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Public Utility Commission

BEFORE

THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

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In re: R-79060865, etc. - Philadelphia Electric Company
Investigation into a requested $123 million
annual rate increase.

- - - - -

Harrisburg, Pennsylvania

December 10, 1979

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DOCKETED

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Pages 2792 to 3009

DOCUMENT FOLDER

Mohrbach & Marshal, Inc.
27 North Lochiel Avenue
Harrisburg, Pennsylvania 17112

BEFORE

THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

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In re: R-79060965, etc. - Philadelphia Electric Company. Investigation into a requested $125 million annual rate increase.

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Stenographic report of hearing held in Hearing Room No. 2, North Office Building, Harrisburg, Pennsylvania,

Monday,
December 10, 1979,
at 10:00 o'clock a.m.

- - - - -

JOSEPH KLOVEKORN, ADMINISTRATIVE LAW JUDGE

- - - - -

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THE ADMINISTRATIVE LAW JUDGE: Before we get into the witnesses that we have scheduled today, I received on December 5th, a letter from Secretary Thierfelder stating:

"This is to advise that the Commission intends to take official notice of the management audit and the findings contained therein." End of letter.

I have sent a letter to Secretary Thierfelder dated December 7th, which states:

"I have received a Secretarial Letter dated December 5, 1979, informing the parties to R-79060865 that the Commission intends to take official notice of management audit of the Philadelphia Electric Company performed by Cresap,McCormick and Paget, Incorporated.

I request that copies of this report be furnished to all of the parties in this case, listed below, and to me. Since the Company and the Commission Trial Staff already have copies, I have omitted their name from the attached list of active parties."

In the list of parties, I have included Mr. Aloff, General Services, Community Legal Services, Miss DuPont, the Consumer Advocate, Mr. Diehl, Mr. Streiff, Mrs. Isaacs and Mr. Beck for the City of Philadelphia.

MR. JOHNSON: In conjunction with that particular matter, it is my understanding that Craig Sayre, who is

co-Counsel with me representing the Trial Staff, informed Walter Hall on December 6th that George Gurney, who is the Management Audit Project Manager for the company that performed the management audit, Crossy, McCormick and Paget, would be available at the December 13th hearing if Philadelphia Electric Company would be prepared to pay for his travel and time testifying.

MR. BURGRAFF: What date was that?

MR. JOHNSON: December 13th.

MR. HALL: Your Honor, I would note two things.

First, the Company does not require Mr. Gurney's presence on Thursday, so any arrangement to bring him on the Company's behalf can be terminated.

Secondly, the Company has reviewed the contract between the company and I believe the Public Utility Commission or whoever it was with regard to the obligation to pay for any appearances by Crossy in support of the management audit and it is our understanding from that contract that there is any obligation for the Company to pay for these visits.

THE ADMINISTRATIVE LAW JUDGE: I'm a bit confused by the Commission letter which states that it is going to take official notice of the audit.

I note in the statute, Section 331, Subsection

G, the term "Official Notice," means the method by which the Commission shall notify all parties and no further evidence will be heard on the material fact.

This being the case, I don't know exactly what purpose for Mr. Gurnsey to be here since, as I read it, I have nothing to do with the matter and I note that the report is not being entered in the record. I note a reluctance on the part of any party to sponsor it.

MR. HALL: Your Honor, in that regard, I would note that the mere fact that the Commission takes official notice of the matter does not close it. It merely is notice to the parties that if they take no further action, the facts which have been noticed will be deemed as facts and are unalterable and will be relieved by the Commission in its order, because of that wording in the statute because it places a burden upon anyone wishing to oppose any of the facts stated in that audit to file an objection with the Commission of it taking official notice.

The Company will tomorrow file an objection with the Commission to its action of taking official notice of the Gresap report. We will do that on two grounds, which are stated in the statute, the first being that a 350 page document which is largely including opinions is not a material fact as provided by the statute as to which the Commission can take

official notice.

Secondly, we will further contest the accuracy of assertions made in the audit.

MR. HENSHAW: I must admit my surprise. The company and Community Legal Services have agreed on something substantially. We already did file our objection on the taking of notice on grounds very similar to those described by Mr. Hall, that is that the statute does not grant the right to take official notice of a document such as this.

In addition, that the taking of official notice denies the parties the right to cross-examine and denies them due process rights.

THE ADMINISTRATIVE LAW JUDGE: All right.

MR. ROCK: Is it your intention to make it part of the record or not?

THE ADMINISTRATIVE LAW JUDGE: It is not my intention. I have not seen a copy.

MR. BURGHART: Is it necessary to present the gentleman in question? There seems to be a consensus that it would be a waste of his time.

MR. JOHNSON: Well, he won't be here on Thursday unless the Company requests him and the Company is willing to pay for his services to appear on Thursday. The Commission itself has not made arrangements for his appearance and the

Trial Staff has not. Since we are not sponsoring this witness, we have not taken it upon ourselves to be the moving party with regard to requesting his presence.

MR. SEGAL: Your Honor, if I may, it would be our feeling there would be no need to require this witness to be here unless the Commission were to sustain the objections and reverse themselves without taking official notice, so the matters contained in that order would then be subject to dispute by any particular party that wishes to and at that point, should the Commission sustain those objections that it would be necessary for someone to sponsor that audit, someone to introduce it, otherwise this won't be part of the record at all.

THE ADMINISTRATIVE LAW JUDGE: It is my understanding since no one seems willing to pay for the witness's travel fee, I don't think we will see him on Thursday.

MR. SEGAL: Since we haven't seen the document, there is no way we can prepare for cross-examination on Thursday.

MR. ROCK: Do we understand Your Honor's position to be with regard to Your Honor's recommended decision that he does not intend to take official notice of the document?

THE ADMINISTRATIVE LAW JUDGE: I think since objections to taking official notice have been filed, let's

see how the Commission resolves that matter before we go on to raise a question.

MR. JOHNSON: May we go off the record?

THE ADMINISTRATIVE LAW JUDGE: Yes. Off the record.

(Whereupon, a short discussion was held off the record.)

(Testimony continued on Page 2800.)

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THE ADMINISTRATIVE LAW JUDGE: Shall we go back on the record? Mr. Burgraff?

MR. BURGRAFF: Yes. Do you have any order of preference?

MR. HALL: Dr. Stutz.

MR. BURGRAFF: We would call Dr. John Stutz. He has not previously been sworn.

THE ADMINISTRATIVE LAW JUDGE: Would you raise your right hand, sir?

JOHN K. STUTZ, called as a witness, having been duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. BURGRAFF:

Q Would you state your name and business address for the record?

A My name is John K. Stutz. My business address is Energy Systems Research Group, 120 Milk Street, Boston, Massachusetts.

MR. BURGRAFF: Thank you. I am having copied right now three copies of Mr. Stutz' prepared testimony and exhibit JS-1, 2, 4 and 5 and I will give them to the reporter as soon as I can give them.

BY MR. BURGRAFF:

BY MR. BURGRAFF:

Q Mr. Stutz, you have those documents in front of you?

A I do.

Q Were they prepared by you or under your supervision and control?

A Yes.

Q Are they true and correct to the best of your knowledge, information and belief?

A Yes. With some minor corrections, they are.

Q If I asked you the same questions today, would your answers be the same as contained therein?

A Yes, they would.

Q Mr. Stutz, you make a reference in your testimony to the filing of Supplemental Testimony on essential human needs. You have not filed that testimony, is that correct?

A No. I have not filed that testimony and for that reason, I would like to delete the reference to it from my testimony. In particular, on page 2 of my testimony, I would like to delete lines 4 through 7 and on page 29, that portion of line 25 and all of 26 which refers to the essential human needs testimony.

Q And could you state for the record the corrections you wish to make in your testimony?

A Yes. The corrections are in Exhibit JS-4. The first correction is on page 70 of that exhibit, Table 8.4, Appliance Use Data. The last item in the column labeled KWH Base Year Average Annual Usage reads 700. It should be changed to 500. The second change is on page 76, bottom of the page. There's a small table untitled, with the entries in the column PD-1977 should be changed as follows: The first entry should be 19.6 instead of 19. The second should be 10.1 instead of 10.

In the next column - -

Q Dr. Stutz, that's still on Exhibit JS-4, is that correct?

A That is correct.

The second column headed PD-1997, the first entry should be 13.2 instead of 12.8. The final entry is correct.

Q Is that the extent of your corrections?

A Yes, it is.

MR. BURGHART: I would ask at this time that Dr. Stutz' prepared statement be identified as Consumer Advocate Statement No. 3 and that the exhibits be identified as stated as JS-1, JS-2, JS-4 and JS-5.

THE ADMINISTRATIVE LAW JUDGE: Without objection, they will be so identified.

(Consumer Advocate Statement No. 3, Direct Testimony of John K. Stutz as to long range load forecasting, was produced and marked for identification.)

(Consumer Advocate Exhibit No. JS-4, a document entitled Volume I The State Base Case Forecast, was produced and marked for identification.)

(Consumer Advocate Exhibit JS-1, a biographical sketch of John K. Stutz, was produced and marked for identification.)

(Consumer Advocate Exhibit JS-2, a document entitled Differences in Residential Per Customer Consumption, was produced and marked for identification.)

(Consumer Advocate Exhibit JS-5, a document entitled Volume II, The State Conservation Policy Case, was produced and marked for identification.)

MR. BURGRAFF: Mr. Stutz is available for cross examination.

THE ADMINISTRATIVE LAW JUDGE: Mr. Hall?

MR. HALL: Thank you, Your Honor. Good morning, Dr. Stutz.

THE WITNESS: Good morning.

MR. HALL: How are you this morning?

THE WITNESS: Oh, quite well.

CROSS EXAMINATION

BY MR. HALL:

Q Dr. Stutz, am I correct that your graduate and undergraduate degrees including your Doctorate are in the field of mathematics?

A That's correct.

Q And I believe you refer to various teaching positions which you have held, is that not correct?

A That is correct.

Q And are those also principally in the field of mathematics?

A It varies with the institution. At MIT I was an instructor in the Mathematics Department. At the State University at Albany, I joined in the Mathematics Department, but after the first year, I joined an interdisciplinary program within the University where I taught a range of courses including mathematics and economics.

At Fordham, my format was in the Math Department. Part of my teaching duties were with a joint directorship with an undergraduate program in mathematics and economics. That is as precise a description as I can give you.

Q In these joint programs, were you the Mathematics Department's representative?

A In the Fordham program, I was. In the interdisciplinary program where I taught for four years,

we didn't divide interdisciplinary lines. I taught a range of courses, some of which were strictly mathematics, others of which were straight economics and one was research methods, which was a combined course.

Q Am I correct that you have no degrees in economics or in the field of engineering?

A That is correct.

Q During the study which you prepared and which has been submitted as your testimony and accompanying exhibits in this proceeding, did you visit the Philadelphia Electric Company's Service territory for the purpose of collecting any data for a use in that study?

A No, I did not.

Q Have you conducted any surveys of PECO customers in connection with the preparation of your testimony for this proceeding?

A No, I have not.

Q Doctor, you have employed an econometric model in your forecasts, have you not?

A No, I have not.

Q You have not. Could you describe to me what you have employed?

A Yes. It varies, depending upon the area I am forecasting in - - excuse me. I have a slight cold. In the residential and commercial area, I have employed an end use

analysis, sometimes called an engineering end use model. In the commercial area, it is somewhat less disaggregated than the residential area. But both would be accurately described in that way.

In the industrial area, I have employed a rather complicated trending analysis, including an adjustment for the presence of co-generation. Econometric models make their appearance in my forecast principally through the determination of input data items such as terminal saturations in the residential area.

Q Doctor, referring to page 6 of your testimony, you there indicate that for the forecast years 1988, there is, in your opinion, different households forecasted in the ESRG forecast which is your forecast and the PECO forecast. Is that not correct?

A Yes.

Q Can you quantify for me, Doctor, the extent of the difference in the two forecasts' kilowatt hour total for that year being 1988, as the result of this difference in households?

A Difference in households alone?

Q Yes.

A Without any other effects?

Q Without any other effects.

A No, I cannot do that.

Q What other effects must you consider in making such an analysis?

A I would have to consider the residential energy saturations and the residential end use consumptions.

Q Would you then be giving me merely a difference between your residential forecast and the company's residential forecast?

A That would be what I could supply you with right now.

Q How would you go about calculating the difference as a result of solely the household portion of the item?

A I am not sure I could do that, exactly, for this reason. We don't forecast exactly the same mix of end uses in the same way. If I could match end use by end use exactly, the assumptions in the two forecasts, then I could get just the effect of households. But my understanding is that that wouldn't be exactly possible because of this difference in methodology.

Q Doctor, would you refer me to the source of your statement that the company's 1988 household projection is 1.475 million households as you state on line 6 of page 6?

A I would have to look for the exact values.

Q Before we do that, Doctor, am I correct that

as indicated in the first paragraph on page 6, it is your view that this difference in the measurements of households between your number which is 1.426 million and that of the company which is 1.475 million is a major cause of the differences in the resulting forecasts of your forecast and that of the company?

A It is, according to my analysis, of some importance, because of the effect it has on the penetration of space heating. The assumptions on penetration, as I explained, are somewhat similar but because of the difference in population growth, you get more space heating customers in absolute numbers in the company forecast and therefore, higher consumption for that reason.

I can't point to a number for the company. What I was looking for was the numbers from which this was assembled. As you know, we include the single point metered customers in with our residential and we have tried to provide the comparable figure when referring to the company.

Q So in essence, this 1.475 would be an extrapolation of a company number as well as a number that you would have developed on your own?

A No. My recollection, and that was what I was trying to find, that the 1.475 was developed from a number of company references.

Q Doctor, could I refer you to page 178 of

Exhibit WCH-1?

MR. SEGAL: What page was that?

MR. HALL: Page 178.

THE WITNESS: Yes.

BY MR. HALL:

Q Looking at the 1988 line - -

A Yes.

Q - - on that page, would you read to me the average dwelling units which is stated there?

A 2. - - excuse me. 1431.1.

Q And would you read for me the number that is stated right below that for the year 1993?

A 1475.4.

Q Would you agree with me, Doctor, that the 1475 matches that which is stated in your testimony?

A They are numerically the same. I don't believe there's any connection between the two, however.

Q What do you use depicted in the average dwelling unit shown on this page for 1988, Doctor?

A Again, this would require going back and looking for some notes which is what I was doing before. I believe these numbers are to correspond with the customers that are served under the residential rates. So I believe to get from the 1431, you would have to add in those other apartments. Now, what I was looking before was at my

demographics folder to see if I have those calculations with me so I can say exactly what we did do.

MR. BURGRAFF: We can supply the calculation.

MR. HALL: Would you do that, Doctor? Supply a calculation which indicates the basis of the 1.475 million households figure which you show for 1988? Now, Doctor, in addition, if you would look at page 176 - - does Your Honor have this exhibit, by the way?

THE ADMINISTRATIVE LAW JUDGE: Not before me.

(The document was handed to the Administrative Law Judge)

BY MR. HALL:

Q Doctor, if you will note on that page, in the upper half of that page, there is listed December 31, 1988, total dwelling units all. Which column is the total of the indicated column for R, RM, both individually metered and single point metered under GS, PD and HT?

A Yes.

Q That number is what, Doctor?

A 1436606.

Q And would you agree with me that that is well below 1.475 and is indeed for the same period and includes single point metered apartments?

A Yes, it is below it.

Q Assuming that what you have just agreed to is

so, Doctor, would you agree with me that the difference in household projections is not a major cause or even a cause of any significant difference between the forecasts?

A. As I have said to you, I am not at this moment able to reproduce that number which I have on page 6, and so until I can look at that number, I don't think I can answer that question.

When you are asking me to make an assumption that I would revise that number in the way that you have suggested from those two pages and all I can say to you is that until I have a chance to provide you with an explanation as to how I got that number, I am not in a position to say what I would do upon revising.

Q. I take it, Doctor, you have studied Exhibit WCH-1 and are familiar with its contents?

A. That is correct.

Q. And I take it you are also familiar with Philadelphia Electric Company's rate schedules, are you not?

A. Yes, I certainly am.

Q. You are familiar with the fact that there are single point metered customers in GS, PD and HT, is that not correct?

A. That is correct.

Q. The other rates with the company has under

which residential customers would be served are rates R, RH and RM, is that not correct?

A That's certainly true.

Q So if you are adding dwelling units which reflect the dwelling units on all of these rates, would you not in fact have a number which is consistent or which should be the same as the number which you state on page 6?

A I certainly follow your logic. All I can say is that until I can review how I got that number, I am not in a position to go any further with you, other than to agree with what you have said.

Q Now, another difference in the two residential forecasts, and perhaps before we go further, we should clarify one thing. Doctor, your forecast is made up of four parts, is it not? The first is a residential forecast for residential customers?

A Right.

Q The second is a commercial forecast for commercial customers?

A Yes.

Q The third is an industrial forecast for industrial customers and the fourth is a transposition of the results of the prior three which are stated in annual kilowatt hour terms to a peak KW basis for use in generating

plant planning, is that not correct?

A. Well, it is certainly true that those are the four parts. Its use, I think, is Dr. Shakow's testimony.

Q. I would agree with that, Dr. Stutz. I didn't wish to mislead you in any way.

A. Okay. Right.

Q. Now, another difference in your residential forecast versus that of the company which you identify at page 6 is in the percentage breakdown of new residential construction between single family and multi-family units, is that not correct?

A. Yes.

Q. Could you describe for me what a single family unit is, Doctor?

A. Yes. I don't know exactly what you are looking for. Single family unit is basically a single detached house. A multi-family unit would be an apartment.

Q. And I take it that is the way you have used them in your study?

A. Now that I have to check, there's a townhouse category that I have to check on the disposition of. For example, I believe that we put the townhouses in with the single families, but I just again, this do sn't seem to be my day for having the right notes with me. I do not.

Q I'm sorry. Doctor, I missed your statement.

A I am saying I am not able to find the note on which I noted how we dealt with the townhouses.

Q Don't you know if they would be single family or multi-family?

A I can check and get back to you.

Q Can you make a rough guess at this point?

A I believe they would be in the single family, but I would have to check it to be sure.

Q Now, would you agree with me, Dr. Stutz, that on average, multi-family units, residential units consume less electricity than single family units?

A Yes.

Q Now, referring you to page 67 of Exhibit JS-4, would you agree with me that in 1990, the ESRG forecast, your forecast, assumes that 28.2 percent of all residential dwelling units in Philadelphia Electric Company's system are multi-family units?

