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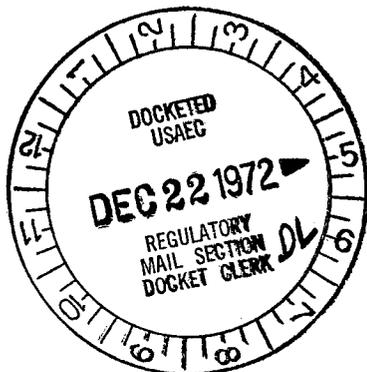
UNITED STATES ATOMIC ENERGY COMMISSION

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IN THE MATTER OF:

CONSOLIDATED EDISON COMPANY OF NEW
YORK, INC.



Docket No. 50-247

Place - Washington, D. C.

Date - Friday, 15 December 1972

Pages: 7635 - 7798

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UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

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In the matter of: :
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6 CONSOLIDATED EDISON COMPANY OF : Docket No. 50-247
7 NEW YORK, INC. :
:
8 (Indian Point Station, Unit No. 2):
:
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Tariff Commission
Third Floor
8th and E Street, N. W.
Washington, D. C.

Friday, December 15, 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.)

ADDITIONAL APPEARANCES:

ANTHONY Z. ROISMAN, Berlin, Roisman and Kessler,
1712 N Street, N. W., Washington, D. C., on behalf
Environmental Defense Fund and Citizens Commission
for the Protection of the Environment.

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C O N T E N T S

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<u>WITNESS:</u>	<u>DIRECT</u>	<u>CROSS</u>	<u>REDIRECT</u>	<u>RECROSS</u>
Edward C. Raney		7652		
Carl L. Newman	7724			
John Lawler	7746			

EXHIBITS

NONE.

Dennis

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P R O C E E D I N G S

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CHAIRMAN JENSCH: Please come to order.

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It must be obvious to everybody that we are having some pretty severe weather conditions this morning, and it is presently observable that some attorneys have not arrived.

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MR. TROSTEN: Yes. Staff counsel telephoned, Mr. Chairman, and said they had car difficulties and they expected to be here by about 9:15.

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CHAIRMAN JENSCH: In view of that absence, we will now recess to reconvene in this room at 9:15.

MR. TROSTEN: Thank you.

(Recess.)

CHAIRMAN JENSCH: Please come to order.

At the outset I might indicate that the space for the hearings in our next session commencing on January 10th will be in the commissioner's oral hearing room of the Federal Trade Commission, which is Room 532 of the Federal Trade Commission Building at 6th and Pennsylvania. There are other Trade Commission Annexes and so forth, but this is the main building.

Applicant's counsel?

MR. TROSTEN: Mr. Chairman, I would just like to reiterate our desire to move forward next week if at all possible. We could do it any way that the Board wishes. We could start with the Intervenor's witnesses, with Dr.

1 Aynsley, or for that matter, with Mr. Clark, if Dr. Aynsley
2 is not available next week. We could start with the Staff.
3 I just kind of hate to see us put the continued cross-
4 examination over until January 10 because it amounts to about
5 a three-week lag, which seems to me we could avoid by just
6 going as far as we could next week with cross-examination.

7 CHAIRMAN JENSCH: As we indicated, we feel that the
8 pre-Christmas week involves a lot of traffic problems and
9 travel complications, and we feel that only two days would be
10 available. It might not be worthwhile. That was one reason
11 we were anxious to have Mr. Cahill's statement yesterday.

12 It appears that it will be April before a class
13 will be ready for whatever is done about it or with it, or
14 any limited operations that are to be considered. Apparently
15 Mr. Cahill feels they wouldn't be able to utilize any arrange-
16 ments until April. We do not believe it would be prejudicial
17 in any way and might be advantageous to have a more continued
18 session than this two days next week.

19 Dr. Raney was the witness yesterday afternoon.
20 He has resumed the stand.

21 Excuse me.

22 MR. ROISMAN: Mr. Chairman, I am here this morning
23 only for a few moments. Your stringent schedules in Vermont
24 Yankee make it difficult for me to do both at the same time.

Mr. Macbeth has advised me that the Board was

1 concerned as to what our intents were with regard to the fuel
2 densification problem. I came here this morning to answer,
3 if I can, the Board's question with regard to that.

4 I just spoke with Mr. Karman and I still don't
5 have clear confirmation, but it is my understanding on
6 November 20th, Mr. Gianguso from the Commission has sent a
7 letter to all Applicants for power plant licenses, PWR and
8 BWR, relative to the fuel densification problem.

9 While I have not seen the letter, it is my
10 understanding that basically what's been requested is that a
11 recomputation of the emergency core cooling system
12 performance be made in light of the problem of fuel densifica-
13 tion.

