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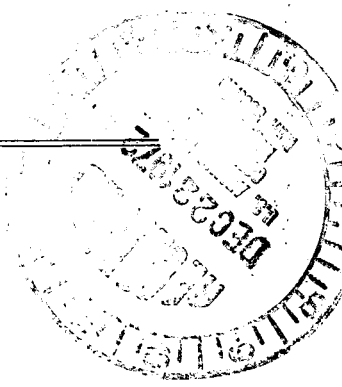


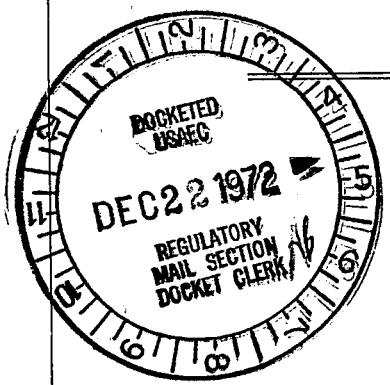
IN THE MATTER OF:

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. Docket No. 50-247

(Indian Point Station, Unit No. 2)

Place - Washington, D. C.

Date - 14 December 1972 Pages 7438 - 7634



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ATOMIC ENERGY COMMISSION

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In the matter of:

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. : Docket No. 50-247

(Indian Point Station, Unit No. 2):

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Tariff Commission,
Third Floor,
8th and E Streets, N. W.
Washington, D. C.

Thursday, December 14, 1972.

Hearing in the above-entitled matter was reconvened, pursuant to adjournment, at 9:00 a.m.

BEFORE:

SAMUEL W. JENSCH, Esq., Chairman,
Atomic Safety and Licensing Board.

DR. JOHN C. GEYER, Member.

MR. R. B. BRIGGS, Member.

APPEARANCES:

(As heretofore noted.)

CONTENTS

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P R O C E E D I N G S

CHAIRMAN JENSCH: Please come to order.

The agenda that was discussed last evening I believe included Dr. McFadden and Dr. Raney, in that order. Is that correct?

MR. TROSTEN: Dr. McFadden, and I believe Mr. Newman would follow Dr. McFadden.

CHAIRMAN JENSCH: Very well.

Whereupon,

JAMES T. MC FADDEN

was called as a witness on behalf of the Applicant, and, having been previously duly sworn, was examined and testified further as follows:

CHAIRMAN JENSCH: Dr. McFadden has assumed the witness stand. Who desires to interrogate him first, Hudson River Fishermen's Association?

MR. MACBETH: Yes, Mr. Chairman. If I could have just 30 seconds to collect my thoughts.

(Pause.)

MR. TROSTEN: Mr. Chairman, we have been double-checking and have ascertained that Dr. McFadden has never been sworn.

Whereupon,

JAMES T. MC FADDEN

was duly sworn as a witness on behalf of the Applicant.

CHAIRMAN JENSCH: It had been my recollection that he had been sworn previously.

MR. TROSTEN: He was a member of a panel, but I don't think -- his testimony was introduced by stipulation.

CHAIRMAN JENSCH: That may be another thing, but I thought he had been sworn.

CROSS-EXAMINATION

BY MR. MACBETH:

Q Dr. McFadden, in the last 10 days or so of this hearing we've had a good deal of discussion about compensatory mechanisms, compensatory changes in fish populations and other populations as well. And frequently there has been reference in those discussions to density-dependent mortality and density-independent mortality. And I would like to ask you first whether the compensatory processes and compensatory changes that you discuss in the beginning of your testimony of October 30, 1972, as far as the numerical size of the fish population goes, are equivalent to density-dependent mortality?

A Yes, that's correct. The two are synonymous.

Q Thank you.

You say here on page 10 of your testimony of October 30:

"No empirical observations on operation of compensatory processes during different life history

wel 3

stages for striped bass in the Hudson River per se are known by me to exist."

And in your discussion of compensatory processes I found no references to striped bass in the Hudson River.

Am I correct in assuming that your testimony does not rely on any data collected on striped bass in the Hudson River?

A With respect to compensatory processes, that's correct.

Q On the other hand, you do discuss three other papers. And the first of those is a paper by Sommani entitled "A Study on the Population Dynamics of Striped Bass, the Morone saxatilis Walbaum in the San Francisco Bay Estuary", a University of Washington abstract. And I take it that in that paper Sommani is arguing that there may well be density-independent mortality in the striped bass population which was studied.

But you point out that he ignored one of the data points and that this destroyed any statistically significant regression and that, thus, the analysis was speculative.

On the other hand, you also pointed out that "It "It is worth noting that one additional datum, if it fell in the 'right' values, would make a significant..." -- well, I think it is supposed to be "parabolic," it says "porabolic," --

A Right. That's a typo.

Q -- "...relationship from which the correct inference would be that during this three-year period in the life cycle compensatory processes did operate."

Now, isn't it equally speculative to add one datum as it is to remove one datum?

MR. TROSTEN: Mr. Chairman, I object to the form of the question. There was a characterization of Dr. McFadden's testimony, and I ask that Mr. MacBeth rephrase that question.

MR. MACBETH: What characterization are you referring to?

MR. TROSTEN: In the earlier portion of the question, Mr. Chairman -- and the Reporter can read it back -- you will see that there is a characterization of Dr. McFadden's testimony in the sense of his description of the Sommani testimony.

If the Reporter will read it back, I think --

CHAIRMAN JENSCH: Will the Reporter read it back.

(Whereupon, the Reporter read from the record, as requested.)

CHAIRMAN JENSCH: What is the objection?

MR. TROSTEN: The objection, Mr. Chairman, was to the reference to Dr. McFadden's testimony as saying that Sommani had ignored one datum point. I just think that the question could be easily rephrased, Mr. Chairman. I think at the end of his question, I believe Mr. MacBeth got to the

point.

CHAIRMAN JENSCH: I thought on page 12 Dr. McFadden had said in his prepared testimony -- and incidentally did you have doubt whether his testimony was included into the transcript? If so, should we not do it now?

MR. TROSTEN: It was included in the transcript.

CHAIRMAN JENSCH: All right.

On page 12 of this testimony he says:

"This analysis..." -- and I take it that is referring to Sommani's testimony -- "This analysis is speculative and inclusion of the ~~arbitrary~~ arbitarily eliminated datum would have destroyed any statistically significant regression."

And I thought that was what the question -- that it accepted the premise, and said, therefore, "Or don't you feel that the exclusion of one is as bad as any one, or vice versa?"

I did not understand that he had taken anything other than the express language.

Objection overruled. You may answer.

MR. MACBETH: I should, by the way, have said Sommani is indicating density-independent mortality, not density-dependent.

WITNESS MC FADDEN: The part of Sommani's work which is referred to here is restricted to a single part of

a life cycle; namely, that from the end of the first year of life until an age of three, at which time the fish are recruited to the fishery.

The point of my comment was simply that it is equally speculative to eliminate or to include an additional data point.

MR. MACBETH: Thank you.

BY MR. MACBETH:

Q In the next paragraph on page 12 you say:

"Year class strength in the same San Francisco Bay population has been shown by Turner & Chadwich..." and there is a citation --

"...to vary over a four-fold rank."

Now, that's an article from number 3 of the Transactions of the American Fisheries Society," and citing pages 442 to 452.

Let me read you a paragraph from page 448 of that article:

"The survival rate of each year class was compared with the density of bass of one inch long of the river outflow and numbers of striped bass caught.

The only significant single correlation coefficient was a positive one between rate of survival and the density of bass of one inch."

Then there are a few figures there.

"High density is unlikely to favor increased survival, so this correlation probably just reflects better environmental conditions."

I'll show you the page so that you can see it in context.

(Handing document to the witness.)

A Is it the red underlined part of it?

Q Yes.

A Okay.

Q Now, is not one inference that could be drawn from this correlation, which is the only significant single correlation which Turner & Chadwich found, is not one inference to be drawn that the striped bass population being studies had a density-independent mortality?

A Do you mean density-independent mortality only?

Q Do I mean that's the only inference to be drawn?

A Is that your question?

Q No. Is that not one inference to be drawn?

A Yes. The population clearly has a large density-independent mortality component.

Q Thank you.

The next article that you discuss in the following paragraph on page 12 is one by T. S. Y. Koo, published in 1970 in "Chesapeake Science."

And you quote there from Koo at page 92 -- and

perhaps just so the record is straight we should make it clear that the quotation -- this is in your sentence, beginning "Significantly, Koo, page 92, demonstrates..." and then a colon, and then open quotes -- in fact, that is the beginning of the paragraph, rather than the middle of a sentence, is it not? Again, I believe it's just a typographical error.

(Handing document to the witness.)

A Yes, that's correct.

Q So that really should be the beginning of the paragraph, with a capital letter?

A Yes, that's correct.

Q And then in the next line down you say:

"...dominate year class."

That really should be "dominant year class?"

A "Dominant," that's right.

CHAIRMAN JENSCH: May I have that last work? Was it predominant?

MR. MACBETH: No. "Dominant."

BY MR. MAC BETH:

Q Now, let me read you another paragraph from this same page of Koo's article, that follows by a paragraph or two the portion that you cite.

He says:

"The causes of the cyclic appearance of dominant

year classes in striped bass are most difficult to ascertain. Whatever the factors are that play the role, they are most likely present in the environment, rather than inherent in the fish. While some density-dependent factors may well contribute to the cause, it may be wise to look more into density-independent factors that tend to enhance the survival of the young."

And again, let me show you the page where that occurs.

(Handing document to the witness.)

Does that indicate to you that Koo at least had some question in his mind as to whether mortality in striped bass population which he studied was density dependent or density independent?

A No, sir. The statement refers specifically to the cyclic appearance of dominant year classes, not to the regulation of population size in general.

Q Well, would there be some question at least as to the population size of the dominant year classes as to whether their mortality was density dependent or density independent?

A I don't see how that could be construed from the phraseology that Koo uses here.

Q What do you think Koo meant?

A I think Koo is associating the cyclic fluctuations in the population in his mind, most likely, with some cyclic environmental factors.

And in that respect I would disagree with his conclusion, if he intends to assert that he sees that is likely the sole basis for cyclical patterns in the fish, because there's a very sound basis for explaining cyclical patterns in fish populations as a result of inherent density-dependent processes.

Q But he does suggest that it would be worthwhile investigating density-independent factors as well, doesn't he?

A Yes, that's clearly what he says.

Q Now, on page 14 --

CHAIRMAN JENSCH: Of the McFadden testimony?

MR. MACBETH: Of Dr. McFadden's October 30 testimony.

BY MR. MACBETH:

Q -- you say -- and here you are talking about the ability of fish populations to respond in a compensating fashion to exploitation -- you say:

"Many studies providing estimates of percentage of fish populations that have ~~moved~~ removed as at a sustained basis have been carried out. Statistics covering 61 reported cases of exploitation by sport or

commercial fisheries are summarized in Appendix I."

Now, is it not true that among the 61 cases summarized in Appendix I there is no study on striped bass?

A That's correct.

Q In light of the state of knowledge about striped bass populations, would you say that whether or not striped bass populations operate with density-dependent mortality or density-independent mortality, is a topic of some dispute in the community which studies striped bass?

MR. TROSTEN: Would the Reporter read that question back, please?

(Whereupon, the Reporter read from the record, as requested.)

MR. TROSTEN: I object to the form of the question, Mr. Chairman, because it contains a premise that the witness has not accepted.

CHAIRMAN JENSCH: And what is that?

MR. TROSTEN: The premise is that the population operates on either density-dependent or density-independent, one or the other. And the witness has never accepted that premise.

CHAIRMAN JENSCH: Well, I understood in the reference to Dr. Koo he acknowledged that Koo at least had said that they might investigate density-independent factors. So he does have some recognition of perhaps something

contrary to his own thoughts.

MR. TROSTEN: It's the either/or part of the question, Mr. Chairman, that I'm objecting to.

Mr. MacBeth's question assumes that there is -- that the striped bass population operates either on density-dependent or density-independent processes. That's the part of it that I'm objecting to.

CHAIRMAN JENSCH: I understood from the previous answer by Dr. McFadden that with reference to the possibility of an inference of some other testimony he said that that reason -- was that the sole one, and Mr. MacBeth said no, but isn't it one aspect?

I assume that that's the same type of premise: Isn't that one aspect of this striped bass situation, but there could be many other factors involved.

So either/or would not mean solely either/or.

MR. TROSTEN: Is that what you mean?

MR. MACBETH: I think that if one is connecting density to mortality the mortality is going to be either density-dependent or density-independent. What's the other option? Density-neutral?

MR. TROSTEN: That's the point, Mr. MacBeth.

CHAIRMAN JENSCH: Let's ask the witness if he accepts the premise.

BY MR. MACBETH:

Q Dr. McFadden, perhaps we could come to the premise: in trying to relate the density of a population to its mortality, must the mortality be either density-dependent or density-independent?

A I know of no reputable population dynamicist who would not recognize the simultaneous operation of both density-dependent and density-independent factors, as Mr. Sommani has admirably shown in his paper.

Q Both factors could be working, but there is not any -- as far as relating mortality to density, mortality is going to be either density-independent or density-dependent, or some mixture of the two. There is not some third option, like density-neutral or super density.

I'm a little bit at a loss as to seeing what further alternative Mr. Trosten would like me to interject into this.

But do you see anything else?

A The form of the question implied to me an either/or proposition, and I would not have answered in those terms, apart from Mr. Trosten's objection.

It is possible at a particular stage of the fish's life history for mortality to be either density-independent or density-dependent. It is also possible, and indeed essential, that at least at some stage in the life history density-dependence be operative. It is common during that

stage for both density-dependent and density-independent processes to be operative.

Q And would it be fair to say that over some of the life stages of the striped bass there is a dispute within the community which studies striped bass as to whether the life stage, the mortality in the life stage, is density-dependent or density-independent?

A My interpretation of those studying striped bass is that they believe that at some stages of the life history mortality is density-independent, and the necessary postulate for successful operation of a population through a long period of time is simply that at some stage of the life cycle density-dependent processes be operative. They need not be operative in all stages.

CHAIRMAN JENSCH: I think the question was: Do you recognize in that regard?

WITNESS MC FADDEN: I don't know if dispute is the right word.

CHAIRMAN JENSCH: Use another term -- difference of opinion, a contrarity of thought -- something of the sort.

WITNESS MC FADDEN: I think there is open-mindedness in regard to certain stages of the life history.

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MR. MACBETH: I did not want to suggest any adversary processes between scientists.

BY MR. MACBETH:

Q And there are some differences of opinion?

A The normal way of approaching that kind of a question in scientific work, is to make a hypothesis which you can attempt to recheck, until strong evidence which is the basis for rejection of the hypothesis is generated. The hypothesis is most properly neither accepted nor rejected.

So if you are talking about the way that scientists approach this kind of question, I think you have to recognize that where there is not any clearcut evidence one way or the other, the tendency is to hold an open hypothesis. And people attempt to test the hypothesis, but within their scientific operation, they don't form sharply divided schools of thought prejudging the conclusion that will ultimately be arrived at.

Does that help to clarify the reaction of scientists to this kind of question?

Q Yes. It does not go quite all the way, I think, though.

ARe you suggesting that there are really no differences of opinion about what the evidence indicates?

A I am suggesting that there are different hypotheses.

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Q And that one scientist might hold one and another scientist might hold another?

A That is right.

Q I think that pretty well gets at it.

CHAIRMAN JENSCH: While there is a pause, let me see if I understand your answer.

This question started on whether one of the factors, or whether at some stage in the life history of this fish, the bass, there is a density independence, or a density dependence; either/or, as I think you mentioned, for some times in the life history.

Well, that being the postulate what other postulate could be proposed for that type of situation to see whether there were differences of opinion?

WITNESS MC FADDEN: The range of postulates are density-independent, density-dependent or both. If you are talking about scientific work on the question, then I think you ought to talk about testing of hypotheses rather than disputes or --

CHAIRMAN JENSCHE: Then some people were testing it with some evidence to say that there could be density-independent, and some people are testing a hypothesis say it could be density-dependent, is that your view?

WITNESS MC FADDEN: That is what I presume their approach is.

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CHAIRMAN JENSCH: You don't know?

WITNESS MC FADDEN: The kind of statements that you find in a paper like Koo's, don't clearly phrase a hypothesis. It is clear that the man is thinking about these questions, but it is not clear that he has rigorously framed the hypothesis which he is in the process of testing.

CHAIRMAN JENSCH: Well don't limit yourself to Koo. We are talking about the scientific world generally.

I understood some of your previous answers and I understood you to say, I presume. In other words, you don't know whether they are testing the hypothesis of density-independent or density-dependent?

WITNESS MC FADDEN: It depends on how the scientist stated his position. I just referred to Koo's approach. Sommani's approach, by contrast, clearly and rigorously defines a hypothesis, namely, that both density-dependent and density-independent processes are operated. And he then proceeds to test it in a proper way.

CHAIRMAN JENSCH: Well that is at some stage in the history.

Now I think the question centered on other stages in the life history of the fish. It can be either/or, isn't that correct?

WITNESS MC FADDEN: I agreed that that was the case.

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CHAIRMAN JENSCH: Do you recognize that there are differences of opinion respecting that phase of the consideration?

WITNESS MC FADDEN: I recognize that, if the question is being approached in a proper scientific way. There are different hypotheses.

CHAIRMAN JENSCH: Well what are the different hypotheses on the either/or situation?

WITNESS MC FADDEN: A hypothesis is a ~~preposition~~ proposition stated in such a way as to be testable, stated in such a way as to be unambiguous.

Opinions, as reflected in scientific papers, frequently, are neither testable hypotheses nor unambiguous and Koo's reference to density-dependent and density-independent mortality I think is an example. It is just a general statement.

You might call it an opinion. It does not represent a testable hypothesis in my view.

The area is a difficult one, so that in order to communicate clearly, I think it is necessary to state oneself rigorously and unambiguously. I don't feel that with loose phraseology I can effectively and clearly respond to questions in this particular area. That is why I am attempting to be a little circumspect in the choice of words with which I respond.

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CHAIRMAN JENSCH: Well I want you to be circumspect, but I am having difficulty understanding.

Aside from Koo, you say there are different postulates, and I wonder what could be the different postulates on an either/or situation for that time in the life history of the striped bass.

Can you state it without saying what is testable and how you analyze it? Just give us the difference -- a statement of the different postulates if you will, please.

WITNESS MC FADDEN: I stated a moment ago that there were three possible postulates, or hypotheses in this area. One or the other, or both types of mortality being operated at a particular life history stage.

CHAIRMAN JENSCH: No, exclude the combination, dependence and independence. Strike them out.

For this question I would like to propound what could be a different postulate, so that we don't get to this question of differences of opinion. What is a different postulate to the either/or situation for that time in the history of a fish, which you could state for us.

WITNESS MC FADDEN: If you eliminate both types hypothesis, then you are left with the hypothesis of either one or the other.

CHAIRMAN JENSCH: Yes.

Now, as to those either one or situation, do you

mm6 1 recognize there are differences of opinion with reference
2 to that type of postulate?
3 WITNESS MC FADDEN: If you mean by that, do some
4 fishery scientists believe that mortality is one kind, or
5 only of the other at certain stages of the life history,
6 the answer is yes.
7 CHAIRMAN JENSCH: Well does that not reflect
8 to you a difference of opinion?
9 WITNESS MC FADDEN: That reflects to me, if you
10 are talking about a person's personal outlook which may be
11 subjective, I am sure that different people hold differences
12 of opinion.
13 If you are talking about a scientist's different
14 approach to a scientific question, I think you have to
15 properly refer to hypotheses, rather than opinions.
16 And a moment ago I explained some important
17 differences between the two.
18 CHAIRMAN JENSCH: Yes, I recall you did, and I
19 was just wondering -- you say you have different postulates,
20 but I don't understand whether you have given us a different
21 postulate for this either/or situation.
22 Can you state one?
23 WITNESS MC FADDEN: The three possible hypotheses
24 or postulates are: Density-independent mortality only;
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25 density-dependent mortality only; or both, density-dependent

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and density-independent operating simultaneously. That exhausts the range of possibilities.

CHAIRMAN JENSCH: Thank you very much.

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Will you proceed.

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BY MR. MACBETH:

Q I want to turn now to page 23 of your testimony of October 30th. And there you discuss the productivity of estuaries and you point out that after making certain adjustments a production of 50 pounds of fish per acre in the Gulf of Mexico seems to be a reasonable estimate, and a similar estimate in Chesapeake Bay and the estuarine tributaries is about 155 pounds per acre, perhaps more since sport catches are not included.

And you concluded by saying -- quote:

> "These fish production figures for estuaries are much greater than annual averages of 1.5 pounds per acre per year for all world marine fishing. 27 pounds per acre per year for the productive North Sea fishery and 1 to 7 pounds per acre per year for the Great Lakes, reflecting the extraordinary productivity of estuaries."

Now I take it that it is your opinion that estuaries generally have a production rate of somewhere from -- very roughly put, from 50 to 150 pounds of fish per acre; is that correct?

A Those are harvest figures. The production figures, if you define production as a commercial or sport fish harvest in the papers referred to, those figures are used

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as minimum estimates of standing crop.

Q Then you go on on the next page, and taking the extreme assumptions postulated by the Staff of the Atomic Energy Commission you conclude that 14.99 pounds per acre for all species in the vicinity of Indian Point might be killed by the operation of the plant. Is that correct?

A That's correct.

Q And from that you deduce that this would not be a very severe impact on the Hudson River estuary; is that correct?

A That is true if the Hudson River estuary falls anywhere near the range of normal estuary productivities.

Q Dr. McFadden, let me show you page S3-29 of Supplement 3 of the Applicant's Environmental Report, Table 1.2-2 entitled "Estimated Annual Near-Shore Fish Productivity as Reflected by Standing Crop of the Hudson River from Bear Mountain Bridge to Croton Point, 2380 Surface Acres," and the following table, Table 1.2-3, entitled "Estimated Total Open Water Fish Productivity as Reflected by Standing Crop of the Hudson River from Bear Mountain Bridge to Croton Point, 10,760 Surface Acres."

(Handing document to the witness.)

I draw your attention to the poundage per acre of all species of fish on those two tables.

MR. TROSTEN: May we have a moment to confer,

Mr. Chairman? I would like to confer briefly.

CHAIRMAN JENSCH: Do you have your answer ready? Maybe we can take a recess.

MR.MACBETH: I haven't actually propounded the question. I was just giving --

WITNESS MC FADDEN: The table does not make clear the origin of the data or the method by which these estimates were derived.

MR. MACBETH: No, it doesn't. That's quite true.

BY MR. MACBETH:

Q On the other hand, assume for the moment that these figures under pounds per acre are correct and they are in no way misleading. Would that indicate to you that as far as the near-shore fish productivity of the area from Bear Mountain Bridge to Croton Point is concerned, that the Hudson River is a rich estuary, or a very poorly populated estuary?

A Do you mean if those pounds per acre figures were accurate estimates of the total standing crop for the species listed? Is that what you mean by correct?

Q Yes, if they in fact reflect what the title says they represent.