A I will have to check the percentage. You said 1990?

Q Yes, I did.

A Yes. That's roughly correct.

Q Now, referring you to page 176 of Exhibit WCH-1, would you further agree with me that in the PECO residential forecast at 1988, there are approximately 28 percent of the

total residential dwelling units which are multi-family units?

A 176?

Q Yes.

A Yes. Approximately.

Q Would you then agree, Doctor, that the difference between or the split between multi-family and single family units in the two forecasts is, again, not a significant cause of difference between the two forecasts?

A I would agree with that.

Q Doctor, does your forecast include either in its kilowatt hour numbers or its customer numbers the customers of Philadelphia Electric Company system or Conowingo Power Company?

A I believe it does.

Q Do you believe it does?

A I believe it does. Wait a minute. Let me think about that for a second. All right. I will let that stand.

Q You believe it does?

A I believe it does.

Q Do you care to check on that and get back to us?

A Okay. I will.

Q Doctor, referring to Exhibit JS-4, page 66 - -

A. Yes.

Q - - I note that you have there failed to compute the growth rate for the PECO population growth forecast for the period 1975 to 1985. Do you have that growth rate available to you at this time?

A. No, I don't.

Q. Now, do you recall that it was your testimony at page 6 that the PECO population growth rate as compared to the forecasts of the census in the Pennsylvania Office of State Planning and Development, which you have used, the latter source - -

A. Yes.

Q - - are relatively high, is that correct?

A. I believe so, yes.

Q. So it is your testimony that the PECO growth rate is substantially higher than that which you have used? Is that correct?

A. Yes. I think I show that in the growth rates to 2,000 column.

Q. I would like to focus on the growth rate of 1985, Doctor, since that is closer to the rates which we are setting in this proceeding. Would you turn to page 178 of Exhibit WGH-1?

Now, Doctor, shown on that page, in the first column, is the Philadelphia Electric Company's population

figures, beginning in 1950 and ending in 1998?

A. Yes.

Q. I would ask you, Doctor, to compute for me if you can, from that data what a growth rate would be between 1975 and 1985. If you would like, I have done it and I can provide it to you.

A. No. That's all right. What is your figure? I just did it through '88.

Q. Through '88?

A. That's the year that's given there.

Q. I extrapolated between 1983 and 1988 and obtained the figure of 23 percent.

A. That's approximately what I get.

Q. And would you agree with me that with the difference of 3 percent, that is very close to the five county Pennsylvania figure shown on your page 66, which is in fact, employed by you in your own forecast?

A. That's certainly true. It is higher, but it is closer. I notice that the figures are, however, diverging as we go toward 2000.

(Transcript continues on next page)

Q Well, Doctor, would you agree with me that on Page 6, you mentioned three principal factors as being the difference between your residential forecast and that other company, that is factors being a difference in the forecast of households?

A A difference in the split between multi-family and single family households and the company's higher population growth projection. That is correct.

Q And according to the figures we have been discussing, at least as they go out to 1995, some of these are not?

A I disagree. I think we have just demonstrated that the forecast is higher for 1985. I think with regard to the others, there is some difference. It is not a great deal of difference, but I don't think even the figures we were discussing earlier which I have to check on, suggest it a very big difference.

However, I do note that in that one area where we come to a conclusion, it was higher, as I said.

Q Three per cent higher?

A Yes, for 1985.

Q Doctor, in your treatment of electric space heating, how have you forecast the conversion of existing electric customers who are existing non-heating customers who chose to become electric heating customers in the future.

A I believe that is included in the forecast.

Q Could you refer me to the location?

A Yes, that is what I am doing now. Yes, if you would take a look on Page 35 of JS-4, you will see the term penetration defined and above that in the paragraph, it states that the concept of penetration is used in developing a number of households and above that is penetration includes both new and switches. In fact, that was how it was done.

Q How have you represented in your analysis the potentiality for existing electric customers with fossil fuel systems switching to electric? What data input have you used and how have you forecast that?

A The basic information that one has is the relative prices of the fuels and the equipment and those were taken into account in developing the estimate of penetration used in the forecast.

Q What did you apply the estimate of penetration to?

A Number of new customers as penetration is defined.

Q Well, if we are talking about applying estimates of penetration to new customers, how does that account for existing customers who will switch?

A Through the percentage?

Q In other words, you have merely arbitrarily

increased it as applied to new customers.

A You don't arbitrarily do anything. You do increase the percentage of your estimate of those who will switch.

Q How did you make your estimate of those who would switch?

A As I explained it, it is a matter of form used based on such factors as the cost of equipment and the cost of tools and any increases over time and previous experience in the service territory.

Q And would you cite for me the source of the previous losses in the previous territory that was available to you?

A I believe all the information that we gathered from looking at MCW-1 and discussions that we had.

Q And would such data be available or separately considered in the company's forecast, Dr. Seitz, at Page 168?

MR. BURCHAPF: 168 of what?

MR. HALL: Exhibit MCW-1.

THE WITNESS: Yes, that is correct. That information is considered separately at that point or presented separately at that point.

BY MR. HALL:

Q Dr. Seitz, on the back of your testimony in Exhibit JS-1, you list a number of proceedings in which you

have testified on load forecast matters, is that not correct?

A Yes, it is.

Q And a number of those are in Pennsylvania, is that not correct?

A I believe only one is in Pennsylvania. The previous case involving Philadelphia Electric.

Q I see a Duquesne Light Company forthcoming.

A That is forthcoming. It has not taken place.

Q And am I correct that other members of your firm have testified at other cases in Pennsylvania, however?

A That is correct. One member of our firm has testified in a Penn Power case.

Q And I take it that was on behalf of the Office of Consumer Advocate?

A That is correct.

Q Now I notice that you have testified in a number of Detroit Edison cases, is that not correct?

A Two.

Q And who did you represent in those cases, Detroit?

A Michigan Citizens Lobby.

Q And who are Michigan Citizens Lobby?

A They are a private intervenor group in the State of Michigan.

Q Are they a consumer group?

A I don't know that I would particularly characterize

them that way. They are a citizen intervenor group.

Q Do they generally oppose or support utility increases?

A My only dealings with these particular people was in these cases.

Q Doctor, have you recently represented the Sierra Club in New York proceedings?

A The Sierra Club is a coalition of 26 other groups, yes.

Q Doctor, in these cases that we have been speaking about and which you have presented load forecasts, have your results generally fallen below that of the utility forecasting group?

A Generally, yes.

Q Doctor, how have you applied your estimates of thermal integrity?

A Is the question how the estimates of thermal integrity are used?

The modern estimates of thermal integrity are used to decrease the amount of energy used to heat a home or to air-condition it as appropriate.

Q Is it a fine percentage that begins in the first year or a percentage that does over time?

A Let me just check. Is the question about space heating?

Q Yes.

A Excuse me. I have to check the computer program for a second. The reason I have to check this is, we changed it recently and I want to answer it exactly as we have done it.

Q Fine, Doctor.

A I believe it is a flat percentage, but I would really have to check that in more detail.

Q You believe that is a flat percentage. Does that mean you apply the same flat percentage from the beginning of the year one through the entire period?

A As I said, I would like to check that but I believe that is my interpretation.

Q Doctor, referring you to Page 78 of Exhibit JS-3, you there state that the fraction of existing ESH, and that means electric space heat, does it not, Doctor?

A Yes.

Q The fraction of existing electric space heat for customers with heat pumps was set using company provided data of 35 per cent for single family unit?

A Yes.

Q Now am I correct that that means that in your analysis you accepted that the company's current residential heating customers were 35 per cent heat pumped?

A 35 per cent for single family. Zero for multi-

family.

Q Can you explain the source of that company information that led you to that conclusion?

A Again, I believe it is developed from material in WCH-1, but since we still have a question as to the disposition of townhouses, perhaps I should give you that in writing along with the information of how we treated townhouses.

Q It would suit my purposes for you to develop it, Doctor, now, if you can. It would facilitate matters.

A I am afraid I can't develop that number for you right here, but I will explain it later on in writing.

Q Thank you, Doctor. To eliminate your suspense, I will note that the Company's figures do show a different set of figures.

A You may note that in preparing this forecast, I do receive assistance from other members of the firm. I do supervise it. I can't bring all the work papers with me. That is the reason for this check and having to go back to the office to look for the derivations.

Q Doctor, in projecting further population in the company's service territory, did you begin first off, Doctor, you have developed, have you not, as the factor to influence the growth population, the projection made by the Pennsylvania Office of State Planning and Development, is that correct?

A Yes.

Q And how have you applied that factor? Have you applied that to the company's indicated population in the service territory at 1975 as shown on Page 78 of Exhibit WSH-1?

A I believe so, sir.

Q Are you certain of that, Doctor?

A I am just checking the notes on population development in front of me. Yes, I believe that is how it was done. took their growth rate and applied it to a company number for the past year.

Q Looking at Page 66 and 67 of your JS-4, can you calculate for me the population of your high case for 1985?

A I would have to do it by interpolation between 1985 and 1990.

Q I am sorry, Dr. Stutz, it was 1990 that we would like. It is a calculation of Dr. Stutz total population using his assumption of the population growth and starting point for the year 1990.

A You want it in high case?

Q In the high case, yes.

A Yes, I have a figure. I got 3,847,950 approximately.

Q And what would the population be using your low ratio?

A Essentially the same, 3,847,250.

Q Now, for your high forecast, Dr. Stutz, as indicated on page 66 of your Exhibit JS-4, you have employed a value of 2.55 people per household, have you not?

A That's correct.

Q And where have you obtained that value?

A I believe it says on the page. From census projections.

Q And these are census projections by the Department of Commerce?

A Yes.

Q Doctor, I have an excerpt from the Bureau of Census document from which this material was taken that I would like to hand to you. I will show it to your counsel first. I only have one copy of it at this time. I don't intend to introduce it.

MR. BURCHAFT: Could we have a second so he can read it?

MR. HALL: Sure.

(Pause)

BY MR. HALL:

Q Now, Doctor, you will note at the bottom of the page there is listed three numbers of which the 2.55,

and you have employed that as one, is that not correct?

A. Yes.

Q And this is under household series B?

A. Yes.

Q Now, the number that is the 2.55, that is bracketed by two other numbers, is it not?

A. That is correct.

Q What are they?

A. The figure above base is 2.69 and below base is 2.45.

Q Do you agree that that means that the 2.5 as employed by this Bureau of Census study is the middle range or the base forecast?

A. I can't tell that from this document.

Q What else would you need to tell that?

A. I would have to go back and review what the definitions of the three series were and what assumptions they made.

Q Doesn't it normally indicate to you, Doctor, when you have three separate projections and one is in the middle in terms of numerical quantity, that that is the base case forecast?

A. I usually look and see how the scenarios are defined, which is what I would do in this case before answering that question.

Q Would you agree with me, Doctor, that you have used that number as part of your high case and not your base case?

A That is correct. That's how I use that number.

Q Now, Doctor, you have forecasted, have you not, two cases, a high case and a low case, is that not correct?

A Yes.

Q That is both for your commercial and your industrial forecast, is that not correct?

A No. I don't believe that is correct.

Q Where is it incorrect?

A The portion of the projection that is sensitive to high and low is the number of persons per household and I believe that's only relevant in the residential forecast.

Q You have only forecast a high and a low case in the residential forecast, is that your testimony?

A I thought the question was concerning whether or not the population forecasts were reflected in those three energy forecasts and what I was trying to convey to you was they weren't connected to two of them.

Q I understand that, Doctor. The question was whether you have made a high and low and what is termed a base forecast in both the residential, the commercial and the industrial sectors of the company's load?

A That's certainly correct.

Q Is it not true that your base case is simply the mathematical average of your high and low case forecasts?

A That is true.

Q In other words, you have not independently, for that particular case, chosen the variables to determine the kilowatt hours that are there shown?

A No. That represents the middle. As determined by numerical average.

Q Now, Doctor, on page 8 of your prepared statement, you discuss another area of difference between your forecast and that of the company, which is in the forecast which is made for refrigerator and freezer consumption, is that correct?

A That is correct.

Q And you there state various saturation percentages, is that not correct?

A That is correct.

Q Now, the saturation percentages which you have stated for your case includes single point metered apartments, is that not correct?

A That is correct.

Q And the saturation percentages that you have stated for the company's case do not, is that not correct?

A That is correct.

Q Would you agree with me, Doctor, that if single

point metered apartments were included in the saturation percentages stated for the company's case, those percentages would be decreased?

A. No. I'm not sure why they would.

Q. Would you agree with me, Doctor -- and I believe you state that somewhere in here -- that apartment residents generally have less refrigerators and less freezers than do single family house owners?

A. That's correct. But I believe I state saturations separately for single and multiple family dwellings.

Q. And in which of those categories do you place single point metered apartments?

A. I put them in multi-family dwellings.

Q. Now, on page 10, Doctor, you refer to dehumidifiers and your disagreement with the company over the projected load for dehumidifiers, is that not correct?

A. Here I am simply -- allow me to step back for a second. As you know, we do not prepare a separate forecast for the dehumidifier as an end use. It is included in our miscellaneous category. The company does prepare a separate forecast for the dehumidifier. I was commenting on the reasons that the company gave for an increase in saturation for that appliance.

Q. Would you agree with me, Doctor, that

dehumidifiers constitute approximately three-quarters of the percent of the 1980 residential load?

A. In the company forecast?

Q. Yes.

A. I will accept your calculation.

Q. Doctor, how do you forecast miscellaneous load? First off, would you define in your answer what that is, so the Judge and the parties know?

A. Certainly. We attempt to forecast all end uses which we feel are A, a significant portion of the load and B, we have sufficient data to prepare a separate forecast for. I'm speaking of residential end uses, here. Miscellaneous is a residual category. It is seen to contain all other usage, that is residential usage for which we cannot account directly and explicitly in our forecast. It is developed in the base year as a residual and it is forecasted future years high and low by applying fixed percentage growth.

Q. In other words, you don't seek to disaggregate the usage of the different types of end uses which would be in miscellaneous load?

A. No.

Q. No. But rather you forecast that on an aggregate basis, is that not correct?

A. That is correct.

Q. How do you determine the percentage which you apply to that total usage?

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A No.

Q No. But rather you forecast that on an aggregate basis, is that not correct?

A That is correct.

Q How do you determine the percentage which you apply to that total usage?

A. We develop a range of percentages reflected in a high and low case, by reviewing the wide range of appliances which are presently contained in miscellaneous categories and which those studies which we are conversant with and felt will be in a miscellaneous category in the future. And then we attempt to seek, through simple calculations, what growth would be like, assuming different things about peoples' use of those appliances.

This allows us to develop a percentage and it is that percentage we apply.

Q. Do you read various journals which are published in this field and from those, decide what sort of a percentage to use, that is the basic process?

A. Journals. Yes. Studies developed by others, such as the California Energy Commission, Lawrence-Berkeley Laboratories, but generally yes, we review the literature and then make an informed judgment.

Q. Dr. Stutz, on page 11 of your statement, you speak of supplementary heating units as being equivalent to baseboard electric units, and as such, are more expensive sources of heat than either the gas or oil units. I'm somewhat confused as to what you are referring to there. Are you referring to gas and oil portable heating units?

A. No.

Q. What are those units?

A. What are the supplemental units about which I am speaking of there? Portable electric?

Q. The supplementary gas and oil heaters you are speaking of here.

A. No. That's not what I'm speaking of. Perhaps I can clarify what is being said. What I'm saying is the supplemental heating units with which I am familiar are simple resistance units. In that case, they are similar in physical operation to simple resistance units which would be connected to the baseboard and as such, it is my understanding that they are more expensive than other types of fixed heating units such as gas heating units and electric heating units, so the comparison is a two step.

From the portable resistance type to the fixed resistance type. From the fixed resistance type to the other types of heating with which it is compared.

Q. What does that have to do with forecasting the usage in the future of supplemental heating units?

A. I think I have explained that at page 11.

Q. Would you consider supplemental heating units to be in competition with fixed whole house gas or oil heating systems?

A. No. By their very nature, they are supplemental. Let me just explain what I have said. Perhaps it is really not very clear. All I said was this. That it appears

that a person using such a supplemental unit in a bedroom or bathroom would be doing so because they wanted to keep their normal fuel house heating system at a low setting. Such a person, I would assume, was an energy conscious person or at least that is the assumption that made sense to me.

Then I go on to explain how their behavior ought to be reflected in the forecast. Behavior here with respect to the use of that supplemental unit.

Q You don't forecast those units independently in your forecast?

A No. As in the previous page, this is a discussion of what I have found in the company forecast, basically my reaction to it.

Q Now, your discussion of the company's assumptions at line 9 refers to a one thousand hours per year use of these supplementary heating units.

A Yes.

Q Could you refer me to the spot in the company's presentation where you see that particular value?

A Okay. I appear to have made an error. I was referring to the statement on page 127 of WCH-1 where I see 600 hours rather than the thousand I have indicated.

Q And the thousand is the average wattage, I take it, is that correct, Doctor?

A Yes. It is a typographical error.

Q Now, Doctor, does your forecast assume at any time the appearance of the electric car?

A I would have to repeat there what I said before, since I do not disaggregate miscellaneous, I can't say to you that it does or does not adhere. What I would say is that I have given the electric car load very low probability of appearance. In other words, I have to look and see what are going to be the significant determinants of that aggregate and/have given it a very low rate as you might gather from what I have said on page 11 and 12.

Q Referring to schedule A, Doctor, which is in Exhibit JS-2 of your testimony.

A Yes.

Q Have you included in your average usage for residential customers from the column under ESRG, single point meter departments?

A Yes.

Q Have you included those same apartments in your PECO column?

A Yes. Let me - - I'm sorry. That's it.

Q Would you care to consider further?

A No. I would - - I was simply going to say that the column under kilowatt hours per year which developed PECO forecast material, my assumption, I have not explicitly

developed those figures so as to include single point metered apartments. They are developed from figures that are provided in the company forecast. The company forecast doesn't have that in those figures. So I guess the answer would be that they are not reflected in the PECO as far as I am aware.

Q So it would be your understanding that the single point metered apartments are reflected in your column but not in the company's column?

A Yes.

Q Would you agree, Doctor, that the reflectio. of single point metered apartments in your column, but not the company's column, would reduce your column, therefore, making the difference greater?

A It would certainly have some effect in that direction.

Q Referring to answer 22 in your responses to the company's interrogatories to you, Doctor, do you have that before you?

A Yes.

Q And noting the miscellaneous column in the high case and in the low case, I note - - well, first off, Doctor, the column 1977, that column reflects, does it not, a calculation of historic data, does it not?