14 Now that letter, as I understand, does not go to
15 the question of fuel rods crumpling such as they have had with
16 the unpressurized rods, but also to the question of the effect
17 on the distribution of the power in the rod at the time of
18 the occurrence of the loss-of-coolant accident as a result of
19 fuel densification. That is certainly the subject area with
20 which we would be concerned and until we can see what the
21 Applicant produces in response to that letter, if I am
22 correct in assuming that they have received such a letter
23 and analyzed the data they utilized in making the computations,
24 it is somewhat difficult to know how much further we will
25 want to go with the question.

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1 In addition, the one reactor that has been
2 examined subsequent to the Ginna problem, it is again my
3 understanding that that reactor's core, which had both
4 pressurized and unpressurized fuel in it, has been examined
5 at some distance by telescope or binoculars or something, and
6 that the portion of the core which did not have pressurized
7 fuel did not show signs of crumpling -- excuse me, the
8 pressurized did not show signs of crumpling, but the
9 unpressurized did. Certainly that is -- that does not
10 establish that the densification problem did not cause some
11 weakening within the rods of the pressurized fuel rods in
12 that core, and it does not necessarily establish at this
13 point that pressurized rods will not also be problems,
14 particularly again looking to the loss-of-coolant accident,
15 the transients that occur at that time, the build-up of
16 pressures, will there be swelling and bursting of those
17 rods at an earlier time, a later time.

18 You may remember in the course of our discussion
19 of the problems of swelling and bursting and flow blockage
20 that the problem of flow blockage is related to the extent
21 to which the fuel rod remains ductile and therefore swells
22 before it bursts. We don't know at this point; and I don't
23 think anybody does know at this point, what the fuel
24 densification may do to the ductility of that fuel rod and
25 whether it will be more susceptible to swelling before it

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1 bursts or more susceptible to bursting before it swells.

2 In short, although the fuel densification report
3 does talk about a number of important issues, it would appear
4 that there are still a number that remain outstanding. We
5 are hopeful that at the time the Applicant responds to this
6 November 20 letter, if such a letter has gone out, that a
7 number of those subjects will be touched upon and it may be
8 that we will find, once we have seen their underlying data,
9 that there are serious questions we would like to have the
10 Board explore.

11 At this point it would be premature to say that
12 we know that's true. Let me simply say that I suspect that
13 it is true and if so, we would be prepared to move ahead on
14 that in a timely fashion shortly after the Applicant has made
15 its final presentation, whatever that may be, to the Commis-
16 sion's concern on fuel densification, and we have had an
17 opportunity to examine the underlying data that the Applicant
18 used in computing that.

19 I would think certainly we are talking about a
20 couple of weeks maybe from the time that that report comes in.

21 In addition, as we have indicated in previous
22 communications on the question, although we feel that it
23 could legitimately be raised with reference to the 50 percent
24 testing license, at this point we will be confining our
25 concerns with regard to the full term license.

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1 Therefore, to the extent that the Applicant is --
2 does not respond to the November 20 letter in a timely
3 fashion or to our request for underlying data, we still
4 would not be interfering with the projected start-up date
5 of April 1 for the plant, since that start-up would be
6 done pursuant to the 50 percent testing license, and I am not
7 even sure whether -- has any license been issued at all?

8 MR. KARMAN: No.

9 MR. TROSTEN: There has been no --

10 MR. KARMAN: The only license is a fuel loading
11 subcritical.

12 MR. ROISMAN: Okay. So at least we will not be
13 interposing this with respect to that, and that holds equally
14 true with our concerns for the reactor pressure vessel.
15 Again while we think they could legitimately be raised with
16 regard to 50 percent testing, we will confine our concerns
17 to the consideration of the 100 percent full power license.

18 I think that's about all that I can say on it now,
19 and I do want to add that I really have not had an opportunity
20 to study the fuel densification report in much detail, nor am
21 I the one who is going to be able to do that adequately.
22 Mr. Ford has been assisting us as he did before with the
23 recent adjournment of the ECCS hearings. He is getting more
24 time available to assist us on that. I hope that within a
25 short period of time I can at least give the Board some outline

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of concerns raised by the fuel densification report itself
with which we are concerned.

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1 CHAIRMAN JENSCH: Will you do that in writing?

2 MR. ROISMAN: Yes, sir.

3 CHAIRMAN JENSCH: As soon as you are able to do so.

4 MR. ROISMAN: Yes, I will do so.

5 If the Board doesn't mind, unless there are
6 further questions, I wonder if I could be excused to go back
7 to Vermont Yankee?

8 (Board confers.)

9 CHAIRMAN JENSCH: Is there any inquiry of the
10 EDF counsel?

11 MR. TROSTEN: The only remarks I have to make are
12 with regard to the remarks of counsel for Citizens Committee
13 for the Protection of the Environment is that we will expect
14 to see, in accordance with the Commission's regulations,
15 a clear specification of the contentions which he intends
16 to raise with regard to the issuance of a license.