A If those were standing crop figures, it would be an extraordinarily unproductive estuary.

Q And the title does say that these are productivity as reflected by standing crop, does it not?

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A The title does not say how the standing crop was measured.

Q No, but it does say standing crop?

A It says standing crop, but that does not tell me anything about what the data mean.

Q Well, many of us have had trouble with the data in the past, but we will see what we can do with it.

Try the next chart on the open-water fish productivity.

Does that look like a productive estuary to you, again assuming that the figures are correct and that they do reflect the standing crop, as the title says.

A Those figures are so low that it would appear to be impossible from that estuary to kill as many fish as have been impinged at Indian Point.

CHAIRMAN JENSCH: I think the question was: Is that a rich estuary or a poor estuary?

WITNESS MC FADDEN: I said that it was low.

CHAIRMAN JENSCH: You don't want to use the word "rich" or "poor"?

WITNESS MC FADDEN: Unproductive. These figures would typify a very unproductive estuary if they were correct.

CHAIRMAN JENSCH: Thank you.

I think that is a premise maybe we should establish right from the beginning. Some of these figures that

we will have to assume may be open to some error, but when they are presented by the Applicant, there's a kind of a rule that it's an admission against interest, so we will have to kind of accept, at least for the purpose of discussion, the --

MR. BRIGGS: Excuse me for a moment.

Do you consider the data to be misleading?

WITNESS MCFADDEN: I consider them-- When I don't know what methods they were collected by, I must say I scarcely know how to respond. They may be so utterly irrelevant that a response is of little value.

MR. BRIGGS: We should consider the table to be irrelevant?

WITNESS MC FADDEN: My reservation is that neither the table nor anyone else has explained to me the method by which the data were collected, nor have they explained whether that method is given in the text.

MR. BRIGGS: Have you read the supplement?

WITNESS MC FADDEN: A long time ago.

MR. BRIGGS: And that question did not arise in your mind when you read it?

WITNESS MC FADDEN: At the time, I believe that question was resolved. Those very low standing crop figures among the various sets of data that I have seen have been generated by such techniques as trawling wherein everybody

knows that the fish are able to escape the collecting gear in large numbers and that the estimates are therefore grossly underestimates.

MR. BRIGGS: Well, then, the numbers that we have been given in tables previously in other testimony,we should consider them to be highly inaccurate?

WITNESS MC FADDEN: I don't know whether the data you are referring to has been supplied without any explanation as to the methods by which they were collected or not.

CHAIRMAN JENSCH: If you answer the question it will be helpful. The question was:

Should we consider those as being highly inaccurate, in your opinion?

WITNESS MC FADDEN: If they were collected by methods such as trawling, they are not accurate estimates of the total standing crop.

MR. BRIGGS: Well, in Dr. Lawler's testimony he has numbers of fish collected which-- As I remember, there is a number like 2.99 per a certain volume or a certain area, and the question was asked the other day whether this 2.99 might be 2 or it might be 4, and no statistical analysis had been made.

I would infer from what you say that although those numbers might accurately represent what was found in the net, that they might be off by a factor of 10 or 100 from

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the density that was actually present in the water from which these samples were drawn.

Is that a correct inference?

WITNESS MC FADDEN: Many of the data that have been advanced very likely are, let's say in some cases, underestimates. But where they are used as estimates of relative abundance, a series of calculations and deductions can be carried out which are very useful and accurate.

In the case before me, the data are presented not as -- or the question is phrased not in terms of the relative abundance but in terms of absolute abundance, and if you use data in that context, then you may draw erroneous conclusions.

MR. BRIGGS: Yes, I recognize that in relative terms, they might well be used as one assumes that the efficiency is constant everywhere.

WITNESS MC FADDEN: Right.

MR. BRIGGS: But when one looks at these then in terms of absolute numbers, the confidence level must be extremely low. Is that your conclusion?

WITNESS MC FADDEN: That's right.

CHAIRMAN JENSCH: If I may just suggest one thing, Dr. McFadden, I know you want to be careful in your answer, and we want you to be careful. But when a question is given to you, "Do you regard this as an estuary of low productivity,"

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or something, the question assumes that you treat these figures as they are presented. You need not respond by saying you don't know who did it, in what boat on what day, at what time and at what flood tide, or how accurate they are, that sort of thing.

If you will deal just with the question, I think we will move along. I know you have a tight schedule today and we want to accommodate you, but I think if you respond directly it would be very helpful.

MR. TROSTEN: Mr. Chairman, lest there be any misunderstanding with regard to the tables which Mr. Macbeth called Dr. McFadden's attention to, I should like to point out that this document-- Mr. Macbeth was reading from Supplement Number 3 of the Applicant's Environmental Report called "The Benefit-Cost Analysis."

This document was prepared by the Applicant in compliance with the requirement of the Atomic Energy Commission, giving the best information that was available to the Applicant at the time. It was prepared in great haste in response to a new requirement of the Atomic Energy Commission for the submission of such a document.

I should point out that Dr. McFadden was not responsible for the preparation of this particular table.

CHAIRMAN JENSCH: We understood that.

MR. TROSTEN: I think it would be well for the

b9 Board to bear in mind ~~that~~ the context and the circumstances under which this document, known as the "Benefit-Cost Analysis," was prepared by the Applicant.

CHAIRMAN JENSCH: Yes, we understood that. Thank you for your statement.

Do you desire to have a conference with Mr. Woodbury?

MR. TROSTEN: No, thank you.

CHAIRMAN JENSCH: Very well.

5 BY MR. MACBETH:

Q Dr. McFadden, if you assume for the moment that the figures I show you on those two tables are correct, and you then assume that 14.99 pounds per acre of all species would be removed from the four square miles of the river immediately adjacent to Indian Point, would that have a severe effect on the local concentration of fish?

A That would be a removal which would be very substantial and one that I certainly would not say a priori would not substantially reduce the standing crop of fish.

There are certain limits. That would represent a removal of something like half of the standing crop. That is clearly a high enough removal to be out of the realm where you shrug your shoulders and say, "Well, no question, the system can easily sustain that." That would be a high sustained removal.

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CHAIRMAN JENSCH: The question was: Would it have a severe effect?

WITNESS MC FADDEN: It is not possible for me to state certainly that it would have a severe effect. There are systems which sustain that level of removal.

CHAIRMAN JENSCH: Well, we're talking about this one system, not some other system.

WITNESS MC FADDEN: I don't know for that system.

The arguments here are based on generalities drawn from typical estuaries. I think that is made clear in the testimony.

BY MR. MACBETH:

Q I know. That's why I really supplied this chart so we could try to bring it down to this river and the Applicant's estimate of the fish in the river.

Do you think that the removal of 14.99 pounds per acre for all species in an estuary with a population such as shown in the figure could well result in a substantial reduction of both the striped bass and the white perch population in the area?

A A population with densities as typified by the table you just showed me?

Q Yes.

A Yes, for the four square miles which are postulated.

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Q Might it have an effect on the four square miles?

A Yes, but as you expand the area, then the pounds per acre removal figure drops accordingly, and if you postulate a large enough acreage, you get down to what is clearly a tolerable level of removal.

That numerical game obviously is an elastic one.

CHAIRMAN JENSCH: Is that the game you set forth in your testimony, or does it apply to the question?

WITNESS MC FADDEN: We were both playing the same game. That's postulating a certain area for a certain poundage removal, and then allowing as how you might postulate a larger area than that.

CHAIRMAN JENSCH: A kind of a flexible thing?

WITNESS MC FADDEN: Yes.

DR. GEYER: How do you estimate productivity if the fish are spawned in one area and grow up and are harvested somewhere else? I'm talking about the spawning area.

WITNESS MC FADDEN: I'm talking about the general ecosystem productivity argument that is raised here refers to the acreage upon which the poundage of fish is reared, so that the fact that the eggs are spawned elsewhere but the fish -- and the larvae drift in here and are reared in this area is not relevant to this argument. It is just what poundage of biological material can be generated on this particular acreage of water.

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DR. GEYER: So this says nothing about the effect of what goes on in this area off the productivity of other areas?

WITNESS MC FADDEN: That's right.

DR. GEYER: Thank you.

MR. MACBETH: Mr. Chairman, that concludes my examination of this witness.

MR. TROSTEN: Mr. Chairman, I would like to make a further observation with regard to the "Benefit-Cost Analysis."

The Applicant did not accept at the time that these proposed guidelines were promulgated some of the basic assumptions underlying these guidelines. In submitting the "Benefit-Cost Analysis," the Applicant stated specifically that the estimated costs -- or that these costs, that is, the environmental costs, are in conformance with assumptions made in the guidelines, ~~our~~ but that our studies indicate that the costs will be zero in this particular instance.

In other words, we were taking the position that we were submitting this information on the basis of the best information that was available to us in response to a requirement imposed upon us by the Atomic Energy Commission. We do not estimate the size of the population. In our view, data were inadequate to make these estimates.

However, we were required by the Atomic Energy Commission to submit a document conforming with the guidelines

of the Commission, and we did so.

CHAIRMAN JENSCH: As we have mentioned or discussed before, especially in reference to emergency core cooling and other factors of that kind, this Board must accept the guidelines established by the Atomic Energy Commission and we will proceed upon that basis.

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MR. TROSTEN: I agree, Mr. Chairman, excepting I would hate to have any impression left by Mr. Macbeth that somehow the Applicant has made two different sets of numbers or something like that. That is not the case in the slightest.

We were submitting information which was considered to be inadequate. We felt that we did not have encugh information to estimate populations -- to estimate costs in the manner required of us by the Atomic Energy Commission, but nevertheless we complied with the regulations of the Commission. And I think that this point should be borne clearly in mind by both Mr. Macbeth and the Board.

CHAIRMAN JENSCH: Excuse me --

MR. MACBETH: Mr. Chairman, --

CHAIRMAN JENSCH: Excuse me, Mr. Macbeth.

I don't know what conclusions or different inferences may be drawn from these data but I presume that computations made are as exact as you knew them to be or you would not have permitted them because they might be misleading.

MR. TROSTEN: They were as exact as we knew them to be at the time. We did not make population estimates, Mr. Chairman. We did not estimate the productivity of the estuary in the sense that we-- This was an estimate that we were putting forth. What we were doing, Mr. Chairman, was giving the best information that we knew how to give in light of a requirement that we felt was wrong, because we felt that it was impossible to do this at the time. But we complied because we had to comply.

CHAIRMAN JENSCH: We cannot argue the basis of Commission regulations, as we know.

MR. MACBETH: I simply want to say I am not at this point drawing any particular conclusions from the evidence. What I have been doing this morning is putting questions to the witness and eliciting evidence, and I think that any conclusions that can be drawn should await the findings of fact and conclusions of law.

I don't think there is any need to characterize it further, and I think the record speaks for itself as to what these figures stand for.

MR. TROSTEN: One final point, Mr. Chairman. The guidelines under which this document was drawn up were not regulations of the Atomic Energy Commission, Mr. Chairman. They were guidelines proposed by the Atomic Energy Commission.

CHAIRMAN JENSCH: Yes, and I understand Part 100

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of the Commission's regulations contains guidelines on exclusion areas and other factors, and I think we have accepted those guidelines as pretty firm. Until we see some other characterization, we will have to accept these as pretty firm.

MR. KARMAN: Mr. Chairman, I believe I just have a few questions, but I think if we could have, say, 10 or 15 minutes now, we can straighten ourselves out, and I think we would finish with Dr. McFadden is just a few minutes.

CHAIRMAN JENSCH: Very well. At this time let us recess to reconvene in this room at 10:15.

(Recess.)

Whereupon, James T. McFadden ~~HARRY G. WOODBURY~~ resumed the stand as a witness for and on behalf of the Applicant and, having been previously sworn, was examined and testified further.

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CHAIRMAN JENSCH: Please come to order.

Does the Staff have additional interrogation?

MR. KARMAN: Yes, we have just a few questions, Mr. Chairman.

CHAIRMAN JENSCH: Proceed, please.

BY MR. KARMAN:

Q. Dr. McFadden, do you know where in the life history, density-dependent mortality is operative for striped bass on the East Coast?

A. No.

Q. Dr. McFadden, is it your contention that there is sufficient compensatory reserve in the Hudson River striped bass population, that we could harvest or kill 25 to 30 percent of the larval population without reducing recruitment to the fishery?

A. No.

Q. Dr. McFadden, how does one determine experimentally the level of harvest to be permitted in any fishery?

A. The normal procedure is to impose successive increments of harvest to monitor the population's response through such measurements of such parameters as survival rates, growth rates, reproductive rates and from that data set, there are standard methods for prescribing maximum sustained yield, for prescribing the standing crop and sustainable yield that would be associated with varying percentage

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removals from the stock.

Q. Has such an experimental determination been made in any estuary, to the best of your knowledge?

A. Yes.

Q. And where would that be, do you know?

A. Salmonic fishes in the North Pacific; Menhaden on the Atlantic Coast.

Q. Thank you, Dr. McFadden.

MR. KARMAN: I have no further questions, Mr. Chairman.

CHAIRMAN JENSCH: Any redirect?

MR. TROSTEN: Not at this time, Mr. Chairman.

CHAIRMAN JENSCH: Very well, thank you, Dr. McFadden, you are temporarily excused.

Mr. Briggs has some questions.

MR. BRIGGS: These questions are related to what criteria one uses to decide whether the Indian Point plant is having an effect on the fishery. And the criteria that one will use early in the business, as I understand, it is proposed in a matter of three to five years one will have knowledge as to whether there is likely to be a substantial effect.

Is there knowledge at the present time, of the egg production, the larva production, and the production of fish of the year for, let's say, 1970, '71 and '72?

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WITNESS MC FADDEN: There are estimates, preliminary estimates of some of those parameters for 1972, which is the initial year of our comprehensive ecological study of Indian Point.

MR. BRIGGS: You say there are preliminary estimates, and you have reviewed those estimates, have you?

WITNESS MC FADDEN: Only superficially.

The intention that the 1972 effort is to lay a solid foundation in field methodology for obtaining more precise estimates in the following years. So it was intended to be a year of field study which would lay the foundation for the next several years and provide only preliminary insights into those population parameters.

MR. BRIGGS: Do these numbers have to form the base of the situation as it exists before Indian Point Two can possibly go into operation, or are there other numbers that would form this base?

WITNESS MC FADDEN: The numbers generated by the study this year, are not in themselves a great improvement over the pre-existing data base. Both the '72 data and the pre-existing data base, in my opinion, are sufficient to indicate that it is safe to go ahead with unit number two for the next several years.

That is, there is no basis in the existing data, in my opinion, for projecting an immediate precipitous or

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irreversible decline.

MR. BRIGGS: Suppose now that Indian Point Two were to go into operation, and suppose there are units that other plants that are already going into operation, and suppose next year one found that the population at the end of the year were a factor of two or three below what it was this year, and suppose the following year one found it was a factor of, let's say, four or five below what it was this year, and that the year following that it remained a factor of three to five below what it was this year; would there be reason for a concern?

WITNESS MC FADDEN: If the data were of a general nature, simply estimates of overall population numbers, it would be impossible to distinguish plant-imposed mortality from natural mortality which in itself could pull the population down to those levels for a period of years.

In fact, the history of the striped bass stocks clearly show that sort of variation.

The program of study which we have prescribed would allow us to separate plant originating decline in numbers from that produced in the natural environment.

CHAIRMAN JENSCH: Excuse me. I think the question was, Dr. McFadden,and I think it would be helpful for you to deal directly with it, assuming these figures, would it be a cause of concern, yes or no. And then you may explain.

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WITNESS MC FADDEN: No, not in itself because that is not beyond the normal range of variation attributable to the environment.

CHAIRMAN JENSCH: Thank you.

WITNESS MC FADDEN: Mr. Chairman, the extension of my answer was merely intended to explain that the data properly collected would enable us to distinguish between these two possible causes of decline.

CHAIRMAN JENSCH: Thank you.

MR. BRIGGS: So the extension of your concern was very helpful. It leads into the next question, and that is, what studies now in the plant are going to provide you with this information that says the plant has not had the effect, but something else has had the effect?

WITNESS MC FADDEN: The study that we have undertaken will provide estimates of the population in successive stages of its life history.

Simultaneously, we will be estimating the mortality associated with operation of the power plant and the difference between the two reflects the operation of natural processes.

MR. BRIGGS: In the natural processes, is it always the case that there is a several-fold decrease in the egg population that results in a several-fold decrease in the young-of-the-year. Or, is it sometimes the case that the

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number of eggs laid is not greatly different, but the surviving population at the end of the year is markedly decreased?

WITNESS MC FADDEN: The latter is frequently the case.

MR. BRIGGS: The latter is frequently the case.

So the number of eggs laid each year might not decrease very much, but the young-of-the-year could decrease substantially?

WITNESS MC FADDEN: Yes, that is entirely possible.

MR. BRIGGS: So you are dependent, then, upon the studies of what is coming into the plant and what is going out of the plant to decide that the plant does not have any effect and something else does?

WITNESS MC FADDEN: That is right.

MR. BRIGGS: Are you satisfied, and on what basis are you satisfied that the studies that will be run at the plant are so precise, so accurate that one will be able to determine that the plant is not a major factor?

WITNESS MC FADDEN: The estimates of mortality caused by the plant, I think, will be made with greater precision than the estimates of the natural processes. So that the limitations on interpretation of the data will be traceable to what is going on in the natural system, or the precision with which we are able to measure that, rather than the

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precision with which we can measure what is going on in the plant, in my opinion.

MR. BRIGGS: Is there a direct -- let's say a well known and direct relationship between what goes on in the plant and what one can expect to go on in terms of change in population of the young-of-the-year and what could be expected to go on in the estuary and how does one relate what he measures in the plant to what he should expect to find in the estuary?

WITNESS MC FADDEN: There are several hypotheses which have been advanced in this hearing. And one of the main purposes of collecting the field data would be to test those hypotheses.

Is this relevant to your question?

MR. BRIGGS: Yes, this is relevent to the question.

WITNESS MC FADDEN: The main question before us, I think, is will the losses imposed by the plant be in some way compensated for by survival processes in the estuary at large, and this is a question that can be answered by the type of data that we propose to collect, simply because the postulate of no compensation would mean that the plant effect was additive to all natural loss.

MR. BRIGGS: Who would interpret the data that are taken in the plant?

WITNESS MC FADDEN: The data collected will be

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interpreted by the contractor, Texas Instruments, and the several other contractors, New York University, ~~Lustine.~~ A.R.T.M.

It is my understanding that the data are to be made available to all the interested parties for interpretation.

MR. BRIGGS: But the data will be compiled by the various contractors and will be analyzed and interpreted by a particular group. Does this group have a name?

Is it an advisory council or -- anybody can answer, I am just interested.

WITNESS WOODBURY: The Hudson River Policy Committee exercises general oversight over the conduct of this study. The first two years of the study that was done by Raytheon, was done by a contract that was let by the Hudson River Policy Committee, and done under their direction.

The last five years of this study is being done by these other contractors that have been mentioned.

But the policy committee serves now as a steering committe. The policy committee, you recall, consists of representatives of U.S. Bureau of Sports Fishery, and the Bureau of Commercial Fisheries, and the Department of Environmental Conservation of Connecticut and New York and New Jersey.

Also exercising oversight over this study and the conclusions, is the Consolidated Edison's Fish Advisory

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Board, of which Dr. McFadden, Dr. RAney and Dr. Lauer and Dr. Lawler and others are members.

MR. BRIGGS: Thank you.

CHAIRMAN JENSCH: I wonder if I understood your answer.

I think Mr. Briggs asked you how do you relate the effects of plant operation and the change in the population in the Hudson River Estuary?

And your answer was, well, there are several hypotheses. The main question is, will losses proposed by the plant be compensated by the survival and so forth.

I didn't quite get how you related it. I wonder if you would come back to the question. Could you do that, please?

WITNESS MC FADDEN: I spoke later to that point when I said that if the population does not compensate to some degree for these losses, then they are additive to natural losses.

If the population does compensate to some degree, then you don't have a straight additive relationship, that is natural mortality plus plant-induced mortality equals total mortality.

That would be the condition that would be violated if there is a compensation by the population.

CHAIRMAN JENSCH: Don't you have to start with an

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inventory of the fish in the first place?

WITNESS MC FADDEN: We have--

CHAIRMAN JENSCH: Try a yes or no, then you could explain how you can expect to get data. Don't you have to start with an inventory?

WITNESS MC FADDEN: No.

CHAIRMAN JENSCH: Well how do you determine whether you are getting any compensation from some loss if you don't know what you started with?

WITNESS MC FADDEN: Well we will know what we started with, because we will begin by estimating the abundance of eggs produced.

CHAIRMAN JENSCH: Well would that not then constitute an inventory, your estimate in that regard?

WITNESS MC FADDEN: I guess I am unclear about what you meant by the term inventory.

CHAIRMAN JENSCH: What do you understand it to be? Yousay you do not need it.

WITNESS MC FADDEN: By inventory?

CHAIRMAN JENSCH: Yes.

WITNESS MC FADDEN: An inventory to me would be perhaps just a list of the species present.

CHAIRMAN JENSCH: And not numbers?

WITNESS MC FADDEN: Yes, an inventory might not have any numbers attached to it.

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CHAIRMAN JENSCH: Let's assume the definition of an inventory that includes not only a list of the species, but numbers for each specie and then a total of those numbers of all species, so that you will get a total of the composite.

Can you accept that definition as an inventory?

WITNESS MC FADDEN: Yes, sir.

CHAIRMAN JENSCH: Do you think it would be helpful to have an inventory of that kind?

WITNESS MC FADDEN: It would be immensely helpful.

CHAIRMAN JENSCH: You would be able to then measure what the losses were, would you not?

WITNESS MC FADDEN: Yes.

CHAIRMAN JENSCH: And you would know where the losses, perhaps, occurred, would you not?

WITNESS MC FADDEN: Yes.

CHAIRMAN JENSCH: Well do you not think an inventory of that kind should be the starting point of your study?

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WITNESS MC FADDEN: Yes.

CHAIRMAN JENSCH: Are you planning to do that?

WITNESS MC FADDEN: We have it underway at the present time.

CHAIRMAN JENSCH: How are you doing it?

WITNESS MC FADDEN: By beginning estimates of the population at various stages of the life history.

CHAIRMAN JENSCH: Will estimates be satisfactory for your use?

WITNESS MC FADDEN: We will know that when the first-- The first indications of that will come when this year's field data are completely compiled. The final indication of that will come at the end of the 1973 field season when a full-scale estimate will have been carried out and it will be possible to see in detail what its possible deficiencies are.

CHAIRMAN JENSCH: Well, the fact is you really can't get an actual count on fish at any time; isn't that correct?

WITNESS MC FADDEN: That's right. You cannot count each individual fish.

CHAIRMAN EJNSCH: And therefore, you really will never know truly about the losses either, will you?

WITNESS MC FADDEN: We will obtain estimates which have attached to them confidence belts so we will be able

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to state that with, say, 90 percent certainty,the number of fish at large lies within the interval X to X-plus N.

CHAIRMAN JENSCH: And would your study assume that they stayed in this X area?