A Yes.

Q And would you not expect, Doctor, that all of the figures in that column relative to each of the different types of appliances which are shown down there, each of those figures would be the same?

A No.

Q You would not?

A I think I let you go away with the historic figure too quickly. Base year data is developed as a best estimate of consumption by a given appliance in the base year so you have a base year usage for refrigerators, for example. But I don't have any direct knowledge of the base year usage of refrigerators as I might, for instance, from the information supplied by the company concerning peak.

There are some appliances, particularly televisions, where there is an effect that I take into account which makes it impossible for me to zero in on a single base year usage.

Q And would that effect require that in your low case, you have a different base year usage than you have in your high case?

A It does and I do.

Q Okay. That's correct. You do. Why do you?

A Oh, it's the effect of the use of the second television. It has been observed that if a family owns a

second television, the second television is used less than the first television. But there's no real agreement as to how much less that might be. There is some notion of what the range might be. Now, these are use per unit. However, they take into account those different kinds of units.

So if you have a different assumption, even if you have the same saturation -- how can I say this clearly for you? That assumption will affect your unit usage figure for the base year. It is quite possible you could have differences in other appliances, too, depending on how uncertain you are concerning the data. We don't show that except for the television.

(Transcript continues on next page)

Q Yes. I do notice that, and why is that?

A It has to do with the methodology. It has to do with our willingness to accept certain data as a starting point for our calculation. In the television we feel there is an apparent element of uncertainty.

Q And that element is the estimate to which people use the second television?

A That is correct.

Q But you are not certain with respect to the extent they use air-conditioning?

A There is always an uncertain amount of uncertainty in a forecast. When you make a forecast, you have to put in those things you feel most important and the way you feel is most appropriate.

Q Now the effect of what you have done is the effect of the uncertainty in the second television is to cause a higher value of the kilowatt hours used for average customer during 1977 and in subsequent years shown on this page for television in your high case, which is offset precisely by a lower usage in your miscellaneous category?

A That is correct.

Q But then in your low case, you have a lower television usage for customer and a higher miscellaneous usage for customer.

A That is correct.

Q I take it miscellaneous is what is left over at the bottom? Is that correct?

A That is certainly true in 1977.

Q Now, Doctor, in your high case, you reflect a growth in miscellaneous usage from 332 up to 497 between 1977 and 1997, but in your low case, you remain entirely constant from a 454 level in 1977 to a 454 level in 1997.

Now I take it that has nothing to do with the uncertainty to television?

A That is correct.

Q What does it have to do with?

A It has to do with my best estimate of growth in miscellaneous under those years. Miscellaneous is determined as a residual, as I said much earlier, in the first year and then grows as a fixed percentage.

In the low case, it does not grow at all. It is zero percentage and the top case, it has grown.

Q Doctor, at Page 33 of your Exhibit JS-4, you indicate that in your high case miscellaneous use per customer during the forecast period has been increased 100 per cent, is that not correct?

A Yes. That is a typo, however.

Q But I take it you agree that is not, in fact, what has happened?

A No. I can tell you exactly what has happened.

What page are you on?

Q I am on Page 82 which is a one-sentence typo.

A Okay. Let me just tell you, I have the data that was actually fed into the computer with me and I can check that.

Q Can't we check the 332 value for 1977 versus the 497 value for 1987 and determine that there has not been a 100 per cent increase in the high case?

A Yes, you can determine that that way. If you like, I can determine exactly what was put in.

Q In terms of the percentage increase?

A Yes.

Q Well, I can calculate that.

MR. HALL: Your Honor, I am at a changing of the guard here. Could we have a short break?

THE ADMINISTRATIVE LAW JUDGE: Yes.

(Thereupon, at 11:40 o'clock a.m., the hearing recessed until 11:55 o'clock a.m.)

THE ADMINISTRATIVE LAW JUDGE: Are we ready to proceed?

MR. HALL: Yes, Your Honor.

BY MR. HALL:

Q Mr. Sente, moving now to your commercial forecast --

A Yes.

Q -- am I correct that the first step in the commercial forecast is to establish clerical floor space in the Philadelphia Electric Company's service territory by commercial customer type, shall we call it, for the year 1975?

A Yes.

Q And do you obtain that data by employing various general data applicable to the Statewide Pennsylvania? In other words, let's deal with it this way, Dr. Stutz. What data have you used to derive that?

A The data is derived from two factors, one of which is employees per square foot which is general data and the other is employment which is specific to the service territory.

Q Now by general data, you mean this is a national study?

A There are a variety of studies used.

Q And do they use the data which is drawn on a national plan?

A Yes.

Q And none of them are drawn specifically from studies in the Philadelphia Electric service territory?

A No.

Q And the second source that you have mentioned is

employees in the Philadelphia Electric Company service territory, is that not correct?

A Yes.

Q I take it that is commercial employees?

A Yes.

Q And is that a document which is put out by the State government?

A That is County Business Patterns, I believe. It is from County Business Patterns. I am going to check it now.

Q Sure.

A Yes.

Q Doctor, will you be able to confirm that source of information?

A Yes, it is listed as reference nine, County Business Patterns data, 1979.

Q So that we are beginning with in the commercial model, is a calculation of the 1975 commercial floor space broken down by different types of commercial customer which is based on specific employee data from the Philadelphia Electric Company service territory?

A Yes.

Q And also data as to the number of commercial square feet per employee which is based on a national study unrelated to the service territory?

A That is correct.

Q Now from there I take it, Doctor, what that gives us is our base of checking commercial customers, is that not correct?

A Commercial square feet, yes.

Q Square feet, from there, Doctor, I take it to increase the commercial square feet, is that correct?

A That is correct.

Q So we do that on the basis of projection as to the increase of commercial employees?

A That is correct.

Q And we use in that projection, I take it, the same medical study with respect to the number of commercial employees per square feet?

A Square feet per employees, yes.

Q What is the source of that projection we use for the increase of commercial employees?

A It is a composite projection. It is a separate projection for employees per dollar of earnings and a projection of earnings.

Actually, the absolute size of the projection is irrelevant the way the model works. Only the ratio of these quantities are employed.

Q Is that data specific to Philadelphia Electric service territory or Statewide data?

A Statewide.

Q How do you move that down from the Statewide level to the Philadelphia Electric service territory?

A The same statewide data is employed for the service territory. The way in which it is connected with the service territory is through the base year estimate which has the service territory specific information embedded in it.

Q Is it a growth rate that is being projected?

A Yes.

Q Now having obtained your 1975 data and having obtained your data for an increase in commercial square feet, Doctor, you check this data against the utility's actual commercial usage, do you not?

A Yes.

Q And that is a one-year check, is it not, in 1977?

A Yes.

Q And what do you do in that check?

A We re-normalize.

Q What does re-normalize mean?

A We adjust the energy intensities in this particular case across the board. Perhaps I should explain so that from square footage to usage, you have to have numbers which give kilowatt hours per square feet. We have those separately for new buildings and existing buildings in various

categories. Those numbers were in this case adjusted to bring me into line with the 1977 total.

Q I take it the ultimate adjustment is to your square footage numbers, is that correct?

A No. In this case the ultimate adjustment was on the intensity numbers because we were fairly happy with the square footage. It is a departure from our usual procedure. Normally we feel we are less confident about the square footage for a variety of reasons. This time we felt reasonably confident about the base year square footage.

Q Why was that?

A Because we got good agreement from data we received from the company.

Q Now you have adjusted the energy intensity number. Now energy intensity number, as I correct, is in essence the number of kilowatt hours of which a square foot of particular commercial type would use during any one year, is that correct?

A That is correct.

Q How did you decide how to adjust those numbers?

A We have those numbers based on studies which were performed by Arthur D. Little. We have them by virtue of their incorporation in reports prepared by Brookhaven National Laboratories.

We felt having discussed the development of these

numbers with Arthur D. Little in this particular case, that we believed that the relationships between the numbers were solid for our use here, but we were going to adjust their overall level so we were going to bring them all down by a fixed percentage.

Q So you applied a fixed percentage to all of them, just dropped in?

A Yes, we did.

Q How much was the fixed percentage?

A That I would have to dig up for you.

Q Would you do that please?

A I am sorry. I thought I brought the raw data with me, but I didn't, so I can provide you with the size of the adjustment, but I don't have it on me.

Q Fine. I would appreciate that.

A As I understand it, it would be a flat adjustment and it might differ depending whether you were in the high or low case, but you want to know the size of the adjustment from the original to the intensities that were used?

Q Yes, as a percentage factor.

A It will be stated as a decimal but you can convert it to a percentage as part of the output.

Q So, Doctor, what we have got now, then, is the picture of commercial square footage for existing customers

which was drawn originally from 1975. We have a projection of employees on a Statewide basis, commercial employees, projection of growth in employees by category.

A Yes.

Q Now the next thing we need then is, as you have indicated, the intensity of use of the extent to which for a given commercial square foot one would find a certain amount of kilowatt hour use?

A Right.

Q Now I take it what is done in your forecast, forecasts forward the extent of square footage increasing in along with the growth rate of employees, there is a one to one relationship, is there not, Hector?

A What is actually done is this. You develop the number of new square feet from the growth rate and that is brought in at the intensity appropriate to the new square feet.

Q And the intensities which are appropriate to existing square feet and new square feet are drawn from a study which is done by Arthur D. Little Company, is that not correct?

A Yes. The numbers are actually presented in a report published by Brookhaven Laboratories. They were developed by Arthur D. Little for use in that report, among other things.

Q Now, Doctor, as you recall, an associate of yours by the name of Mr. Rosen testified with respect to a similar energy forecast in Philadelphia Electric's last rate case, is that not correct?

A That is correct.

Q And if you recall, at that time, Dr. Stutz, your colleague, Mr. Rosen, employed in his commercial forecast at that time he was responsible for that forecast and analysis which I believe is identical to yours, is that not correct, or very similar?

A It is quite similar.

Q And Mr. Rosen at that time relied, did he not, upon an A.D. Little study for his study of intensity of usage, did he not?

A Yes, I believe he did.

Q And this was the same A. D. Little study that you and I are discussing with respect to your study?

A It is an updated version of what he relied on, yes.

Q If you recall, Dr. Stutz, was it not true that you initially submitted your testimony in this company's last electric rate proceeding based upon an initial version of that A. D. Little study, is that not correct?

A That is correct.

Q And during that prior case, the study changed and

was amended and, therefore, the numbers were amended and your testimony had to be amended to reflect that, is that all not also true?

A That is correct.

Q One other question with respect to the prior case --

A Can I interrupt you for a second? I don't believe the amended had to do with the A.D. Little portion. I think it had to do with other features of the forecast.

Q I would disagree, but we do not argue about it now.

A Okay.

Q Is it not true, Mr. Sears, that in fact at the time of that prior study, at the time of the prior rate case, this A. D. Little study that you relied on was not a public available document, is that not correct?

A Yes, that is true.

Q And you were requested to provide that study to the company but were unable to do so as it had not been approved or released by the Department of Energy at that time?

A That's correct.

Q Now with respect to the updated version -- first off, with respect to the original A. D. Little study, Mr. Sears, would you agree with me that is still not a published

document and you have still been unable to provide a copy of that even at this late date and despite its revisions for the company to review?

A Yes. A. D. Little has chosen to publish part of the data in a report I did provide to the PECO representatives, but they have not provided the data we were particularly interested in.

(Testimony continued on next page.)

Q Now, would you further agree, Dr. Stutz, that with respect to the new and updated A. D. Little study that you are relying upon, that new study has in addition, not been published. It is not publicly available?

A I think somehow in the -- --

Q Could you answer my question?

A The answer is I relied upon the numbers in the published Brookhaven study, as I indicated in my testimony.

Q Well, is the study published or not?

A There is a document published by Brookhaven National Laboratory, which contains all the information with respect to energy entities upon which I have relied and that document has been furnished in this case.

Q And that document, I take it, merely takes figures from the A. D. Little study which has not been furnished in this case?

A That is correct.

Q What is the date of the Brookhaven study?

A January, 1978.

Q And could that Brookhaven study, Dr. Stutz, be the same Brookhaven study that you provided in the last case to this company?

A I believe it is an updated version.

Q Dr. Stutz, you were cross examined when, in the last case? I can refresh your recollection that it was May.

A. Why don't you do so. I don't have the exact date.

Q May, 1978?

A. Yes. I don't believe we had this particular form of the study at that time. I could be wrong, but my recollection is that we provided you with a preliminary copy of the study that we have furnished you with in this case.

Q I would take it you would have to agree that the revised A. D. Little study would not be reflected in that January, '78 Brookhaven study, is that not correct?

MR. BURGRAFF: May I interject? I think we have had some testimony from Dr. Stutz saying that he believes the '78 document was dated. We can check on that. You are referring to the report as if it is not dated.

MR. HALL: I take it Dr. Stutz has referred to a single report of January, 1978. I can go to the transcript here and demonstrate that we did, in fact, get such a report in the last case. Now, what I'm trying to demonstrate, and I believe that Dr. Stutz will agree, is that if this Brookhaven report is the January, '78 report, then in fact it does not include the revised A. D. Little study. Or any numbers therefrom. That's got to be true.

THE WITNESS: The problem with the A. D. Little numbers is not that they are -- --

MR. HALL: I would like an answer to my question.

I have not asked the problem with the A. D. Little study.

MR. BURGRAFF: I think the witness should be allowed to answer the question in the way he sees fit. We have gone through this with company witnesses, when someone has tried to get a yes or no answer. At that point in time, the answer was what was worked out was you can answer yes or no, but you also have the latitude to explain. What's fair to the company witnesses is fair to everybody else's witnesses.

MR. HALL: I would certainly agree with that. But I did not hear a yes or no.

THE WITNESS: Could I hear the question again and I will try to give you a yes or no if I can.

BY MR. HALL:

Q The question is, Dr. Stutz, is it not true that this January, 1978 Brookhaven Laboratory's report which you have referred to does not contain the revised A. D. Little study which you have relied upon in this case? In this case meaning this electric rate proceeding?

A I think I have to state again that the numbers that I used in my forecast are the numbers that are reflected here. What will subsequently appear in the A. D. Little documentation which is supposed to be forthcoming shortly, I believe is the underlying calculations for the numbers that I have used. Now, I have spoken to Mr. Gleak at A. D. Little who is writing it. That is the impression he has given

me. I can't answer any more fully until I see the documents, myself.

MR. HALL: Your Honor, at this time, I would make a motion to strike the commercial portion of Mr. Stutz' testimony with regard to the commercial forecast of this A. D. Little document and the numbers which are in it. It is a very important part of Mr. Stutz' testimony. It is, in fact, the document which provides the energy usage or the kilowatt hour usage which he projects forward for this commercial forecast.

This is the most important piece of information in it. Now, in the last case, we requested of Dr. Stutz or in fact his associate at that time, Mr. Rosen, that this information be provided to us. At that time, it was indicated that this was draft information.

Mr. Rosen had access to it through his connection with Brookhaven Laboratories and it could not be provided to us. We have now come through two separate changes in that information. The study is apparently still not available, still can't be provided to us.

We cannot examine the study. We can't determine how Dr. Stutz is using the data from this study, whether he is using it correctly or incorrectly and I think the company is denied its ability to rebut and its ability to cross examine Dr. Stutz with respect to this particular forecast.

The most important single piece of information cannot be provided to the company and this is the second case in a row that that is true.

MR. BURGRAFF: I would like a word with the witness, if I could, before I respond.

(Counsel and the witness conferred)

THE ADMINISTRATIVE LAW JUDGE: We will have a three minute break.

(A brief recess was taken.)

THE ADMINISTRATIVE LAW JUDGE: Let's go back on the record.

MR. BURGRAFF: Yes. I think our comments would be essentially along those lines, Your Honor. Dr. Stutz has relied on the numbers as shown in the Brookhaven report. These numbers have all been provided to the company. His views of those numbers or why he has chosen to treat those numbers as he has has been the proper subject of discovery.

Clearly, Dr. Stutz has not misrepresented any of the numbers. If that's the allegation at all, then of course, that's just not the case. I don't see any problem with what has been presented, what has been relied on. Obviously, if the company chooses not to agree with the treatment of them, then that's entirely up to them.

I don't see what the point of it is, when the numbers, themselves, have not been misrepresented. And

now we are talking about taking a report that is unknown and changing the numbers as a starting point in dealing with them, I think that's one thing. But that is not the case.

They have come from the Brookhaven report. We haven't done anything to them. I think it is entirely appropriate. The company obviously would disagree with Dr. Stutz' perhaps viewpoint, treatment, but as a starting point, I don't see any problem with them.

MR. HALL: Obviously, the company doesn't disagree with Dr. Stutz' use of the numbers because the company does not know how the numbers were derived. The company does not know how Arthur D. Little went about doing its analysis. We don't know the limitations which Arthur D. Little believes exist on these numbers or their usefulness.

We have not seen that report, which it is my understanding has been seen at least by some in Dr. Stutz' organization. We have not had access to Arthur D. Little to discuss with them. We can't even call and discuss them. We have tried that. There's no way we can adequately examine Dr. Stutz' use of these, merely because they have appeared in some other report published by some other agency.

They do appear on that report, as numbers, but other than for that, there's nothing else there, and

that provides us very scant information with respect to an evaluation of this very important feature of one-third of the company's system as forecasted by Dr. Stutz.

MR. BURGRAFF: I'm sorry to interrupt. It is our view that the company can examine these numbers. I don't think the A. D. Little matter has really any relevance at all to the admissibility of the testimony. I think that the company's argument, more or less, goes to perhaps the weight or the way the numbers have been used.

But once again, I fail to see how they can't examine the use of the numbers. They had every opportunity to do that.

MR. HALL: Your Honor, we took every opportunity. We called Arthur D. Little. We called the Department of Energy. We asked Dr. Stutz and all of those sources told us we could not have that study and could not request it.

MR. BURGRAFF: I'm referring to the use of the numbers by Dr. Stutz.

MR. HALL: We have no way of knowing whether he has used the number right or wrong other than what he tells us. The purpose of cross examination or discovery is to check on that the witness tells us. We are denied the ability of cross examination and discovery and I believe due process of law as to this particular portion of Dr. Stutz' testimony.

My motion to strike is limited to the commercial portion of that testimony.

MR. BURGRAFF: Well, we have, I think pretty much covered the ground. I don't - - once again we don't think the motion is appropriate. Certainly to the admissibility of the evidence.

MR. BOCK: I would join in that, Your Honor. It is a question primarily of weight and not admissibility in this Administrative proceeding.