17 We would hope and expect that these would be
18 provided promptly and then the Board and the parties could
19 examine those to see if the requirements of the Commission's
20 regulations have been met and the hearing can proceed.

21 MR. ROISMAN: Mr. Chairman, just so we know where
22 the battle lines will be drawn on that issue, no rational
23 person that I know reads the Commission's regulations to say
24 we must totally identify every contention until after we have
25 had discovery.

1 I assume that as in the past in this hearing,
2 the discovery will be able to be done informally, and once
3 we have the information related to this subject in hand,
4 that we will be able to do it in great detail.

5 What I hope to provide the Board shortly is
6 what I do not consider to be the type of contentions that one
7 needs prior to the commencement of cross-examination, but
8 rather to identify areas of concern in order to alert the
9 applicant and the Staff of areas in which we would like to
10 conduct discovery.

11 The final, if we are going to request cross-
12 examination, the final narrowing of those issues would be
13 done, of course, only after we had the documents in hand and
14 had had a chance to study them.

15 As I say, I trust that is not going to be any
16 problem.

17 CHAIRMAN JENSCH: We will take the matter up when
18 it arises. I don't think we should give any blanket
19 indications at this time. I think the area of specificity that
20 is required is under some deliberation and concern in many
21 areas and there are many different approaches to that
22 problem.

23 I think the Federal Rules of Procedure may be
24 one guide in that regard, but in any event, we will all have
25 to be guided by the regulations of the Atomic Energy Commission.

1 Very well. We understand the position of the
2 Citizens Committee for the Protection of the Environment
3 and the Environmental Defense Fund, and we will hear further
4 from them as they have indicated.

5 We do have a question about the proposed
6 technical specifications that Mr. Briggs might mention now,
7 that might be of interest to the Applicant.

8 MR. BRIGGS: In the Initial Decision, the Board
9 asked to review the technical specifications for the testing
10 operation and this has been done.

11 We note only one thing that we have a question about.
12 On page 4 of the license, of the proposed license, the
13 last paragraph indicates that it is proposed that the license
14 -- the duration of the license shall be for nine months.

15 In the Initial Decision, we indicated that the
16 decision was based on a period of testing not to exceed
17 100 days and we assumed that this fits into the nine-month
18 period in some way.

19 However, in the technical specifications on page 6-10,
20 lines 9 through 15, it is stated that:

21 "Acquisition of river temperature data
22 will require a period of steady state operation
23 at 50 percent of full power beyond the period
24 of testing as defined in the FSAR."

25 It is not clear whether that period of steady

1 state operation of 50 percent of full power also fits within
2 the assumed period of testing not to exceed 100 days.

3 MR. TROSTEN: Mr. Briggs, it goes beyond the period
4 of 100 days. It fits within the nine-month period of time
5 set forth in the license. The technical specifications indi-
6 cate, in accordance with the belief of the Staff, that it would
7 be desirable to obtain this information to confirm the
8 projections with regard to the thermal model; and for this
9 reason, the technical specifications recognize the testing
10 program which would take place in order to acquire this
11 information.

12 MR. BRIGGS: Well, in arriving at the Initial
13 Decision, the Board pointed to this period of testing not
14 to exceed 100 days because of some discussion that involved,
15 well, the Applicant will -- not the Applicant will, but the
16 Applicant might go through his 100 days of testing and then
17 say, "Well, but we need to do some more, and we need to do
18 some more," and the 50 percent operation would go on
19 indefinitely.

20 It is not clear to us how this period of operation
21 beyond the 100 days fits into the statement in the Initial
22 Decision, the basis for the Initial Decision that testing
23 would be limited to 100 days.

24 MR. TROSTEN: Mr. Briggs, very frankly, we
25 interpreted -- I should say I interpreted the language in the

1 Initial Decision having to do with 100 days as reflecting
2 the concern of the Board that the testing not be unnecessarily
3 prolonged or prolonged without reason or prolonged simply
4 for the purpose of producing electrical power.

5 The testing is stipulated to take 100 days.

6 There is a period of time required in order to obtain the thermal
7 model -- thermal model testing which goes beyond the 100
8 days; but any testing which was performed beyond the 100
9 days or any testing which was performed which carried us
10 beyond that period of time for the purpose of verifying the
11 ~~thermal~~ ^{thermal} model would be solely for that purpose and would not be
12 for other purposes.

13 That is the reason why we feel that this is
14 consistent with the Board's decision, which referred to this
15 100-day period. We did not interpret the 100-day period as
16 establishing an absolute limitation on this.

17 CHAIRMAN JENSCH: I think it was predicated upon
18 the evidence adduced that the period needed was 100 days and
19 they might not even need that, and that at the end of 100
20 days, there would be a full report back and the Board would
21 have a chance to see what the results were and give con-
22 sideration to other factors that might then be pertinent.