WITNESS MC FADDEN: No. We would make such estimates at successive intervals of time, expecting the numbers to change through time, so we get estimates at particular points, at successive stages in the life history.

CHAIRMAN JENSCH: Well, if you expect the numbers to change, how can you identify the cause of the loss?

WITNESS MC FADDEN: You carry on associated studies. To cite one example, estimate the numbers of, say, striped bass at two successive intervals in the life cycle. In the meantime, you collect data on the food habits of possible predators. You will note a decline in abundance over the time interval and you will be able to possibly attribute part of that to predation by certain species.

What the inevitable outcome is is that certain categories of loss can be identified and you are left with a substantial residue of, say, other natural causes of death. There is no expectation of being able to say this particular mortality component -- let's say 50 percent loss for stage A and stage B -- breaks down to -- and you give an exhaustive list of every cause of that loss.

CHAIRMAN JENSCH: Could you tell us what you

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believe your conclusion might be? Supposing you conclude, after some years of study and calculations and estimates and projections and consideration of the change in numbers as you mentioned, that the fish are increasing in the Hudson River and perhaps associated with that study, you have noted that there has been a tremendous increase in the fish killed in the screens and the revolving mechanisms and so forth.

How do you assess the impact of the Indian Point plant in view of those data, assuming they exist?

WITNESS MC FADDEN: I would not attribute the increase in the population to the kill. I would attribute it to some change in natural conditions which favored increased survival over that period of time. There would be a very definite, technical reason for operating that way.

Before the data are collected, I would not expect that imposing heavier mortality on the population would cause it normally to increase in abundance. There are certain mechanisms that could cause that, certain patterns of operation of compensatory mechanisms, but I would want to set up the entire statistical testing program to test the hypothesis that operation of the plant will cause a decline in numbers and not an increase.

Setting the hypothesis up that way allows you to test it with greater power, with greater precision, if you only look at the one-sided possibility that operation of the

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plant -- the hypothesis that the operation of the plant will harm the population. If you allow for both possibilities, that operation of the plant may either harm or improve the population, then you cannot test the harm-to-the-population alternative with as much precision and power.

CHAIRMAN JENSCH: I take it there is a lot of uncertainty and flux in these calculations and considerations that you're entertaining about your studies. Is that correct?

WITNESS MC FADDEN: Definitely.

CHAIRMAN JENSCH: Now supposing you find in your studies and calculations and projections in the X areas that you identified, that the fish population in the Hudson River is declining but the fish killed on the screens and the revolving mechanisms are increasing. How do you assess the impact of the operation of the plant in view of those possible conditions?

WITNESS MC FADDEN: The fish population is declining but the fishkill is increasing?

CHAIRMAN JENSCH: Yes. Would you conclude that the plant is having a severe impact on the Hudson River ecology?

WITNESS MC FADDEN: Yes.

CHAIRMAN JENSCH: And if you cannot truly know the population in the Hudson River you perhaps will start with an unknown as to the exact number for each species and the mortality of all species, so you are comparing an unknown,

say, inventory of number of fish in the river, but you do have a known condition when you scrape off the fish or collect them in baskets or whatever you do. Does that affect your confidence level in the determination of the impact of the operation of the plant?

WITNESS MC FADDEN: Mr. Chairman, it is not clear to me whether this is another hypothetical question or whether it's a real-world question pertaining to the present state of knowledge, or whether it pertains to an anticipated future state of knowledge. Could you clarify that for me, please?

CHAIRMAN JENSCH: I'll try.

You have suggested that you did not know whether it was a real-world situation. Is there a possibility of that being a real-world situation today?

WITNESS MC FADDEN: It is very much the situation today. We don't have usable estimates of the absolute abundance of the fish, and so the situation you describe where we have reasonably accurate estimates of the kill but not of the population from which the kill is drawn is the way I characterize the present state of affairs.

CHAIRMAN JENSCH: Well, assuming a continuance of that condition, how would you assess the severity of the impact of the operation of the plant on the Hudson River?

WITNESS MC FADDEN: If that condition continued, then we would have to rely on the temporal course of indices

of relative abundance which are available and have been for some years. We would have to rely upon changes in certain population parameters such as age distribution, growth rate, fertility rates, condition rates of fish.

We would have to rely upon those rather indirect indices to assess the impact of the plant and this would not be as precise a way to proceed as would be the development of estimates of absolute abundance of the fish.

CHAIRMAN JENSCH: Well, let me come back to my question:

Assuming the continuance of the condition you just described as a possibility that there is an unknown as to the inventory of the fish in the river, and assume with that that there is a decline in the total population in the river but there is an increase in the fishkill at the Indian Point plant, does that affect your confidence level in your determination of the severity of the impact of the plant on the river?

WITNESS MC FADDEN: Yes.

CHAIRMAN JENSCH: It lessens your confidence?

WITNESS MC FADDEN: Yes.

CHAIRMAN JENSCH: Does anybody have any further questions?

MR. BRIGGS: Could you tell us whether, on the basis of preliminary data, 1972 appears to be a good year or

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a bad year for striped bass?

WITNESS MC FADDEN: No.

MR. BRIGGS: You have not decided yet; is that right, or you could not tell from the data?

WITNESS MC FADDEN: I don't believe we would be able to tell that from the data in the form that they have come in this year.

As I said before, the primary intent was to develop and field-test our methods, which will be used starting in '73.

MR.BRIGGS: Thank you.

CHAIRMAN JENSCH: Did you have further questions?

MR. MACBETH: Yes.

I have spoken to Applicant's Counsel in the last break and we agreed to go on to the research effort after Mr. Karman's cross-examination, and that is really where we have come. We have been thinking of slightly different questions for Dr. McFadden, so I do have a few for the panel on the research effort.

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I take it Mr. Woodbury is sitting there and a member of the panel rather than anything else.

MR. TROSTEN: Mr. Woodbury has been sworn previously.

BY MR. MACBETH:

Q Dr. McFadden, isn't the usual procedure in

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conducting a series of scientific experiments to postulate a hypothesis and then to collect data to attempt to prove or disprove that hypothesis?

A (Dr. McFadden) Yes, the attempt is always to disprove the hypothesis.

Q To disprove.

In arranging the five-year research program, what hypothesis is it that you are attempting to disprove?

MR. TROSTEN: Mr. Chairman, at this point I am going to object to Mr. Macbeth's question on the grounds that the Hudson River Fishermen's Association and the Environmental Defense Fund have not specified with a sufficient degree of accuracy their contentions with regard to the Applicant's research program, as required by the Commission's regulations.

MR. MACBETH: We have not specified as much as the Applicant would like because we don't think the research is necessary. It is the position of the Hudson River Fishermen's Association and the Environmental Defense Fund that sufficient data is presently available for the Commission to reach a decision and that further research is not necessary, and that it is highly doubtful that further research would in fact be very useful.

And I am simply attempting to show from the evidence from the witness how useful or necessary research would be.

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MR. TROSTEN: Mr. Chairman, --

CHAIRMAN JENSCH: Do we have a reference to the statement of contentions by the Hudson River Fishermen's Association?

MR. TROSTEN: Yes.

CHAIRMAN JENSCH: May we see it, please?

MR. TROSTEN: Certainly.

MR. BRIGGS: I think I probably have a copy.

MR. TROSTEN: It's contained in-- I believe, Mr. Macbeth, it is contained in the attachment to the document dated November 12th, 1972.

In my opinion the identification of it, to the extent there is an identification, is contained in Item IX on page 4 of the attachment under the heading "Matters in Controversy."

MR. BRIGGS: Which item on which page was that?

MR. TROSTEN: Item Number IX under the heading "Matters in Controversy," Mr. Briggs, in the attachment to the November 12th, 1972 letter. There is a document called "Intervenors' Statement of Contentions and Matters in Controversy Concerning Environmental Issues," and then on page 3 there is a heading, "Matters in Controversy." On page 4 there is a Roman numeral IX which reads as follows:

"ConEdison has not carried its burden of proof in attempting to show that its proposed

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research program will allow identification and prevention of any significant adverse effects on the striped bass and other fish and biota of the Hudson."

MR. MACBETH: I think that is perfectly specific, Mr. Chairman.

MR. TROSTEN: Mr. Chairman, this --

MR. MACBETH: We've been back and forth across this ground for some time. It has always been difficult for me to understand exactly what the Applicant's research program has had to do with the licensing terms it's asking for. It's a point I emphasized again and again.

I don't think that this testimony is even relevant to the license terms the Applicant is asking for, and I think that contention is perfectly specific to the questions I'm asking the witness.

MR. TROSTEN: Mr. Chairman, I'm afraid I must disagree that that statement is sufficiently specific. The Intervenors have been given an opportunity on a number of occasions to specify the areas in which the Applicant's research program is inadequate. And when I say "a number of opportunities," I mean a number of opportunities not only in an informal context but in a formal context.

We have no specification of contentions in the sense of identification of areas in which the research

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program is inadequate and indeed, Mr. Macbeth has stated very forthrightly the reason why we don't have such a statement. It is because they don't think you can form one, or that it is impossible, or that you don't need it.

But in any event, they have not specified the areas why the research program is inadequate, and I maintain that until they do specify those matters in which the research program is inadequate, they should not be permitted to cross-examine or adduce evidence in this proceeding in this respect.

CHAIRMAN JENSCH: Do you care to speak further to that?

MR. MACBETH: There is certainly no question that the Hudson River Fishermen's Association and the Environmental Defense Fund do not think that the research effort is necessary. There is a sufficient base of evidence. The whole series of lengthy contentions which were presented by the Applicant made that perfectly clear.

We also agree generally that the formulation of the issue as put by the Applicant's Counsel that the research effort cannot be properly formulated and will not properly prove or disprove the significant effects of the plant, I think that is spelled out in the ninth contention on page 4:

"Applicant has not carried its burden of proof in attempting to show that its research

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program will allow identification and prevention of any significant adverse effects on striped bass and other fish and biota of the Hudson River."

I further have argued continuously in this proceeding, and I press the point again, that I don't think this research program is relevant to the license terms ConEdison has asked for, a 40-year full-term license without conditions.

The Applicant, after being pressed on this point a number of times, has never said he wants conditions in the license which would require this research program. And I stand firm on the ground that I think all this evidence is irrelevant. I think it should not have been admitted into this proceeding, as I said in Croton last week. I think it should be struck now.

MR. TROSTEN: Needless to say, Mr.Chairman, lest my silence with regard to Mr.Macbeth's last remark be considered assent, I regard the evidence concerning the research program as entirely relevant and the motion to strike as unfounded.

MR. MACBETH: Mr.Chairman, I think if the specificity of Contention 9 were compared with the specificity of the matters in controversy that ConEdison advanced against the Staff's position, it would quickly generate the game of getting things down to specific, reasonably specific detail, and is as likely to start striking allthe Applicant's contentions as anything else.

I don't think this is a fruitful line of inquiry.

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MR. TROSTEN: Mr. Chairman, I submit that the Hudson River Fishermen's Association should take this opportunity to specify,if not this instant, then very promptly, in what respects the Applicant's research program is inadequate. Then we would have something on which this hearing could proceed.

CHAIRMAN JENSCH: Could we have a reference to where your statement is on what your research program is?

MR. TROSTEN: Yes.

The statement of what the research program is, is contained in very general terms in Appendix G, which has been offered in evidence under Mr. Woodbury's sponsorship.

It is also contained in the Applicant's Environmental Report in various sections, which I could provide if I had a moment or two. I believe we have copies of the Environmental Report.

(Document handed to the Board.)

Do you wish to view the portions of the Applicant's Environmental Report, Mr. Chairman? Of course the substance of the research program has been discussed this morning in response to the Board's question, in testimony by Dr. McFadden.

Do you wish to see the portions of the Environmental Report, Mr. Chairman? Not the Final Environmental Statement, but the Environmental Report? The Applicant's Environmental Report?

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CHAIRMAN JENSCH: Yes.

May we see that please.

MR. TROSTEN: Mr. Chairman, I would identify this generally, and I would want to check this with the record later, as being discussed on pages 2.3.6-1 through 2.3-6-15 of the Applicant's Environmental Report. I forget what the exhibit number is.

MR. MACBETH: Three.

MR. TROSTEN: No, I think it is Exhibit A,but I will doublecheck.

CHAIRMAN JENSCH: I think we incorporated it into the transcript, did we not?

MR. TROSTEN: This is an exhibit, Mr. CHairman. This is the Applicant's Environmental Report, and Mr. Macbeth has kindly let me borrow his copy. We will have a copy brought over here very shortly.

(Handing document to the Board.

These are the portions where the research program is discussed. In addition, as I mentioned, a summary of it is contained in Appendix G of the Applicant's Comments on the Draft Environmental STatement, which has been offered in evidence in this proceeding, and incorporated in the transcript. That is a ~~supplement~~ a portion of the Final Environmental Statement on page 286, I believe, Mr. Chairman.

CHAIRMAN JENSCH: We have been in sort of an

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informal discussion for the past few minutes.

The present pending question, as my notes indicate is, what is the postulate you are seeking to disprove?

I understood the witness to indicate that that was the way he approached it.

But aside from the precise question as pending, we are now getting into the research program. The Board is very much interested in the research program. It apparently forms the basis of a substantial position by the Applicant with reference to recommendations made by the Regulatory Staff.

The Board does have questions in that regard and will have questions of the Regulatory Staff at a later time. But the particular question and the subject matter of the research program, appear to be relevant to the Board, but in a broader sense, the Board does intend to comply with the regulation of the Commission with reference to specificity of contentions and that problem of determining the sufficiency of specificity is a persistent one in many proceedings. And it is difficult to know just where there is adequate specificity and where there is not.

The specificity that is in the portion of the Intervenor's statement of contentions appears to be that the research program will not allow identification and prevention of significant adverse effects on striped bass and other

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fish and biota of the Hudson. And I take it that the specific contention of the Hudson River Fishermen's Association is in reference to identification and prevention of significant adverse effects.

In the opinion of the Board in this new era and area of environmental investigation, it may be that the specificity is adequate for environmental concerns and it cannot be guided too much by the kind of guidelines on specificity for radiological safety considerations.

On that basis, the Board concludes that the Hudson River Fishermen's Association has sufficiently identified the areas of specific contention not only in that particular part, but it is a part of the context of their various contentions about the damage which they allege, at least, will occur to the Hudson River ecology by the operation of this plant.

Paragraph 9 to which Applicant's counsel referred in the Intervenor's statement, is part of the context of the allegation that they damage, and in the composite of considerations the Board believes that the specificity on the research program is adequately set forth as the Identification and Prevention of any Significant Effects on the Striped Bass and Other Fish and Biota in the Hudson River.

The objection is overruled and the pending question may be answered.

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MR. TROSTEN: Mr. Chairman, before the witness answers will the Board not, however, adopt the same procedure required of the Applicant, that is to require the Intervenors to specify so that the Applicant can have a better understanding of the Intervenors' position those aspects of the research program which are inadequate so that at least via the mechanism of the Board order, we can obtain from the Intervenors that which we have been seeking from them.

CHAIRMAN JENSCH: Are you able to indicate in any further particularity, your contentions, aside from the relevance, the argument you mentioned? We have that noted but in dealing with specificity, are there any particulars you can supply at this time with reference to the research program?

Dr. McFadden has mentioned that trawling activity is somewhat inherently inefficient.

I infer from some of your questions, you feel that that is one area that might be beefed up a bit. I don't know, but are there any others of that kind?

MR. MACBETH: I think that a list could be put together varying from problems of efficiency of gear to estimated population abundances, problems imposed by the fact that other power plants begin operating at the same stretch of the river during the course of the study, which would make an analysis of the data more difficult, there being

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very little in the way of baseline from which the effects of this single plant could be measured.

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I think to do that fully, I should consult with my technical advisor and produce a complete list. I do not think it is necessary under the terms of the Commission's Regulations. This is, to some extent, a broad position, but I think quite pointedly we have narrowed it down to the research program, and we do not think that the research program will produce -- well, I'm not quite sure what it is designed to produce, until I hear the answer to the pending question.

I've always had a little trouble working this research program into --

CHAIRMAN JENSCH: Well, go ahead with your questions and see if you can talk with your consultant as soon as you can. We want to accommodate Dr. McFadden's schedule. He has an early airplane departure, I understand.

The pending question, the objection to which has been considered and the objection is overruled, as I recall it is: What is the postulate you are seeking to disprove?

MR. MACBETH: Hypothesis, I believe, sir.

CHAIRMAN JENSCH: Hypothesis.

WITNESS MC FADDEN: The overall hypothesis is a fairly obvious one. It's the null hypothesis which we seek to disprove is there's no effect by the plant.

The alternative hypothesis which is accepted ~~is~~ up the null hypothesis of no effect is rejected on the basis of

the data is that the plant is causing some decline in the fisheries, some damage to the ecosystem in those terms.

Following that hypothesis testing step there is a second important step that we might label parameter estimation. That is, if the alternative hypothesis that the plant is damaging the fish population is accepted, then we make an attempt to estimate the magnitude of the damage. That is not what is referred to as testing the parameter. That is not part of hypothesis testing this parameter estimation, but is an integral part of the study.

Practically speaking, a very broad overall hypothesis such as the one I have stated is likely to be untestable, and operationally we structure a series of much more specific hypotheses such as applying this general hypothesis of no plant effect, or the alternative of a plant effect, to things like survival rates at various life history stages, the absolute abundance of fish, the growth rate of fish, the relative abundance of fish, the age at which the fish reach sexual maturity, the abundance of fish food organisms, et cetera, et cetera.

So that is the operational level at which the hypothesis testing and the parameter estimating is carried on.

BY MR. MAC BETH:

Q Could we go down that list and take each one of those particular aspects and put them into terms of the

hypothesis?

Perhaps the Reporter could read back the list slowly, and we could take notes and then work down them one at a time.

(Whereupon, the Reporter read from the record, as requested.)

BY MR. MAC BETH:

Q I think the first one was the survival rates of fish at various life stages. Could you formulate the hypothesis which you will be attempting to disprove?

A (Dr. McFadden) It might simplify matters if I make it clear that I ~~think all~~ think for of these effects listed, the same hypothesis is tested: No plant effect, and the alternative, plant effect. And if there is a plant effect, measure its magnitude.

Q Perhaps if you stated the first one in whatever formal terms a hypothesis is generally stated in it would help.

A We would hypothesize that survival from egg deposition to advanced juveniles is not changed by the operation of the power plant. That would be a null hypothesis. And there are a variety of data sources which can be utilized to test that hypothesis.

Q Do you think you could just state the other side in proper hypothetical terms, just so we have it for the

record?

A Yes. And I hope that the "et cetera, et cetera" appended to the end of the list made it clear to you that that was not an exhaustive list.

Q Oh, yes. Absolutely.

A We would hypothesize that there will be no decrease in absolute numbers of fish as a result of the plant effect.

And the alternative is that there will be a decrease.

In the case of growth rate, it would be a little bit different. Here we would hypothesize no change in growth rate. The alternative we would look for would be an increase in growth rate, because that's the response that would be consistent with a substantial reduction in the population.

In relative abundance, we would hypothesize we had no change in relative abundance. These are statistics which are available from previously existing trawl data, so we have the longest pre-plant operation base here and we simply hypothesize that there is no change in these relative abundance indices upon operation of the plant.

There are other variations of that hypothesis that can be worked out by testing the hypothesis about changes in relative abundance in different areas of the river near the

plant and farther away from the plant.

So we have both temporal sort of treatment control and then spatial treatment control kinds of contrasts.

The hypothesis about age of sexual maturation would be no change with the alternative of sexual maturation being attained at a younger age, which would be the population response consistent with a substantial decline in population size.

We also are investigating plume effects on behavior and physiology of the fish, both lethal and chronic types of effects.

We hypothesize no change in the abundance of, say benthic organisms, in the area affected by the plume and outside the area affected by the plume. And a similar hypothesis would apply to before plant operation and after plant operation.

That's the general structure along which the inquiry is pursued.

Q And I take it that while, of course, there are more hypotheses these are the major ones?

A Yes. I think that fairly represents the major ones.

Q And the data, of course, is being collected for the purpose of testing these hypotheses? You are not just engaged in general data collection, are you?

A No. We state the hypotheses, describe the specific set of data which is required to provide what we would construe to be an adequate test, and we then proceed to collect those data and those data only. The general rule of thumb is don't collect any data unless you have set up a hypothesis that you are going to test.

So it is not a random hodge-podge type of data collection operation which almost inevitably would produce the wrong kind of data to answer the particular hypothesis that has been posed.

Q Is this a change from past procedure around the plant?

A Past procedures at Indian Point?

Q Yes.

A It's a much more rigorous structuring of the study; both the breadth and the intensity of the study are expanded very substantially. We take pains to continue certain lines of data collection which were begun, say back during the era of the Raytheon Study, the indices of various organisms, for example, because that provides us with valuable pre-plant, post-plant comparisons.

Q Concerning the pre-plant/post-plant comparison, wouldn't it be helpful to have a group of baseline data in all these various fields before the plant goes in operation?

A Yes.

Q And do you feel you have that baseline data in all these fields?

A Not a scientifically ideal baseline, but in these kinds of management questions you normally don't. That is, the typical situation where you are attempting to define a rational basis for management of the fishery is one in which the fishery is already in operation, and you have to collect what pre-existing data are available and develop a program for accumulating the really relevant data as you move through the prosecution of the fishery.

So it's almost unheard of to be able to operate in an ideal way in these kinds of situations.

Q Is this a pretty good set of baseline data, about as good as you get, generally, in a fishery situation?

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A Better than some situations, poorer than others. It is not a typical. I would be almost overwhelmed if I encountered a situation in which there was a good pre-existing data base.

Q Will it be possible when you have collected the data and the plant is operating and there are other plants operating on the river that have similar effects, will it be possible to distinguish the effect of Indian Point from, say, a fossil fuel plant a mile or two away?

A All the plants which have been operational before Indian Point #2 goes on line have their effects included in

background or baseline.

Q What about the ones that kind of go on simultaneously? You know, here we are in the winter of '72 and you will be collecting data in the spring of '73 starting into that year of spawn and so on.

Now, what if Indian Point was going on line that spring and there were, say, two or three other units going on line also, and that would be their first summer of operation?

MR. TROSTEN: I object to the question, Mr. Chairman, on the ground that it asks for information concerning other plants, other ~~than~~ than Indian Point 1 and 2 plants, plants that are not in operation at the present time, bringing up the matter pending before the Board in the Hudson River Fishermen's Association motion that evidence be adduced in this proceeding having to do ~~with~~ with Bowline and Roseton plants. This obviously is a line of inquiry that Mr. MacBeth is about to pursue. Accordingly, I object to the question on the grounds that the answer called for is ~~relevant~~ irrelevant to the matters at issue before this Board for the reasons set forth in all the papers filed with that motion.

