental organizations or our electorate can properly prepare for and resolve the issues of the future without an understanding of the important facts involved. I suggest that the way in which to begin such preparation is to start now. For example, I believe that your Committee can make a significant contribution if it develops and presents, in readily understandable terms, the data relating to the present and near-term energy problems. If we can look at the near-term situation clearly, our vision of the long-term future is less likely to be distorted.

Although the matters to which you have requested that I direct my comments do not embrace the item of electric utility return, I think it necessary to make reference to the fact that this is an important ingredient in planning for the future. In order to provide for present and anticipated demands for electric energy, electric utilities are being called upon to install new facilities at an unprecedented rate. For example, in the case of two of our major subsidiaries, we are being required to quadruple our investment in a single decade. Yet, utilities

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are not receiving rate increases in amounts and in time to permit them to finance the growth and investment which they are expected to make. Electric utilities must compete for capital with all other agencies and enterprises seeking capital. If they are not permitted to obtain a reasonable return, the requisite capital will not be forthcoming. In the past two or three years the electric utility industry has been rapidly losing ground on this score and unless the rate regulatory process becomes more responsive and responsible in very short order, we may well find an energy crisis produced by the simple fact that electric utilities were unable to finance the facilities that would have helped them deal with the energy demands made upon them.

Respectfully submitted,

William G. Kuhns,
President



Sierra Club

NEW JERSEY CHAPTER

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STATEMENT FOR THE NEW JERSEY SENATE ON THE ENERGY CRISIS

DR. R. STOCKTON GAINES

The energy crisis is real, has been a long time in coming, and will not be easily disposed of. The problems are fundamental since energy questions are at the root of our economy. Such diverse and fundamental questions as the proper uses of our coastal areas, wetlands and rivers and the development of mass transit facilities are related to the energy crisis. The formation of this committee is a welcome sign and the Sierra Club urges the Senate, and indeed the Legislature as a whole, to appoint a committee of longer duration to investigate the many ramifications of this problem, and to advise the legislature when questions on which energy considerations have an impact are before it. The hiring of energy and environmental consultants by such a committee would seem advisable.

What are the main problems, and what are the environmental impacts associated with them? Our principal energy sources in this state are or will soon be oil, natural gas, and nuclear power. For any kind of fuel, there are problems of acquiring it, the means used to convert it, and the waste products associated with its use. For the moment, let us consider the problems related to oil. Natural gas is a clean, desirable fuel but is going to be difficult to obtain for the next few years. There is much to say about nuclear power, but we will defer such comments except to urge favorable consideration of A. 1673, the power plant siting bill. Early consideration of the land use questions involved in power plant siting is essential. There are many questions related to the use of petroleum products in New Jersey that should be examined with care.

How does New Jersey get the crude oil and refined petroleum products it uses? Much of it comes in by sea, and the state should make an effort to place environmental controls on this. The threat of deepwater ports that could handle supertankers has recently received public attention. Largely ignored is the fact that at this moment large tankers are lying to off the Delaware Bay, and in the vicinity of the Raritan Bay and New York harbor, where they off-load to lighters until their draft is reduced enough to proceed into port. Such unregulated traffic in the vicinity of our important coastal areas poses exactly the same threats as those associated with the deepwater ports, and yet is allowed to proceed unregulated, and at considerable hazard to New Jersey.

New Jersey's requirements for oil, both for itself and for the refineries located here whose products are used elsewhere, are going to increase in the near

future. There is a chance, however, that we will soon run out of refining capacity. Little new refining capacity has been constructed in the last few years in the U.S., and our once adequate reserves are now barely sufficient to meet the demand. We can expect that we will soon see the start of construction of more refinery capacity. At the very least, we need a bill such as A. 1429, which will give the state control over development in its coastal areas. Refineries require power, large supplies of water, and pipelines to service them, and are usually major air and water polluters. If the state controls the construction of such facilities, and plans for their siting as part of a comprehensive land use plan, the results are going to be a lot more to the liking of the people of this state than if those industries which will make a profit out of these facilities make all the decisions without supervision. In this connection we point out that the Coastal Zone Protection Act was passed last fall and signed into law by President Nixon. If properly funded and implemented it will provide financial and technical assistance to coastal states to develop proper management of their coastal areas. Such legislation as New Jersey may adopt should be compatible with this law.