MR. HERSHEY: I would also point out, Your Honor, that in objections posed by intervening parties in this case or motions to strike, in several cases, the motions to strike were put off until the end of the case and in one case, where we were attempting to inquire into the background of I believe it was Mr. Mallard, we were not allowed to do that or in decisions that he had made which would have reflected on the testimony that he was bringing to this case, and I think the situation is very parallel here.

MR. HALL: I think the decision there was that the request was irrelevant which is certainly not the case with respect to this motion. It is totally different. I would note that the argument that this only goes to the weight is always the bromide that is advanced in these situations. How you can give weight to testimony that cannot be examined by cross examination or discovery escapes me

entirely and such testimony should not be permitted into the record.

MR.HERSHEY: I think that was exactly the problem with Mr. Mallard's testimony as it related to his previous experience in New Jersey, and in this case, we were not allowed to inquire into what he had done in New Jersey.

MR. BURGRAFF: And also cross examination as to the use of the numbers is available in this case.

MS. BUSH: Mr. Mallard was allowed to rely on an audit of a Virginia Electric and Power Company project, of which we parties did not have the right to cross examine.

THE ADMINISTRATIVE LAW JUDGE: I think the only reference to that was in the Theodore Barry audit. I don't think there was any reference in that.

MS. BUSH: Excuse me.

MR. HALL: The audit was - -

MS. BUSH: Excuse me. I'm responding to the Judge. That referred to the Hope Creek Project maintenance and referred to the percentage figure he used as the appropriate percentage for rework and the audit he referred to done by Theodore Barry on another project.

MR. HALL: I would note that you were permitted to see the audit, to examine it and before you continued your cross examination. I would note also that there was an audit done by your own witness which was available to you

from him had you asked.

MS. BUSH: It was a percentage figure. We had no way of investigating what it related to, what particular factual situation was referred to.

THE ADMINISTRATIVE LAW JUDGE: Before I rule on this motion, I want to review Mr. Stutz' testimony again. We will get an answer back to you as soon as possible.

MR. BURGRAFF: Thank you. I might note for the record, Your Honor, that Dr. Stutz is suggesting when you are reviewing his testimony, you also review a section of the Brookhaven report which in essence, explains how to use the data in question and we will furnish copies of that to you and to all parties of interest.

I believe the company already has it.

MR. HALL: I would note that the Brookhaven people, of course, are not the people that put the study together. That is not the study.

MR. BURGRAFF: That's where the numbers come from.

MR. ROCK: That's what the witness is relying upon.

BY MR. HALL:

Q Dr. Stutz, you were present during cross examination of Mr. Rosen in the last case, were you not?

A Yes, I was.

Q And you and I recently just had a colloquy with respect to whether or not the Arthur D. Little numbers changed during the course of the last case, is that not correct?

A Yes.

Q I'm going to ask you if you recall this following exchange between myself and Dr. Rosen from the last case with respect to that particular item.

A Yes.

Q The question is"well, Dr. Rosen, do you have a copy of the study which you refer to page 25 of your prepared statement?" And that study was the A. D. Little study.

A I am just looking at page 25, if you don't mind.

Q Excuse me?

A I'm looking at page 25 of the last testimony, if you don't mind.

Q Okay. Fine. Mr. Rosen answered me by saying "A final copy of the MOPS report is not available. The data that I received to enable me to perform my study was received by colleagues of mine at the Brookhaven National Laboratories, who were working on the MOPS study. This data that went into the supplemental testimony, some of the numbers were changed from the earlier testimony and a few changes were

made because we did receive final numbers from Arthur D. Little." Do you recall that exchange?

MR. BURGRAFF: Could I show this to the witness?

MR. HALL: Yes. Sure.

MR. BURGRAFF: Is that the extent of the quote?

MR.HALL: Just this. (Indicating)

(The document was handed to the witness)

THE WITNESS: Yes.

BY MR. HALL:

Q So with respect to this A. D. Little study which I believe is reference eight in your exhibit JS-4, is that not correct?

A Yes.

Q And it is listed as forthcoming there, is that not correct?

A Yes.

Q Now, with respect to this A. D. Little study, when you filed your initial testimony in the last case, you used a set of A. D. Little numbers, is that not correct?

A Yes.

Q And those numbers changed during the course of the case, is that not correct?

A That is apparently correct.

Q And during that entire period the A. D. Little study was at that time forthcoming, was it not?

A That is correct.

Q Now, we are in a second case some year and a half later and there is an A. D. Little study still forthcoming, is that not correct?

A Yes. As I indicated, one portion has appeared and we supplied that. The other portion is still forthcoming.

Q The portion that is still forthcoming is the one which contains the numbers and the analysis which you have employed in your commercial forecast, is that not correct?

A No. As I said before, the numbers I have employed are in the Brookhaven report. I have employed them as described in my testimony. The document we are discussing is a background document that supplies information concerning the derivation of those numbers, information which I have received through contacts directly with A. D. Little and Brookhaven National Laboratories.

Q The document we are discussing, is it not, Dr. Stubs, is the document from which the Brookhaven Laboratories presumably got these figures?

A No. Since it doesn't exist yet, it isn't the document they got it from.

Q Well, perhaps you could enlighten me, Dr. Stubs. You have used what you term the A. D. Little data from the Northeast United States.

A. That's correct.

Q Am I correct in assuming from that that the A. D. Little data must be divided by Northeast, Northwest, Southeast, Southwest? Is that correct?

A. Yes.

Q What is the A. D. Little data from the northeast?

A. Specific data you are talking about is energy intensity data. It is data on energy consumption per square foot for different types of buildings in the commercial sector. That's the data.

Q How many commercial buildings did they use in the northeast?

A. Five. Five different types.

Q Five different types, five different buildings?

A. Yes. I should point out that one of the operations we haven't discussed, which is described on page 85 of JS-4 is an adjustment.

Q Dr. Stubs, I don't have a question pending at the moment.

A. Okay.

Q I don't mean to cut you off, but I do have another question that I want to ask.

Q Okay. I just realized I had gotten myself in a situation where I didn't mention something, so it had

been omitted from the discussion. It might be misleading if it weren't entered.

Q Perhaps we will get back to it. Dr. Stutz, the northeast United States as used in the A. D. Little study, is that Philadelphia or is that some other area?

A It certainly includes Philadelphia.

Q You made an adjustment to apply that data to Philadelphia?

A Yes.

Q And these are stated in your testimony, aren't they?

A Yes. On page 85.

Q Those are weather adjustments, I take it?

A That is correct.

MR. BURGRAFF: For clarity of the record, page 85 of what?

THE WITNESS: JS-4.

MR. BURGRAFF: Thank you.

BY MR. HALL:

Q Now, you indicate a .5 percent commercial growth rate on page 4 of your testimony, do you not?

A Yes.

Q Does that growth rate or does the commercial class upon which it is based include, in addition to what one might normally think of as commercial, i.e. stores, commercial

office buildings, and others such as pipelines, transportation utilities and Government accounts or such as the Navy Yard and the Mint? The Government Mint?

A. Yes.

Q. Would you refer to Table 1.3 at page 5 of your Exhibit JS-4, Dr. Stutz? There's a column there headed Other Sales. I have calculated from the change in numbers in that column -- well, first off, what is other sales?

A. Sales not included in the residential, commercial and industrial categories.

Q. And what generally would that be?

A. Oh, street lighting, other miscellaneous things of that sort.

Q. I have calculated the increase which you show on an average annual basis from 1978 through 1987, and then separately from 1988 to 2000. Now, during the first ten year period, I get an average million kilowatt hour increase of 42. During the second ten year period, I get an average million kilowatt hour increase of 114. Can you explain for me why the vast difference between those average annual increases?

A. I would have to go back and look as to how we developed those. My recollection is we were developing them from company data. But I will have to look to be sure. According to my notes and also my recollection, we developed

this from company data. I would have to go back and look at my data development to tell you why there is that break. We include in that, as you will note on page 93, the number of categories, losses, et cetera. I would have to go back and review my notes to tell you exactly how I obtained those numbers.

Q Doctor, you don't mean to suggest, do you, in your prior response, that in fact these numbers are taken directly from the company's exhibits, do you?

A. As I explained, they include a number of categories of use by the company. Line losses, et cetera. They are a developed figure. I can certainly indicate in writing how they were developed.

Q Okay. That would be fine. Thank you.

A. Let me just indicate preliminarily that they are developed by a linear interpolation, so I will give you the three values that we interpolate to in the years they correspond to. How those were developed.

(Transcript continues on next page)

Q Now, Dector, I would like to move now to your industrial information document. Dector, am I correct that the only significant difference between your industrial forecast and that of the company is in your treatment of cogeneration?

A That is correct.

Q And in your treatment of cogeneration, do you rely for your data upon a study which was done by the Thorne Electron Corporation for the Federal Energy Corporation in June, 1976?

A That is one of many things I relied upon, yes.

Q What additional things did you rely upon?

A I relied upon other studies done by the industry such as a study by Resource Planning Associates. I relied upon information supplied by the company concerning studies of cogeneration done by the Electrical Association of Pennsylvania.

I relied upon a study which my company completed for the New York State Energy Office concerning cogeneration.

I relied upon various articles in journals, energy-related publications which I subscribed to concerning cogeneration.

Q Now in making your adjustment for cogeneration, Dector, how have you developed the number of megawatts hours which you have assumed that the industrial customers can

cogenerate?

A That is developed as a fraction of the total processed energy requirements by two digit SIC. Do you want me to go into the development of that fraction?

Q Yes, where did you get that fraction from?

A If you take a look at Page 92, you will see a description of how I did it.

MR. BURGRAFF: Is that JS-4 again?

THE WITNESS: I am sorry. I keep referring to the exhibit. I think that the testimony describes it completely.

BY MR. HALL:

Q And I take it Table 810 provides the percentages which you have assumed could be employed in cogeneration by different industries by type of industry, by SIC code, is that correct?

A 810 contains the fractions, yes.

Q What is 810?

A It is energy intensity.

Q Oh, I see. With regard to No. 24-SIC-24, I see a fraction of .345. That is for the pase year in the high case and the low case. What type of industry is that?

A I have to get out my SIC list. I am sorry, I don't have a memory for those kinds of things. I have to look it up before you can supply me with it.

Q Would you agree that we don't have any lumber manufacturing locations in Philadelphia? Let's say 33. Now, in the high cost, you show approximately 15 per cent and in the low cost, approximately 27 per cent?

A Yes.

Q Where do you get the 27 per cent?

A As I said, it is described there. It is the largest of two numbers. If you want, I will see if I have the data which tells you which of the two numbers I used.

As you can see, the procedure is very, very simple though. I don't think I have that list, but I will look for it.

Q Well, Doctor, referring to Page 92, you say that for the low case, we assume historic sales levels, is that correct?

A That is correct.

Q That is historic sales of Pennsylvania?

A Yes.

Q And this is from census data?

A Yes.

Q Do you know how old that census data is?

A I would have to go back and check the data.

Q Could you provide that to us?

A The age of the data on which the base year fraction was determined?

Q Yes.

A Yes.

Q Now you say reachieved by 1985. I take it that means we are not achieving the level you have assumed at this time?

A Yes, that is correct.

Q And I take it another input into your load case has been the Thorne Electron study?

A That is one of the inputs.

Q In other words, you either assume this census data or the Thorne Electron data depending on which is lower?

A No, that is another item. Potential generation levels by the Pennsylvania Electrical Association, there are three candidates. We examined those three and chose among them in the way described.

Q You picked whichever of the three is higher?

A That is correct. It is designed to be a high-low split. In the high case, which was least amount of cogeneration assumed, you will notice we leave everything constant and the low case, which has the largest amount. We picked the larger of the three.

Q In other words, for the high case, you assumed the same cogeneration level as the company, is that correct?

A Yes, base year levels are maintained as indicated in Table 819.

Q Okay. Doctor, are you aware of the historic growth of cogeneration in the Philadelphia Electric service territory in recent years?

A I am aware that we received information that it had not grown.

Q Has it, in fact, been negative growth?

A I don't recall that. I recall something to the effect of it being flat for ten years.

Q Doctor, are you familiar with the Department of Energy's current position on cogeneration with oil plants?

A In general, yes.

Q What is that position?

A I believe the Department of Energy is interested in decreasing oil consumption as much as possible so it does not look to that kind of cogeneration very favorably.

Q Doctor, would you agree with me that cogeneration through coal plants would not be a feasible alternative in the Philadelphia area?

A That is my impression.

MR. HALL: That is all the questions I have, Your Honor.

MR. DIST: No questions.

THE ADMINISTRATIVE LAW JUDGE: Let's break for lunch. We will come back at 1:45.

(Whereupon at 12:55 p.m. a recess was taken and the hearing reconvened at 2:05 p.m. the same day.)

THE ADMINISTRATIVE LAW JUDGE: Okay. Back on the record. Mr. Burgraff, do you have any redirect?

MR. BURGRAFF: Yes, we do, Your Honor.

JOHN E. STUTZ, the witness on the stand at time of recess, resumed the stand and testified further as follows:

REDIRECT EXAMINATION

BY MR. BURGRAFF:

Q Dr. Stutz, we have had some cross examination earlier today concerning a group of numbers that are present in the Brookhaven report. What are those numbers?

A The numbers referred to are numbers which give the energy consumption per square foot for specific building types and end uses.

Q Okay. And what do you do in your analysis with those numbers?

A The numbers, the energy consumption per square foot by building type is multiplied by our estimate of square footage to get an estimate of consumption for a given year.

Q And do you use those numbers strictly as they are found in the Brookhaven report?

A No. There are a number of adjustments made

for the numbers as they are found in the Brookhaven report. They're initially represented in terms of BTU's per square foot. We convert to kilowatt hours. We then adjust for temperature, heating degree days and cooling degree days and then we make an initial scaling based upon information we have about base year consumption.

It is only the final intensities, kilowatt hours per square foot that are used as input data for our commercial model.

Q And do you test the resulting KWH per square foot figures which you use as input data?

A Yes, we do. We don't simply take the output of that procedure and put it into our model. We do endeavor to check the numbers that we obtained in this fashion against other model output, against other studies. In particular, we use output that we have used received from Prinsin model. It is a computer model. We also check it against output that we have received from other studies.

For instance, Dubel, Mindel and Bloom, a planning firm in New York has put out a book recently in which they show energy consumption per square foot. We check it against such a source. We have also endeavored to check it against any information we can obtain concerning company estimates for the same quantities. We did receive some information from the company in response to one of our

interrogatories concerning the electric heating consumption for new buildings.

We checked it against the numbers that we were putting in to our computer based on the procedures I have described and found them to be in the same range. So the general procedure, then, is to check it against any other model output, any other studies we have available and certainly any information we can obtain from the company.

Q Were you asked to derive your energy intensity by the company?

A No. We were not asked specifically if we could provide any independent derivation of the numbers nor were we asked to go over our reasons for choosing those numbers. We were asked for general background information and input to the Brookhaven model of which those are the numbers. That was we supplied the Brookhaven report which I have referred to and that was as far as the discussion went.

MR. BURGRAFF: That's all we have at this time, Your Honor.

THE ADMINISTRATIVE LAW JUDGE: Mr. Hall?

MR. HALL: Just a second.

(Brief pause)

RECROSS EXAMINATION

BY MR. HALL:

Q Dr. Stutz?

A. Yes.

Q With regard to the Trinsis model?

A. Yes.

Q That's a model that you now indicate that you have used to check the A. D. Little data, is that correct?

A. What I indicated I do is precisely this. I have information about energy usage in the commercial sector from a variety of sources. One source is the output of this model. I do, in the course of selecting the data to be put into the commercial sector, check it against various sources. That is one of them.

Q Is that a model that you have developed?

A. No, it is not.

Q Who developed that?

A. That, I believe, was originally developed by the California Energy Commission.

Q How long ago was that?

A. I would say about a year and a half ago.

Q Do you cite that anywhere in your testimony?

A. No, I do not.

Q Do you explain this checking procedure anywhere in your testimony?

A. I believe I do. I don't indicate it in the section dealing specifically with the electric intensities.

The general procedure, however, is mentioned, oh, actually it is related. Closely related and in the same subsections, on page 86, we discuss the use of cross checking for our estimates on saturation.

Q Where is this?

A This is on page 86, first paragraph.

MR. BURGRAFF: Once again, that is Exhibit JS-4?

THE WITNESS: This is Exhibit JS-4. We talk about the commercial saturations in the first sentence and we talk about referring to a variety of other works in particular, here, to check on an assumption to make concerning the saturation models.

So I said it does not refer directly to the intensities, but in fact is a similar procedure as used in all of our inputs.

BY MR. HALL:

Q It refers only to saturation?

A That's what I said.

Q Would you agree that's considerably different than intensity?

A Actually, they're very closely related in terms of the way the model operates.

Q In terms of the intensities being the actual kilowatt hours being used by the square footage and saturation

being the number of customers or the number of square feet which possess a certain electric consuming appliance, is that not correct?

A. It is certainly correct that they are different.

Q. Those are the different concepts that are involved?

A. That is certainly correct.

Q. You don't mean the Dubel, Mindel and Bloom material, either, do you?

A. No, I don't.

Q. Dr. Stutz, what was involved in the A. D. Little report? These weren't figures that they picked off the wall somewhere. They had to come from some study.

A. No. Certainly it was not. What is involved is this. They developed the set of prototype structures for which they assumed thermal integrity results, results on degree of penetration, degree of their transfer between the interior and exterior of the building, lighting levels for different mix of tasks.

In other words, all of the parameters that one would need to describe the building from an engineering standpoint. Once they have had those parameters, they then check the computed building loads against actual building loads which they had from places like the Jack Faucet studies or the FEA. Once that was completed, they had calibrated by

weather and by section of the country, building loads. They then used these as a basis for estimating commercial consumption by building category. That information is then transferred to BNL on the form you see.

Q I take it there were a number of judgments made in the compilation of this data and I believe you stated a number of assumptions made in the compilation of this data?

A That is certainly true.

Q Now, could you provide me with the source of company data that you used to cross check these energy intensities?

A Certainly. The only item I was able to cross check directly is from the response to the Consumer Advocate question number 23 in which the company provides information with respect to kilomtt hour per square foot usage in 1984. This is the answer to 23-B-2.

Q Now, have you ever seen a copy of a written document, Dr. Stutz, entitled the ADL Report or the draft report?

A I have seen written output memoranda through Brookhaven which I was told originated with ADL.

Q But you, yourself, have never seen a full copy of that report?

A I don't think a full copy of the report in the

sense you mean the term exists. It is in bits and pieces.