MR. MACBETH: It's true I'm thinking about Bowline and Roseton; there's no question about that. But I think this is somewhat different from the general motion that I put before the Board, which is that those plants should be

considered as part of the environment in weighing the entire impact. This really concerned the research program, and our general contention whether the research program can be effective. And I really think here that we have to take clearly a look at what else is going on in the river. If they cannot make a distinction between Bowline and Roseton we are reaching the point of utter absurdity, in which we blind ourselves to the fact that Bowline and Roseton are about to start operating, and we go ahead and say go and do a research program, which the company knows full well cannot have any effect at all, because you cannot distinguish Indian Point 2 from Indian Point 1, or Bowline or Roseton -- and I suppose Storm King, if Storm King ever gets built.

Really, I find this -- well, as the Board is well aware, my clients find the whole research effort a little fantastic at times. But this would, I think, reach the point of utter fantasy to think that one could go out in the river and, you know, collect data about this plant and just ignore the fact that there are two other plants of enormous size, one five miles downstream on the other side of the river, another 22 miles upstream on the other side of the river, starting in virtually the same time.

I think that Consolidated Edison Company is aware that those plants are there, and that they're going to start operating. I realize there is always slippage in getting the

plants going.

CHAIRMAN JENSCH: The Board in its consideration concludes that it appears that the research program would have to identify in some way the effect of Indian Point number 2 plant.

The objection is overruled.

MR. MACBETH: Could the Reporter read the pending question?

(Whereupon, the Reporter read from the record, as requested.)

MR. TROSTEN: Mr. Chairman, would the record note that the Applicant counsel's objection is continuing, objection to questions by Mr. MacBeth relating to plants that are coming on line after Indian Point 2, so that I can avoid burdening the record with a series of objections? Would that be satisfactory to the Chairman?

CHAIRMAN JENSCH: We note your position, but we are apprehensive about a continuing objection to a long series of questions as to whether the objection applies to each question. We would therefore prefer a specific objection to each question. We would not regard it as intrusive.

Do you have the question before you?

WITNESS MC FADDEN: Yes, sir.

CHAIRMAN JENSCH: Would you answer it?

WITNESS MC FADDEN: Yes. My answer is yes.

BY MR. MACBETH:

Q How would you make that distinction?

A In two ways. Similar studies dealing with impingement and entrainment effects are being implemented or have been implemented at Bowline and Roseton, and the existing plants operating in the estuary.

The second part of my answer is that in a number of very important study areas we -- let me cite an example. In asking the question of the effect of impingement upon fish populations, we marked fish at successively more distant zones from the water intake at Indian Point with differential marks, and can then identify the proportion of marks which appear on impinged fish. So that we can follow the gradient of impact as you move away from the Indian Point plant, and those same marked fish could be identified when ~~collecting~~ collected upon the ~~the pond~~ intake screens of other plants.

That's an example of the kind of approaches that we use to take cognizance of the very problem that you cite in this respect.

Q Thank you.

This time I would really like to pick up a dropped stitch from a day or two ago with Dr. Lauer.

Mr. Woodbury, if the pump storage project in Cornwall is constructed will it be owned and operated by the Consolidated Edison Company?

MR. TROSTEN: Objection, Mr. Chairman.

CHAIRMAN JENSCH: I don't understand the relevance.

MR. MACBETH: We went back, you remember, to the question of knowledge in the technical community as to problems of entrainment and withdrawal, and we have been discussing the report by Carlson and McCann in connection with the proposed pump storage project. And Dr. Lauer pointed out that in his opinion there had not been knowledge -- or concern I think was actually the word -- concern in the technical community about entrainment or withdrawal. And I was pointing out that there had been some concern in connection with this pump storage project at Cornwall, and that it did involve striped bass in the Hudson River.

And I am seeking to establish that that was a plant in which the company had some interest.

CHAIRMAN JENSCH: I think your explanation is better than your question.

The objection is sustained.

MR. MACBETH: Could I ask for the grounds on which the objection was made and sustained?

CHAIRMAN JENSCH: I think what you really are thinking is: Are there any data with reference to the effect on striped bass, and I don't think it makes any difference who owns the Cornwall plant or whether they have sold it, mortgaged it, or leased it. But you are interested

in are there any data, or were there any data, about the effect -- the possible effect on striped bass, are you not?

MR. MACBETH: I'm also trying to show knowledge of the concern about this problem, and that this company in fact had knowledge of that concern.

CHAIRMAN JENSCH: Why don't you try that question?

end 12

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BY MR. MACBETH:

Q Did the Consolidated Edison Company have knowledge and concern in 1965 about the possibilities of withdrawal of non-screenable sizes of striped bass from the Hudson River into the pumped storage project?

A (Mr. Woodbury) I was not with Consolidated Edison Company in 1965, but from my understanding of their concern as expressed in the goals set forth in the report of the Northeast biologists in the Cornwall study, it is clear that the company was concerned on the totality of the effect of the Cornwall project, whatever it might be, and undertook to finance a study that was directed not by Consolidated Edison but by the Hudson River Policy Committee to move in whatever direction that Policy Committee felt was appropriate.

Q Part of that total concern involved withdrawal of non-screenable sizes of organisms from the Hudson Estuary, particularly striped bass?

A It did, yes.

Q Thank you.

MR. MACBETH: That concludes my cross-examination of the research project, Mr. Chairman.

CHAIRMAN JENSCH: I believe we will take a few minutes recess at this time. Let's recess to reconvene in this room at 11:40.

(Recess.)

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CHAIRMAN JENSCH: Please come to order.

Does the Staff have interrogation of these witnesses?

MR. KARMAN: No, Mr. Chairman.

CHAIRMAN JENSCH: Is there any redirect?

MR. TROSTEN: No redirect at this time.

CHAIRMAN JENSCH: Very well.

You are temporarily excused.

(Witnesses temporarily excused.)

Is Mr. Newman the next witness?

MR. TROSTEN: Mr. Newman is the next witness.

CHAIRMAN JENSCH: He has not been sworn?

MR. TROSTEN: He has not yet been sworn, Mr. Chairman.

I might add, if it would be possible for us to respond to the Board's questions concerning the schedule of the plant before the luncheon break, we would appreciate that.

CHAIRMAN JENSCH: Do you want to do that now?

MR. TROSTEN: Is that all right with you?

MR. MACBETH: Surely.

MR. TROSTEN: This will be fine.

CHAIRMAN JENSCH: That is Mr. CAhill?

MR. TROSTEN: Yes, Mr. Cahill.

CHAIRMAN JENSCH: If you will please.

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Whereupon,

WILLIAM CAHILL

resumed the stand as a witness on behalf of the Applicant, and having been previously duly sworn, was further examined and testified as follows:

FURTHER DIRECT TESTIMONY

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WITNESS CAHILL: Well the question is, what is the current plant schedule?

As you know, the fuel, the first core for Indian Point Two has been returned to the Westinghouse fuel fabrication plant for rework to avoid the problems that were associated with the so-called ~~Ginnay~~ Ginna fuel.

This fuel is being refabricated to have pressurized clad tubes and the uranium-oxide fuel ~~material~~ material for Region 2 and 3 is being fabricated to higher density thereby avoiding potential clad collapse and also avoiding peaking problems associated with densified lower-density fuel.

This is the controlling factor in plant schedule and our schedule for the fuel rework is that the fuel -- that work will be completed and the fuel, all of the fuel will be delivered back to the plant in February and loaded in February. Then we will repeat the process of pre-critical testing and anticipate that in early April, say the first week in April, that the plant would be ready to go critical. And thereafter we are following essentially the same schedule that we have

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indicated before.

We would hope to go through the testing program to 50 percent, including 50 percent power, and be ready to go to higher powers about the beginning of June.

This is our anticipated schedule. We believe that it is realistic and I don't have to say, of course, that there may be contingencies, ~~and~~ and in these contingencies as in the case of the fuel rework on our own initiative we would delay the plant again if we felt that that was called for.

But we see nothing now that would prevent us meeting the schedule I have outlined.

CHAIRMAN JENSCH: About the first of June you will be ready to go above 50 percent?

WITNESS CAHILL: Above 50 percent, sir.

CHAIRMAN JENSCH: One reason I was asking, and the Board was interested in this situation, if the Board were to accept the kind invitation of the Applicant to view some of the discharge and intake facilities, would such facilities be operable in February by virtue of the Indian Point number one plant, at least.

WITNESS CAHILL: Indian Point One is scheduled for an outage for refueling, although their intake facilities for both Indian Point One and Two run without plant are operable. And I believe that could be arranged.

I would have to check with the operating people as

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to some specific day and time,but yes, this could be done.

CHAIRMAN JENSCH: Well, what is the scheduled outage?

WITNESS CAHILL: Indian Point One is scheduled for outage at the end of this month. It is a refueling outage, including in addition to that, some extensive maintenance and overhaul work.

So it is a long outage. I don't know exactly --

CHAIRMAN JENSCH: Well as long as Indian Point One is operating, it would be pulling water through and we could see the effect on the screens and so forth.

If the Board is to view this with any operation underway, it would have to be done this month, is that the expected schedule?

WITNESS CAHILL: The flow of water -- we can run the circulating pumps and the screens, and you can see the water flowing. The water would not be heated by the plant.

CHAIRMAN JENSCH: I see.

MR. BRIGGS: Could you tell us a little bit more about what was done on the piping that caused problems?

WITNESS CAHILL: Yes, sir.

This fall, I don't remember just what the specific date was, but one of the several hydrostatic tests that are imposed on the plant prior to going into operation, uncovered leaks in three-quarter inch socket ~~welding~~ welding vent piping connected to

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I believe it was the safety injection system.

Now this type of piping, socket-weld three-quarter inch small piping, the standard procedure for determining whether it is sound piping involves visual examination, dye ~~puncture, checking~~ and hydrostatic tests. The hydrostatic test is the final proof test.

Some of this piping -- some of these welds had leaked before on previous hydros and leaking again, we decided to investigate further and found some defective welding and in a few cases, pipe that was thinner-walled material than was specified.

We, therefore decided that we would take the time to investigate this whole area of piping, which was small, two inches and smaller, field-fabricated socket-weld piping, to assure that there was no other thin-walled pipe or defective welds, or incorrect situations not in accordance with the particular design.

And this program has been in process. We have done an extensive reexamination of the piping in this area, that is still continuing, but is, we believe, well within the envelope of the fuel rework so we do not see that as a controlling item.

end 13

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MR.BRIGGS: Are you continuing to use socket-weld fittings?

WITNESS CAHILL: Yes, sir.

A socket-weld fitting is a perfectly proper piping application for this type of work. It is widely used. In fact, it is the way to connect small piping,and it is a matter of correcting the defects which we have searched out. But there is no reason to decide against socket welds.

MR. BRIGGS: You indicated the kind of inspection it was used. These welds are not normally radiographed because of the technical weld you use, is that right?

WITNESS CAHILL: That is right.

The industry practice and the code calls for visual examination, dye penetrant, and hydro. Since the weld is a fillet-type weld the radiograph would not provide a definitive standard of acceptance, although we have used -- as an exploratory tool to find thin-walled nipples and to search out defects, we have used radiography in this rexamination program.

MR. BRIGGS: What did you find to be the cause for the cracking in the welds that resulted in leakage?

WITNESS CAHILL: Well it was hard to determine. It was a thin-walled nipple, but that should not -- although there may have been strains there was some defective welding, not enough penetration.

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MR. BRIGGS: Was there a tendency for the cracks to originate, a root crack I will call it, where the crack goes into the socket or was it not associated with that?

WITNESS CAHILL: There were some -- I believe one leak was where the coupling is attached to the larger pipe. These were drain and vent pipes, and in some cases there was insufficient penetration and the coupling is required to have full penetration weld at a point where it joins a larger pipe. And in some cases, that was only a fillet weld.

MR. BRIGGS: And the coupling where it goes on the larger pipe, that is sort of a saddle coupling?

WITNESS CAHILL: Generally it is not a shaped saddle. It is a socket-weld coupling, but generally what they call a half ~~couple~~ coupling. A socket-weld coupling say for three-quarter inch pipe has two sockets, one on each end joining the three-quarter inch pipe. Where you connect the three-quarter inch tube, say to a four or six inch, you could use such a coupling. But generally it is what they call half coupling, it has a socket on one end and a thicker wall at the other end.

MR. BRIGGS: It is welded to the pipe at the other end?

WITNESS CAHILL: Yes.

MR. BRIGGS: And those are normally full penetration welds and in some cases they were not full penetration welds?

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WITNESS CAHILL: Yes. And it is possibly that, or possibly vibration strains because at that point the pipe forms a cantilever that led to the actual leaks.

There were only one or two leaks.

This work that we did in response to those leaks has led to the examination of hundreds of individual lines.

MR. BRIGGS: But you found other cases where --

WITNESS CAHILL: We found other cases of defects ~~and~~ but not of leaks.

MR. BRIGGS: Thank you very much.

CHAIRMAN JENSCH: Thank you very much, Mr. Cahill. We appreciate your coming down here.

(Witness excused.)

CHAIRMAN JENSCH: It is five minutes to 12. Shall we take a few minutes of examination and then recess?

Did you have something, Applicant's counsel?

MR. TROSTEN: I merely wish to have Mr. Newman sworn.

CHAIRMAN JENSCH: Mr. Newman, will you take the stand, please.

Whereupon,

CARL L. NEWMAN

was called as a witness on behalf of the Applicant, and having been first duly sworn, was examined and testified as follows:

MR. TROSTEN: I have a few qualifying questions, if you please.

CHAIRMAN JENSCH: Proceed, please.

DIRECT EXAMINATION

BY MR. TROSTEN:

Q. Mr. Newman, what are your responsibilities with the Consolidated Edison Company?

A. I am responsible for mechanical nuclear general engineering and plant siting engineering for Consolidated Edison.

Q. And you are a vice president of the company?

A. I am a vice president of Consolidated Edison Company.

Q. How long have you been associated with Consolidated Edison?

A. I joined Consolidated Edison Company in November 1970.

Q. Prior to that time, what were your professional responsibilities?

A. Prior to that time, from my graduation from school in 1948 until the time I joined Consolidated Edison I was with United Engineers and Constructors in Philadelphia, Pennsylvania. I held positions of increasing responsibility from the time of joining them. At the time I left I was chief engineer of the power division of that company.

Q. Have your responsibilities included the designed and

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construction of cooling towers?

A. Yes, they have.

Specifically, starting in 1949 I became associated with cooling tower projects. The first one I was associated with was a cooling tower serving three 90,000 standard cubic feet per minute turbo blowers at the Youngstown Works of the U.S. Steel Corporation.

In 1957, I was responsible for the design and installation of the first cooling tower application to White Water Cooling in Southern Paper Mills. This job was performed for the Bowaters Southern Paper Companies in their new mill at Calhoun, Tennessee.

And a number of chemical plant expansions of which I was the project manager, we installed cooling towers for general purpose cooling. This was at Leominster, Massachusetts, one particular plant; Illiopolis, Illinois, on several occasions I was responsible for the installation of mechanical draft cooling towers.

And at the time of my departure from the United Engineers, we had completed the design and partially gone into construction of the cooling tower at Hatfield Ferry serving unit 3, and partially serving unit 2 of that installation.

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Q Mr. Newman, I show you now a five-page document entitled "Professional Qualifications, Carl Newman, President, Consolidated Edison Company of New York."

Is that a true and complete statement of your professional qualifications?

(Handing document to the witness.)

A Yes, it is.

Q Do you desire to have this document included in the transcript of this proceeding as your testimony?

A Yes, I do.

MR. TROSTEN: Mr. Chairman, I now offer in evidence the document which I have just identified and ask that it be physically incorporated in the transcript.

CHAIRMAN JENSCH: Is there any objection?

Regulatory Staff?

MR. KARMAN: No objection.

CHAIRMAN JENSCH: Hudson River Fishermen's Association?

MR. MACBETH: No objection.

CHAIRMAN JENSCH: The request of Applicant is granted and the statement of professional qualifications of Carl Newman may be incorporated in the transcript as if read.

INSERT

(The document referred to follows:)

PROFESSIONAL QUALIFICATIONS
CARL L. NEWMAN
VICE PRESIDENT

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

My name is Carl L. Newman. My business address is 4 Irving Place, New York, New York 10003.

I majored in Liberal Arts at the University of Pennsylvania from 1939 to 1942 when I entered the United States Air Force. I returned to the University of Pennsylvania where I graduated with a Bachelor of Science degree in Mechanical Engineering in 1948 and a Master of Science degree in Mechanical Engineering in 1952. While working towards the Master of Science degree, I was employed by United Engineers and Constructors, Inc., as a designer.

In 1952 I was promoted to Power Engineer. Assignments included economic studies on optimum methods for meeting steam and power requirements and heat balance studies on steam, electric generating units in the 30,000 to 75,000 kilowatt range.

In 1953 I was promoted to Consulting Engineer. In this position, among other things, I consulted on the design and construction of the SSN 575 "Sea Wolf"

atomic-powered submarine and land base prototype.

In 1954 I was promoted to Mechanical Engineer. Between 1954 and 1958, I was responsible for the design and all mechanical work performed by United Engineers on the boiling water reactor facility (ARBOR) for the Argonne National Laboratory and for the design and erection of a 10,000 kilowatt power station and black liquor recovery unit for Bowaters Carolina Corporation, Catawla, South Carolina, among other projects. In 1959 I served on the fluid fuel task force which reviewed aqueous homogeneous, liquid metal fueled, and molten salt reactor concepts for the Reactor Development Branch of the Atomic Energy Commission.

During 1959 through 1963 as both an Assistant Supervising Engineer and Supervising Engineer, I was responsible for the coordination of mechanical, structural, and electrical design of two 150 megawatt generating units for Shawiningan Water and Power Company, Montreal, Canada; for the design of a polyvinyl chloride extrusion facility at Borden Chemical Company, North Andover, Massachusetts; for

preparing specifications and coordinating the construction of a polyvinyl chloride plant for Borden Chemical Company, Illiopolis, Illinois; and for supervising the design of a melamine plant for Brook Park, Inc., San Juan, Puerto Rico.

Between 1963 and 1968 in various capacities as Project Manager, Consulting Engineer, and Power Consultant, I studied the mine mouth generating capability of a 2000 megawatt power plant for Middle Atlantic Power Company, Philadelphia, Pennsylvania; conventional and sodium heated steam generating equipment for a fast breeder reactor for Argonne National Laboratory; and a water reactor plant for two 900 megawatt units for Joint Generation Task Force, Philadelphia, Pennsylvania. I participated in the design and construction of three units for a new generating station for Allegheny Power Company, Masontown, Pennsylvania, and preliminary design of the proposed 800 megawatt boiler water nuclear unit at Bell Station, New York State Electric and Gas Corporation. I participated in the architect-engineering assignment by Westinghouse Electric

Corporation, for the engineering and design of Indian Point Generating Station Unit Nos. 2 and 3. I participated in the architect-engineering services for a 1000 megawatt fast-breeder reactor follow-on study for the Atomic Energy Commission.

From 1968 to 1970 I was Chief Engineer of United Engineers Power Division. In this capacity, I directed preliminary engineering for proposals and for consulting assignments.

I left United Engineers in 1970 to join Consolidated Edison Company of New York as an Assistant Vice President. In this capacity I was responsible for mechanical, civil and nuclear engineering functions. I was responsible for the design of the Narrows Generating Station, the molten carbonate pilot plant to control sulfur dioxide emissions at Arthur Kill Generating Station, and I developed a nitrogen oxide control program for use in the Con Edison system. In 1971 I was promoted to my present position of Vice President responsible for the engineering functions of generating, civil, mechanical, nuclear and plant siting.

I am a licensed professional engineer in the states of Massachusetts, Nebraska, North Dakota, Pennsylvania, and Utah. I am a member of the American Nuclear Society and the American Society of Mechanical Engineers.

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MR. TROSTEN: The witness is now ready for interrogation by Mr. Macbeth.

CHAIRMAN JENSCH: Will you proceed, please?

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CROSS-EXAMINATION

BY MR. MACBETH:

Q Mr. Newman, has the Consolidated Edison Company undertaken studies of alternatives to the closed-cycle cooling systems at Indian Point 2?

A Yes, we have.

Q And have they had outside contractors undertake such studies for them as well?

A There has been an outside contractor study this before for Consolidated Edison Company.

Q Was that performed by Burns and Rowe?

A Yes, it was.

Q Mr. Newman, I show you a copy of a document entitled "Indian Point Nuclear Station, Report on Studies of Alternate Cooling Systems," from Burns and Rowe dated June 28th, 1972, and ask you whether that is the report to which you just referred?

(Handing document to the witness.)

A Yes, it is.

MR. MACBETH: Mr. Chairman, I would like to offer this document in evidence. Obviously I do not have any large number of copies. Perhaps the Applicant might be able to

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supply copies for the record. It is a lengthy document but I think it is an important one to this aspect of the case.

CHAIRMAN JENSCH: Do you have any objection?

MR. TROSTEN: Yes. I object to the offer of this document in evidence.

CHAIRMAN JENSCH: On what grounds?

MR. TROSTEN: Mr. Chairman, this document was provided to Mr. Macbeth at his request. As Mr. Newman has indicated, it is a study that was performed under contract with Consolidated Edison Company, a study of alternate cooling systems.

The company has been performing a number of studies of alternate cooling systems. There has been a lengthy study within the Consolidated Edison Company's own Mechanical Engineering Department of this subject. This document, provided to Mr. Macbeth for his information, is merely one of the bases upon which our witness and the company rests its position with regard to alternate cooling.

We are not offering this document in evidence and I object to its offer in evidence, there being no foundation for its offer in evidence.

MR. MACBETH: Mr. Trosten did just say it is one of the bases on which our witness relies and I'm offering it for that reason, as a foundation document.

If the Applicant wishes to offer any other studies,

which I have not seen and which have not been provided to me, I might object at that time but I certainly don't have any general objection to the Applicant putting in every study that the Applicant has undertaken on this topic. I think the record would be fuller and fairer and a more complete decision would be possible for the Board if all the studies that the Applicant has undertaken were in the record.

MR. TROSTEN: Mr. Chairman, I believe the record will indicate that I did not say that this is one of the bases upon which Mr. Newman relies. It forms one of the pieces of information upon -- that Mr. Newman has formed a judgment. He has a great deal of information available to him. This is one piece of information that was available to him.

All of the studies, all of the documents that are being generated by the Mechanical Engineering Department of Consolidated Edison are other pieces of information that are available to Mr. Newman. His own extensive professional experience is available to him.

There is no foundation for the offer by the Intervenor of this particular document in evidence in this proceeding. There is no sponsoring witness for it.

CHAIRMAN JENSCH: May we see the document?

(Document handed to the Board.)

MR. MACBETH: The sponsoring witness is Mr. Newman,

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who has identified it as a study --

MR. TROSTEN: Mr. Macbeth, if you desire to cross-examine Mr. Newman, he's available to be cross-examined. He is not offering the document in evidence. He is not sponsoring it. He did not undertake the study that is described in the document.

CHAIRMAN JENSCH: To what point are you directing this information? Pertinent to what aspect of the case, Mr. Macbeth?

MR.MACBETH: To the environmental effects of closed-cycle cooling systems, to the costs of-- Excuse me, I should say alternative cooling systems. The environmental effects of alternative cooling systems, the costs of alternative cooling systems, and the time that would be needed to construct such a system, and also to indicate the range of information and professional analysis available to the Applicant in reaching its decision on alternate systems.