Turning now to the use of refined petroleum products, two of the chief areas which should receive immediate attention are transportation and electric power. In transportation, there is a tremendous advantage in efficiency to be obtained if the use of mass transit facilities increases and automobile traffic is reduced. This whole area needs a great deal more study, but some immediate actions come to mind. Increases in bridge and toll-road tolls would probably have some effect, and the reservation of bus lanes on heavily travelled roads during peak traffic periods has obvious advantages. There are other measures which can be taken on a short term basis, and for the long term the development of adequate mass transit facilities should be a major priority.

Electric power is the fastest rising segment of the power industry. It is also the least efficient way to use fossil fuels. We use it because it is so convenient, and also because it has been so artificially cheap. But there are many problems associated with it. Power plants are going to become one of the major consumers of water in the state. More than two-thirds of the energy created by a nuclear power plant is wasted -- in the Newbold Island plant it will be used to evaporate precious Delaware water. Power plant site selection has been at the whim of the power companies in the past, and this has led to many environmentally poor results. We reiterate that A. 1673 is badly needed. The cheap price of electricity has been a boon to the American economy in the past, and we recognize that increases in its cost will have major impact. Nevertheless, part of the reason that the direct cost has been low is that many hidden costs are not included in the price, which we suggest should be identified as actual costs which should be paid for by the consumers of electricity. If we must build dams to provide cooling water, if we must run the risk of damage to our coastal areas by increased petroleum production, if we must donate our park lands for power transmission

lines, then we should reflect these general costs in the price of electricity. Further, we believe that if efforts are made to reduce the use of power, this will not be synonymous with a reduction in the standard of living in this country. We can build buildings so that less power for heating and cooling are required. We can use containers which are less energy-intensive to produce than aluminum cans. If proper economic incentives are achieved through price adjustments, it is quite evident that appropriate reductions in the use of power will take place. At the very least, all users of electric power should pay as much per watt as the small consumer of power pays. We should no longer encourage the use of our scarce fuel resources by giving a discount to the large user. (It would be appropriate to charge different rates for different times of the day, so as to smooth out the load.)

To summarize, the Sierra Club believes that there is a real energy crisis. Demand is rising, and new facilities for meeting this demand are going to be needed. We do not have the kind of reserve capacity to meet rising demand that once existed in this country. At the same time, we have become aware of the environmental costs associated with the supply and use of energy. Efforts must be made to reduce the environmental impact of energy use, and to include the actual costs in the price of energy. Legislation is necessary to achieve this. We urge the legislature to study carefully the problems involved in meeting the energy crisis, and to provide adequate legislation to safeguard the state as the crisis is met.

Nation Without Power

If anyone still needs evidence that this country's jerrybuilt system for supply and distribution of fuels and energy has collapsed, look around. From the Rocky Mountains to the Atlantic, schools and factories are threatened daily with mid-winter closedowns for lack of heating oil. As emergency stocks become available, trucking lines find themselves so short of diesel fuel that they may not be able to deliver what there is. Were it not for a fortuitous few days of unseasonable warmth, the Northeast would be an icy disaster area.

This is an energy crisis with a vengeance, only tangentially related to the more abstract long-term energy problem which the whole developed world will face in the coming decade. The immediate crisis springs from a failure of planning and stockpiling that would seem unbelievable in a well-ordered society, and the final convergence of economic dislocations that have been allowed to mount unchecked for months and years.

The present shortages were foreseen long before winter set in. Instead of gathering reserves of heating oil, the nation's refineries found it more profitable to pump out a more than adequate supply of gasoline, prices of which are set at a far higher level. Instead of arranging for more imported oil to fill the anticipated gap, the Administration waited until the crisis was already fullblown before reacting in justified panic and lifting import quotas that should have been abolished long ago. The fuel shortage which the nation is now experiencing arose not from natural or technological shortfalls; it is largely artificial, the result of a price structure gone haywire.