Q Or have ever existed?

A As I say, bits and pieces exist in the form of informal communications.

Q But a full and final copy of the report or ever a full and final draft of the report has never ever existed?

A I have not seen such a thing.

MR. HALL: That is all that I have, Your Honor.

THE ADMINISTRATIVE LAW JUDGE: Thank you. You are excused.

THE WITNESS: Thank you.

(Transcript continues on next page)

MR. DOCK: Your Honor, before we proceed with the next witness, based on redirect of the Consumer Advocate outlining the basis and the study and number to use, is Your Honor ready to rule on the motion to strike?

THE ADMINISTRATIVE LAW JUDGE: Not at this time.

MR. HALL: Your Honor, before we begin with the next witness, I wonder if I could make one request? There is due to be filed today a brief by Your Honor in support of the company certificates. I was wondering if Your Honor would entertain a request to have that brief filed the first thing tomorrow morning?

THE ADMINISTRATIVE LAW JUDGE: Yes.

MR. HALL: Thank you, Your Honor.

MR. BURGRAFF: We would now offer Dr. Shaken at this point. He has not been sworn as yet.

DON M. SHAKEN, was called as a witness on behalf of the Consumer Advocate, being first duly sworn according to law, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. BURGRAFF:

Q Could you state your name and business address for the record, please?

A Don M. Shaken, and my business address is

Energy System Research Group, Inc., 120 Milk Street, Boston.

MR. BURGRAFF: Dr. Shalow has prepared a narrative testimony and exhibits BS-A through BS-E, which we will provide three copies to the Reporter at a future point in time.

BY MR. BURGRAFF:

Q Do you have those materials in front of you, Doctor?

A Yes, I do.

Q Were they prepared by you under your direct supervision or control?

A Yes, they were.

Q And if I asked you the same questions today as contained therein, would your answers be the same?

A Yes.

Q Do you have any corrections you would like to make at this time?

A No, I don't.

Q And is the information excerpt therein true and correct to the best of your information, knowledge and belief?

A Yes.

MR. BURGRAFF: We would ask that Dr. Shalow's testimony B be identified as Consumer Advocate's Statement No. 4 along with the attendant exhibits, BS-A through BS-E.

THE ADMINISTRATIVE LAW JUDGE: Without objection, they will be so identified.

(Multi-page document which is the testimony of Don M. Shakow, with accompanying exhibits DS-A through DS-E was marked Consumer Advocate's Statement No. 4 for identification.)

MR. BURGHAFF: Now Dr. Shakow is available for cross-examination.

THE ADMINISTRATIVE LAW JUDGE: Mr. Hall?

MR. HALL: Good afternoon, Dr. Shakow. How are you?

DR. SHAKOW: I am fine, thank you.

MR. HALL: Before we begin, Dr. Shakow -- Your Honor, I would move at this time to strike Dr. Shakow's entire testimony, the theory of that testimony and recommendations that are made in it, that the company should terminate construction of its Limerick generating unit.

As Your Honor is aware, the company filed objections to interrogatories previously with regard to the Limerick matter and has taken the position that Limerick, its timing and whether it should be built or not, are not issues directly affecting the rates in this case and should not be decided in this case and the company adheres to that position and based on that, I move to strike Dr. Shakow's

testimony in its entirety.

In addition, the company would especially move to strike that portion of Dr. Shaker's testimony which recommends that this Commission adopt for Philadelphia Electric Company a new reserve reliability criteria which is different than that which has been historically employed by this Commission for utilities subject to this jurisdiction.

The company believes such an issue is one of Statewide applicability and should be raised in a Statewide proceeding and in addition, believes that that particular issue again does not directly effect rates in this proceeding and it is indeed an extremely complex, extremely difficult issue and one with extremely great effects upon the health and safety of members of the Commonwealth, and for that reason believes it should not be considered in a proceeding such as this where there are extreme time constraints on all parties.

MR. KNIGHT: Your Honor, if I might respond, Dr. Shaker, we would note that the objections raised by the company to any matter having to do with Limerick as to its relevancy to this proceeding has been raised before. I believe the Commission has given direction in that regard.

I might note that Dr. Shaker's testimony in essence is a unified whole and as a technical matter, it is not that easy to split it up. As a legal matter, I already think we have the direction set forth as to how Limerick will

be treated in this case.

As far as reliability is concerned, I think it relevant. The company has offered their own viewpoint as to appropriate reliability level for their system. I don't think the objection is really going to its relevance. It seems to go whether this proceeding is the proper form. We agree it is a difficult issue, but we agree it is the proper form.

I am not sure what a generic proceeding would be given the differences within various utilities in Pennsylvania. I don't see any other form more appropriate than a rate case dealing with this company in particular.

MR. SEGAL: If Your Honor please, if I may, Your Honor, the company's motion is inappropriate for two separate and related reasons.

First of all, it is a matter of law. The company has already raised the issue of the relevancy of Limerick. Your Honor has already ruled that Limerick is relevant to these proceedings. That question was then certified to the Commission. The Commission has ruled adverse to the company and that is now the law of the case.

Second of all, the issue of Limerick is directly relevant to the setting of rates in this proceeding for two reasons. One, it is very much involved with the area of excess capacity which is then the topic of testimony concerning

possible adjustments to rate base as a result of any possible excess capacity and, second of all, the company's own witness, Mr. Paquette, has testified that a major reason for requesting rate relief is the need to attract capital for the company's construction company which as Mr. Paquette, himself, has stated primarily involves the construction of Limerick facilities.

I think for those two separate reasons, one very clearly that the issue of Limerick is relevant to rates in this case, and for that reason, the motion should be denied and a separate reason is in the law of the case as established by the Commission that the motion cannot be granted.

THE ADMINISTRATIVE LAW JUDGE: Thank you. I will deny the motion. I cannot find that the material is relevant or irrelevant or unduly repetitious.

MR. HILL: Your Honor, we will take an exception to your ruling, but we will not seek a certification of the Commission at this time.

THE ADMINISTRATIVE LAW JUDGE: I am sure the Commission will be very happy to hear that.

CROSS-EXAMINATION

of MR. HILL:

Q Dr. Shulow, turning first to your educational background, do I understand correctly that you have a Bachelor

of Science degree in Humanities and Sciences?

A A Bachelor of Science in Humanities and Sciences.

Q What is a Bachelor's Degree of Humanities and Sciences?

A It is a program offered by the Massachusetts Institute of Technology in which you specialize in both scientific fields and in humanities, particular fields, and my scientific specialty was figures and mathematics and my humanistic specialty was economics and history.

Q And your Doctor's Degree is in Economics, is that correct?

A That is correct.

Q And I take it you do not have any degrees in the field of engineering?

A I do not have any degrees, no, although I would note that one of my outside fields for my economics degree was when you take two outside fields and this is the primary basis for your oral examinations, and one of my fields was in the Industrial Engineering Department and the exams administered by this Department.

Q During the period that you were seeking your Doctorate Degree, were you employed in any capacity?

A I was employed for a time by the University of California at Davis on a lecturer in Economics.

I was employed by the University of California at Berkley as an Instructor of Economics.

I was employed by Western Washington State College as a Lecturer in Economics.

I was also employed by Weyhaeuser Corporation as a Research Analyst.

Q When did you receive your Bachelor's Degree?

A 1962.

Q When did you receive your Doctorate Degree?

A 1972.

Q Were you full-time employed after leaving college initially? Did you have any full-time position between 1962 and 1972?

A I spent two years in Israel. If you want me to go into my activities there, I would be happy to.

Q No, that is all right.

Now since I take it we have covered all of your employment up to 1972 at this point, is that correct?

A No, not quite. As I indicated on my vitae, from 1970 through 1975, I was essentially self-employed.

Q You indicated you had a vitae? Do you know where that is?

A It wasn't clear to me whether you had received copies of that or not. We can provide you with it if necessary.

Q Now, in 1970 to 1975.

I was employed by the University of California at Berkley as an Instructor of Economics.

I was employed by Western Washington State College as a Lecturer in Economics.

I was also employed by Weyhaeuser Corporation as a Research Analyst.

Q When did you receive your Bachelor's Degree?

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A No, not quite. As I indicated on my vitae, from 1979 through 1975, I was essentially self-employed.

Q You indicated you had a vitae? Do you know what that is?

A It wasn't clear to me whether you had received copies of that or not. We can provide you with it if necessary.

Q Now, in 1973 to 1975.

A I was self-employed in business.

Q But what did you do in business?

A I was in the food business on the West Coast.

Q What did you do in the food business?

A I was a wholesaler of various kinds of food stuffs, produce, grains and other food stuffs.

Q Now following 1975, what did you do?

A In 1975, I was employed by Mathematical Science Northwest, and a consulting firm based in Washington as an Econometrician. I was so employed until 1976.

In 1976, I assumed the position of Assistant Professor of Economics at Clark University in Worcester, Massachusetts and am so employed at present.

Q How long have you been associated with ESRG?

A I have been associated with ESRG for approximately seven months.

Q I have used that several times. Can you provide us with the words that go with the initials?

A Energy System Research Group.

Q Have you ever previously testified, Doctor, in opposition to the construction of a nuclear plant?

A No, I have not. I am not so testifying today as far as I know.

Q Doctor, would I be correct that you have had no professional experience in either design or operation

capacities as an engineer?

A That is certainly correct.

Q Would I be correct that you have never been employed by a utility and charged with the operation of its system?

A That is very true.

Q And would I be correct that you have never been employed as a financial analyst or advisor to investors?

A That is likewise correct.

Q And would I be further correct that you have never been employed as a utility rate expert accounting witness?

A That is also true.

Q Have you ever been professionally employed, Doctor, to render opinions with regard to the income tax code? The Federal income tax code?

A Absolutely not.

Q Have you ever been professionally engaged to advise on the lifespan of nuclear fossil power plants for the purpose of utility depreciation?

A No, I have not.

Q Did you, as a part of your study, which is the basis of your testimony in this proceeding, Doctor, make a study of the generating plant reserve margins of other Pennsylvania or PJM utilities other than PECO?

A Not as part of the preparation of the study, although I should indicate that I am currently engaged in such a study.

Q But prior to making this testimony, you were not?

A Not prior to the testimony.

Q And I take it similarly, you did not make a study of the anticipated future load or generating plant construction programs of such companies?

A That is not correct. I have done an analysis of load forecasting procedures by the Duquesne Light Company and have advised the Energy Systems Research Group with regard to my analysis.

Q And this is in regard to Duquesne Light Company?

A That is right.

Q And it is with regard to the load forecasting methodology employed by them?

A That is correct.

Q And is this on behalf of the Pennsylvania Office of Consumer Advocate?

A No, it was not.

Q Have you made a study, later, of the available generating plant sites in the Philadelphia Electric Company service territory?

A No, I have not.

Q Are you aware of the various legal restrictions placed upon the operations of generating plants within that area?

A No, I am not.

Q And I take it that would include environmental restrictions, Doctor?

A Specifically for Philadelphia?

Q Philadelphia.

A The answer is no. I should note that we did submit interrogatories regarding the cost of various environmental regulations as they pertain to the construction cost of generation facilities, and we did not receive information in that regard.

Q But you, yourself, have never undertaken a study of the environmental laws of the Commonwealth of Pennsylvania or the Federal regulations as they would be applicable to the service territory of Philadelphia Electric?

A Specifically in regard to the Philadelphia Electric Company?

Q Yes.

A No.

Q Doctor, have you analyzed the contract by which Philadelphia Electric Company will sell capacity and engineering from its Salem-2 facility to Public Service

Electric and Gas?

A I have looked at that. I should note that I specifically excluded an analysis of that contract in my testimony.

Q What do you mean, Doctor?

A The testimony pertains to an analysis of this sale based on certain explicitly stated assumptions which we can go into during the course of this cross-examination, so I would say in my analysis that I might have made independently of this contract is not germane to my testimony.

The statements in my testimony, as they pertain to the sale of Salem-2, are developed under certain explicit assumptions as I stated in my testimony.

Q Now, Doctor, the analysis in your testimony has been made on a current basis and by that I mean you have not attempted to reconstruct conditions which existed at the time Philadelphia Electric Company decided to build the Limerick Station?

A That is very true.

Q You have rather stood today and looked only to the future to exercise your judgment?

A That is correct. I assume that that plant was undertaken in the late 1960's and early 1970's and I have not put myself in a position of Assistant Planner during that

period of time.

Q Now the basis of your testimony is obtained from results which you had taken from an econometric model, ESRG ESGTM Computer Model, is that not correct?

A That is not correct. That is not the econometric computer we employed.

An econometric computer is a model developed from historical data and employs statistical estimates based on that historical data.

But this model, I think, is totally different from the econometric model. There is no resemblance whatsoever.

I employed econometric models to a very large degree for load forecasting and this does not bear any relationship to these models.

Q Thank you, Doctor.

A You are welcome.

Q I misused that term twice today. Would you agree with me, Doctor, that the function of the model that you have employed is to obtain an accurate mathematical representation of the Philadelphia Electric Company's power production system both as it exists today and under alternative future generating plant expansion proposals?

A Could you repeat that question? It doesn't sound quite right and I want to make sure I am answering

concisely.

(Thereupon, the previously referred to question was reread by the Reporter as follows:

Q I misused that term twice today. Would you agree with me, Doctor, that the function of the model that you have employed is to obtain an accurate mathematical representation of the Philadelphia Electric Company's power production system both as it exists today and under alternative future generating plant expansion proposals?)

(Testimony continued on next page.)

THE WITNESS: I would say I would not characterize the purpose of my model in that way. The purpose is not to represent the production system, but rather to indicate what would be an optimal generation expansion plan and reserve margin from the social cost perspective. So I think if we are going to indicate the purpose of the model, we should phrase it somewhat differently.

BY MR. HALL:

Q I take it boiling down your words into a few key ones, the purpose of the model is to measure social cost, is that correct?

A I think that is fair.

Q What are social costs as you define them, Doctor?

A Social costs, as I define them are the costs that the consumer would have to pay in light of one, a given generation expansion plan; two, a given production system, assuming economic dispatch of plants, which not only represent the way the Philadelphia Electric Company effects dispatches. I haven't made an independent study of this. And social cost explicitly taken into account what is called consumer time preference. That is it weights as a dollar at one point of time differently from a dollar at another point of time. It takes into account the preference the consumers might exhibit of a dollar at a period closer to the present.

Q If I can try and summarize what you have stated, Doctor, I deduce three elements in your answer. One, it takes into account a generation plant expansion; two, it takes into account economic dispatch and three, the time value of money. Is that a fair statement?

A That is correct. I don't know if that's exhaustive, but those elements are certainly present.

Q Now, could we agree that the model that you have constructed represents the Philadelphia Electric Company's system through what could fairly be termed mathematical symbolism?

A Well, represents, I think, is the word that just to be literal here, I take some exception to in that I have not, as I said, undertaken an independent analysis of the dispatching procedure employed by Philadelphia Electric Company. In the event that the economic dispatch simulated by my model departs from practices by the company, I would not want to suggest that this is in fact, a representation.

Q What is the principal basis of your economic dispatch system?

A Principal basis is that plants are dispatched in order of increasing operating costs.

Q Do you include in your costing analysis to

determine what is economic and what is not, start-up costs?

A. Start-up costs - -

Q. I guess my real question is what do you consider in determining where a unit would list under your concept of economic dispatch?

A. I see. That's fair. Fuel costs, operations and maintenance costs. We also have a category in there for an environmentally related cost. But as I noted earlier, the company was not responsive to our interrogatories in that regard. So we could not include numbers associated with that category.

Q. And that category would be what? Capital costs?

A. No. Not capital costs. We are talking about operating costs, so it would include, for example, higher heat rates as a consequence of the installation of various pollution control devices, for example. Costs that are associated with company conformance with various anticipated environmental regulations.

Q. But I take it you don't assume any start-up costs in your economic dispatch model?

A. That's correct.

Q. Doctor, could you agree with me that there are three possible sources of error in a model such as the one which you have used? I don't mean by the question to suggest

that they are there.

A I understand.

Q Only that they are possible.

A Absolutely.

Q First off, such a model could be potentially accurate in its representation of a specific facility, which it seems to represent. Is that a possible source of inaccuracy?

A Only where representation is an issue. As I noted before, my model is a normative rather than positive model, to use a term that's current in economics. By this I mean I am trying to determine what would be best from consumer's point of view, and to the extent that the company practices the part from what is best from the consumer's point of view in the course of its operating its system, this would be reflected in its merchandise.

I want to steer away from the question of representation. It diverts us somewhat from the purpose of my model.

Q Perhaps it is an unfortunate wording. Leaving aside operating parameters that can be controlled by the managers or by the modeler, I take it the purpose of the model is to accurately depict those parameters which cannot be removed by choice. Such as a capacity of units, such as costs which are known and which cannot be varied by a choice

of management and so forth?

A. I would agree with that.

Q Is that not correct?

A. Yes.

Q And I take it a second possible inaccuracy in the results achieved through the application of a model such as this would include the nature of the assumptions and the various data input? Data could be wrong. Is that not correct?

A. Oh, most certainly.

Q And I take it finally there could be simple mathematical or computer programming errors which would cause certain errors in the results?

A. That's very true.

Q Now, Doctor, your choice of optimal generating plant expansion programs and reserve margins has been made on the basis of a comparison of total social costs over a 1980 to 1992 planning horizon, is that not correct?

A. That is correct.

Q Doctor, referring you to table 1, you there show in the fifth column over, under the real cost of 1979 column a column which I take it reflects the social costs which you have calculated for the indicated years and the total for the period, is that not correct?

A. That's correct.

Q And what is included, for example, in the social cost figure 739.7, which is the first figure there stated?

A 739.7? The social cost for any year would include the similar factors to wit: Well, maybe I should describe the procedure. I think that would make things clearer since the answer in reference to 739.7 would apply to any figure shown in the course of this testimony. We initially calculated an optimal generation expansion mix. We then employ that mix and simulate the production of electricity employing this mix.

This yields a series of operating costs. The operating costs are then added to the fixed costs associated with the mix. Now, I should indicate from the outset that the fixed costs do not include all fixed costs of facilities currently on line. It includes only a portion of those fixed costs.

Q Is that it?

A I think for now. If you want to probe deeper - -

Q Let's begin with operating costs. Now, operating costs, obviously, include fuel costs?

A Yes, they do.

Q And it obviously includes all of the general costs which arise from operating a station such as the

men there to operate it?