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CHAIRMAN JENSCH: Let me inquire of Applicant's Counsel, while there is not a witness here from Burns & Rowe, this does represent the results of the work that was contracted for; is that correct?

MR. TROSTEN: Yes, sir.

CHAIRMAN JENSCH: And you believe that Burns & Rowe constitute a reliable engineering organization?

MR. TROSTEN: I would say they are, yes, sir.

CHAIRMAN JENSCH: And does this study encompass all of the areas to which the contract with Burns & Rowe, the contents is directed?

MR. TROSTEN: I don't know the answer to that, sir. It may or may not be.

CHAIRMAN JENSCH: Well, let me ask Mr. Newman. Was there anything left out when Burns & Rowe submitted this report?

MR. NEWMAN: I was not responsible for this contract. I really cannot answer that question.

CHAIRMAN JENSCH: You never read the contract?

MR. NEWMAN: No, sir.

The study was not sponsored by my department. It was a piece of information that was requested by another department, really for their education in the field rather than as a piece of work directed toward the design and construction of cooling towers.

CHAIRMAN JENSCH: Well, as I recall some of the contentions in this proceeding, especially following the recommendation by the Regulatory Staff, while the Regulatory Staff, as I understand it, limited their position to alternative cooling systems, there has been some -- well, let me say basis indicated that perhaps the inference should be that the only feasible alternative cooling system would be a cooling tower.

Does this study, can you tell us, does this cover cooling towers and cooling ponds?

MR. TROSTEN: Mr. Chairman, this is a study which is rather similar to the study that is contained in the benefit-cost analysis, the supplement 3 that was referred to earlier. It discusses in a very general way the various alternate cooling systems, and in a general way the cost associated with these alternate cooling systems. In a similarly general way, the environmental effects of these cooling systems.

So it is in the same general vein. It covers the same general areas, I would say, as portions of the benefit-cost analysis that was submitted to the Atomic Energy Commission.

As a matter of fact, it was --

CHAIRMAN JENSCH: Was it identified in your Supplement number 3?

MR. TROSTEN: No, I don't think it was ever identified. Mr. MacBeth may have some indication that it was.

But in any event, it was a contributing document that helped in the formulation of Supplement 3.

CHAIRMAN JENSCH: A kind of a worksheet for Supplement number 3?

MR. TROSTEN: It was one of the documents that was used in working up Supplement number 3, yes.

CHAIRMAN JENSCH: The Board believes it would be better for the Board to spend a little time with this document before making a ruling, and if there is no objection, the Board will retain the document over the noon hour and scan it and get some idea of its scope.

If it is a working paper type of transaction for Supplement number 3, we may give it a little different consideration than the objection heretofore has indicated.

MR. TROSTEN: I think it would be fair to characterize it, Mr. Chairman, as a working paper for Supplement number 3.

CHAIRMAN JENSCH: I think that adds considerable focus to the situation.

At this time, in order to give some review to this, we will take a few minutes earlier recess, but follow the usual schedule.

At this time let us recess, to reconvene in this room at 2:15.

(Whereupon, at 12:10 p.m., the hearing was recessed, to reconvene at 2:15 p.m., this same day.)

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A F T E R N O O N S E S S I O N

(2:15 p.m.)

CHAIRMAN JENSCH: Please come to order.

The Board has been giving consideration to the last question, and the objection made thereto, and in particular the pertinence of the so-called Burns & Roe Indian Point Nuclear Station report on studies of alternate cooling systems.

In the review that has been undertaken by the Board over the noon hour, of course the Board has not had an opportunity to fully review all parts of this report, but some parts of the report appear to be somewhat irrelevant to what is actually at issue between the Hudson River Fishermen's Association and the Applicant.

There are other parts, however, of the report that appear to be pertinent to the Board, and in view of the broad scope of this report, the Board would prefer to defer ruling on this until the Hudson River Fishermen's Association and the Applicant can stipulate on what they believe would be true relevance from this report for consideration, rather than have consideration be directed to the receipt or the rejection of the entire report.

Now, just offhand, the Board believes some of these studies that have been undertaken in reference to alternate cooling systems, without so much of this historical

background, the fact that there will be a plume, for instance, from a cooling tower system, I think that almost would be a premise in your consideration, if you ever did arrive at the cooling tower considerations.

So that is one example of some of the -- I don't say triviality -- but irrelevancy to the issues here. And the Board suggests that the Hudson River Fishermen's Association and the Applicant endeavor to develop a summary of this that they could propose reflecting the pertinent provisions for the contentions of each, and the Staff likewise may desire to participate in that endeavor toward a summary, or they may desire to review whatever the Hudson River Fishermen's Association and the Applicants can develop.

But it does appear from this report that certain analyses, calculations and studies and other considerations have been undertaken, and they may well be pertinent not only to the question of that which the Hudson River Fishermen's counsel asserted before the recess, but also in reference to the entire recommendations that have been made by the Staff.

The Board is anxious to have all of the data that can be made available to it. As a working paper, of course, a foundation document, in one sense it would be admissible entirely, since it has been identified as a working paper, if to analyze the basis of the conclusions asserted.

But there is too much in this document, it seems

to me, for what the parties are talking about. If they can not arrive at a summary by the next session, we will give consideration to a further review.

But I will return this document to the Hudson River Fishermen's Association counsel at this time.

The question I think was supplemented by an offer of this document as an exhibit. The offer consideration will be deferred.

Can you restate a question in view of these comments by the Board, and we will defer ruling on the question as well in view of the possible re-statement of the problem.

MR. TROSTEN: Before Mr. MacBeth restates his question, Mr. Chairman, I should note just for the record that this particular document which is dated June, 1972, June 28, 1972, was actually put together after the date of the benefit-cost analysis, which was submitted to the AEC under date of, I believe, February 15, or in any event, in February, 1972.

What it represents is a compilation of the work that the Burns & Roe Company had performed for Consolidated Edison Company, which work, among other things, underlay and was considered by the Company in preparing the benefit-cost analysis for submission to the Atomic Energy Commission.

I do want to offer that clarification in light of

my interchange with you this morning.

We will endeavor to work with the Hudson River Fishermen's Association on this matter, as the Board requested. Perhaps Mr. MacBeth could clarify for us which portions of the document he desires to offer in evidence, for what purpose, and then maybe we would be able to sharpen the inquiry as to whether or not the document is indeed admissible.

CHAIRMAN JENSCH: We would prefer that if you are able to develop a summary that the summary be submitted for consideration for receipt, rather than the entire document, because it seems to me there is too much of the document that is not pertinent to the issues here.

Will you proceed, please?

MR. MACBETH: Mr. Chairman, would it be proper for me in the course of the interrogation this afternoon to ask Mr. Newman whether he was aware of certain information contained in this report? I don't want to go beyond the scope of what the Board has in mind.

On the other hand, I would at sometime like to ask him questions of that nature, and I would be happy to defer those questions until such time as I have had a chance to work out a stipulation with the Applicant.

I do have some other questions, but at some point I would like to come back and ascertain whether Mr. Newman

has considered some of the information in the document.

CHAIRMAN JENSCH: Just as we indicated to the Applicant this morning about a continuing objection, we don't like to have a continuing approval of a question we haven't heard. So if you will propound the questions, and we will see what the objections are, and we will consider it on that basis.

I think this, for the accommodation of Mr. Newman, however, that we can bear in mind that the Board does believe that many parts of the data shown are relevant in this inquiry, as to the studies of the alternative systems and the cost and benefit and so forth.

And it may obviate the necessity of Mr. Newman returning if we keep that in mind, and try to permit interrogation.

MR. TROSTEN: Mr. Chairman, I am perfectly happy to proceed on that basis. I have to make one point clear. I don't want to state a continuing objection, but we have had some discussion in the past, in this proceeding, about the effect of permitting cross-examination to proceed using a particular document. I would just like to make it completely clear that if we are proceeding on this basis, if I do not object to a question which Mr. MacBeth is asking, which is based upon that document, that does not mean that I am waiving any objection to the admission of the document into

evidence.

CHAIRMAN JENSCH: That may be so understood.

MR. BRIGGS: The questions that you will be asking that come from that document will involve information that is different from that in the Supplement 3 of the environmental report?

MR. MACBETH: There may be certain differences. I was interested in this document particularly because it does represent one analysis of the situation as late as June 28, 1972, which makes it comparatively recent. And it is obviously more exhaustive in some ways than the documents in the cost-benefit analysis.

So that it seemed to me to be a useful document from which to work.

Whereupon,

CARL L. NEWMAN

resumed the stand as a witness on behalf of the Applicant, and, having been previously duly sworn, was examined and testified further as follows:

CROSS-EXAMINATION (Resumed)

BY MR. MACBETH:

Q Mr. Newman, I show you a page marked Exhibit 15, sheet 1 of 6, of the Burns and Roe document and draw your attention to a column headed "1" marked "NDCT Closed."

Does that column reflect the conclusions of the

authors of this document as to the cost and benefits of a natural draft cooling tower which would operate on a closed system?

A It appears to, yes.

Q Does that indicate that in the opinion of the authors of the document the noise impact of such a tower would be it would raise the noise level due to slashing?

A The authors so state.

Q Would you consider such an environmental impact to be a minor one or a major one? How would you typify it?

A I think I don't really have sufficient information on the site at Indian Point, and we are proposing to do studies to learn what the actual impact will be.

Q Perhaps I could simplify this line of questioning if I read to you the whole series of conclusions that were reached in this report on environmental effects.

Would your answer in each case be that you didn't know what the effects were because --

A Not in each case, no.

Q Then let me work down a little bit.

The authors of this report contend that the effect of such a cooling tower on recreation would be nil.

A They so contend.

Q Is it your opinion that there would be no effect from such a cooling tower on recreation?

A That is not my opinion. There would be some effect on recreation.

Q What would the effect be?

A The area where the cooling towers would go is a wooded area. We had hoped at one time to put hiking trails and a recreational area in this wooded area. The cooling towers would require the leveling of this area so that facility would be impaired.

There is also a possibility that from time to time there may be fogging which would impair boating on the river, and private seaplane activity.

We intend to study these effects to determine just what the magnitude of impairment would be.

Q Turn for a moment to Figures 1 and 2 in your testimony of October 30.

A Yes.

Q -- which are maps of the Indian Point site showing the location of towers.

Now, in Figure 1 am I correct that the towers would be placed downstream of the plant itself and that pipes would lead the water around the plant and down to the towers and back to the river?

This is, again, a natural draft closed cycle cooling tower.

A Yes, that is true.

Q And in Figure 2 the tower is placed directly upstream of the plant and there is, again, a natural draft closed cycle system, with only one tower; is that correct?

A That is correct.

Q Is it correct that it is the second figure, the single tower plan directly to the north of the plants, that would involve the clearing of the wooded area and so on?

A That is correct.

Q So that you said, I think, that the tower would go to the north, or would involve the clearing of this wooded area. Do I take it from that that the decision has been made that this is the better scheme for cooling towers?

A Of the two schemes that are in my testimony we have concluded this is the least costly scheme.

Q Is it also the preferred scheme for the Company?

A At this time, yes.

Q Let me just inquire for a moment about the comparative scale on these two figures. It is true that the second figure is a much greater scale, isn't it, and in fact, the tower represented on that figure is not greater in size than one of the two towers represented on Figure 1? There is just a little confusion in my mind when I see this large cycle.

A Well, there are scales included on the figures.

Q I had scaled them off, that's why I asked you.

A And I have the exact dimensions of this in my notes,

I believe. One is 420 foot in diameter and the other ~~3445~~ 345 foot in diameter. There is considerable difference in the height of course, and that is not evident on the figures. But the 2-tower scheme is 370 feet high overall, and the 1-tower scheme is 450 feet high overall.

Q May I assume through the rest of the questioning on the environmental effects of natural draft closed cycle tower that you will refer to the second newer scheme, the single higher tower near the river in the answers? That will obviously represent a change from the cost-benefit analysis of February, since those were 2-tower schemes and it would just be useful to know you are going to refer to the 1-tower scheme.

A You may assume that subject to the condition that we are looking at the technical feasibility of obtaining a 1-tower system that will do the entire job. There have been no towers of this size built to date. We have every hope that the technology available at the time the tower is built will allow us to build such a tower.

But we are continuing to consider the 2-tower scheme in the event that it becomes necessary to use two towers, should, indeed, towers be proven to be necessary.

Q Perhaps ince we are talking about a different scheme than reported in Burns & Roe, maybe I should put questions to you directly about the 1-tower scheme and get

information on that.

Do you anticipate that there would be any adverse effect on natural history from the 1-tower scheme?

A There are several historical spots closeby which may see the effects of the plume. There is the Stony Point Battlefield, and also the Palisades Interstate Park. Part of our investigation is on the persistence of the plume in the local climatology, and we would be investigating the persistence of plumes in and over these historical monuments.

Q In discussing the effects of the plume from the tower, would there be any fogging effect at ground level from a 1-tower scheme?

A You must realize that these particular towers would be located in a hilly terrain. While we don't expect the plume to come down to river level or ground level at the elevations that the towers are located, there is a distinct possibility that the plume could impinge upon the local hills.

These are areas, again, that our studies contemplate.

Q Would that be more likely with the 1-tower scheme than with the 2-tower scheme?

A No, it would be less likely with the 1-tower scheme.

Q Now, I believe in the cost-benefit analysis, included in Supplement 3, it was stated there would be zero

hours of fogging at ground level. I had taken that to mean ground level, whatever level the ground was at.

Are you suggesting that there is in fact an error in the cost-benefit analysis, in that with the 2-tower scheme there would have been some fogging at the ground?

A I am suggesting there is a refinement to our thinking when we consider the actual terrain involved.

Q How about icing on some object on the ground? Would you expect icing with the 1-tower scheme?

A Not in the immediate vicinity of the tower, but if indeed the plume does impinge on the surrounding terrain, then I would believe there would be icing.

Q Any large amount of icing?

A I'm not sufficiently knowledgeable at this stage to know.

Q How about fogging, would you expect a large amount of fogging?

A I have to answer the same way. They are concurrent phenomena, really.

Q Yes.

I just wanted that clear.

How about salt deposition from a 1-tower scheme. Would you expect any damage from salt deposition from a 1-tower scheme?

A I would not expect damage from salt deposition. I

would expect some salt deposition. There has been a fair amount written in the literature about salt deposition, but not necessarily in the type of ~~fauna~~ flora that is indigenous to the surrounding hills, a deciduous tree area, and what the effect of salt deposition will be in the deciduous tree area.

So that is something I don't think is in the literature yet.

Q You would expect no worse salt deposition from the single tower scheme than from the 2-tower scheme described in the cost-benefit analysis?

A I would expect less from the single-tower.

Q Let me turn for a moment to the cost of the towers.

Earlier this morning during one of the breaks you showed me a document you have which indicated the breakdown of the cost of the towers. Could you show that to me again?

A I believe these are the documents you are referring to.

(Handing documents to Mr. MacBeth)

This is the single tower or 1-tower scheme.

Q Could I recite some of these figures that appear here for the record?

These are the capital cost estimates for a closed cycle 1-tower natural draft closed cycle wet cooling tower.

In millions of dollars the cost of excavation and foundation would be 8.75 --

A I am going to introduce this sheet on this; this is the sheet you should be reading from.

Excavation is $9 million . These total numbers are the same, but the breakdown is slightly modified.

Q All right.

You are now working from a new sheet. You expect in millions of dollars the cost of excavation to be 9, the cost of modifying the intake structure to be .75, the cost of the booster pump house 1.47, the cost of the cooling elements installed and the foundation, 10.

And there are three categories of piping, the first, condenser pump house, .20; the second, the pump house cooling elements, 4.75; third, the blowdown line, .07.

Then the electrical cost would be 3.25.

Producing a total base cost of 31.27.

And then adding the indirect costs, which consist of contingency, escalation, engineering, interest during construction and administrative and overhead, a total is arrived at of 68.91.

Is that correct?

A That is correct. That is our current estimate.

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Q. Now the figures that have been produced from time to time have shown a certain variation in range. I would like to sort of pin down the elements that make the change.

As I remember the cost figures for the two-tower natural draft closed cycle system, as part of the base cost, the largest single cost was for this piping that took the water from the river around behind the plant and down, more or less behind the Indian Point Three and led it back to the river.

Is that correct?

A. That is correct.

Q. So by simply moving the tower from down there around behind the plant near the river, next to the plant, you have reduced the piping costs on the order of something over $15 million, have you not?

That is part of the base cost?

A. Yes, we reduce the piping from something in excess of $25 million down to about $5 1/4 million.

Q. This would seem to be one piece of research that was really worth undertaking.

A. I might add that this advantage was known to us at the time we did the two-tower study. It was a corporate decision to sacrifice the trees.

At one time we had this reserve and when it became apparent what the cost was, we engaged in the study of the one

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tower. We knew these costs would come down. We knew the piping, of course, was an expensive portion of it.

Q. I just wanted to go over for a moment the change from the base cost to the total cost.

That includes a multiplication of the base cost figure, does it not, for what are termed escalation and contingencies?

A. Yes, it does, among other things.

Q. Among other things.

But there is a factor by which you multiply for escalation and contingencies.

What does escalation involve?

A. Escalation involves a fact of life that I think we are all familiar with. It is a rising cost of living type of thing, and we find the cost of doing business in every area of our endeavor is increasing annually.

Q. Basically, inflation.

A. So if you talk in terms of 1972 dollars, as our direct cpsts, realizing we are going to build the cooling tower possibly sometime in the future, we haveto convert the 1972 dollars to dollars that will flow through our corporate sometime in the future and therefore, we multiply by an experience factor which, in our judgment, is what the increase in this cost is going to be as the years go by.

Q. It is --

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A. Our basis is 7 percent per annum compounded simply. And it is very much in line with industry predictions.

I could also possibly have a dozen predictions that we have obtained from prominent architect engineering firms in the country, all of which are in the 6 to 7 percent range.

Q. I really wanted to identify it more than anything else.

Is it basically inflation that is involved?

A. Well, it is inflation, decreasing productivity on the American scene, it involves many factors.

Q. Is the 7 percent figure an annual increase?

A. Yes, it is annual.

Q. Does that mean that every year you wait to build the towers, the price goes up by 7 percent over the base cost?

A. Essentially that is what it means.

Q. So if you started the construction of these towers immediately, say the first of January, 1973, and build them at a fast rate, the cost would be less than the total of, what is it, $68 million we just went over?

A. Yes, it would.

Q. And if you finished construction of the towers in 2 1/2 years, say, how much would that reduce the cost of the towers?

A. This is a hypothetical question?

Q. Yes, a hypothetical question, but just to get a

mm4 little information and a sort of fix on the situation.

A. That would involve a calculation I would have to make.

You said completion in 2 1/2 years, and this is based on 5 years, so it is a 3-year change. That would drop us back about 10 1/2 percent on our escalation factor under the hypothesis you pose.

Q. Thank you.

What would happen if you finished in three years?

A. That would be, that would roughly drop us about somewhere around 3 1/2 percent.

Q. Now, in the cost-benefit analysis, supplement 3 to the Environmental Report, you did indicate, did you not, that construction time for a natural draft closed cycle system would be 3 years?

A. I believe that is correct.

Q. And is there any reason why the construction of a single-tower scheme should take longer than a double-tower scheme?

A. No reason.

Q. And is it not true it is also the opinion of the authors of the report from Burns & Roe that the construction time would be 3 years?

A. As I recall that report, yes.

Q. Just a moment, I put the page in front of you so

mm5

you can be sure about it.

A. As I recall the report, we didn't have any construction times indicated in there. It is a matter of what you define as construction.

Q. Well, let me show you what they define as construction.

I show you Exhibit 9 of the Burns & Roe Report, Sheet 1 of 3, construction schedules for natural draft cooling tower. I draw your attention to the line marked "Natural Draft Cooling Towers," and this seems to be the longest line -- well, strike that.

What is the total number of months --

A. They show 36 months.

The point I was making was, do they include engineering and design? This chart indicates they did. That was a consideration.

Q. They do include the following factors, do they not: Engineering and design, out for bid, award, construction, and delivery.

A. That is correct.

Q. All of that is included in the three-year period, is it not?

A. Yes, it is.

Q. Thank you.

Was that also what was meant in the Environmental

mm6

Report Supplement by construction time, three years?

A. Essentially, yes.

Q. Now, another element that is included in the total cost of the cooling towers is lost generation time, is it not?

A. Yes.

Q. Excuse me, both lost generation time and in the long range, loss of generating capacity.

MR. TROSTEN: May I ask Mr. Macbeth to clarify that. You said included in the total cost. Which total cost do you mean?

MR. MACBETH: The total cost of either the two-tower scheme or the one-tower scheme.

MR. TROSTEN: As presented in Mr. Newman's testimony?

MR. MACBETH: Yes.

THE WITNESS: That is not the $68 million we are talking about, however.

BY MR. MACBETH:

Q. Yes. That is in addition to -- well, perhaps I could make this clearer if I just point out that I am now looking at Table C, and there what we have just discussed as total cost is described as additional capital expenditure.

So what we were discussing is your estimate of the total additional capital expenditure. That is what we were referring to as total cost to this point, is that correct?

mm7

A. The $68 million we have been discussing is indicated as additional capital expenditure.

Q. That would be the total additional capital expenditure obviously?

A. Yes.

Q. In addition to that there are certain costs which involve loss of generating capacity by the addition of the cooling tower, is that correct?

A. A loss in capability of the station that accrues from the addition of the cooling towers, that comes from the additional auxiliary power that is required to power the auxiliaries associated with the circulating water system, and it also comes from a certain derating of the plants, due to the higher temperatures of the inlet circulating water to the condensers, which causes a poorer performance of the energy conversion system.

Q. And in figuring out that loss of generating capacity, is it correct that you included annually a period of eight weeks for scheduled maintenance of the plants?

A. Yes, it is.

Q. And is that a realistic estimate?

It is the company's plan that Indian Point Two will be shut down for roughly eight weeks a year for scheduled maintenance?

A. Yes, it is.

mm8

When you say scheduled maintenance, that includes refueling?

Q. Oh, yes, yes. Getting the crud out of the reactor and allof these other things that we discussed earlier.

Let me return for a moment to the contingencies elements in the total capital cost.

What do contingencies involve?

A. To answer your question, I have to explain how we estimate it. We estimate the cost of known factors. We do take-offs of materials from drawings, from sketches, from engineer's calculations.

And by applying unit factors to these quantities, we arrive at a total dollars.

Now we obviously do not have a completed design at this time, or at any time when we make an estimate. Therefore, contingency covers those items and those amounts of money that we know historically we are going to spend on a project, that is defined in the statement like this is defined, but which we cannot allocate to a take-off of material.

These contingency factors have been gathered through about 30 years of historic ~~records~~ records. This particular estimate that we made for this plant falls into what we call category 2 facility, which is one that is relatively unique, one we haven't done before, and on which we don't have a real experience in and also, it is a preliminary plan type of

mm9

estimate and we carry 20 percent contingency under these conditions.