There is a lesson here for the broader global energy crisis. A senior professor of economics at the Massachusetts Institute of Technology, M. A. Adelman, has published a well-documented rebuttal of the conventional wisdom that says the world faces a profound petroleum shortage. Arguing in *Foreign Policy* magazine and a forthcoming book, "The World Petroleum Market," Professor Adelman charges that the pressures now perceived are a result not of any foreseeable shortage, but of inflated prices set by the multinational oil companies and the Middle East producing nations in cartel. He goes on to charge that the United States Government, far from being trapped in this economic distortion, actively assisted in bringing it about.

There is much in Professor Adelman's thesis which will be fiercely contested in the months to come. What is beyond dispute is that fuel shortages are and will be threatening to this country as long as the economic

structure of the energy business is so twisted. Government regulation keeps some prices artificially low, others artificially high; industry profits are similarly disordered. The present economics of energy has allowed many people to become quite comfortable over the years; but it leaves too many others out in the cold.



SIERRA CLUB

Mills Tower, San Francisco 94104

25 October 1972

by Ansel Adams in *This Is the American Earth*

TO: Those in Attendance at October 21-22 Board Meeting

FROM: June Viavant, Secretary

RE: ENERGY POLICY

The following policy with regard to energy was adopted by the Board of Directors of the Sierra Club on October 22, 1972:

Sierra Club policy on energy applies to the entire spectrum of production and uses of energy in our society, and has as its basic tenets:

- 1) The conservation of energy resources by the elimination of inefficient, wasteful, and unnecessary production and consumption with the goal of limiting the total rate of energy conversion to a level that would produce minimal damage to the natural environment.
- 2) The restoration and maintenance of a quality environment by subjecting energy to environmental constraints such that there shall be no significant air, water, and land pollution, and such that facilities shall conform to comprehensive regional or national land use plans.

To achieve these goals, the Sierra Club supports:

- 1) The formulation and enforcement of a National Energy Policy that is consistent with these goals and that coordinates all energy resources.
- 2) The formulation and enforcement of a comprehensive national land use plan that embraces all the principal uses of land and waters, and in which all energy-related facilities and activities are subject to environmental, ecological, and aesthetic constraints.
- 3) Regulations on extraction, transport, and storage of fuels; on the siting, design, and operation of facilities for energy conversion; on the discharge of ~~waste~~ and by-products into air, water, and on land, and the disposal and storage of solid wastes; on the coordination of the use of energy and energy resources; on advertising and other promotion of energy consumption; and there shall be provisions for prompt public disclosure of all matters related to energy production, public participation in planning and decision-making, and for appeal and judicial review.
- 4) Economic incentives, including the institution of taxes and price structures, that promote the conservation of fuels and of energy, the development of sources and facilities that are more efficient and environmentally benign, and the abatement of pollution. Existing economic incentives that tend to promote energy consumption and waste should be eliminated.

5) Research and development to determine the nature and extent of environmental impacts of fuel extraction and energy transport, conversion, and use; to improve the efficiency; to reduce emissions from present forms of energy conversion; to develop new, efficient, and environmentally less harmful energy facilities and conversion methods; to improve safety and reliability; and to devise means for safe and environmentally acceptable disposal of all wastes.

6) Reformation and creation of institutional structures for the formulation and enforcement of energy policy and land use planning, for the regulation and administration of energy production and use; and for research and development. As a matter of principle and of proper administration, no agency should be responsible for both regulation and promotion of any activity.

7) Education and promotion that engenders an ethic of energy conservation.

8) International coordination and planning to achieve these goals.

Breeder program:

The Sierra Club is not opposed to research on fast breeder reactors and the development of prototype plants, provided that:

1) An environmental impact analysis and statement of known or suspected effects be prepared, before construction of the prototypes, not only for the prototypes but also for the mature breeder program which may result;

2) Sufficient safety research to answer the outstanding safety questions be completed prior to the decision of whether or not to proceed with a mature breeder program;

3) The number of prototypes be limited to numbers necessary to determine feasibility and safety;

4) There be no relaxation of existing legal requirements for limiting radiation exposure; and

5) The question of funding breeder research be considered in the context of the alternative costs and benefits that are projected for other energy sources and the total resources available for energy research.

Increasing safety margins for water-cooled nuclear plants:

The Sierra Club is concerned that the safety margins in possible accidents in some water-cooled reactors operating, under construction, or planned, are not sufficient to avoid accidental release of radioactive material. We believe that the maximum allowable power, fuel temperature, and heat transfer rates should be reduced to less than the original design specifications limits to increase this safety margin, pending completion of adequate safety research.