23 As I say, I think that if you read the transcript,
24 the evidence, you will find that the Applicant was very firm
25 in its outside estimate of time needed for testing to be

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1 100 days and the Board accepted the evidence of the Applicant
2 in that regard, but that certainly not more than 100 days
3 would be required.

4 Now, you say you have another purpose in mind.
5 That is fine, but that other purpose in mind was not revealed
6 in the transcript to us as reflected by the hearing.

7 MR. TROSTEN: May I just address this point?

8 The technical specifications reveal to the
9 Board, and there was certainly no attempt of any sort not
10 to have all of this fully before the Board, the purpose for
11 the additional testing. It is to verify the thermal model,
12 and the Staff and the Applicant both agreed that this would
13 be a desirable thing to do from the standpoint of acquiring
14 necessary environmental information.

15 CHAIRMAN JENSCH: We don't raise the issue of what
16 the Applicant and the Staff thought would be fine. We were
17 guided by the record available to us.

18 MR. TROSTEN: If the Board desires, Mr. Chairman --

19 CHAIRMAN JENSCH: We did not feel there was any
20 evidence in the record that indicated there was any need for
21 any testing beyond 100 days, no matter whether you say we
22 now need more time to get the thermal model. It was not clear
23 to the Board that those factors were involved, from the
24 transcript.

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1 MR. TROSTEN: Yes.

2 One reason why the language in the tech specs,
3 Mr. Chairman, reads the way it does, is to provide the infor-
4 mation and the background to the Board as to why this was done.
5 The transcript is not clear on this point, I would agree with
6 you, Mr. Chairman.

7 The technical specifications are an effort to
8 provide to the Board the information as to why this is desirable.

9 CHAIRMAN JENSCH: Well, the technical specifications
10 as proposed were not available to the Board at the time
11 that the hearing was on or at the time of the review of the
12 transcript for the decision.

13 We had the impression that perhaps the proposed
14 technical specifications were a little broader than the initial
15 decision involved and may have concerned matters that were
16 not really reflected in the record, and the Board was concerned
17 to have a further review of that matter.

18 Hudson River?

19 MR. MACBETH: Mr. Chairman, the Hudson River
20 Fishermen's Association did not oppose the issuance of a license
21 for testing the 50 percent of full power, and we did not
22 oppose it on the basis of the stipulation reached with
23 the applicant.

24 It was certainly my understanding that the testing
25 involved there was testing of the reactor and not of any other

mm2 1 kind of environmental testing of the thermal model or anything
2 else. Now it comes to me as a surprise this morning,
3 perhaps because I simply assumed that was the basis on which
4 we were going forward and I had not carefully re-examined the
5 technical specifications.

6 I would like an opportunity to examine the
7 technical specifications and review the stipulation.

8 CHAIRMAN JENSCH: I think we all will have an
9 opportunity to review it, before this session of hearings is
10 over.

11 MR. MACBETH: Thank you.

12 MR. ROISMAN: Excuse me, Mr. Chairman. I am in
13 Mr. Macbeth's boat, I am afraid. I was somewhat lulled into
14 a sense of security also by the Board's initial decision, and
15 the narrow limits thereof.

16 I wonder if it would be possible to find out how
17 much time we are talking about for steady state operation at
18 50 percent outside limit. If we are talking about a day or
19 two, that is one thing. If we are talking about a month or
20 two, that is obviously something entirely different.

21 Would it be possible to get that kind of information
22 this morning, or maybe the Applicant could write it since this
23 hearing will begin on January 10 and the critical date
24 has not yet, of course, come up.

25 MR. TROSTEN: Mr. Chairman, let us confer for a

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1 moment.

2 CHAIRMAN JENSCH: My thought was perhaps you would
3 like to consider that a little further and -- the Board does
4 intend to make some inquiry about the matter. We could
5 take it up later.

6 I was thinking of Dr. Raney being here.

7 MR. TROSTEN: Yes.

8 Let us proceed with Dr. Raney.

9 CHAIRMAN JENSCH: Very well.

10 Dr. Raney has resumed the stand. Hudson River
11 Fishermen's Association, please proceed.

12 Whereupon,

13 EDWARD C. RANEY

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

xxxx

17 CROSS-EXAMINATION (Continued.)

18 BY MR. MACBETH:

19 Q Dr. Raney, at the close of the hearing yesterday,
20 I was questioning you about the conclusion that you designated
21 as B on page 9:

22 I believe that you said that it was your opinion
23 that 95 to 100 percent of the striped bass fishery in the
24 middle-Atlantic area was supported by Chesapeake Bay, is
25 that correct?

4
1 A In response to your question and in view of the
2 variances in year class strength, I made an estimate that is
3 in accord with your statement.

4 Q And also you stated as your opinion that the
5 Hudson River contributed between zero and 5 percent to
6 middle Atlantic striped bass fishery, is that correct?