A. That's correct.

Q. And the other day to day costs that you have?

A. That's true.

Q. I take it it would also include maintenance costs?

A. It does include it.

Q. Any other element? Are taxes included?

A. I don't think we included them in the variable component.

Q. I take it if we were to go back to your Exhibit C, Doctor -- -

A. Yes.

Q. -- - we might be able to relate these to specific items that you have used in your program. Looking at page 7 of 24, one sees in the middle var. O & M, variable operating and maintenance?

A. That's correct.

Q. I take it the items I have read would be included in that column?

A. Correct.

Q. Next to that is energy and I take it that's the actual cost of the fuel used in the generation?

A. That's correct.

Q. And next to that on the other side is card,

which I take it is carrying charge?

A. That is correct. That's not included in the operating cost.

Q. What is included in carrying charge?

A. For plants one through eighty-seven, we include only fixed operations and maintenance expenses.

Q. What is a fixed operation and maintenance expense?

A. Fixed operating and maintenance expense would be. I shouldn't say operating. I should say fixed maintenance expenses. There would be a cost associated with the maintenance of the plant without accounting for operations.

For example, a plant requires a watch person to make sure that no trespassers enter the premises, so that, for example, would be included in this charge.

Q. Okay. Now, this does not include, I take it, any capital carrying charges? In other words, this does not - -

A. That is correct. It does not.

Q. No return and no taxes?

A. That is correct. Not for those plants. For plants one through eighty-seven.

Q. You keep saying one through eighty-seven. I can't find those on mine. Are they both on page 7?

A. Note on sheet 1 of 24 in Exhibit DSC, under

the heading option, to the left of the page, there are some plant options noted and next to each of the plant operations is a number. I'm referring to plants numbered one through eighty-seven.

Q And what is the capacity, megawatt capacity of the one that ends eighty-seven?

A I cannot hear you, sir. Would you repeat that, please?

Q What is the megawatt capacity of the plant that is number eighty-seven on your list?

A Sixty-five.

Q That's right above 474?

A That is correct.

Q Now, for all of those plants, there's no carrying charges?

A That is correct.

Q That would include depreciation, I take it?

A There are no charges incorporated in that column other than what I have defined as fixed maintenance.

Q Now, looking at the 474 number, which I take it is Salem 2, is that not right?

A That is correct.

Q Now, does that unit have associated with it any costs other than those that we have discussed?

A In the operations - - oh, yes. On the carrying

charge, yes. It includes depreciation. It includes taxes.

Q Return?

A As well as fixed maintenance.

Q Fixed maintenance?

A Yes. It includes fixed maintenance as well as do the others.

Q It includes all of the other components?

A Yes.

Q Does it include a return on the investment?

A That's factored in in a slightly different manner.

Q How is it factored in?

A It is factored in through the category capital. Let me take a moment, please.

(Pause)

A (Continuing) I guess here we are dealing with the incremental cost option. So there would not be a carrying of -- there would not be a capital charge. I was including only charges that would be in addition to those presently incurred by consumers. So since Salem 2 expenses have been virtually completed and have been incurred, there's no way of eliminating those charges to consumers. And since we are dealing here with incremental costs only, the entry under capital would be zero. However, in the event we do include plants such as the Limerick facility or any of the

generic options where incremental costs would be expended in the future, in that case, we do include capital charge. So for example, let me direct your attention to say sheet 13 of 24, under option 102, generic cell three, you will note that there is a capital charge associated with that option.

Q How can you tell, Doctor, whether this is an incremental or a full cost computer run?

A Well, the question was in regard to all options we employed incremental cost as a general principle. In addition, with regard to the Limerick facility, specifically, we distinguish between what we term the full cost and the incremental cost option. This was necessitated by the fact that the Limerick facilities are partially complete so they're really in a unique situation as far as PECO's generating mix is concerned.

PECO's general expenses which find that either plants that are already on line or in case of Salem 2, just about on line, or on the other extreme, generic facilities which have not been commenced, insofar as their construction is concerned. The only exception to this is the Limerick facility which is partially built and so therefore, we distinguish between the full and incremental cost, specifically with regard to the Limerick units.

Q Now, Doctor, you seem to be making various

gradations here between generating plants?

A. That's correct.

Q The first gradation, I take it, are plants that are presently installed, and presently on line. For them, we only include in the analysis operating costs and fixed operating and maintenance costs, is that not correct?

A. That's correct.

Q Then we have another group of plants who are kind of a category away from that which I think includes only Salem 2 at this point?

A. That's correct.

Q And for Salem 2, we include operating costs, fixed operating and maintenance costs and depreciation?

A. That's correct.

Q But no return on investment?

A. That's correct.

Q And no taxes?

A. No. Taxes are included in here.

Q Taxes are included?

A. Yes. I mentioned that before.

Q Then finally, we have Limerick and generic plants where we include all of the things included for Salem and something in addition, is that not correct?

A. That's correct.

Q What is the addition?

A. The addition is the return on investment.

Q Why do we distinguish between return on investment for Salem 2 and Limerick?

A. Because we were - - our question was to what degree will consumers incur extra costs as a consequence of the imposition of new facilities? In the case of Salem 2, the plant has already been capitalized and presumably is entering the rate base and there was no question as to what the incremental costs were with respect to Salem 2. With respect to Limerick, this is precisely what is at issue and the model was developed in such a way so as to address a number of pertinent questions that applied to this proceeding.

For example, let's talk about the older plants just one minute. You might ask why did we exclude all costs other than fixed maintenance from the calculation of the old plants? Well, the answer is the following: In order to compute the effects of all these other factors, we would have had to request data regarding capitalization of all these other plants and this would have lengthened the analysis substantially. Since, in our opinion, the inclusion of these costs would only have biased our results in favor of lower reserve margins as I will point out later, I'm sure, in this cross examination. We felt that it was not germane to the issue at hand.

Likewise, in the case of Salem 2, the issue of

capital, total capital cost for Salem 2 was not at issue because the incremental cost of including the Salem 2 or excluding it was not germane to the question of what would be and what would not be included.

In the case of Limerick facilities, on the other hand, these questions are germane and therefore, we have undertaken a number of analyses of the Limerick facilities, including assumptions which impute the full capital cost of these facilities, specifically including costs that have already been expended by the company and alternatively, costs that apply just to the portion of the construction budget that has not already been undertaken.

For the generic plants, we invariably include the full cost.

Q Referring you again to table 1, Doctor, you there show various columns across the page. Now, the first column is entitled Demand. I take it that depicts the company's load forecast projections and where it says ESHC, it projects Dr. Stutz' load forecast projections?

A That is correct.

Q I take it the choice between these two for purposes of whether to build Limerick or not to build Limerick is not particularly significant, is that correct?

A It is not at all significant.

Q I take it we can see that on table 6 where it

can be seen that two cases of the eight which are put together there, which differ only because of the load growth selection, doesn't make any difference to the results?

A That's very true.

Q And I guess that would be case two and eight would be the two - -

A That's correct.

Q Now, you show a second column on table 1 which is titled forecast assumption cost. Now, does that refer to the cost which you assign to future generating plants, and by that, I mean capital cost of construction. And in addition, various operating parameters and inflation rates?

A That's correct.

Q Are those basically the three major cost assumptions?

A I should mention, too, that the differences in terms of capacity factors assumptions as well, and that is also subsumed under the term cost even though that is strictly speaking, incorrect.

Q So let me just repeat that if I can, to get the concepts in mind of the first is a difference in capital cost assumptions between you and the company?

A Correct.

Q The second is a difference between capacity factors between you and the company for say a coal plant or

nuclear plant?

A. Yes.

Q. And the third is a difference in inflation rates or discount rates?

A. Inflation rates, discount rates, escalation rates.

Q. Now, the plant construction plan column, I take it, reflects a difference between what you have determined to be an optimum construction plant and that which is presently being pursued by the company?

A. That's correct.

Q. Now, in the year column, you show three years, 1981, '87 and '92.

A. That's correct.

Q. As well as a total column?

A. That's correct.

Q. Now, the total column, as I understand it, represents total social costs as we have previously defined them from 1980 to 1992, is that not correct?

A. I believe it is '81 through '92.

Q. Okay. Now, the three years that are shown are the years in which you have actually computed through your computer analysis as social costs?

A. That's correct.

Q Now, between those two years, you have not made actual computations, is that not correct?

A That's correct.

Q You have, in deriving the total that you indicate extrapolated?

A Interpolated.

Q Interpolated?

A That's correct.

Q Between the years 1981, '87, 1987 and '92, is that correct?

A Yes. That's correct.

Q Would you agree with me that that injects a potential error in that where there is a significant change in the generating plant mix in between the years indicated, say years '81 to '87, say there was a change in 1985, that change could have significant social cost consequences as you measure them, but the interpolation technique would not fully reflect the change?

A I would submit that this is the source of minor error. In my judgment, major error would not result from this interpolation procedure.

Q Suppose the change occurred in 1988? Would the error be more major than one that occurred in 1986?

A I can't make a judgment on that.

Q Would it assist your judgment if there were

more years following the change? To the next measurement point?

A. I don't wish to comment on that. I would have to run the program in order to assess the nature of the error, completely. I should add that this is only a potential source of error. In my judgment, it is not consequential in terms of the statements that I make in my testimony.

Q But I take it to be sure, one would have to run the program?

A That is true.

(Transcript continues on next page)

Q Now, you have used different reserve levels in your liability analysis, is that correct?

A That is correct.

Q How do I fairly summarize your proposal with respect to reserve reliability, Doctor, as being the company should not employ a standard such as it does now which is a fixed reliability standard of one day in ten years but should employ an economic analysis?

A Most certainly. That summarizes my feelings.

Q And the economic analysis is an analysis which compares the cost of curtailment and by cost of curtailment we mean the cost of shutting a person off who wants electric who can't have it because we don't have enough generating plant versus the cost of building a generating plant to supply it to him, is that correct?

A I think that is an inaccurate representation of what I describe as the cost of curtailment. I would describe it in a slightly different way. It is not the way you said is incorrect. The contextual remarks don't reflect the spirit of this undertaking. In the event that the total generation capacity of the company in addition to what it can reasonably import would not be sufficient to meet the load, then there is certain consequences that ensue.

We disaggregated these consequences and have attempted to assign a cost with these various consequences.

Consequences included in this procedure include such things as interruption to customers under a series of interruptible rates involving a reduction and then they went to actual curtailment at the extreme end of this analysis. So describing this as a situation of shutting off power, I think is really missing some of the spirit that underlines this mind.

Q But your proposal, Doctor, does it not include as a consequence of the cost of actually shutting off power to various persons?

A It includes that as one among several components, yes.

Q And you include that in your economic tradeoff?

A That is correct.

Q Now, Doctor, I take it real 1979 costs means the dollars shown under that column have been trended back in an appropriate discount rate?

A They have been discounted, correct.

Q Now, Doctor, I note that in the first note at the bottom of the page it says: "Defined as total production and curtailment costs plus capital costs of new plant not overturn and income tax." Now that refers to your total social cost.

How is that not overturn in income tax as to all plans, the old ones as well as Limerick?

A It is accounting not of return for the old plants and income tax for the old plants. In the case of Limerick, I suppose this was run under -- yes, I guess that is, strictly speaking, not quite true for Limerick.

Insofar as we used incremental costs, we include that the return relative to that incremental cost, if we use the full cost, it is relative to that full cost with the exception of Limerick, I suppose that is true.

Q Or with the exception of your generic cost rate in other cases?

A Yes.

Q Now I take it you include a return, what do you do with regard to income tax?

A With regard to income tax, I think that was intended to reflect the situation for the older plants, so that we exclude Limerick and generic because the representation there in that is not quite accurate.

Q So for Limerick, you would include both return and income tax?

A That is right.

Q How do you determine the return on income tax on Limerick, Exeter?

A Let me refer to my testimony, if I may. I don't keep all of those numbers in my mind.

Q Sure.

A The return was equal to that we defined in our scenario for the discount rate. That is the return that we employed. The income tax, I can't find precise reference in my testimony to income tax. The number that sticks in my mind is three per cent, but I can't verify that from a perusal of my testimony. If necessary, I will provide that later on. I think it is on the order of three per cent.

Q Now it is your testimony then that the return on Limerick and other generic and future type plants equals the discount rate that is employed?

A That is what we employed for purposes of this model. You always have a problem in running a model as complex as this is the choice of everyone of your parameters, so to some extent, I have to take responsibility for that number and I accept that, but I don't think it would be correct to state that I have undertaken an exhaustive analysis of future returns on particularly allowed returns on investment as determined by the regulatory bodies in 1985 through 1990, so this represents a number that we felt is reasonable citing it equal to the social rate of return, but one shouldn't take it too serious.

Q I promise, Doctor, I won't try to make you a rate of return witness.

Now, Doctor, you indicated taxes were taken in a three per cent rate.

As I said, I don't recall precisely. I would have to check that with my staff and review my testimony once again. I thought I could extract it through a perusal of my testimony.

Q Well, the specific number does not interest me. Was it a flat rate?

A It was for the purpose of this model.

Q Flat rate?

A Yes.

Q How have you reflected the investment tax credit?

A We have not.

Q How about accelerated depreciation?

A We have not.

Q Would not the investment tax credit and accelerated depreciation effect to some degree the rate of return requirement for future plans?

A Yes, I would agree. However, I don't think it is very consequential in terms of the outcome of this program. I would say maybe talking about a difference between an annual fixed charge rate of say 16 to 18 per cent. I don't know exactly how it would come down, but in my assessment, it would not be consequential. It is a problem I recognize in the analysis, but I decided not to undertake an exhaustive analysis in this area.

I think the number we are using for a fixed charge

is applied to the cost of the facility or within ball park figures given the uncertainties involved in future estimates.

Q Would you agree with me, Doctor, that you take an investment tax credit, you get an immediate tax deduction?

A Yes.

Q And assuming the time value of money, you have that deduction for a substantial period before it is flowed back?

A That is true.

Q Would that not increase the significance of that as an item in your planning horizon?

A It would indeed. It is a question of how consequentially they pertain to the output of the model. In my judgment, although it operates in the direction you indicate, sir, it is not of major consequence in determining the principal results that emerge from the calculations employed in the model.

Q But you have not run the model with that included?

A No, as I indicated, I have not.

Q Now, Doctor, you show four separate cases in Table 1. Can we agree, Doctor, that for comparative purposes the only cases we can compare are the two PACO demand cases, one against the other and the two ESAB, one against the other? In other words, you are comparing apples to oranges?

A Well, it depends how the apples and oranges relate to one another. For example, if I show an RSRG case emerges with lower costs than the PECO case, then if we note the fact that the RSRG cost assumptions are relatively pessimistic as compared to PECO cost assumptions, generally speaking, although I can't speak to all the particulars, then we can, in fact, make that comparison, but if anything, the RSRG cost assumption will buy us the total cost upward so employing PECO assumptions to be sure would lower the cost estimate, so I think in certain cases one can make those comparisons.

Q Well, Doctor, I am talking about comparisons where you are comparing actual cases at the company's load forecast versus RSRG's load forecast. In that instance, aren't you comparing costs that have included in their different levels of energy consumption and, therefore, different levels of energy-related costs?

A I don't quite understand your point. What we are saying here is that given a series of assumptions, let's assume that those are the assumptions that materialize, those are the assumptions in regard to future possibility, let's assume they materialized and let's assume that we compare, given these assumptions, that a particular construction plant that certainly can be compared for purposes of assessing optimal versus the imposed generation plan of PECO. That would

certainly disaggregate the effect of the PSCO construction plan as compared to the effect of running what we term an optimal construction plan, so in that respect, you are correct.

However, we might want to make a different comparison. We might want to compare what the social costs will be of PSCO construction plant as attempted in the first line under that table with what the cost would be in the event that ESMS assumptions are realized, number one, and number two, that we optimize in the way suggested by the ESMS model so that kind of comparison, I think, is quite reasonable although it is in variance with the comparisons that you are suggesting.

Q At Page 5 of your prepared testimony, Doctor, you testified that the model was run, by that you mean the ESMS model was run only for target reserves of six, 14, 22 and 30 per cent, is that correct?

A That is correct.

Q And I take it what you have in fact done is you have run the model for each year, 1981, 1987, and 1992 of each of those reserve models?

A That is correct.

Q And you then have compared different social costs, and let's remove from consideration at this point the different generating plant options and say you were looking at reserve margins to decide what is the best of those. You

those comparative social costs for this reserve of margins, is that correct?

A That is correct.

Q And you based your comparison on, how many figures in front of you, 12 figures, correct?

A That is correct.

Q And you pick an optimum reserve margin based on the lowest social cost for 1981, for 1982?

A No, that is not correct.

Q Why is it wrong?

A The problem with the way you describe this is, in fact, we run the model at a given reserve margin for the three years taken as a whole and then we calculate together the present value calculation, the net present value for those three years and then we make the comparisons between the various reserve of margins on the basis of the total discount for social costs for each reserve margin.

Q Are you telling me, Doctor, that you make a choice as to the proper reserve margin based on the total three-year analysis?

A That is correct.

Q How did you arrive at your 14 and 22 per cent in this procedure, then, Doctor?

A I compared the social costs in the manner that I have described for a reserve margin of 6, 13, 22 and

30 for a number of scenarios that I considered realistic. In general, those involved the HSRG load forecast as well as the HSRG cost assumptions. I attempt to focus primarily on what I have termed in this testimony the HSRG low cost assumption. Note that I believe this is more realistic than the high cost assumption. In fact, if presented, I would submit that the high cost assumptions are more realistic of the two, but I wanted to employ assumptions that were conservative as possible.

For runs employing these assumptions, the social cost was minimized at either 16 or 22 per cent.

Q All right. Let me see if I understand. Let me take a step back, Doctor. What we are doing is we are making comparisons for three years worth of data.

A That is correct.

Q 1991, 1997 and 1992?

A Correct.

Q We are trying to determine from that analysis two principal things. What the appropriate reserve margin should be and what the future generating plant should be?

A That is correct.

Q And we run those analysis in conjunction or do we run them separately?

A We run them in conjunction. The reserve margin implies a particular generating mix.

Q Doctor, on Table 1, what reserve of margin is associated with your total figure for the DCF? The low DCF, the fourth case indicated, that is the 7969.63 figure.

A I would have to refer back to my computer runs to establish that.

Q Would you do that?

A Yes. I will make a note of that.

Q You mean you can't do that now?

A Well, it might take me as long as five minutes to go through all this material now. If you would like me to do that, I would like to accommodate you, but it would delay this somewhat.

Q Would you agree with me today that the 6976 is an interpolation for the 12-year period based on the three years based on the numbers shown? In other words, within that 6904.5 there is the 5.249 and the 577 per cent.