This is independent of whether it is cooling towers or any other type of facility that comes in as a type 2 facility in the preliminary planning stage.

Q So these are really costs that might or might not be there, but historical experience leads you to believe they probably will be?

A. No, as I said, historically we know we are going to spend this money. We just cannot put it into a specific account. So we carry it as a contingency item.

But our historic experience is that we do spend this money and it is indeed a cost of doing business.

Q Let me return for a moment to the estimates of construction time.

If you put people on overtime, worked at this construction as hard as possible, it is true you would undoubtedly increase the cost. But is it also true you would probably reduce the construction time?

A. No, it is not.

When you talk about overtime, overtime in the Westchester area we have found to be counterproductive.

I see you smiling. This is indeed a fact of life. We found, for example, that two-shifting a job which one would expect to gain productivity on, in many cases has shown

mm10

a negative productivity for the second shift. This is brought about by the fact that there just is not sufficient labor in the Westchester area, in view of all of the activity on both our side of the river and across the river. And what you find on second shifts, are people who really don't know their trade,they are dredged up by the unions. In many cases they want to seem to be doing something and it might be even negative in the impact.

We find after this goes on for a while, the day shift, rightly or wrongly, get the impression that they are the ones doing all of the work, so they start to slack off, and we find that two-shifting, for example, gives us a negative productivity.

We find that we do get some gain going beyond normal workweek on a one-shift basis. We are currently working five days at nine hours per shift at the Indian Point. We are doing this primarily to attract labor, to get people there. We find that we get very little productivity for the extra five hours a week. We don't find that there is very much incentive, other than the ability to man a job, in going beyond the 48-hour week.

Q In the Environmental Report Supplement, it lists off the various environmental costs of a natural draft closed cycle cooling tower scheme and as I remember it, it indicates that there would be adverse environmental effects

mm11

of serious magnitude only in the aesthetic intrusion into the landscape, which is described as subjective judgment, and a minor impact from noise.

Have any further reports or studies been made by the company that would indicate that those judgments were inaccurate, or that they are different for a one-tower scheme than for a two-tower scheme?

A. We are preparing to contract for such studies at this time. The effort is in the inquiry stage, bids are due shortly, and we will be commencing our studies in the near future.

Q. But apart from the famous Burns & Roe documents, there is no other formal study?

A. No, sir, none that I am aware of.

Q. This looks like it is going to be one of those runs around the merry-go-round, then. Are you aware of any other officer of the company who might be aware of such a report?

A. No, I am not.

Q. All right.

MR. TROSTEN: May I confer briefly with the witness, sir?

CHAIRMAN JENSCH: Yes you may.

MR. TROSTEN: Thank you, Mr. Chairman.

MR. MACBETH: I believe I have no further questions

mm12

for the witness, Mr. Chairman.

I would like to reserve the right to just ask one or two after the conclusion of the Staff's corss-examination, should something turn up. But I know of no other lengthy examination.

CHAIRMAN JENSCH: As usual we don't give any blanket endorsements to procedures. You can make the request at a later time, if you desire.

Do you have some questions?

MR. KARMAN: Mr. Chairman, Mr. Lyle, my colleague, will conduct the cross-examination.

CHAIRMAN JENSCH: Proceed.

BY MR. LYLE:

Q. Mr. Newman, I would like to turn to the Burns & Roe study also for a minute, and ask you precisely what the purpose of that study was?

Was it commissioned?

A. I believe I answered that earlier today. When the study was first established, that it was primarily an educational type of document, that was prepared for another department of the company, to the best of my knowledge that is why it was procured.

It was not procured by the engineering department.

I haven't discussed the motivation behind the procurement of it with the responsible people.

mn13

Q. So you don't know why the company wanted that particular information?

A. No, other than apparently the people who were then preparing the Environmental -- I guess it is called Appendix 3, whatever it is called, desired some backup or working paper for their preparation of it.

Q. But you have no indication that the company was trying to find, for instance, what the best of a series of alternatives on a closed cycle cooling system would be?

A. No.

Q. Do you know -- I take it you do, but could you tell me what the conclusions of the Burns & Roe studies are with regard to the closed cycle cooling alternatives?

A. As I recall, it concluded the best alternative was a natural draft closed cycle cooling system.

Q. I would like to turn to page 4 of your testimony where you list four specific factors and one more generalized factor which will constitute some of the principle questions in the program of environmental evaluation which you propose to conduct.

Those specifically are meteorology, salt deposition, acoustical emissions, blowdown, and the more generalized is consideration of the impact on land, air and the community.

You state that the program will include these subjects. Are these the principle subjects of the inquiry?

mm14

A. Yes, they are.

Q. Now, considering together the reports which you have, that is the cost benefit analysis, supplement 3 to the Environmental REport, the Burns & Roe study, and any other information which you have, is each of these subjects discussed by at least one of these reports?

A. Could I have the question repeated?

(Whereupon, the reporter read from the record as requested.)

THE WITNESS: I believe these are, yes.

BY MR. LYLE:

Q. Does not the Burns & Roe report, on page VII-5 and II-6, is there not an indication there that the ground level effects of the closed cycle natural draft cooling system would be negligible for most of the area surrounding the plant, for all of the nearby residential areas, river, railroad, rivers, roads and so forth, insofar as that system is a natural draft closed cycle system?

A. This report so states.

Q. On page II-7 with regard to salt deposition, is there a statement that salt deposition should not be a problem for either mechanical or natural draft cooling towers?

A. That statement appears.

Q. Now, with regard to supplement 3 -- I recognize that that may have been prepared in different circumstances

mm15

than the Burns & Roe report -- it does talk about noise levels. Is there not a statement there on page III-108, that the noise levels for a closed cycle cooling system will be relatively low?

A. I don't have that document available.

CHAIRMAN JENSCH: If you state what is in the report, he may not have to look it up. Rather than have him look it up, you can state what it is, and he can check it later.

Is that agreeable to move it along?

We will do that. Anything else you find in the document, if you want to read it to him, we will accept your statement it is there.

Proceed, please.

end #2

BY MR. LYLE:

Q I realize that the one-tower system was not discussed in the Burns and Roe Report and possibly not in the other information which you have at hand, so I will confine this to a two-tower operation.

Could you tell me whether these reports which you have in hand, whether they are insufficiently reliable for the purpose of making a general evaluation of closed-cycle systems at Indian Point and selecting the best system as opposed to the best design of that particular system for use at Indian Point?

MR. TROSTEN: May I have that question read, please?

(Whereupon, the Reporter read from the record as requested.)

MR. TROSTEN: Mr. Chairman, I object to the question. In the first place, it is not clear which reports are being referred to. I think that the question is excessively vague.

MR. LYLE: Mr. Chairman, I have indicated previously, I think, that I am referring to the Burns and Roe report, the cost-benefit analysis in Supplement 3 and also any other reports which I don't know but perhaps Mr. Newman had available to him.

And as to the question of vagueness, I think what

eb2

I'm asking essentially is why these reports do not constitute a sufficient basis for making a selection among a series of alternatives, as opposed to gaining more information on one particular alternative.

MR. TROSTEN: Is the Chair going to rule on the question?

CHAIRMAN JENSCH: We would like to hear you if you have anything further.

MR. TROSTEN: My only observation had to do with the appropriateness of the witness, Mr. Chairman. I think we had better hear the Chair's ruling first before I address that.

CHAIRMAN JENSCH: The appropriateness of the witness in what respect?

MR. TROSTEN: With regard to which witness should answer the question. We may wish to confer about that.

CHAIRMAN JENSCH: Well, I think that is a very valid consideration before a ruling is made. If you have a suggestion of another witness that would be more appropriate, I think you should so indicate.

MR. TROSTEN: May we confer?

CHAIRMAN JENSCH: Surely.

MR. TROSTEN: Can you re-read the question, please?

(Whereupon, the Reporter read from the record as requested.)

MR. TROSTEN: Thank you, Mr. Chairman.

Is the Chair waiting for us?

CHAIRMAN JENSCH: Yes. Are you suggesting the gentleman does not have the proper foundation?

MR. TROSTEN: No, I think the witness has the proper foundation. I think with the clarification that Mr. Lyle made, I think it is sufficiently clear.

CHAIRMAN JENSCH: Very well.

The witness may answer.

WITNESS NEWMAN: We think that these reports, plus the investigations that we have made, do form a basis for our decision and if you will refer to page 2 of my testimony, in the fourth from the bottom line, we do indicate that our investigations have indeed narrowed it down to one alternate cooling method which is suitable as an alternate consideration for Indian Point, namely the closed-cycle cooling tower.

BY MR. LYLE:

Q So you are satisfied at this point that you can pick out one among the various alternatives as the best system to use if a closed cycle system should be needed?

A We are satisfied that that is the only one that is suitable to the Indian Point site. There remains a question of course as to whether any alternate cooling system is needed and we haven't made a decision on that as you well know.

Q With regard to the five factors which you mention

eb4

on page 4, what further information -- those five I previously alluded to -- with regard to the five factors, what further information in your opinion is absolutely essential to have as opposed to simply providing further refinements of an already substantial amount of data?

A We need psychometric data. The meteorological effort that has been undertaken at the site to date has not included wet bulb temperature information, it has only gone to an altitude of 350 feet initially, and continuing information at 150 feet.

The meteorological data we intend to obtain will include a 400-foot tower effort, plus balloon work which has not been done before. We are talking in terms of plume penetration possibly to 800 feet from a natural draft cooling tower and our meteorological data does not encompass information that allows us to predict plume behavior at these elevations.

On salt deposition, again we have in the literature numerous predictions of what salt drift will be from the tour. This then has to be fed into the dispersion models for this particular terrain area, with our climatology and meteorology. And that is the work we intend to do.

We are not going to use other than available data in the prediction of salt production, but the effect of dispersion still has to be done.

eb5

In acoustical emissions, we really have to make some assumptions as to the design of the tower and look at the resonant conditions of these designs on a coupled situation, with the foundation conditions that will exist at the tower site. Blowdown is one that is extremely nebulous in our minds, as to what the effect of blowdown will be.

We have no doubt that there are no deleterious effects from blowdown but gathering the information to prove it to the regulatory agencies is the real nature of our efforts. I am sure that you will agree that no regulatory agency is going to take my word that we have no effect. We must investigate what sort of treatments are available for blowdown.

I don't think this question has been faced by anyone yet for a saline water cooling tower, or not effectively faced. The solution that is proposed usually is just discharge possibly with dilution. Well, we have indications from the State that they are going to consider this question very carefully before they pass on it. And we are going to have to have sufficient data to convince them that this is indeed a fine solution.

In our cost estimates, the $68 million, there is no allowance for any capital cost of blowdown other than the pipe that discharges it. Should indeed a blowdown treatment system be involved, we are talking about multi-million dollars

eb6

above the estimate we now have.

Considerations of impact on land, air, and the community, of course we have alluded to the visual impact. This will be a dominant feature of the Village of Buchanan. It will be quite visible.

I jotted down this morning a list of the types of agencies that we think we will be encountering with the data we have to gather. Just off the top --

MR. MACBETH: Mr. Chairman, may I interject?

Is this going to be a legal opinion from the witness as to what permits are necessary from what agencies?

CHAIRMAN JENSCH: I think what is he indicating are cost-benefit, and I think he is enumerating some of the factors. Whether he includes them all or not, I'm sure it wouldn't be binding on the Applicant. But I think within the scope of what he has stated he has understanding, I think he can properly refer to what he envisions as cost.

Proceed.

WITNESS NEWMAN: I envision we will have contact with the FAA, EPA, AEC; the Coast Guard will be involved, if we indeed have fogging on the river. We have the State Department of Environmental Conservation; the Public Service Commission will very likely enter into this.

We must get permission from the Hudson River Valley Commission, local Westchester agencies, the Village

eb7

of Buchanan, and the National Register of Historic Places. So that is the type of people we are going to have to have information for and we envision quite a data-gathering effort.

BY MR. LYLE:

Q Mr. Newman, do you know, with regard to the meteorology, whether the Burns and Roe study took into account the site of the plant, thatis that it was located in a hilly area, with hills on both sides?

A I had no discussions with the Burns and Roe personnel concerning what was behind the statements, other than as they appear in the report.

Q If there is no such consideration, you have no knowledge of why there was not?

A Again I repeat, I had no conversations with them as to their motivations in writing the report.

Q Also with regard to meteorology, in your opinion is it likely that meteorological conditions surrounding any natural draft wet tower constructed at Indian Point would change substantially as a result of the operation of the tower itself?

A That would be just a matter of my opinion. It is my opinion that the effects would be observable. I can't conjecture as to the order of magnitude of these effects. But certainly there will be a thermal occurrence developing from a tower.

eb8

I know generally the order of magnitude of the energy we are putting into this thermal draft, and it is of the order of magnitude of natural phenomena. Therefore, one would expect that under coincident conditions of high humidity and possibly inversions, that one would experience fallout from the plume in the form of a mild rain or snow.

These are the types of things we have to go into further detail on in our studies and for which we would hire people who are far more professional in the area of meteorology than I am.

Q Well, the consideration of the operation of the tower itself and possible changes it might have on the atmospheric conditions surrounding the tower would be one limiting factor, would it not, in the use of any data collected prior to construction of the tower in predicting what those conditions would be?

A I'm not sure I understand the question.

(Whereupon, the Reporter read from the record as requested.)

WITNESS NEWMAN: What confuses me is the use of the word "limiting." I don't know what you mean by that.

But certainly in using the data we would consider the interaction of the tower with the climatology as we observed it, and predict what the performance of the tower will be and what the effect of the tower will be on the local

eb9

meteorology.

I'm not sure that answers your question. That is as I understand the question.

BY MR. LYLE:

Q What I meant by the word "limiting" is making less useful any data which you would accumulate and analyze before construction of the tower because conditions would be different after the construction and during the operation of the tower.

A I think not. It is my opinion that the interaction of the tower with the local phenomena is predictable, once we know what the local phenomena is before installing the tower.

Q You think you can predict, then, what the meteorological conditions will be at that height, before the tower is constructed, taking into account the operation?

A I said I think I can predict-- Knowing before what the climate is, we can predict what the climate will be after the tower. When I say "we," I mean our consultants.

Q On the question of salt deposition, if there is concern about the environmental impact of salt deposition, has Consolidated Edison considered the importation of fresh water from a point on the Hudson River north of Indian Point for use in conjunction with one or more wet natural draft towers?

eb10

A We made a study in early 1971 in connection with another project where we seriously looked into the ability to import fresh water and it is technically feasible.

Q And you have not pursued it further?

A We have not arrived at a decision point where such a pursuit would be necessary. We have this study done in quite sufficient detail to convince us it is technically possible and should the need arise for such importation, -- at very high cost I might add -- fresh water could be made available for a tower makeup.

Q Couldyou tell me the technique you considered for the importation of the water?

A Yes, we considered two techniques. In both cases the source of the water was above the salt line, which took us about 40 miles north of the plant.

We considered the obvious pipeline solution which involved 40 miles of, as I recall, about 36-inch diameter pipe, pump house, relay stations for boosting pressure.

And as an alternate, a lower-capital, higher-operating-cost program, with many operating disadvantages, we considered barging importation, multiple barges plying the river.

We found that these two solutions were virtually a standoff over the life of the plant, the pipeline being a higher-initial-capital, low-operating cost solution. In

both cases, as I recall, and this was in terms of 1971 dollars, the estimated cost of the fresh water makeup added approximately $60 million to the cost of a plant of comparable size which we were studying at that time, and very close to this site.

Q Since you determined that, and subsequent to the receipt of information from Burns and Roe and also any other information you got which went into Supplement 3, you have not done a cost-benefit analysis of such importation and its incorporation into a particular closed single system as opposed to other alternative systems which would not use the importation?

A No, we have not.

Q With regard to acoustical emissions, do you know the nature of tests which ConEdison would run during this one-and-a-half year period to gauge acoustical emissions?

A I believe our program at present is we have a technical proposal from a selected consultant who is conducting this sort of study for other utilities, and would establish on scope our program for us.

I don't believe that we have arrived at the point where we know precisely what these studies will be. I will check that for you in a moment.

I have nothing specific on the acoustical program. That still has to be developed.

b12

Q Could you give me a rough estimate of the amount of time that you feel it would take to gain reliable information regarding the acoustical emissions at Indian Point 2, to analyze it and arrive at conclusions?

A That is very difficult to conjecture in the absence of a program. In my testimony I did indicate in Table A that we were allowing 12 months for the total environmental study package, from Feburary 1, 1973, to February 1, 1974.

This particular schedule that is presented indicates that with very expeditious handling of the program, including allowing time for those studies which we feel are vital to obtain data, if the decision were made to go to cooling towers, to install and operate cooling towers, that this program would carry us until September, 1980, which is about as soon as we could get towers in and operating under the program that we envision as being absolutely necessary and it involves our committing right now -- We have our staff working on it -- a considerable engineering effort, despite the fact that there is no decision to go to cooling towers.

Now this schedule does not include any time required for the river water studies. The river studies that are being performed under Mr. Woodbury, I guess. When we factor in the logic of those studies, the five-year river study, it adds about one year to this program and results

eb13

in an end date for the cooling tower program of September 1, 1981.

Q Could you explain in general terms or more specifically if you can why it would take that length of time?

MR. TROSTEN: Mr. Newman-- Excuse me.

I either object or simply ask for clarification, Mr. Lyle, if I may. When you say -- which time? Are you referring to the studies of the river or the studies of the cooling towers, the environmental effects of the alternate cooling system or are you asking for both?

If you are asking for an explanation of the time necessary for the completion of the studies of the river, I ask that you direct that question to Mr. Woodbury. If you are asking for the other information concerning the time for studies of the environmental impact of the alternate cooling system, you are properly directing it to Mr. Newman.

MR. LYLE: No, it is the second one. Let me rephrase that and say:

BY MR. LYLE:

Q Would you explain why it would take the time you postulate for whatever studies of acoustical emissions you plan to perform at Indian Point 2?

A I don't think I indicated any time for the acoustical studies. I said, as I recall, that to conduct the environmental studies we have allowed one year. The acoustical

eb14

studies will take less than one year.

The critical activity is the meteorological studies for which we would like to have one year's data. This is the absolute minimum that we can conceive as being representative of the climate at Indian Point. It is not statistically a very large sample, to have just one year's data, because we have no assurance the year 1973 will be an average year, maximum year or minimum year, or anything, but we feel that we at least have to have the four seasons' data in hand.

So the thing that conditions our environmental studies is the 12-month period for the meteorological effort.

We have allowed in our program only three months for evaluation of this data after receipt of the final data in Feburary 1974. We then believe that this data has to be submitted and evaluated by Fed, State, and other agencies. Our experience to date has led us to feel that will take approximately 15 months.

Q Could you explain to me --

CHAIRMAN JENSCH: Had you finished your answer?

WITNESS NEWMAN: Yes, sir.

CHAIRMAN JENSCH: Proceed.

BY MR. LYLE:

Q Could you explain to me, with regard to the acoustical studies only, why they will take the length of time that you postulate?

eb15

A I haven't postulated any time for acoustical studies. What I have said is the acoustical studies can be accomplished within a time period that is controlled or, to use scheduling terms, the critical path does not go through acoustical studies, it goes through environmental studies.

We have a parallel activity of acoustical studies that is within the time, has float, if you are familiar with that term. There is float in the acoustical path. The critical path goes through the conducting of the environmental studies, particularly the meteorological studies.

Q I would ask you to turn to page 1 of your testimony. I would simply like to get something clear which is troubling me at this point.

You state in Paragraph 2 that the schedule recommended by the Regulatory Staff in its Final Environmental Statement on Indian Point 2 fails to allow adequate time for the completion of necessary environmental studies and evaluations.

A Yes, sir.

Q Could you elaborate on the question of necessary for what? That is, is it necessary for the selection of an alternative, necessary for the selection of a design, final design perhaps?

A Well, as I have indicated the selection of an alternative, namely the consideration of a closed single

eb16

cooling tower, is accomplished. We believe that if the necessity were shown today, that an eight-year program is required to obtain sufficient environmental data,to do the design, procure equipments, procure approvals,construct, alter the existing facility -- that is a very detailed effort that is required in the altering of the existing facility -- and placing in operation an alternate cooling system.

My Table A in the testimony indicates the sequence of steps and the time duration, the activities and their durations that are required if the decision were made right now to go to closed single cooling.

It does not include any time for gathering of data that indicates that closed single cooling is indeed the preferred method of cooling at Indian Point. That is the schedule that Mr. Woodbury has prepared which shows indeed if we are to make a logical decision based on information being gathered in the river water studies, the river studies, that then instead of taking eight years, that is a nine-year program.

But just the minimum environmental studies, procurements, et cetera, as I enumerated previously, will take eight years.

Q And the last general subject I would like to ask you about is on page 7 of your testimony, more particularly with regard to the sentence:

eb17

"Consolidated Edison estimates that governmental review and approval and preparation of a detailed design could take approximately two to two and a half years to complete."

A Yes.

Q I would like to qualify the questions I am going to ask hereafter so they pertain only to the review conducted by the Atomic Energy Commission.

Do you conceive that the review by the Atomic Energy Commission could be one of the significant factors in requiring two to two and a half years to complete your submission?

A I would have to ask legal counsel for an opinion as to the jurisdication of the Atomic Energy Commission in this matter.

If I may confer with my counsel?

MR. TROSTEN: May we confer?

CHAIRMAN JENSCH: With whom?

MR. TROSTEN: With the witness?

CHAIRMAN JENSCH: Proceed.

End 3

WITNESS NEWMAN: If the AEC does indeed have jurisdiction at the time this review comes up --

BY MR. LYLE:

Q I can't hear you.

A I said if indeed the Atomic Energy Commission does have jurisdiction in this area at the time the review is conducted, I believe it is the opinion of the Staff that this would be three to six months of review, and that in my opinion is a major factor in the review procedure.

Q Do you have any indication or is it your belief that the review would take longer than that period of time?

A Based on the type of review that you conducted, I have to conclude that it is a reasonable time for review, what one would experience.

Q Leaving aside governmental approval at this point, and taking up design and construction practices, I would like to refer to the chart in your testimony, the schedule in Table A, Indian Point 2 cooling tower. And I would like you to consider also in the section on government approvals and detailed design, beginning on page 7, carrying to page 8, that a final design, including specifications for components, layouts, excavation design, pourings, site investigations, erection specifications and foundation design for even a natural draft system must await final governmental approval.

Now in Table A you show the evaluation by federal

and state regulatory agencies as Step No. 7. And you show release for bids and selection fo the contractor as steps 9 and 10.

Now is it normally the practice that final design, the final design is specified before a contractor is selected?

A Yes, sir. That is the normal practice.

Q For cooling towers?

A It is normal practice for virtually everything where we can accomplish that. We are in a labor area that requires us to engage in a segregated contract type of construction, and under the decisions of the Public Service Commission of the State of New York we have been required, wherever possible, to take competitive bids.