7 A That is right.
8 That is outside the area near the mouth of the
9 Hudson.

10 Q Well --

11 A In other words, the Hudson River contributes very,
12 very heavily to the Western quarter of Long Island Sound, to
13 the Hudson River, to the bays south of Manhattan Island,
14 spills out very little around Sandy Hook in New Jersey,
15 Jamaica Bay, occasionally as far as Jones Beach and in some
16 years, a few juveniles, two years old, get as far as Great
17 Bay, but basically for the -- the bulk of the fishery on New
18 Jersey, Delaware, Long Island, the South Shore of Long Island,
19 the tip of Long Island, my estimate is that basically 95
20 percent, year in and year out, comes from the Chesapeake
21 Bay.

22 Q When you say Great Bay a moment ago, did you mean
23 the Great South Bay on Long Island?

24 A Yes, thank you.

25 Q Could I just say -- just so I can get these figures

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1 clear and in the same category, could we just take the techni-
2 cal definition that you gave us yesterday of the middle Atlantic
3 area which would include, as I understand it, at least the
4 western quarter of Long Island Sound, and areas such as
5 Jamaica Bay and Jones Beach and parts of the New York body,
6 and taking that whole -- that whole group, what percentage of
7 the middle Atlantic fishery would be supported by the
8 Hudson River?

9 MR. TROSTEN: Mr. Macbeth, before you proceed,
10 I will state this as an objection.

11 Dr. Raney, do you accept Mr. Macbeth's definition
12 of the mid-Atlantic area?

13 THE WITNESS: No, sir.

14 BY MR. MACBETH:

15 Q Well, perhaps --

16 MR. MACBETH: Thank you, I didn't understand him
17 then properly yesterday.

18 BY MR. MACBETH:

19 Q Could you describe to me in terms of these areas
20 around the mouth of the Hudson that we have just been
21 discussing where the line is between the middle Atlantic
22 fishery and I guess it would be the Hudson fishery.

23 A This is as I consider it.

24 Q Yes.

25 This is the --

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1 A. The middle Atlantic fishery includes the coastal
2 fishery in Delaware, New Jersey, Long Island.

3 The commercial fishery statistics, which are
4 recorded by the U.S. Fish and Wildlife Services defines
5 this area in that way as the middle Atlantic area.

6 In a broader sense, of course, the middle Atlantic
7 area encompasses Virginia and part of Connecticut.

8 Q. Yes.

9 A. My statement basically is this: That the Hudson
10 River contributes very little to the coastal fishery.

11 CHAIRMAN JENSCH: They are first asking you to
12 just define the areas. Then we will get your conclusions.

13 THE WITNESS: My definition of the coastal areas
14 is basically Delaware, coastal New Jersey, southern Long
15 Island as the seaward side of Long Island, including
16 Montauk Point.

17 BY MR. MACBETH:

18 Q. You are excluding Long Island Sound?

19 A. I never include it.

20 Q. Never include it?

21 A. My inclusion of Long Island Sound is with the
22 Hudson River race which contributes very heavily to the
23 western quarter of Long Island Sound, but contributes little
24 or nothing to the eastern end of Long Island Sound.

25 Q. So that now when you say middle Atlantic fishery,

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1 you mean the fishery along the coast of Delaware, the coast
2 of New Jersey and the South Shore of Long Island, is that
3 correct?

4 A. Yes, sir.

5 Q. And just so we are clear about it, how far do you
6 go into the New York ^{light} ~~bite~~?

7 A. Basically not at all.

8 In other words, if the lower or southern bay is
9 part -- is contributed to heavily by the Hudson River race of
end 3 10 striped bass.

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MR. TROSTEN: How do you define New York *bight*,

4 Reba 1 2 Dr. Raney?

3 THE WITNESS: I would define it as the area included
4 inside or to the north of the area between Sandy Hook and
5 Southern Brooklyn.

6 BY MR. MACBETH:

7 Q Coney Island?

8 A Coney Island, Jamaica, the western end of Jamaica
9 Bay.

10 Q Yes, Breezy Point, okay. Could you indicate to me
11 the studies and other sources of information on which you
12 rely in the opinion that the Hudson River supports zero to
13 five percent of the fishery, Middle Atlantic fishery as you have
14 just defined it?

15 All I am really requesting is a listing of the studies
16 or other sources of information.

17 A Yes, sir.

18 Raney and DeSilva, 1953, "Racial Investigations of the
19 Striped Bass." Incidentally, sir, these are listed in my
20 *paper* papers, page 101. That was a paper that first defined the
21 racial separation of the Hudson River striped bass from the
22 Chesapeake Bay striped bass. The next paper, Raney, Wolcott,
23 and Mehring, 1954, "Migratory Pattern and Racial Structure
24 of Atlantic Coast Striped Bass."

The several other papers by Raney on that page 101 of

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1 my testimony also involve discussions of the Hudson River
2 population of the striped bass but to a lesser extent.