A Oh, definitely.

Q And this is the DCF preferred case, I take it? Is that correct?

A I wouldn't characterize it as a preferred. I would characterize it as a conservative type - preferred.

As I indicated, the DCF high are the ones I considered to be more realistic to the DCF low.

Q Now, Doctor, you have testified in choosing the appropriate reserve of margin out of the four calculations

that were made, you used a three-year analysis whereby you combined the individual indicated social costs and the preferred generating plant expansion program to determine which was the lowest social cost, is that right?

A That is correct.

Q On a three-year basis?

A Yes.

Q Did you choose the generating expansion program before you chose the reliability criteria?

A The reserve margin specified initially and the social cost as well as the generation mix is calculated so as to be consistent with the reserve margin, but it is the reserve margin that is specified.

Q What do you mean specified?

A We start with the six per cent reserve margin. We specify that. Then we calculate the generation mix given the six per cent. Then generation mix associated with the six per cent, we then simulate production for the system and assess production cost. That is the cost reported as associated with the six per cent. We do that for all the years in question and discount.

We then proceed to 14 per cent and go through the same procedures and then again the 22 per cent and again the 30 per cent.

After this entire calculation is completed, we

compare the discounted value for the various reserve margins and select what we determine as an optimal reserve margin based on criteria of minimizing social costs.

Q Have you previously selected a capacity expansion program which is optimal to be used when you are making your analysis of what the reserve margin should be?

A No, the reserve margin determines the capacity. One is contingent on the other. I could amplify precisely how this is done in the model if you desire, sir.

Q Doctor, if the three members that go into making the 69.063, are those all stated at the same reserve margin?

A Yes. I am confident that the report in this table is with respect to the optimal reserve margin, whatever that might be, for the scenario in question. Obviously for the PECO case, this is not a real consideration.

In the PECO case the generation mix is taken as given, but for the plant construction plan noted in Table 1 as ESEE construction plan, we chose the 1979 costs associated with what we term the optimum reserve plan.

Q And that could be anywhere from 14 to 22 per cent?

A It could be same to 22 per cent.

(Testimony continued on next page.)

Q How can we have an optimal reserve margin, Doctor, which varies, if we made a three year analysis to pick out the one that was best? I thought in responding to an earlier question of mine - -

A. No, you are misunderstanding, sir. For a given scenario, we are talking about really two scenarios among the four indicated in table 1. Those are the third and fourth scenarios where we indicate under plant construction plan, ESRG. Now, all I'm saying is for three, we chose a given reserve margin which we applied throughout and for four, we chose a given reserve margin that we applied throughout. It is reasonable that these might differ, given the fact of the input assumptions of it.

So what we are saying is that given the input assumptions specified in table 1, for example, under the third scenario, assuming the PECO demand forecast on one hand and the PECO cost assumptions on the other, particular reserve margin will be optimal. Say 22 percent, which is, to the best of my recollection, precisely what we had in mind here.

If we employ ESRG forecast demand, and ESRG costs. Then in fact, the ESRG optimal reserve margin we apply. For any given scenario, we apply a consistent reserve margin throughout.

Q 22 percent?

A. 22 percent, 14 percent, whatever.

Q. Now, Doctor, the calculations have been made at discreet reserve level, 6 percent, 14 percent, 22 percent and 30 percent. Now, am I correct that based upon your calculations, you only know what the social costs are at those four discreet levels?

A. I should indicate these are target levels. There may be some small deviations from those target levels which emerge in the course of optimal generation. These are of the order of two to three or two to five percent, so the actual reserve margins that emerge from the program may be of the order of say, 22.3 percent or 22.1 percent. These refer - - the reserve margins that we have been referring to heretofore in this cross examination are target reserve margins.

Q. My point, Doctor, is you have - - let us say that you have calculated the social costs for each of the four levels and the best social cost indicated to you is 22 percent. That is the lowest social cost?

A. Yes.

Q. That isn't the one you would select?

A. That's the target reserve margin that they would select.

Q. Isn't it in fact true that all that calculation would tell you about social cost relative to reserve margin is that the lowest social cost relative to reserve margin would

fall somewhere between 14 percent and 30 percent and that you would not know whether 22 percent was, itself, the lowest level?

A That is true. Except for the fact that socially all the reserve margins that we calculated were assumptions that we considered a plausible range between 14 and 22 percent. So as a consequence, after completing the analysis for a very large number of scenarios, I felt that even had we run the analysis, say, at reserve margin intervals of 1 percent, which we could have done, in principle, that the optimal reserve margins would, in fact, apply at some value between 14 and 22 percent.

Q Doctor, referring to Exhibit C, now, this is a sample gem run, is it not?

A That is correct.

Q And the one I am looking at is at pages 15 and 16 of 24 and it is identified as ESRG construction program, ESRG demand forecast?

A Where does it say construction program?

Q It says that on the cover sheet before page 7 of 24. And ESRG low cost and full plant capital?

A Where does it say ESRG construction program? I want to identify the page. Oh, under Exhibit C. Okay. I see. Fine. Thank you.

Q Yes?

A You are referring to sheet 15 and I couldn't find

it on my sheet.

Q Now, on sheet 15, this is for the year 1987 as we can see up in the left hand corner?

A That's correct.

Q And it is for 22 percent targeted reserve level?

A That's correct.

Q And the total system cost which is the total social cost is 577.7, is that not correct?

A That is correct.

Q Now, this computer run that you have provided here as Exhibit C is in fact, the computer run that goes along with the 1987 figure on table 1 under ESRG, ESRG low, ESRG plant construction plan. Is that not correct?

A That's correct.

Q And that's 22 percent?

A Yes.

Q Referring you to sheet 8, we there have the reserve margin of 14 percent for the year 1981, and we have a total social cost of 595.1. Now, that sheet is, in fact, is it not, the sheet which is comparable to or in fact the development costs of the 1981 figure shown on table 1 under ESRG, ESRG low, ESRG, is that not correct?

A Yes. It is.

Q So in fact in your cases you increase or decrease reserve reliability margins, is that not correct?

A. No. These are just sample runs. They are not taken to indicate our choice of the optimal reserve margins. They are just meant to display the output from our computer runs. They don't imply anything about these reserve margins that we selected as optimum. In fact, they don't show the discounting procedure at all. As you will note.

Q This does not show the discounts?

A It does not show the discounting procedure over time. It shows the discounting procedure year by year, but it does not, in any sense, imply a comparison of the reserve margins. It is merely a display of output from our computer program based on ESRG load growth assumptions and ESRG low plant data assumptions.

At 14 percent reserve margins noting sheet 8 of 424, for example.

Q This is merely a display of what your computer produced?

A Precisely true. As I said, I do not have at hand in a readily available form a comparison of the discounted social cost. So I can't tell you for that reserve margin which is the preferred reserve margin. I indicated that the optimal reserves range for what we consider to be plausible assumptions 14 to 22 percent. That's the only statement I'm making about optimal reserve margins to this point in the cross examination.

Q Okay. Now, you have indicated that this does not show discounted costs?

A It does not show the sum of discounted costs over the three years and a comparison of those discounted costs with discounted costs associated with other alternative reserve margins. It merely shows the discounted cost for a given year at a specified reserve margin.

Q Doctor, referring you, again, to Exhibit C, sheets 16 and 18 - -

A Yes. You are referring to number 15, 16 and 18, aren't you?

Q Well, just 16 and 18 are the only two sheets we have to compare for purposes of this question.

Doctor, you there show a sheet on sheet 15 we see that this analysis for 15 and 16 is a 22 percent reserve margin. For the analysis on pages sheet 17 and 18, we see that that's a 30 percent reserve margin as shown at the top of page 17?

A That's correct.

Q 17?

A That's correct.

Q Now, looking at the loss of load probabilities, Doctor, I note that despite the fact that we have increased the reserve margin and therefore, one would presumably think the

reliability, we have a greater number of brownouts at line 115, which are voltage reductions. By comparison of 2.3 for the 30 percent reserve margin versus 0.2 and we have a greater number of blackouts at the 30 percent margin versus the 22 percent by 0.2 versus 0. Can you explain to me, Doctor, where increasing the reserve margin results in a greater amount of load curtailment?

A. Surely. This is a simulation program which means that we generate random numbers and on the basis of those random numbers, attempt to calculate what production costs would look like given certain eventualities. Now, any simulation program on occasion, may spew out random numbers that are in the extreme of the range and presumably that's what happened in this 30 percent run, we are not talking about major discrepancies here. We are talking about fairly minor discrepancies.

What I assume occurred was in the 30 percent run at the time of system peak, for example, we had an outage in, say, a major baseload plant. This is a random event. We do attempt to allow for this by averaging over 25 simulations, and we find that in general, averaging over 25 simulations will produce results that are to our satisfaction, accurate results.

However, there are certain minor anomalies which can occur with respect to a simulation program of this type.

MR. HALL: Your Honor, I wonder if this would be a good point for a brief recess? I would note that I probably have at least two more hours for Dr. Shakow. I would propose to finish if others wish to stay. It is up to Your Honor.

THE WITNESS: I have an 8:00 o'clock plane and anything consistent with that constraint would be fine with me. Two hours is no problem.

THE ADMINISTRATIVE LAW JUDGE: Let's take a brief recess.

(A brief recess was taken.)

THE ADMINISTRATIVE LAW JUDGE: Are you ready?

BY MR. HALL:

Q Doctor, could you define for me what the investment tax credit is?

A Investment tax credit is a percentage of new investment that the Government allows the corporation to subtract from its taxes.

Q Now, Doctor, the conclusions of your study, or I guess the best pictorial representations of what those conclusions are would be on tables 6 and 10, is that not correct?

A I have to look at 6 and 10.

Q That's page 20 and 57?

A We can address those tables. I won't characterize that as in any sense summarizing the overall testimony. But it

there. It is fair game.

Q I would agree with you, Doctor. I merely found it most useful in my efforts to understand the process.

A I appreciate that.

Q Now, looking at table 6, it there shows eight cases, is that not correct?

A That's correct.

Q We have already gone over and discussed what's in the load growth column and the plant column and the capital cost column. Not the capital cost column. Is that correct?

A Would you repeat that?

Q We have discussed what is meant by PECO and what is meant by ESRG and what is meant by PECO and ESRG low in the plant cost column, is that not correct?

A That's correct. We have done that.

Q I note that under case two and case eight, Limerick is selected?

A That's correct.

Q I take it the purpose of each of these cases is to include various different assumptions and see what is the optimal new capacity under those assumptions, is that not correct?

A That is precisely correct.

Q Now, under the PECO plants costs and the incremental

capital costing method, Limerick is selected, is that not correct?

A. That is correct.

Q And it makes no difference whether you have got the PECO or the ESRG load growth?

A. That's true.

Q What is the incremental capital cost method, Doctor?

A. Incremental capital cost means that the account only shows costs of the Limerick facility which have not already been committed. As I understand it, the company has already committed roughly 900 million dollars, and that is not accounted as part of the capital cost under this assumption.

Q It is your understanding that's $900 million in the study?

A. I won't swear by those figures. That's a number that comes to mind. I just want to mention that for purposes of identification here, I don't want to in any sense commit myself to it.

Q You say we don't consider the sunk capital costs, and by that I mean what you refer to as the $900 million?

A. That's right.

Q Does that mean that in our generating plant computer program runs, when we are costing Limerick, we only

include capital carrying charge costs, i.e. return, depreciation and taxes, as to that amount which is yet to be expended to complete the plant?

A. I believe so, but I would have to refer back to my data sheets in order to confirm that.

Q. Could you do that, please?

A. I would say for fixed maintenance, that would be computed relative to the plant as a whole. No, I don't believe that's true. As a matter of fact, I think that the income tax, et cetera, would be computed on the entire capital cost of the plant. Yes. That's what we did. That is proper.

Q. So in other words, it is your testimony that what you do when you incrementally cost something is you include all of the variable operating and maintenance costs as we define it in our earlier discussions?

A. Yes.

Q. The energy costs as we defined it?

A. Maybe I can rationalize that. If that would be appropriate, I would be happy to do so at this point.

Q. Let me run through the list and I will let you go on.

A. Fine.

Q. We include all of the taxes relative to the entire capital cost of the plant?

A That's right.

Q But we only include the return applicable to the incremental part of the investment yet to be expended?

A Yes.

Q We only include the depreciation applicable to the incremental part yet to be expended?

A Yes.

Q Why do we split the return and the taxes in that fashion?

A I think - -

Q What I had in mind was the following reasoning. Let's assume that the plants were canceled. Then the question is what would be capitalized and included in the rate base and would remain as a kind of a sunk cost from the consumers - -

A Don't forget, everything we are doing here is from the standpoint of optimizing social costs which I have defined as costs from the perspective of the consumer. Now, under the assumption that there's no way of my knowing this, under the assumption that cancellation would still lead to a capitalization of this plant so that the ratepayers would have to assume at least the return on that figure, it seems reasonable to run a scenario in which we excluded that from the incremental cost which distinguishes between the case where we keep the plant in and where we cancel. If we cancel, obviously, I shouldn't say obviously, but my guess is that the

company could make the argument that it should not pay property taxes, for example, on plant that's basically excluded from the generating capacity of the company. Now, maybe that wouldn't be the case. And a future litigation, some other results might arise, but at least it seemu reasonable to make that as one of our 25 assumptions.

We make runs in addition to the eight described here and it seemed as if that was at least a reasonable thing to assume and to pursue.

Q And that is to assign total tax cost but only partial return costs?

A Yes. Exactly. You follow my reasoning, I see.

Q No.

A You don't?

Q No.

A Should I go through it again?

Q If you can shorten it, yes, please.

A Okay. We are asking the question what would be the impact of a cancellation as compared to the maintenance of the facility, and the completion of the facility. Now, there's been certain amounts of moneys expended on the plant. If the plant were canceled, it wouldn't be of use to anybody. But nonetheless, it is possible it could be capitalized and included in the rate base.

There's no way of knowing exactly how the Commission

would proceed on this matter. But that's at least a possibility. If that's the case, the only costs that would remain for the consumer would be the return on that portion. I'm assuming that for tax purposes, one could get a write-off on the plant. That's why one makes the distinction between taxes on one hand and return on the other.

Q Now, Doctor, turning on table 2, page 6, you show a 6 MW coal plant as entered into case two or your case two assumption. Where do you get that plant?

A Where did I get that plant?

Q Yes.

A That is one of our generic options. As you may recall from the description of the program we employed a fairly sizable set of generic options which we allowed in principle to enter the generation mix. This included a large number of plants. It included, for example, three distinct types of coal plants ranging from coal plants with the capacity of 300 megawatts to coal plants with a capacity of 900 megawatts. It included, in addition, a nuclear plant which we termed a generic nuclear plant.

It included various combustion turbines, combined cycle facilities and so forth. What this table is indicating is that of all those generic facilities, the one that enters the capacity mix is the 600 megawatt coal plant under the assumptions indicated.

Q In all of the other cases, Doctor, that are indicated here, do you not include 300 MW coal plants? In other words, where you've got 2400 coal there, that is 300 MW coal plants?

A Yes.

Q Isn't the 1500 PM 300 MW plants? Five of them?

A Yes. I think it is indicated. This table doesn't really disaggregate the cases where we would have say, a 600 megawatt coal, or 2300 coal plants. That's not quite right. What's indicated is the total capacity of the generic option. I can't tell you from looking at this table exactly the technology that's involved in the particular scenarios.

Let me -- however, referring, let's refer again, for example, to Exhibit DSC, say sheet 14. Note under option 102 that the optimal generation mix under the assumptions of ESRG load growth and ESRG low plant data assumptions, the generic technology that enters the mix is generic coal of 300 megawatts and two of those enter the mix. And this is indicated under 302 by the term G coal three, which suggests a coal technology where the unit size is 300 megawatts, then under the megawatts capacity, 600 is indicated, which suggests that we have two of those facilities entering the mix.

Q And your social cost minimization criteria indicated

to you that for PECO plant costs and incremental capital costs, it was best to construct the two Limerick plants and in addition, 600 MW/coal plants?

A That's correct.

Q For a 30 percent reserve margin?

A That's correct.

Q Do you know how much the 600 MW coal plants add to the cost analysis?

A I cannot tell you offhand. If I'm not mistaken, I have -- I'm not sure if it was in response to interrogatory or some of the other documentation I read, I did/ come across some indication that PECO planning for that period did incorporate at least one coal facility. So this is -- I should indicate that I think it is noteworthy that my model, given PECO's assumptions, generates an outcome that is fairly consistent with the PECO planning mix, as it is presently conceived. That would pertain to the reserve margins as well as to the generation mix.

Q Now, Doctor, I believe you indicated at one point in your testimony that indeed, if you do accept that incremental costing is the way to go and that PECO plant cost levels are the appropriate levels that indeed the Limerick units should be constructed and that is the best social cost alternative?

A That's correct.

Q Now - -

A I hasten to add, of course, that I disagree pretty violently with those assumptions, so in fact, I'm not making the recommendation of this sort.

Q Now, Doctor, in determining whether to choose incremental or full costs as the appropriate costing methodology, you indicate two factors which must be considered, I believe.

A Yes.

Q The first and each of them go really to the same point which is the possibility of the company recovering its sunk investment in the Limerick units?

A That's true.

Q Despite their cancellation?

A That is correct, precisely. I should say cancellation is not the only alternative. One possibility is the company selling its shares in the plant. In which case the plant would be built, but the company would not assume any of the cost burden.

Q Now, have you made any study, Doctor, of the potential for selling the Limerick units when they go into service in the mid 1980's?

A I'm sure that is something the company is as anxious to find out about as I am. No, I have not.

Q You have not?

A No.

Q Now, Doctor, you spoke about tax credits, the potentiality of tax credits in the event that the plant is terminated and the company is unable to sell it, is that not correct?

A Yes. I should have mentioned, I did not, but I should also have mentioned the whole question I alluded to before as to whether the cost of an incomplete facility would be incorporated in rate base. I think that is very pertinent here as well.

(Transcript continues on next page)

Q And what is that option you just referred to?

A I said that this is the question as to whether the cost expended on an incomplete facility would be incorporated in the rate base.

As I indicated before, if they would be incorporated in the rate base, there is some justification for using the incremental cost.

Q And that is because the company would then refer its investment in that plan?

A That is correct, and from the consumer standpoint, the only difficulty would pertain to the incremental. They would have to pay for the sunk cost.