Therefore, our lead engineering time is considerably longer than one would encounter in the type of construction that is known as force account, where the construction management is retained, the construction management, whether it is in-house or an outside contractor then retains the field labor, acts as a laborer-broker, where you are essentially doing cost-plus type of work.

If we do not have a complete construction package, detailed designs in our labor area, showing the last detail of construction, including the bending of a rod, location of conduits, et cetera, our contractors will charge us extra

for any changes that appear subsequent to their bidding the job and obtaining the award. And therefore we have indicated that although we say 2 to 2-1/2 years for design, we would be letting the structural packages during construction, but we indicate a nine-month lead time for the first package, which allows us to get the first contractor into the field, so that the 2-1/2 years is not lead time, that is total execution, but part of those tasks are going on in parallel with the first construction.

Does that answer your question or do you want me to elaborate further?

Q No, that is all right.

Q Then it is not really a final design, is it, then, that you are referring to? So far as you are going to be having designing and construction going on, overlapping.

A Final design of each package is performed prior to release for bid. What I mean by bid package is we have an excavation contractor, possibly a clearing contractor, as distinct from the excavation contractor, a legal contractor, a piping contract, a contract for the supply and erection of the cooling elements, a general mechanical contractor, what we call a rigging contractor for erection of the mechanical equipment. There will probably be a separate civil works contractor for erection of the booster pump house and usually these contracts are broken up by the dominant craft

that executes the work.

We do all of our work with what are called the building trades, boilermakers, steam fitters, et cetera. These are the AFL-CIO members. We try to keep these, retain them in single packages, because of the economy of construction. We find if we package several crafts in one contract, we usually have a subcontract executed by our contractor, with duplicate profits and so on.

So our construction packages are usually left as a dominant trade type of package.

Q Is there some leeway left within the final design, general design which you are referring to for these packages, for modifications as construction goes on, all of the way up to virtually the completion of the tower?

A I would think that the position of the tower is one of the major impacts on cost, as was brought out earlier, because of the high cost of piping. We are talking about pipes in this case that are some 12 feet in diameter. We have recently purchased this type of pipe for another installation and the cost of the pipe itself, this is just delivered to the site on a truck, is $400 a foot. Thispipe then has to be installed in rock. This requires an excavation of some 15 feet depth, to allow a cover over the pipe.

By the time this pipe is installed in the ground, its value has increased to something over $1300 per

foot. We are talking in terms of runs of six of these per foot, so you have six times $1300 for every foot.

So these costs mount up very rapidly. The optimization studies we are engaged in play off the location of the tower versus the excavation costs to bring the site down to a level area of approximately 10 acres, where this tower can be sited.

Our present location which is 200 feet from the Class A structures, which we may have to move farther for seismic considerations, envisions approximately 300,000 yards of excavation. I know that there has been some question as to the magnitude of our estimates, but let me point out we have $9 million of excavation alone associated with our site.

This is not a hypothetical study, this is a real site, on the side of a hill. We have some contours that are as high as 90 feet above the terrain that must be brought down to an elevation of 10 feet.

So the location of this tower is a very vital parameter and probably one we would set before we would let any bids out.

Our excavation contract, next to the erection of the piping and the cooling elements, is probably the highest cost element in our cost package. And certainly something we would want to fix. We could be off by a factor of 2 in a

$9 million excavation contract or off by a similar factor, possibly more, in a $5-3/4 million piping contract.

Q One other question related to design.

Are you looking at the possibility that the cost of a closed cycle cooling system would be lower if the condenser flow were reduced and what steps would be needed to achieve that condition?

A Our one tour concept did lower the condenser flow. On the two-~~tower~~ tour situation, we have retained the 840,000 gallons per minute. Our evaluation of costs included the fact that we lowered the flow rate to 590,000 gallons in the single tower.

Now this has penalties of course in that our condensers exist and they were designed for a certain velocity through the tubes. The heat transfer coefficient in the tubes vary as the square root of the velocity. And therefore we have a loss of heat transfer capability for the square footage that we have installed. That is one aspect of the penalty.

Also in reducing the gallons per minute, we have increased the range of the tower from 17.3 degrees to 25 degrees, or an increase of 8 degrees in the temperature to where our saturation temperature is approached.

So if you look at our penalty tables, which appear in my testimony, you will find they don't exhibit the same

megawatt losses and these are values we want to play off against each other.

We have arrived at the 590,000 gallons per minute as what we think right now is the limit of technology. We don't think a single tower can withstand a higher hydraulic loading than 590,000 gallons per minute under the current techniques of construction and design that are available to the manufacturers.

We certainly intend, during all of the time we are making our studies, to stay abreast of the technology, not only for this site, but as you probably know, we are considering other sites for future plants, and therefore we have a continuing effort to stay abreast of all current technology that affects our designs for our future generating capability.

So our single tower studies do envision optimizing at a lower gallons per minute than the 840,000 that goes through the existing condenser.

Q And you have also looked at a lower condenser flow with regard to the two-tower system and the modifications that would entail?

A We have run some optimization studies that don't indicate any attraction of it. Because you are not looking at only initial capital dollars now. That is a figure that is very much publicized, but in addition you have the owning and operating costs for a period of 30 years. When one ~~does~~ goes

a way performance for the sake of additional capital dollars, that performance reflects in continuing costs forever after, in replacement power and in capability penalties. To some extent too fuel cycle costs. So taking all of that into account, we can only say we can look at reducing the gallons per minute, but have to look at the effect of doing it on the operating costs too.

MR. LYLE: No further questions, Mr. Chairman.

CHAIRMAN JENSCH: Any further questions?

Any redirect?

MR. TROSTEN: Not at this time, Mr. Chairman.

CHAIRMAN JENSCH: Do you have any further questions, Mr. Macbeth?

MR. MACBETH: No, sir.

CHAIRMAN JENSCH: You are temporarily excused. Thank you.

(Witness temporarily excused.)

CHAIRMAN JENSCH: Who is the next witness?

MR. TROSTEN: Dr. Raney is the next witness.

MR. MACBETH: May I inquire how long the Board intends to sit this evening? I doubt if I can finish with Dr. Raney this evening. I am feeling rather tired. How long do we intend to go?

CHAIRMAN JENSCH: Could you cover some preliminary matters tonight and maybe we will cut off -- we have generally

been running to 5:15 or thereabouts.

If you would like to stop short of that --

MR. MACBETH: I wondered whether perhaps substituting Dr. Lauer might be sensible. I don't know how long --

MR. TROSTEN: Perhaps we can talk in the break. If it is possible, I would appreciate it. But Dr. Raney would like to get off. Maybe I can talk to you about it.

CHAIRMAN JENSCH: At this time we will recess to reconvene in this room at 4:10.

End #4

(Recess.)

CHAIRMAN JENSCH: Please come to order.

My recollection is that Dr. Raney has been sworn, has he not?

MR. TROSTEN: Yes.

CHAIRMAN JENSCH: Are you ready to proceed, Hudson River?

MR. MACBETH: I am.

Whereupon,

EDWARD C. RANEY

resumed the stand as a witness on behalf of the Applicant, and having been previously duly sworn, was examined and testified further as follows:

FURTHER CROSS-EXAMINATION

BY MR. MACBETH:

Q I draw your attention to page 9 of your testimony of October 30, 1972, and the first conclusion you list there in relation to the Staff's Final Environmental Statement where you say, "The Staff inference that passive drifting of eggs and larvae of striped bass would permit from 70 to 90 percent of the surviving portion of the total production in the Hudson River to pass the Indian Point Plant in early August is not true. Such a conclusion by the Staff was reached because of limited investigation and imprecise knowledge of the distribution and movements of young striped bass in the Hudson. Probably too much emphasis

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was placed upon studies which were done for other purposes and which did not accurately reflect the substantial annual production to the striped bass population in the upper sections of the river."

What studies were you referring to in that statement?

A. The so-called Hudson River Fisheries Investigation and any other studies they might have used.

Q. Were you thinking of any other particular studies?

A. I was thinkingof particular studies, but I am not certain that they have had an opportunity to use them.

Q. Perhaps you could indicate to me the studies and at some later time perhaps I can ascertain whether or not the staff did consider them.

CHAIRMAN JENSCH: Do you understand the question, doctor?

WITNESS ~~NEWMAN~~ Raney: Yes, sir.

CHAIRMAN JENSCH: You have said the staff relied on studies, and you said there was something else they might have relied on.

Can you tell us what you thought they relied on?

WITNESS ~~NEWMAN~~ Raney: Yes. I think they relied largely on the Hudson River Fisheries Investigation, which were done mostly in the vicinity of Cornwall.

CHAIRMAN JENSCH: Is that the so-called Carlson-McCann

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Report?

WITNESS ~~NEWMAN~~ Raney: Yes, sir.

CHAIRMAN JENSCH: And that is the only one you can think of on which they relied?

WITNESS ~~NEWMAN~~ Raney: I don't know what they relied on actually. I assume they relied on that.

CHAIRMAN JENSCH: With that assumption, do you know of any additional studies which you think they might have relied on?

WITNESS ~~NEWMAN~~ Raney: They may have looked at the Ratheon Reports, they may have looked at reports that were submitted by Dr. Lawler and Dr. Lauer.

CHAIRMAN JENSCH: Well, you understand the inquiry, enumerate all of those that you say the staff placed too much emphasis on so if you will identify what those studies were that you said there was too much emphasis on --

WITNESS ~~NEWMAN~~ Raney: I said probably too much emphasis was placed upon studies, and I enumerated those as studies which I believe they used.

BY MR. MACBETH:

Q Could you be a little more precise about which of Dr. Lawler's and Dr. Lauer's studies you think are involved here?

A I am not sure how much access they have had to either of the studies, but I know that both Drs. Lawler and

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Lauer have made sutdies of distribution of eggs and larvae of striped bass, particularly in the Indian Point area.

Q You don't know off hand what the titles of those studies are?

I would just like to know that we are talking about the same studies.

CHAIRMAN JENSCH: Ask Dr. Lawler, he is here.

Dr. Raney said he made some studies. Would you describe them, please, Dr. Lawler?

Whereupon,

JOHN P. LAWLER

resumed the stand as a witness on behalf of the Applicant, and having been previously duly sworn, was examined and testified further as follows:

XXXX

FURTHER CROSS-EXAMINATION

WITNESS LAWLER: The studies that Dr. Raney is probably referring to are the studies that were reported on yesterday and the day before yesterday by both myself and Dr. Lauer.

I don't know what access the Staff had to those documents.

CHAIRMAN JENSCH: I take it from your answer that there are several, and you can't recall the titles?

WITNESS: LAWLER: Well, if you will recall yesterday I was discussing my testimony of October 30, in which

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investigations that my organization carried out this past year were reported on and similarly, Dr. Lauer, in discussing his testimony of October 30, also was reporting on investigations that had been carried out by NYU, both this past year and in 1971.

I don't know what other studies -- those were basically the field efforts that were made by our respective organizations.

NYU, of course, as Dr. Lauer indicated, has conducted field investigations on the Hudson for some years past, even prior to the time that he, Dr. Lauer, came there. I don't know what, of that sequence of NYU studies were made available.

CHAIRMAN JENSCH: Will you give us a list of the documents that you prepared on the distribution of eggs and larvae of striped bass in the Hudson River, so we may have them and perhaps that would refresh Dr. Raney's recollection of what he thinks the Staff might have relied upon?

WITNESS LAWLER: Those two documents are the testimony, my testimony of April 5, and of October 30.

CHAIRMAN JENSCH: And that is all?

WITNESS LAWLER: That is all.

CHAIRMAN JENSCH: Do you know -- maybe I should ask Applicant's counsel, would you ask Dr. Lauer if he would give us a list of the studies that show distribution of eggs

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and larvae of striped bass in the Hudson River, prepared by New York University on which Dr. Raney belives the Staff might have relied?

MR. TROSTEN: Well, the documents were the '71 and '72 studies. Those are the studies that NYU has performed, I believe, Mr. Chairman.

CHAIRMAN JENSCH: And that is all?

MR. TROSTEN: As far as I know, that is all, sir.

CHAIRMAN JENSCH: Thank you very much.

Will you proceed?

BY MR. MACBETH:

Q. Dr. Raney, could you amplify a little bit on how the Staff would be led to an incorrect conclusion by relying on the studies performed by Carlson-McCann, Ratheon and Dr. Lauer?

A. These studies were done for specific purposes.

The Hudson River Fisheries Investigation Study was done for the purpose of trying to estimate the number of eggs and larvae which might be entrained in the Cornwall project.

Q. Entrained in the Cornwall project?

A. Yes, entrained in the Cornwall project.

The entire river was not covered.

During some years, some other parts of the river were sampled, but in my opinion, this sampling was totally

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inadequate to come to any decision with regard to the number of eggs and larvae which might pass Indian Point Two and be entrained.

I have had some personal experience on the Hudson and I do know that the upper reaches of the Hudson produce substantial numbers of young striped bass. And any estimate of mortality at Indian Point Two that does not properly consider the distribution, the numbers and the fluctuation in numbers of these young striped bass that are produced in the upper Hudson, would in my opinion, be invalid.

Q. How far up the Hudson are you thinking of?

A. I am thinking of the entire Hudson, up as far as Coxsackie or thereabouts, to the limits of the polluted area below Troy and Albany.

In my experience, the oxygen sag has pretty much been relieved by the time you get to Coxsackie, which is approximately 20 miles downstream from the Troy-Albany area.

Q. I show you Appendix 3-1 of the Carlson-McCann Report and draw your attention to the first station in the north, in which sampling was done.

What is the title of that station?

A. Coxsackie.

Q. Does that indicate that Carlson-McCann did sampling for eggs or larvae in the Coxsackie area of the river?

A. No, sir.

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It says here that that area was not sampled.

Q. I think if you look at it more carefully it means in the week of the 30th of April to the 6th of May it was not sampled. You will see a number of those marks, in fact, you see marks of that sort in every segment except one, is that not so?

A. That is correct.

There is no indication it was sampled in any other week.

Q. Well, what do you make of this number down here at the bottom marked "total" where under Coxsackie it says zero?

A. Well, what I make of this is they got zero fish because they did not sample.

Or, if they sampled at all, they sampled occasionally.

Now I have not examined the original data upon which this was based, so I am not sure. The only thing I am sure of is they did not take as many samples in upstream areas over a period of years, that you would need in order to come to an estimate of what eggs and larvae are produced by striped bass in those upstream areas.

Q. In other words, what is really needed is not sampling Coxsackie, which it seems quite likely Carlson-McCann in fact did, but more sampling at Coxsackie, is that so?

A. Not only more sampling at Coxsackie, but more sampling at the other river miles from Coxsackie to Palisades,

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which is located downstream from Indian Point Two.

CHAIRMAN JENSCH: Excuse me, may I interrupt.

I am having a little difficulty understanding what your answer is.

Is it your view that the Carlson-McCann report did not do any sampling at Coxsackie?

WITNESS ~~NEWMAN~~ Raney: No, sir.

CHAIRMAN JENSCH: You recognize that they did --

WITNESS ~~NEWMAN~~ Raney: He showed me a single table, sir.

I was answering a specific question.

CHAIRMAN JENSCH: Now answer mine.

WITNESS ~~NEWMAN~~ Raney: I am answering you, yes, Carlson-McCann did some studies in the Coxsackie area and in my opinion these were totally inadequate to draw any conclusions about the abundance of larval striped bass.

CHAIRMAN JENSCH: My problem was, I understood you to say that you thought that Carlson and McCann did not have any studies in Coxsackie. So I wondered how you could give an opinion you thought it was inadequate.

Now you recognize there were some studies?

WITNESS ~~NEWMAN~~ Raney: I have always known Carlson-McCann made some studies of Coxsackie. I was really referring to a specific question, and a specific part of an exhibit which he showed me.

CHAIRMAN JENSCH: How many studies do you understand

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were there which you say are inadequate?

WITNESS ~~NEWMAN~~ Raney: I would have to refer -- I don't recall how many studies they made at Coxsackie.

The only thing I recall is that when I made my analysis they were woefully few, and totally inadequate to come to a decision about the number of striped bass that are found in the upper river.

CHAIRMAM JENSCH: I wasn't interested so much in the opinion aspect of what they found for the moment, but how many studies did you understand they had undertaken upon which you said that it was therefore, inadequate.

You don't recall now?

WITNESS ~~NEWMAN~~ Raney: I don't recall the exact number.

CHAIRMAN JENSCH: Will you check that?

You said when you examined it, you thought it was woefully inadequate. Will you look at your notes and tell us later what the number was as you understood they had undertaken?

WITNESS ~~NEWMAN~~ Raney: Yes, sir.

CHAIRMAN JENSCH: Thank you.

end 5

BY MR. MACBETH:

Q Could you tell us how many tows you think would have to be taken to be adequate?

A Not only a matter of tows at a given time; it's a matter of being there night and day, taking tows across the river at various stations, and taking replicate tows when you do take them, and being there through the season.

Obviously, what was done here, in my opinion, it appears obvious to anybody reading the report, is they concentrated -- as they should have -- in the area of Cornwall. This was the area of study.

And then more or less as an afterthought they went upriver and downriver, and accumulated additional data.

My opinion is that the studies have been done both by Carlson and McCann or by Northeast biologists, because they were the ones who did the study, and by other biologists who have studied the river. As far as young and eggs are concerned they are woefully inadequate, and totally inadequate to come to a conclusion that 70 to 90 percent of the population of the total annual production passed by Indian Point by early August.

Q Dr. Raney, so we can save a little time I will show you Table 2 of the Carlson-McCann Report on page 15. Would you indicate to the Board the number of tows taken in

1966 in Coxsackie and the amount of water strained?

A The number of non-metered tows reported is 23. The number of metered tows reported as 85. The volume strained is reported as -- in thousand cubic feet as 126.1.

This compares with Cornwall where non-metered tows were 98, metered tows were 509, and volume strained in thousands cubic feet, 884.4.

Q Perhaps we could have a few other comparisons as well. Let's just take the metered tows, since they are the measured ones, to start with.

It was 85 at Coxsackie. Could you read the numbers off for the other stations in the river?

A Yes, sir.

Coxsackie, 85 -- these are metered tows only -- Saugerties, 86, Kingston, 94, Hyde Park, 76, Marlboro, 141, Cornwall, 509, Peekskill, 95, Croton, 81.

Q So there is a big emphasis on Cornwall. But Coxsackie is left out more than any other segment of the river that year, is that correct?

A That is correct, sir. The studies were totally inadequate to come to a conclusion with regard to the number of striped bass larvae that are found in the river.

Q Just indicate the number of metered tows taken at Coxsackie and the other stations for 1967.

A In 1967, metered tows, Coxsackie, 174; Saugerties, 297; Kingston, 198; Hyde Park, 340; Marlboro, 167; Cornwall, 2,046; Peekskill, 449; Croton, 184.

Q Thank you.

Is it also your opinion that taking the combined total of tows for 1966 and 1967, that that data is totally inadequate to form a judgment as to the abundance and ~~direction~~ distribution of striped bass eggs and larvae in the Hudson River?

MR. TROSTEN: I would ask Mr. MacBeth to break his question into two parts; abundance and ~~direction~~ distribution.

BY MR. MACBETH:

Q Take abundance first.

A I think those data are fairly good for the Cornwall area. The study was planned to study eggs and larvae in the Cornwall area. I think they did a good job.

But I think the data are totally inadequate to come to any reliable estimate of the number of larvae in the other parts of the river.

CHAIRMAN JENSCH: I think the question was how good was it for abundance.

WITNESS RANEY: This is what I'm talking about, abundance, sir, numbers of striped bass eggs and larvae.

CHAIRMAN JENSCH: Thank you.

BY MR. MACBETH: distribution

Q Let's try ~~direction~~ dist next.

A The ~~direction~~ distribution of striped bass in the Hudson River is not covered by those stations. If you want to cover the ~~direction~~ distribution of young striped bass in the Hudson, you should go to a study which was done by Raney, reported in 1954, which actually covered the stations in the Hudson from the Palisades to Coxsackie, and where collections were actually also made above Coxsackie, but without results, I believe, because of pollution.

So the point is, sir, that in 1949, 1953 and 1954, there were young striped bass throughout the river, that is up to Coxsackie. In other words, to come to any determination of the abundance in the river, you would have to sample adequately. And by adequately, I would say at least at the intensity it was done in 1967 for the Cornwall study.

Q Let me get clear in my own mind your position now.

You say on page 9, the third sentence, paragraph (a):

"Probably too much emphasis was placed upon studies which were done for other purposes, and which do not accurately reflect the substantial annual production of the striped bass population in the upper sections of the river."

Now, I realize that you don't think that Carlson and McCann had adequate data. But you did suggest that going up to Coxsackie was far enough up. Are you now

suggesting that the real problem was they didn't go down below Croton Point to Palisades?

A This is another question you are asking me, sir. If you are going to make an estimate of the number of eggs and larvae in the Hudson River, certainly you should go as far down the river as you can find eggs and larvae.

Q Again I show you Appendix 3-1 of Carlson and McCann's Report, and would you indicate to me how many eggs were found in the Croton sector, which I believe extends from mile points 20.1 to mile points 40.1.

MR. TROSTEN: What page is that on, please?

BY MR. MACBETH:

Q Could you indicate the page?

A Appendix 3-1, the table at the top of the page. I'm sorry, sir. I didn't get the first part of the question.

(Whereupon, the Reporter read from the record, as requested.)

WITNESS RANEY: Based on these data, there were no eggs found in Croton.

BY MR. MACBETH:

Q Would that indicate that Carlson and McCann went as far downriver as they found eggs those two years?

A It would not, sir. It would only indicate to me that they went to Croton and found no eggs.

Q I do wish to draw your attention to the fact that

the critical sector, I believe, extends to mile points 20.1 -- down, if that is correct, Dr. Lawler.

WITNESS LAWLER: Not offhand.

MR. MACBETH: Maybe we can refer to one of Dr. Lawler's tables to be sure of that point.

CHAIRMAN JENSCH: While he is doing that, I wonder if I can understand this:

As I recall the question that was put to you, it was: Are you suggesting they should have been down as far as Palisades, and your answer was I think they should go down as far as they find eggs.

WITNESS RANEY: Eggs and/or larvae.

CHAIRMAN JENSCH: My question is: Would you direct your attention to what the question was and identify that far down point as Palisades or not? Do you think Carlson and McCann should have gone as far as Palisades?

WITNESS RANEY: I know from my experience in the river, sir, that I have found young striped bass at Palisades. This was reported in the literature.

Now, it would seem to me if you were making a study of the striped bass, of young striped bass in the river, what you would do would be to cover the entire river.

Now obviously this was not the mission of the Carlson-McCann report. The mission was to study the vicinity of Cornwall and to estimate the entrainments of eggs and larvae

in that area.

CHAIRMAN JENSCH: Do you think they should have gone as far as Palisades? Yes or no.

WITNESS RANEY: I don't think, if you will excuse my language, I don't think that question is relevant.

CHAIRMAN JENSCH: Just forget that part. Just answer the question. We will try to work out the relevancy later. Just answer: Do you think --

WITNESS RANEY: If I had been studying the Cornwall project, I would not have gone to Palisades.