3 The next reference on page 94, Alperin, 1966, "Dispersal,
4 Migration, and Origins of Striped Bass from Great South Bay,
5 Long Island" and the second paper, Alperin, 1966, "Occurrence
6 of Yearling Striped Bass along the South Shore of Long Island."
7 It was in the first paper by Alperin on "Dispersal and Migration"
8 that he summarized the number of bass which had been tagged
9 in the Hudson River between the period 1940 and 1956.

10 I summarized that in my testimony, which you might want
11 to refer to for your convenience, on page 36. It was in this
12 summary paper for those years that for the Hudson, 504 striped
13 bass were tagged in the Hudson between 1940 and 1956 and of
14 these, none were recovered anywhere except the Hudson River
15 to New York Harbor or the adjacent Jamaica Bay.

16 Now the taggings which are summarized in those one hundred
17 and four taggings were done at various times by various people
18 on various sized striped bass.

19 MR. TROSTEN: Dr. Raney, you have just referred
20 to a hundred and four taggings.

21 THE WITNESS: That was a mistake, 504.

22 The next reference is on page 94 of my testimony, Briggs,
23 1962, "Sport Fisheries of Great South Bay and Vicinity" and
24 Briggs, 1965, "The Sport Fisheries in the Surf on the South
25 Shore of Long Island from Jones Inlet to Shinnecock Inlet".

4

1 I refer also to John Clark's paper listed on page 96,
2 1968, "Seasonal Movements of Striped Bass Contingents of
3 Long Island Sound and the New York ^{Sept} Bite." In my review of
4 John Clark's paper, which was based upon returns by both tagging
5 and returns mostly from sport fishermen, I could not determine
6 that any fish in that study had been tagged in the Hudson River
7 which were representative of the Hudson River race.

8 However, ^{Mr} Dr. Clark did not list the location of tagging
9 and the location of recovery. He indicated these locations
10 by placing black dots on maps.

11 These dots were so large that in some cases it was almost
12 impossible to tell the precise locality. It is possible that
13 John Clark has some data on fish that were tagged in the
14 Hudson which are included in his report.

15 The most recent data I refer to is given in my testimony
16 on page 69. These data are original data which have not before
17 appeared. They are included in a paper which was presented
18 to the International Game Fish Conference several weeks ago
19 in Miami Beach and will appear in the proceedings of that con-
20 ference shortly.

21 However, because these to my knowledge are the most
22 recent data which pertain to the area under consideration, I
23 summarized them for the purpose of this hearing.

24 These data are listed in detail so that they may be con-
25 sidered by anyone who wishes to study the problem.

1 Basically the findings of this study, which incidentally
2 were returned from tagged fish, these tagged fish had been
3 -- the fish -- they were all striped bass that are reported
4 here, they had been tagged by sports fishermen along the Atlan-
5 tic Coast and this was a program that was being supported by the
6 American Littoral Society and is still underway.

7 They published the list of recaptures in the various issues
8 of the "Underwater Naturalist", which is the official journal
9 for the American Littoral Society.

10 The volumes in which they appear, in which the returns
11 are listed, are listed on page 69 of my paper.

12 To conclude my answer to your question, this 1972
13 manuscript by Raney includes 13 fish that were tagged in the
14 Hudson.

15 All of these fishes were recovered in the New York area
16 except one. This fish was recovered at Plymouth, Massachusetts.
17 In Raney's paper in 1954 and in all subsequent studies of
18 the striped bass along the coast, it has been shown that segment
19 of the Chesapeake Bay population over-winter occasionally,
20 and perhaps quite regularly in the mouth of the Hudson -- and
21 by the mouth of the Hudson I include the area up through
22 Haverstraw Bay -- that fish tagged in winter or in the early
23 spring fishery in Haverstraw Bay are likely to be a mixture
24 of the Hudson River race and the Chesapeake Bay race.

25 In order to test this hypothesis, back in 1954 we

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1 collected young striped bass from throughout the Hudson River.
2 We found that in the upper parts of the Hudson, that is from
3 Peekskill north, the populations were very much the same as
4 far as their countable characteristics.

5 But in the Pallisades area, to a lesser extent in the area
6 of Nyack, both of these being downstream areas in the location
7 of the Hudson, there were at times fishes that we believed of --
8 that were of Chesapeake Bay ^{origin} ~~original~~, spawned. Historically
9 this is not surprising because as I mentioned yesterday the
10 Hudson River population of striped bass is a relatively recent
11 population.

12 It has only been in existence for basically ten or perhaps
13 twelve thousand years. This is also true of the other popu-
14 lations of striped bass in the north except in the St. Lawrence
15 River system, and as most of you appreciate, the striped bass
16 is an unusual fish in as much as it goes from the St. Lawrence
17 all the way down and through the Gulf of Mexico, at least as
18 far west as Lake Ponchartrain near New Orleans.

19 To get back to the Hudson River race, it is apparently
20 a recent offshoot, recent in terms of fish evolution, but it
21 is a very real important population of striped bass, but it is
22 important, in my opinion only to the New York area.