Q So it is your testimony that if, in fact, the Commission had adopted the policy of permitting the company or was inclined to adopt the policy permitting the company to recover for the sunk costs, in the Limerick Plant in the event the Commission were to order termination of the plant construction and assuming it had the authority to do so, if it decided to permit the company to recover these costs, the rate you should use is incremental?

A I didn't quite say that. What I said was that this would be a genuine consideration. There are many other things to be considered. The tax situation has to be considered and the market for this power in addition would have to be considered if the company could refer its fuel

costs, by assuming the power or by sinking the power.

Then I would propose using the actual cost measure.

Q Well, putting those two considerations aside, do you have any others to offer us in response to my question?

A Not at the moment, but I am sure if I could consider the matter, I would have a good number. I think it a very complicated issue.

Q Now referring to the tax credits, what provisions of the income tax go to what you are referring to, Doctor?

A I don't care to discuss that. All I said in my testimony was that this would be germane in some sense to the degree that the company was forced to assume some continual payment as a consequence of this incompleted facility. It would certainly affect the matter of incremental cost, but I have not undertaken an exhaustive analysis of what provisions of the tax code are really here. All I am saying is this general category tax code is one of the factors that has to be considered in making this judgment.

I have not purported to analyze the specific provisions that are applicable here.

Q I take it you presume there are some provisions there without having made an analysis?

A Well, I think one can justify this as a realistic

ground. For example, let's consider property tax. If property taxes were waived on this incompleted facility, that means that the incremental cost of calculation would go up by a certain amount.

The difference between a cancelled plant and a plant undertaken would be more substantial in the event the company would have its property tax waived on those facilities, so I think one can conceive realistically of also where this general category tax would be relevant without going into the particulars in terms of the tax code.

Q I take it you have made no study of whether the Philadelphia Electric Company would have sufficient taxable income in the future or the past to be able to use any such tax deductions as the code might grant it as a result of losses incurred from the computation?

A If I were to make all the studies you suggest, it would be a very ambitious project.

Q One last question on this point. You have not included in any of your cost analysis and particularly your full cost analysis any factor, have you, for the uncertainties which relate to whether or not the company, in fact, will be able to recover the sunk costs in Limerick if that plant is terminated?

A Well, that is why we have run into a large number of scenarios. The purpose of scenarios formulation

is to account for various alternative possibilities and why do we account for various alternative possibilities when it would be easier to stick to one, and we don't know what possibility is going to materialize, so scenario development, I would say, is an explicit response to uncertainty.

Q Doctor, in Table 1, Case 4, have you included any factor to reflect the risk which the company will experience?

A What table was this?

Q Table 1, Case 4. Have you included any factor to reflect that risk which the company will experience that it will not recover the sunk costs in Limerick if the plant terminated, and by factor, I mean cost factor?

A As I indicated, it depends on the specifications here. I believe Case 4 in Table 1 was run in the full cost assumption, so that would be consistent, for example, with the assessments of the final capacity of Limerick to some other company.

As an example, I could give you our scenario as well. That would be consistent with that, but what is important here to note is, this was run under full cost assumption, so Limerick was accounted at its full cost assumption.

Q What is important to us, Doctor, is the answer

is no, is that not right?

A I forget the original question.

Q The original question is you have included no cost in your case 4, which is, as I understand it, your preferred case to reflect the potentiality that the company will not recover its sunk costs in Limerick. You have simply assumed that it will do so?

A That it will recover its sunk costs?

Q Yes.

A In effect, that is correct. I would like to correct my answer to that question ever so slightly. I would say it is consistent with the assumption that the company recover its sunk costs. It is also consistent with the assumption that none of the expense of construction budget is included in the rate base which would be an adverse assumption from the company's standpoint, so there are a range of assumptions that are consistent with that, so I spoke so hastily in response to your question.

It is consistent with that assumption, but it does not assume it explicitly.

Q In fact, there is no addition to the costs shown to account for the risk that the company will not recover from Limerick?

A The critical thing --

Q You can answer that yes or no and explain as you

choose.

A Let's go through this again. Why don't you start the question once again? My memory is very short at this hour. I hear the question when you asked it but there has been an intervening comment in the question and I lose my mind.

Q In Case 4, Dexter Shahon, there are no factors, no costs, no consideration given for the fact that if the company terminates Limerick, it may do so by losing the entire existing investment in that plant.

Answer that: yes or no and go on with whatever you want to say.

A No, that is one of the possibilities. I think the answer is no. The answer is yes to your specific question that it is consistent.

Q I don't want consistency. I want does it consider it or does it not? Are the costs increased as a result of this uncertainty or not?

A As I understand your question, I think the answer is yes, although the possibility exists that I haven't understood your question.

Q Well, I thought I was pretty clear. Why don't you try and explain to me how these costs have been increased as a result of the company's loss because of the termination of the Limerick plant?

A That we are trying to do, we are trying to distinguish a case where the difference to the consumer of a cancellation equals the full cost of the plant. That is the critical thing here.

Now if the company, for example, is not able to incorporate the expended construction costs in the rate base, then that would be a case in which a cancellation from a consumer's standpoint would mean that there would be no responsibility undertaken by the ratepayers for the plant. This would compare to a case where Limerick was completed and which the full cost presumably would be incorporated in the rate base, so the difference between cancellation and no cancellation is the full cost of the plant.

This would be true also under the scenario. If the company were able to assign all the capacity of Limerick, then the consumers would likewise not assume any of the responsibility as compared to the case where Limerick was incorporated and the generation mix was assessed power and the consumers in that case would assume total responsibility. So what I am suggesting then is here we have two scenarios. One very adverse from the standpoint of the company and the other relatively desirable from the standpoint of the company and the contingency from the standpoint of the consumer, and yet in both/the differences between the plant cases,

actually being included in the rate base and included in the generation mix and the plant not being included in the generation mix includes the full construction budget.

Q I take it, Doctor, the social cost, as you have measured them, of CO2 would be the same regardless of whether the company sold Limerick or merely ate it?

A Yes, that is right.

Q Doctor, would you turn to Sheet 14 of 19 of Exhibit A. Doctor, do you have that page?

A 14, Exhibit A, sure.

Q Now referring you to the section where it speaks of the use of incremental costs, I would like to read you the following passage and state my interpretation of it and see if you agree. It says in that passage, "It should be noted that the default option on Model 1 is the capital costs include only the incremental rather than the full cost of capital. If a plant has been in operation for 20 years, the fixed costs already committed do not play a role in the economic comparison with other plant. Current carrying charge and fixed O&M are relevant, however, and are included of fixed charges in the cost comparison. This default option can be waived for plant where cancellation requires full recovery of cost of its construction to date, either through tax write-offs or assignment of catastrophe."

Now the initial paragraph in that would indicate

that incremental costs should be considered where investment will be lost?

A Let's go back a little bit. The critical consideration is what the difference is between the inclusion of a plant and the exclusion of a plant. That is what I am trying to get across to you. Perhaps the phraseology is a little confusing, but as plant presently on line, it is clear when we retire the plant, the critical thing will be the application of the costs that have to be assumed by the consumer.

When we consider a plant that is presently under construction such as Limerick, the critical consideration again is what will be the difference from the consumer's standpoint between the inclusion of the plant and its exclusion. I think that is the point I am trying to get across here and it is, I think, consistent of what I had been saying over the course of the last 15 minutes.

Q Doctor, would you agree that the Philadelphia Electric Company could sell a plant presently on line and producing power?

A It could in principle, yes. I see no reason why not.

Q Why shouldn't we use the full cost for that as well?

A Because I speak for the plant on line, the cost

realistic option seems to be retirement rather than sale.

Q Well, Doctor, I guess you are correct. / A In principle, we could, I imagine, elaborate the model to incorporate the possibility of an assignment, any of plant currently on line. If that is the case, then we should include the full capital cost. I think that is fairly true. I should note though that in my estimation, were we to do that, it would merely confirm our results to even greater degree because what would happen is the cost parity of just the higher reserve margin would be still greater than it is under our present assumption and so it is a consequence that would be a greater tendency to optimize reserve margins at lower levels, so one can perceive the omission of this possibility as a conservative approach.

I will go through that again.

Q No, I can follow that very easily, Doctor, but I take it that would also depend, Doctor, if you are removing a unit from service when you put in your incremental base load plant, you are then removing capital cost to offset the capital cost of that plant, are you not?

A Yes, to some degree. I think there is a certain degree of extension that I will admit as a consequence of this omission. However, as I indicated, I think it errs in a conservative direction. In fact, the reason for our omission possibility as I indicated before is largely a

particular question, we would have had to obtain data regarding the capitalization of all those old plants and it was difficult enough to simulate the information regarding the new plant without magnifying the data requirement of the program and the reason we did exit to this information was because, as I indicated, we felt it would only tend to confirm our result. We could make our case obviously without using this dimension.

Q Returning to your, I will call it modeling, for lack of a better word, how have you represented in your programming the company's pump storage operations?

A The only distinction we make between pump storage and run-of-the-river hydro -- let me correct that. There is no effective distinction made between pump storage and run-of-the-river hydro. Both are considered energy limited options and enter the generation mix subject to an energy constraint, so we didn't really consider the effect of pumping exclusively. That again is to some degree a deficiency in the model, but I feel it rather consequential.

(Testimony continued on the next page.)

Q You didn't consider the cost of energy to pump?

A To pump, precisely.

Q Is that not correct?

A That's not included presently in that.

Q Now, how have you modeled, Doctor, the company's participation in the Pennsylvania, New Jersey and Maryland interchange? Or interconnection?

A I would say only the crudest way. We distinguished between economy emergency and force. One thing. We attempted to employ our energy construction payments based on the economy imports, experienced energy consumption, I suppose, over the recent past. We derived the data from responses to interrogatories, and since the economy imports are provided under the power pool, this pertains directly to the experience of Philadelphia Electric in the power pool.

We specified emergency power as an option. We entered the rates associated with the emergency power at the rates -- well, not precisely but at roughly the emergency rates associated with the PJM power pool, in that we costed out that kind of power at 10 percent above the most expensive PECO plant.

I understand that in fact we should have taken the most expensive plant in the pool, but again, we are into

the same kind of problem as before. We would have had to find out all the information for all of the various facilities in the pool. So that was not practicable.

We had some fairly, I would say, abstract or simplified assumptions on the interconnects which probably are really exact representations of the reality, but we think are adequate for the purposes of this testimony.

Q Now, with regard to maintenance outages, how have you reflected those in your model?

A. That's a fairly important part of our model. We designate a period of the year that we considered to be the maintenance period. We derived this maintenance period as a representation, simplified representation of actual maintenance practices by the company. I think it was in response to this document here, supplement number 6 to tariff electric Pa. PUC No. 25, which has some data on maintenance, and while we didn't model the maintenance for every particular plant, that enabled us to give a rough idea of when maintenance was practiced by the company.

The maintenance period that we defined is composed of weeks 17 through 23 of the year plus weeks 36 through 50. And that's defined as our allowed maintenance period.

Q And when a unit goes down for maintenance, Doctor, does it do it by a deration?

A. Yes.

Q By that I mean you don't assume the unit is off for eight weeks or ten weeks entirely?

A. That's correct.

Q What you do is if it was Salem 1, instead of putting it in for this half a year period which you allow me, you back it down to a portion of its indicated capacity?

A. The precise method in which we do that is somewhat complex, but essentially it is a deration method. We feel this is reasonable, again, in light of the purposes of this testimony in that what we are really looking for is the cost of extreme events, that is cases where the plant is simply not available and particularly where this coincides with extremes in the load so as to create a situation of supply demand imbalance. That's what's going to generate social costs at the low end of our reserve margins.

Now, if we derate rather than assuming that the plant is not there, then we are assimilating a fraction of the capacity in our mix. And so the likelihood of experience and, say, costs due to blackout or other curtailment is less likely to be significant.

So we account this as a conservative assumption, even though strictly speaking, we should have modeled it precisely.

Q I take it it is a conservative assumption because

it reduces the cost of curtailment. It reduces the numbers of hours the curtailment will occur?

A. In effect, yes.

Q. Now, you don't believe the company's figures for what Limerick 1 and 2 will cost, do you, Doctor?

A. No.

Q. Would you agree with me that about a ballpark difference between your position and the company's position is a total cost of the company's part of 3.1 billion and on your part, either 4.2 or 4.9 billion?

A. I think so. My memory is really rather weak, so I can't account for all those figures, but that sounds general.

Q. I wouldn't give you bad figures.

A. I just don't want to take responsibility for them.

Q. Now, in calculating the cost of Limerick, as well as the cost of your generic coal and generic nuclear options, and indeed in developing certain of your plant capacity factors, you have relied, have you not, on an analysis which was prepared by a Mr. Charles Komanoff, is that not true?

A. That is true. I would say not with respect to capacity factors. I have done a good deal of research on my own in the area of capacity factor. I am not going to implicate Komanoff in the capacity factor calculation. Komanoff's analysis is confined to an estimation of the direct 1979

dollar construction cost.

Q Okay. And this appears at pages 44 and 45 of your testimony, doesn't it, Doctor?

A I'm taking a look. Yes, it does.

Q Now, this is a pretty detailed analysis that Mr. Komanoff has done, isn't it?

A In my opinion, it is, yes.

Q And in your opinion, it is?

A Could I summarize what Mr. Komanoff has done this way, and would it be fair, Mr. Komanoff has taken a publication which was put out by the Energy Information Administration, which publication, itself, took data from utility FERC form ones and classified that data in particular fashions?

A Yes. I don't know if he -- he may have referred directly to the FERC form ones. I'm not sure if it was via this indirect route. I don't know if you have been supplied with the latest publication by Mr. Komanoff. Unless my -- let's see. Does my testimony state that in there? That he went through this route particularly?

Q Doctor, your testimony indicates as does your answer to our request for the data that these were private communications between you and Mr. Komanoff?

A Yes. But he indicated that it was in FERC

form one, specifically.

Q Well, Mr. Komanoff, as I understand it, has taken cost data with respect to nuclear plants and coal plants completed during a period of 1972 to 1978, is that not correct?

A I believe that's correct, yes.

Q And this data comes either directly from FERC form 1 or I believe you have indicated in a response to an interrogatory through a publication from FERC form one?

A Let me just check. That's possible. What interrogatory response was that?

Q Response one.

A It is taken from utilities annual - - assembled in the annual publication. Okay?

Q Yes.

A I guess that's ambiguous as to where he got it from. It just indicates that it's been so assembled.

Q Now, having taken this data, it is indicated that Mr. Komanoff applied some Handy Whitman Indices to it. Would you know how he did that, Doctor?

A I assume that he, in order to get his dependent variable in the form of 1979 construction dollars and given the fact that the reporting on these forms presumably is in current dollars, that he discounted these current dollar estimates by the real escalation rates as derived from the

Handy Whitman Index. So just so we could get a '79 figure.

Q Now, you - -

A That's what I assume he did. I have not communicated directly with Mr. Komanoff on that matter. This is really a presumption on my part. That's what I would have done if I was doing the analysis.

Q This material that Mr. Komanoff has provided to you, is it published anywhere?

A I have it on hand. However, the text states not for public dissemination, so even though I have it in hand, and can refer to it in the course of this cross examination, I am not impowered at this time to let it go. It is not copywrited material as yet.

Q You cannot provide us with a copy of it?

A I am not saying that. I could not today provide you with a copy of it. I would have to consult first with Mr. Komanoff.

Q You responded in response to our interrogatories you could not.

A I could not at the time of the interrogatories because I had not consulted with Mr. Komanoff. I have still not communicated with Mr. Komanoff. If compelled to do so, then I will, in fact, consult Mr. Komanoff. I should also mention that I think that a precursor of this analysis which at least suggests the methodology is available in the form of

testimony which Mr. Komanoff presented before the New Jersey Public Service Commission. I can get the exact date for you if you would require it. I don't think the results are necessarily consistent in every numeric detail, but I believe there are at least methodological consistencies. So that is of public record.

Q Are you familiar, Doctor, with the characterization of Mr. Komanoff which was made by the New Mexico Public Service Commission in the case No. 1216?

A. Sounds like it was unfavorable.

Q Let's see if you are familiar with it. The Commission stated and I quote, at pages 14 and 15 of its order, "Mr. Charles Komanoff, Energy Projects Director of the Council on Economic Priorities, appeared as an expert witness on behalf of Intervenors, Attorney General of New Mexico. Mr. Komanoff testifies concerning the capacity factors of nuclear and coal fired generating units.

"Capital costs, fuel costs and operating and maintenance costs of coal and nuclear units. The record shows that Mr. Komanoff has little or no engineering training and experience. His only college degree is a BA in Applied Mathematics. Mr. Komanoff's analysis of coal and nuclear capacity factors depends almost exclusively upon the result of the statistical analysis of existing units. The credibility of Mr. Komanoff's testimony in other areas was considerably

weak and by his demonstrated lack of engineering expertise or training, lack of familiarity with the specific details of the utility in question, demonstrated lack of familiarity with conditions in New Mexico pertaining to coal and coal costs and numerous unsupported assumptions and calculations.

"For example, Mr. Komanoff's claimed expertise in the area of nuclear fuel costs was largely based upon his attendance at a one week summer course at the Massachusetts Institute of Technology." Are you familiar with that statement?

A That summer course? I'm a graduate of Massachusetts Institute of Technology. As I have indicated. But I have not come across that particular course.

MR. BURGHART: Could we please have a cite from the opinion and also the case number?

MR. HALL: Yes. The case is case number 1216. It is in the matter of the participation of Public Service Company of New Mexico as tenant in common and electric generating station. I would note that I have read from an original order that was issued in the proceeding. There was a subsequent order in which the language that I have read was struck on the request of the Attorney General, although with no indication of disagreement in the subsequent order.

It was merely done.

A I am compelled to comment -- I would like to comment on this.

MR. BURGRAFF: Is this published anywhere in PUR, that type thing?

MR. HALL: I o not have a citation of that nature, no.

MR. BURGRAFF: So you are not sure if it is published or not? You don't have a citation?

MR.HALL: Not in the PUR, no.

MR. SEGAL: Could you provide copies of that to the parties?

MR. HALL: That would be no problem.

MR. SEGAL: May I inquire, that copy to which you are referring, is that a certified copy from the New Mexico Commission?

MR. HALL: I have a certified copy of the subsequent order. I do not, in my possession here, have a certified copy of the original order. I do know there is one. I don't have it with me.

MR. SEGAL: The order from which you quoted, I take it that is the one that is not the certified copy?

MR. HALL: That is the original order, that is correct.

MR. BURGRAFF: Will we be able to see both of them?

MR. HALL: Yes.

MS. BUSH: I believe that Dr. Shakow had a comment.