CHAIRMAN JENSCH: Do you think Carlson and McCann should have gone to Palisades?

WITNESS RANEY: No, sir.

CHAIRMAN JENSCH: Thank you.

Proceed, please.

WITNESS RANEY: But that is only on a very limited basis of the study that was set up to do a given job and I think they did it very well.

CHAIRMAN JENSCH: Thank you.

BY MR. MACBETH:

Q Dr. Raney, let me read to you from page 4 of the Carlson-McCann Report:

"The following actions were initiated by the policy committee to compile data relevant to the effects of the proposed pump storage plant on the

fisheries of the Hudson River: The study program was developed that would: Determine the ~~direction~~ distribution in time and space of all fish life stages in that section of the Hudson River, subject to the effects of operation of the proposed pump storage generating plant at Cornwall, New York; determine the ~~direction~~ distribution of these life stages outside of the Cornwall area and their abundance relative to that at Cornwall; determine the impact of possible losses in the striped bass fisheries in the area."

I will show you the page so you can see it in context.

Does that indicate that one of the purposes of the Carlson-McCann study was to determine the ~~direction~~ distribution and abundance of striped bass eggs and larvae throughout the entire Hudson River as far south as eggs and larvae would be found?

A No, sir.

Q What do you think they meant when they talked about the abundance of eggs and larvae relative to the abundance in Cornwall?

A They are speaking in general terms. They are speaking generally. They are not as common. Here we are dealing with a situation where we need to know, if we are going to make estimates of --

Q Excuse me. Are you talking about Carlson-McCann or Indian Point? I was asking about Carlson-McCann.

A Excuse me. My answer was no. I don't think that they had in mind to do the kind of study that we need done in order to year by year get a measure of fluctuations of eggs and larvae of striped bass in the Hudson River.

CHAIRMAN JENSCH: I think the question was what do you think they meant by what they said. Can you interpret their statement of objectives?

WITNESS RANEY: It is awfully hard for me to interpret what might have been in the minds of the committee when they were sitting there.

CHAIRMAN JENSCH: We don't want you to do that. Just take the words that are in the paper.

WITNESS RANEY: That is even more difficult.

CHAIRMAN JENSCH: I see.

WITNESS RANEY: I have already said that I think that they were saying generally speaking, as long as we are going to study the Cornwall area we also better take a look at the rest of the river, and that's what they did.

end 6

BY MR. MACBETH:

Q Dr. Raney, you have referred to your own studies of the distribution of striped bass egss and larvae in the Hudson River.

How many tows did you take in the Coxsacke area?

A I took no tows any place in the Hudson River at any time.

Q How did you conduct the study?

A My studies were done for the purpose merely of getting young striped bass from various places in the Hudson under the same conditions and therefore what we did was to start at Palisades, at high tide, we ran the river with high tide, and we seined and we seined merely to get specimens, we did not seine to determine how many striped bass ~~or~~ and how many shad or how many other fish were there.

We merely went in, got specimens, put them in a jar, got back in the car, ran up to the next station, did the same thing, and we did this fast enough so we would meet the high tide at Coxsackie.

Now these types of studies were done only to get specimens to do a ~~ratio~~ racial study. They were not quantitative in any way. At one station we might take one seine haul, at another two or three. But we had to get out of here pretty fast or we wouldn't get to Coxsackie on the high tide.

Q On page 9 you say "The Staff inference of passive

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drifting of eggs and larvae of striped bass would permit from 70 to 90 percent of the surviving portion of the total annual production in the Hudson River to pass the Indian Point plant by early August is not true."

Now you say that Carlson-McCann data are totally inadequate to make any analysis of distribution. You say that the work of Raytheon and Dr. Lawler and Dr. Lauer are inadequate to make such a calculation and you say you, yourself, in your own studies, did not make any quantitative calculations.

On what data do you base that positive statement that it is not true that 70 to 90 percent of the surviving portion of the total annual production in the Hudson River do not pass Indian Point by early August?

MR. TROSTEN: Mr. Chairman, I object to the question. I do not agree that that is a correct characterization of what Dr. Raney has said.

MR. MACBETH: I will take it a piece at a time.

BY MR. MACBETH:

Q Is it your opinion, Dr. Raney, that the Carlson-McCann data are totally inadequate to make an accurate calculation of the distribution of striped bass eggs and larvae in the Hudson River?

A The distribution, sir? Distribution by number or just gross distribution?

Q Let's take abundance first.

A They are totally inadequate to make estimates of the abundance, except for the Cornwall area. This is the only place that there were adequate tows.

Q I am really just trying to get this clear so Mr. Trosten and I are on the same wavelength.

What about distribution? Are they adequate to make numerical calculations of distribution?

A I don't understand what you mean by numercial calculation of distribution. If you mean are they adequate to determine the abundance at the extremes or any place else on the river, the answer is no. If you mean is this a general idea of the distribution of eggs and/or larvae, yes.

Q I meant something where you could say 50 percent of the eggs and larvae are north of this point or at least an estimate at the level that 40 to 50 percent of the eggs and larvae are north of this point in the average year on the night of July 25.

A My point is no such data have ever been taken with regard to the Hudson and therefore the assumption that these larvae by August or that 70 to 80 percent of the surviving portion passes Indian Point is totally nonsense.

Q I don't see that -- well, let's see what you said. You said it is not true. Did you simply mean it is unproven?

That is rather different than saying it is not true.

A I will say it is not true and I will say it is nonsense.

Q How do you know it is not true, if there have never been any data taken to demonstrate it one way or the other?

A Well, inferentially the data in the McCann report can be used to show the inadequacy of sampling elsewhere. In other words, if you had sampled adequately at other places, the data in the Carlson-McCann report I feel would be different. The reason ~~Ther eason~~ I feel this is that through personal experience in seining along the shore, the young striped bass in 49 and 53 and 54, we found them throughout the river. They do fluctuate in abundance. And this is another reason these data are inadequate. The studies were carried on for too few years. For a base line study of this type you would need at least five, most of the time I recommend ten, and you would, for the striped ~~bass~~ bass need at least 10 years study subsequent to the operation of a plant. Because you are dealing with fluctuating year classes.

Q We may come back to the fluctuating year classes later. I am interested in this inferential analysis from Carlson and McCann.

Explain to me how that works. If you would like the report, I will give it to you. I just don't understand how you derive the inference of -- perhaps the reporter would read

back just what inferentially can be derived from the Carlson-McCann in Dr. Raney's opinion.

(The reporter read the answer as requested.)

THE WITNESS: What I infer is that going upstream and downstream was kind of a second thought, and not perhaps much effort was placed on it.

Now you can't go to a locality once or twice and make samples and perhaps without ~~replicas~~ replicate, perhaps not at the surface and the bottom and the intermediate layers, and come up with some data of this sort that is usable except in a very general way.

What you can say is, yes, there are eggs at Coxsackie, or no, there were no eggs at Coxsackie on a given date.

BY MR. MACBETH:

Q You aren't much in favor of tests that take place in one day; is that right?

A Sir, I am in favor of good studies.

Q Would a test that took place on one day be a good study?

MR. TROSTEN: I object to that, Mr. Chairman.

CHAIRMAN JENSCH: I think he had so many variables of what constitutes a good study and what is inadequate, I think we should find out something specific. He hasn't answered the question. The gentleman asked him would one day studies be adequate and he said I prefer good studies.

WITNESS RANEY: One day's study is adequate for one day.

MR. TROSTEN: Mr. Chairman, if we are going to have a discussion of a one day study, I would insist Mr. Macbeth state the purpose for which the one day study is being used and then Dr. Raney can address himself to the question of whether the study is adequate for that purpose.

CHAIRMAN JENSCH: Let's take one question at a time and we might discern the materiality as we go along. I think we are trying to find out, he has expressed some pretty comprehensive opinions about other people's work, and I think the questioner is trying to test him to see whether he has any data for the opinion he has expressed.

I think to that extent it might be material.

Would you proceed?

MR. MACBETH: Yes, Mr. Chairman.

BY MR. MACBETH:

Q Dr. Raney, let me direct your attention to Appendix 5 of the Carlson-McCann report, which is entitled "Weekly Abundance of Striped Bass Eggs by Day and Night Per Sampling Station in the Hudson River at Cornwall" -- excuse me, that is not the chart I want. Strike the question.

Let us move on for a moment from Carlson-McCann.

You mentioned these other three studies, the Raytheon study, the Lawler and the Lauer study.

What are the inadequacies of the Raytheon study that make it inapplicable to the kinds of conclusions that you think the Staff may have drawn from it?

A I am not sure that the Staff used the Raytheon study but the basic thing about the Raytheon study was it was a general ecological survey of the area. It was not concentrated on striped bass. And I think more efforts by day, by night, and day after day, season after season, would be called for if you are going to do the job that needs to be done in order to come to a conclusion with regard to the effects of entrainment.

Q Is the principal problem with Dr. Lawler that he has relied on Carlson-McCann? He told us yesterday he relied very heavily on Carlson-McCann.

A Dr. Lawler took the best data that are available. My point is these data are totally inadequate in order to come to a conclusion with regard to the ~~unadjustments~~ entrainment of striped bass young or larvae by the Indian Point 2 plant.

Q In other words, the model is only as good as the data that goes into it.

A I didn't say anything about model.

MR. TROSTEN: I object to the question, Mr. Chairman, because the question is suddenly shifted from the adequacy of the data collected to the model prepared by Dr. Lawler and his organization. Let us have clarity.

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CHAIRMAN JENSCH: I think the objection is well taken.

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Sustained.

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BY MR. MACBETH:

Q Dr. Raney, let's move to Point B here in the conclusions on page 9. You state:

"The Staff estimate of the great impact of entrainments and impingements at Indian Point Plants 1 and 2 on the Middle Atlantic fishery is inaccurate and greatly exaggerated. The bulk of the Middle Atlantic fishery for striped bass (outside of the Hudson River, the western part of Long Island Sound, and New York Bay area) is supported by striped bass production in areas to the south of New Jersey and ~~plainly~~ mainly by the Chesapeake and Delaware ~~Basin~~ Bay."

Would you tell me what percentage of the Middle Atlantic coastal striped bass fishery is supported by Chesapeake Bay?

A May I inquire, sir, as to what you mean by Middle Atlantic striped bass fishery?

Q Well, I was just trying to--

A I can tell you what I mean by it.

Q You tell me what you mean.

A I divide the coast, the Atlantic coast into three sections, as do most people, I believe, South Atlantic, Middle Atlantic, and North Atlantic. And in this division most of the charts that I have used indicate that Virginia

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Maryland, Delaware, New Jersey, New York, and Connecticut are Middle Atlantic. Massachusetts northward is North Atlantic. South of Virginia, it is South Atlantic.

Now if you are using this term as it may be used for the commercial fisheries statistics, which are gathered by the U. S. Fish and Wildlife Service, they use Middle Atlantic as Delaware, New Jersey, and Long Island.

It makes a great deal of difference what you are thinking about.

Q I'm sure it does. I appreciate your efforts to make it clear.

Which definition do you think the Staff used?

A I would conclude that they must have used a very, very narrow geographic definition.

CHAIRMAN JENSCH: Which would include what States?

WITNESS RANEY: Sir, I can't speak for them. I would like to know what they did use. But I can tell you my reasons that I think they used a narrow definition. That is because I heard in testimony that 20 percent or possibly less of the striped bass found in the Middle Atlantic area came from the Chesapeake Bay area.

And this would indicate to me that the Middle Atlantic area must have been reduced to the area around the mouth of the Hudson River.

MR. MACBETH: Mr. Chairman, this might be a little

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easlier if we could inquire of the Staff what their definition of Middle Atlantic was, just so any further questions I address to Dr. Raney I will be sure don't involve any problem of definition. Would it be appropriate for me to inquire of the Staff?

CHAIRMAN JENSCH: Yes, I think this one question. Where did you put Long Island?

WITNESS RANEY: Long Island is in the Middle Atlantic, sir, in both the generally accepted terminology and with regard to the Fisheries statistics.

CHAIRMAN JENSCH: Thank you.

Proceed.

MR. MACBETH: Would the Staff offer a witness to define what was meant by "Middle Atlantic" in the Final Environmental Statement?

MR. TROSTEN: Mr. Chairman, if we are going to put Dr. Goodyear on I had a series of questions I wanted to ask him.

MR. KARMAN: We are not subjecting ourselves to further cross-examination now.

MR. TROSTEN: This is one of the areas-- I had a number of things that puzzled me about the Staff's testimony in this respect. I would be delighted to have Dr. Goodyear put on the stand.

CHAIRMAN JENSCH: I suppose if we made a

round-robin inquiry we would likely get to that. The only point to get now is the definition of the Middle Atlantic. That is a single question from one lawyer.

We will certainly give you an opportunity, if you have puzzling questions, a little later.

MR. TROSTEN: If we could get the definition and then I could put the rest of the questions to him later about it, that would be fine.

CHAIRMAN JENSCH: All right.

Whereupon,

PHILIP GOODYEAR

resumed the stand on behalf of the Regulatory Staff and, having been previously duly sworn, was examined and testified further as follows:

MR. KARMAN: Dr. Goodyear was previously sworn, Mr. Chairman.

FURTHER DIRECT TESTIMONY

WITNESS GOODYEAR: We used the Middle Atlantic as used by the Fishery statistics, which includes Delaware, New Jersey, and New York.

FURTHER CROSS-EXAMINATION

BY MR. MACBETH:

Q Including Long Island Sound?

A (Dr. Goodyear) Yes.

(Witness Goodyear excused.)

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CROSS-EXAMINATION (Resumed)

BY MR. MACBETH:

Q Now in your statement on the bottom of the page 9, when you say:

"The Staff estimate of the great impact of entrainments and impingements at Indian Point Plants 1 and 2 on the Middle Atlantic fishery is . . .greatly exaggerated. . ."

which definition were you using in that sentence?

A (Dr. Raney) I was using the very narrow definition of it, which Dr. Goodyear used, Delaware, New Jersey and New York.

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BY MR. MACBETH:

Q Perhaps we could return now to the line of inquiry that I embarked on. Would you tell me what percentage of the middle-Atlantic striped bass fishery is supported by the Chesapeake Bay.

MR. TROSTEN: Would it be helpful if we put a map up here?

MR. MACBETH: That is fine with me.

CHAIRMAN JENSCH: I think we have reached the five o'clock bell. In view of the previous request of the Hudson River, if you are going to start a new subject, shall we start it in the morning with the easel.

MR. TROSTEN: The only problem, Mr. Chairman, is that I expressly brought ~~Mr.~~ DR. Raney here with the understanding that he would be concluded today. That is why I wanted to have the session run a little longer. Dr. Raney was held here because the questioning quite understandably went longer than we expected on the other witnesses. But I would be deeply appreciative if we could conclude Dr. Raney's testimony today.

CHAIRMAN JENSCH: I don't know, but I have the impression that Hudson River might take more than our usual recess time. I can only emphasize that I believe there is a lessening of efficiency by this continued session. I think we have been here since 9 until 5, and that is almost double the time of ordinary courtroom proceedings; I think they try to test theirs

by efficiency and I think we are pushing it pretty hard. I would like to accommodate Dr. Raney, and I would like to see you hold to your commitments, but the circumstances seem to be unavoidable and we don't seem to have totally adequate time.

MR. TROSTEN: Could we not recess briefly and reconvene on this, so Dr. Raney can leave town as he planned.

MR. MACBETH: I am not promising that the efficiency of questioning will increase as time goes on but I am willing --

MR. TROSTEN: I know that. We do make efforts to accommodate witnesses in these hearings and I would appreciate it if we could make such accommodation in this case.

CHAIRMAN JENSCH: The Board would like to extend the accommodation. Does the Staff have any interrogation of Dr. Raney.

MR. KARMAN: It is getting less with each question, Mr. Chairman.

CHAIRMAN JENSCH: I see. I don't know as we can apply that too reliably here.

MR. TROSTEN: We can forget the easel, if that is going to delay things.

CHAIRMAN JENSCH: The easel sounds pretty good for adequacy of the presentation. Let's push it to our usual time of a quarter after and maybe Mr. Macbeth will be done by then. I just think we can't prolong, just because the witnesses

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are here, we will stay here as long as the lights are on.

BY MR. MACBETH:

Q Dr. Raney, I am not quite sure what we are going going to do with the map now that we have it, but could you indicate to me the answer to the question. The question was what percentage of the middle-Atlantic striped bass fishery is supported by the Chesapeake Bay.

A A very high percentage.

Q Well --

A And contrary, very little comes from the Hudson. For example, between 1940 and 1956, 504 specimens of striped bass were tagged in the Hudson River. There were 82 returns. Now, these returns were all from the Hudson River or from the New York Harbor and a few were from the adjacent Jamaica Bay which lies just -- I better not leave the microphone, but it is very close to the mouth of the river. These data are substantiated by studies that John Clark made and reported on in 1968. They are in line with the studies that I made and reported on in 1954. And that is that there is a separate race of bass in the Hudson River which is important in connection with the Western quarter of Long Island Sound, the lower Hudson base, or the base at the mouth of the Hudson, the upper and lower bay, the narrow area, which is still in the Hudson River, and to a very slight extent in Northern New Jersey, around Sandy Hook, and to Jamaica Bay. Occasionally a few get as far as Jones Beach

a little further to the east, and a few got as far as Great South Bay.

The vast, since 1936 we have had a whole succession of excellent year classes in the Chesapeake Bay area -- and incidentally, in the Chesapeake Bay area there are at least 20 rivers, 20 rivers, which are good spawning rivers. Many or most of these are probably equal in their production to the Hudson River.

However, you do not get big year classes in every river in Chesapeake Bay every year. The percent of striped bass which have been recovered outside of Chesapeake Bay is small, half a percent to seven percent.

To understand these figures, you have to remember that if you have a seven percent of say a billion striped bass, you have a lot of bass.

Now, there have been at least five good tagging studies which have shown that the bass leave Chesapeake Bay in the spring, migrate up along the coast, in some cases as far as Maine, and they are the source of the New York fishery and of the New Jersey fishery, of the Connecticut-Rhode Island-Massachusetts and Maine fishery.

Again, in their migration to the south, in the fall of the year, they again are the source of this fishery. Some of them overwinter in the Hudson. Some overwinter in the Connecticut. Some overwinter in the Amalga River near Atlantic

City. These are normally non-spawning fish and they may move out, although in some cases they probably spawn there. So what we have is this unusual situation in the last 10,000 years, since the ice years, since the ice went out and the Hudson River was uncovered, we have developed from this great concentration, here is 2,000 square miles of water in the Chesapeake Bay area, and virtually every bit of it is striped bass habitat.

So from this area you have this tremendous migration in the spring and fall and that is what feeds the commercial and sport fishery, which incidentally probably is nine or ten times what it was back in 1936 to '40, when I first started studying these fish.

It is kind of unusual, isn't it, with all of this development we have had on all of these rivers, particularly on those in the Chesapeake Bay that we could have had such a very large year class if indeed, the industrial situation has been such that 70 to 90 percent could be killed by passing a single plant.

CHAIRMAN JENSCH: I thought they were talking about eggs and larvae.

MR. MACBETH: I will have to ask the reporter to repeat the question. I thought it called for a rather simple numerical answer. I have a feeling I won't get too many more questions in before 5:15. There is certainly a lot of material in that answer that will take a little discussion.

CHAIRMAN JENSCH: I think that has kind of necessarily extended some of the examination. We have had a little longer discussion than you perhaps contemplated. Can you read the last question, please.

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(The reporter read the record as requested.)

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BY MR. MACBETH:

Q Could you give me that?

A I answered that. I said a very high percentage.

Q Could you give me a range of numbers?

A Yes, I could. I can give it to you because from all of the evidence that I have, the Hudson may contribute from zero to below 5 percent, to this middle Atlantic fishery. And it does so only around the mouth of the Hudson. So that I would guess -- this is, the migration is not based on a guess, this is based on solid tagging studies, one of which was done by John Clark -- that 95 to 100 percent come from the Chesapeake Bay area or some place else in the south, or occasionally from spawning in the north, although the latter is only occasional.

Q Could you answer my question, which was what percentage of the middle Atlantic striped bass fishery is supported by Chesapeake Bay?

A Well, it is basically 95 to 100 percent, depending upon fluctuations in ~~your~~ year classes and what year you are talking about.

Q 95 to 100 hundred percent.

MR. TROSTEN: By middle Atlantic, were you referring to the Delaware -- would you indicate?

THE WITNESS: I am referring to Delaware, New Jersey and New York, excluding the Hudson River, the western

quarter of Long Island Sound, the bay area in the Hudson River and the small amount of spillover in northern New Jersey in Jamaica Bay.

BY MR. MACBETH:

Q You are excluding that from the middle Atlantic fishery?

A I am excluding it by giving it an up to 5 percent value. In other words, I think the value is miniscule. On the basis of the figures, 504 tagged and 82 returned, not a single one of them between the years 1940 and 1956, were captured outside of the Hudson River, the New York Harbor, except for a couple that went to Jamaica Bay. These are fish that were tagged in the river.

CHAIRMAN JENSCH: Tagged in the river?

THE WITNESS: Tagged in the river, yes, sir. Now the reason, if you are going to attribute an addition to the Atlantic fishery from the Hudson, you have to have some reason for, or way of knowing they came from the river. So one of the ways you find out is to tag them, or cut off certain fins, and then try to recover them later. Notice there is a good fishery around the mouth of the Hudson River. And there was between 1940 and 1956, although the fishery has been increasing as far as sport is concerned, and decreasing as far as commercial is concerned. But there was an opportunity at least for some of these fishes to have been taken. So in some

years I say it must be zero.

CHAIRMAN JENSCH: Excuse me. I had understood -- did you refer to a tagging also in the Chesapeake Bay?

THE WITNESS: Yes, sir.

CHAIRMAN JENSCH: Is that this 82 returns out of 504 tags?

THE WITNESS: No, sir, that was the Hudson River.

CHAIRMAN JENSCH: What was the figure on the Chesapeake Bay tagging?

THE WITNESS: On the Chesapeake Bay there have been a number of studies starting back 25 years ago. The percentage of recovery -- incidentally, the recoveries come from all of the way up the coast to Maine. The percentage of recoveries has varied from about one half of 1 percent to about 7 percent. This year there were 600 fish tagged in the Choptank River, which is a tributary of the Chesapeake Bay, these were large fish, more than 15 pounds, and of these, 40 were recovered this summer. And these 40 were recovered in New Jersey, off Long Island, off Massachusetts, off Rhode Island, and off Maine. And this has been the same picture we have gotten year after year, when tagging studies have been done in Chesapeake Bay.

CHAIRMAN JENSCH: Is this a convenient place to interrupt your examination?

MR. MACBETH: Yes, I think it would be, Mr.

Chairman.

CHAIRMAN JENSCH: I am sorry we were not able to accommodate your witness. There seems to be more examination than we anticipated. At this time we will recess to reconvene in this room tomorrow morning at 9:00 o'clock.

(Whereupon, at 5:15 p.m., the hearing was adjourned, to reconvene at 9:00 o'clock, Friday, December 22, 1972.)

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