23 I think that I have covered all the papers which indicate
24 taggings which would be pertinent to the New York population.

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1 BY MR. MACBETH:

2 Q. Could you now tell me the papers and data that
3 you rely on for your opinion that the Chesapeake supports 95
4 to 100 percent of the middle Atlantic fishery as you defined
5 it earlier this morning?

6 A. It might be easier to follow this if you refer
7 to page 38 in my testimony which is an attempt to briefly
8 summarize the taggings that have been done in Chesapeake Bay
9 where recoveries have been made along the coast.

10 There was only one study of tagged fish in Chesapeake
11 Bay where there were no returns outside the Bay. This was
12 done by Pearson, John C., 1938, The Life History of the
13 Striped Bass or Rockfish.

14 In this paper, John Pearson or colleagues tagged
15 a substantial number of fish in the Bay. These were fish
16 that were native to the Bay and which were not of the 1934
17 year class.

18 Within some 12 months, 30 percent of these fishes
19 were recovered inside the Bay and none were taken outside the
20 Bay.

21 Now, with the advent of the 1934 year class --
22 this is a very important year class because this was the start
23 of the upswing in striped bass populations both in the
24 Chesapeake and in the Atlantic coastal fishery.

25 This 1934 year class arose from a very small

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1 population of adult striped bass someplace in Chesapeake
2 Bay, precise spawning areas are not known.

3 It became apparent however in 1936 that something
4 explosive had happened because in 1936 along the Virginia,
5 Delaware, New Jersey, Long Island, Massachusetts, Connecticut
6 coasts, there were tremendous numbers of what we speak of as
7 school bass. These were bass that had passed through their
8 second winter, were approximately 10 to 14 inches long.

9 Fortunately, at that time Dr. Vladykov,
10 V-l-a-d-y-k-o-v, and colleague Wallace, made studies by tagging
11 Chesapeake Bay.

12 These results were published in 1938 and the paper
13 is listed in my contribution.

14 Now they found that only 28 percent of the -- I am
15 sorry, only 1 1/2 percent of the fishes which they tagged
16 in Chesapeake Bay left Chesapeake Bay.

17 Now percentagewise, this doesn't seem to be much,
18 but remember that these fish, when tagged in the Bay, are
19 subject to a very heavy fishery. The fishery, even before the
20 34-year class, was cropping some 34 percent of the bass as
21 indicated by Pearson's study in a given year.

22 Now, as Dr. McFadden pointed out, this is not an
23 unusual percentage of a population to be taken in a given
24 year.

25 But the important point to remember is that when

3
1 you begin to ^{go} ~~get~~ through the summer in a given area, that you
2 will also have fishing in that area, and this crops a great
3 many of the fish, including the tagged ones, so that what seems
4 to be a small percentage of tags recovered outside the Bay,
5 may represent a considerable number of fish.

6 Now, from actual experience of observers who were
7 present along the coast in 1936 and '37, these schools were
8 described as in the millions. The catch records
9 immediately jumped and the 1936 and '37 catches along the
10 coast were tremendous.

11 Now there have been a series of other studies and
12 taggings in Chesapeake Bay. On page 39 of my testimony, I
13 mention Mansueti, M-a-n-s-u-e-t-i, 1961. He reported
14 fewer than one percent of tagged returns.

15 On the other hand, in 1961, Massmann and Pacheo,
16 P-a-c-h-e-o found roughly 4 percent of recoveries outside
17 the Bay.

18 In the studies by Chapoton and Sykes, 1961, they
19 reported that of 27 recaptures, 14 were taken outside the Bay,
20 50 percent.

21 Now, one of the things that is important to remember
22 for one trying to understand these populations in the Bay, is
23 that all this time they have been increasing, and at the same
24 time the populations which leave the Bay in the spring and
25 return to the Bay in the winter have also been increasing,

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1 and the pressure on them both from sport fishing and commercial
2 fishing has been increasing as is obvious from the catch
3 records.

4 Now, the real classical study which I haven't
5 mentioned yet, which is one of the finest studies that was
6 ever done on striped bass, was done by Daniel Merriman,
7 1941. He was the one that was really able to show that
8 these striped bass from Chesapeake BAY that were spawned in
9 1934, ran along the coast in '36 and in '37. They ran up the
10 coast as far as Cape Cod. Some of them to Maine, and back
11 down the coast in the fall.

12 Now, every one that has studied the striped bass
13 since 1941 has come to the same conclusions and these
14 include my work in '54, John Clark's work in 1968, the study
15 that I report here, Raney, 1972.

16 Now, in this '72 study as given in my presentation
17 here, I include only the New York catch.

18 In a paper which has been finished subsequently,
19 we have included all of the fishes which were tagged or
20 recovered by the American Literal Society group and this can
21 be made available if desired.