(This resolution was adopted in principle, subject to language revisions by the ad hoc energy committee.)

STATEMENT OF RONALD M. HEYMANN
COMMISSIONER, NEW JERSEY DEPARTMENT OF LABOR AND INDUSTRY
AD HOC COMMITTEE ON ENERGY CRISIS, JANUARY 23, 1973

The Department of Labor and Industry is concerned with the energy problem confronting New Jersey and the nation today, as well as its short and long term effects on the overall economy of the State. It has been reported that our reserves of natural gas and No. 2 fuel oil are nearing depletion and a serious shortage looms. I will not add any comments on this problem which lies in the province of other State agencies. I am sure they will amply cover the problems involved from a supply point of view.

Before briefly outlining some of our views on this situation I would like to point out that I wholeheartedly support Governor Cahill's proposal for a joint legislative committee to study the energy problem. As Governor Cahill said in his third annual message on January 9, "The joint committee should have adequate financing and staffing in order to conduct a comprehensive study of the problem."

Looking at the State's economic base, we know as of January 1, 1973, our population stood at approximately 7,416,000. These residents live in some 2,300,000 housing units across the State, and work in some 140,000 industrial and commercial establishments. Our employed work force for the same time period totalled 2,961,300. Of these, about 30% were employed in manufacturing and about 70% in the other categories that comprise our economy.

New Jersey was hit by the recent recession and its effects are still being felt across the State, as reflected in a troublesome unemployment problem that continues to persist. Given time we will

rebound, but our lagging production capacity has the added burden of constant growth and expansion to provide some 50,000 new jobs a year to absorb new workers generated by our population growth.

What does this mean? Well, simply, that we must expand our base daily and provide the services, utilities and raw materials that will insure even greater growth.

Our No. 1 industry is chemicals and we also rank first in the nation in this field. The chemicals industry is fed by another major State industry that supplies the bulk of the raw materials used in providing this essential industry with its "life blood" - the petroleum industry. These two industries provide the foundation of modern industrial life and without them, under conditions of today's technology, our society could not exist.

Specifically, regarding energy used in manufacturing throughout New Jersey in 1972, we have determined that production is dependent by 33.3% on natural gas, 33.3% on oil, 23.8% on electricity and the balance on coal. For heating and ventilation, the figures show oil 66.7%, natural gas 22.2%, electricity 6.4%, and the balance on coal. From the above, it is obvious that a shortage of any source of energy would have a direct effect on all other energy sources.

Black and brownouts have been experienced in the past and continue to be a threat in the future. We estimate that our power output must be doubled by 1985 to meet the anticipated demand of our society that insists on constant economic growth and expansion.

The alternative is harsh. By that date, without sufficient power, we will have failed to maintain the necessary expansion of

production and the job market.

Let's look at another component -- the residential side. I said that we have approximately 2.3 million housing units across the State. The 1970 Census of Population and Housing tells us that 52.6% used oil for heating while 41.2% use gas, and the 6.2% remaining is divided equally among other energy fuels.

Need I tell you the effect a shortage of either gas or oil would have here on our residential base. The figures speak for themselves.

I am not trying to paint a picture of doom. I am not even trying to establish the fact that an energy crisis exists. That problem lies in the realm of those that have the figures on supply in hand. I am only trying to establish the magnitude and scope of the problems that an energy shortage could pose. I am concerned because energy is the basis to all our major industry and residential activities and is essential if we are to continue --

- to put gasoline in our automobiles
for our commuting population
- to put agricultural products on our tables
- to provide electricity, heat and light
for our comfort
- to supply medicine for our health, and
clothes for our body
- to have entertainment for our relaxation,
and
- to provide the power to keep the machines running
in our production facilities and our labor force
gainfully and fully employed

In closing, I would like to commend the New Jersey Senate for its foresight in grappling publicly with this critical question. I am hopeful that as a result of these hearings New Jersey will progress further toward a balanced policy which recognizes the needs of economic development and the requirements of environmental protection. To this end may I assure you that the resources of the Department of Labor and Industry are at your disposal.

Thank you very much.

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