22 There are two other studies that also shed important
23 light on this problem. The study by Alperin, which I mentioned.

24 The people that have studied fishes on the South
25 Shore of Long Island for 50 years or more were always aware

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1 of the fact that there was a spring and fall fishery, but they
2 weren't sure where it came from until the studies of Dan
3 Merriman in 1941. Subsequent to that, Irwin Alperin and
4 Briggs made studies. These were published in the New York Fish
5 and Game Journal, and they substantiate the concept of a
6 north-south migration, north in the spring, south in the fall.

7 This concept is not unusual among fishes. The
8 shad does the same thing; the shad that enters the Hudson
9 down runs after it spawns, the adults migrate up along the
10 coast, over summer in the Gulf of Maine. As the water
11 temperatures begin to fall, they migrate to the south, spend
12 the winter off North and South Carolina and make their way
13 up along the coast, peel off in their various home rivers, and
14 spawn again at least in the case of some adults.

15 The young on the other hand, make their way down
16 the rivers in the fall of the year, much like bass do when
17 they are two years old, and move out to sea and undertake a
18 miniature migration of the same nature.

19 These studies were reported in detail, and were
20 a result of the studies of the Connecticut Yankee Atomic
21 Plant on the Connecticut River. They were reported by William
22 Leggett and Richard Whitney in the recent issue of
23 the Fishery Bulletin which is published by the National
24 Marine Fisheries Services.

25 We could give other examples of this type, but

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1 probably the striped bass and the American shad are
2 the best known and most worked on, at least on the East Coast.

3 Q Let me be clear, the Leggett and Whitney study
4 refers to striped bass or shad?

5 A American shad, sir.

6 Q Would you give me the title of your 1972 papers,
7 and would you be -- I would appreciate it if you would provide
8 me with a copy of it.

9 A It is included -- the portion that pertains to
10 New York starts on page 73 of my testimony.

11 Q I would just like to see the whole thing if I
12 could.

13 A Yes, I would be glad to -- I am sorry, it begins
14 on page 69 of my testimony. I would be glad to furnish it
15 to you.

16 The reason I did not include the whole thing in
17 this is that the paper was as not -- was not yet included at
18 the time.

19 Q Would you just give me the title now so that I
20 can refer to it by something more than the date?

21 A I don't recall the precise title, but I expect
22 that it is Migrations of Striped Bass Along the Atlantic
23 Coast, or some such title as that.

24 Q - Fine.

25 Thank you.

1 You also referred, in the course of your discussion
2 of the data on the striped bass in the Chesapeake, about
3 observers on the coast in the '30s in relation to the 1934
4 year class.

5 Now, are those -- are those included in the
6 various reports to which you referred or --

7 A. Yes, they are, sir.

8 William Neville, whose name appears in the
9 bibliography of my testimony, William C. Neville, summarized
10 his observations in two papers that appear on page 100.
11 William Neville, 1940, Conservation of Striped Bass and also --
12 well, there are two papers which appeared in different places.

13 Then there is also a paper by Neville, Dickinson
14 and Westman, 1939 on striped bass. This appeared in the waters
15 along Long Island.

16 Incidentally, I participated in that survey and
17 at that time I was a graduate student at Cornell. We covered
18 the waters adjacent to Long Island and found not a single
19 young striped bass. But in the fall of that year, there
20 was a very large run of striped bass at Montauk and other
21 places along Long Island.

22 This was the beginning of that tremendous year
23 class or actually it was near the end of the tremendous year
24 class which was spawned in 1934.

25 The point here is that Long Island -- the tributaries

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1 of Long Island are not good areas for spawning the striped
2 bass.

3 Others who were around in those days include Dave
4 Wallace and on page 105 is a paper listed by David Wallace
5 and William C. Neville, The Problem of Conservation of Striped
6 Bass on the Atlantic Coast.

7 Unfortunately, although this is listed, it is
8 an unpublished manuscript and therefore is not generally
9 available. Basically it covers the same types of thing
10 that Neville covered in his 1940 paper.

11 This is the best historical review that I know of
12 up until the early '40s.

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Q Would you be kind enough to provide me with a copy of the Wallace and Neville papers?

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A Yes, sir.

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Q Thank you.

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Does that then cover the studies and other data on which you rely for your opinion that 95 to 100 percent of the mid-Atlantic striped bass fisheries are supported by the Chesapeake?

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Q Thank you. Would you tell me in your opinion what is the numerical size of the mid-Atlantic fishery as you defined mid-Atlantic fishery earlier this morning?

A At what time?

Q Let's take it season by season. That would be an appropriate way to break it down. Let's take it first for the -- say the past year, 1971, and maybe we will take one

1 year a little further back just to give a comparison.

2 A The striped bass fishery along the coast is a
3 spring fishery. It is a May-June fishery, and this year
4 the Chesapeake Bay bass hit off Atlantic City approximately
5 from the end of the first to the end of the third week in
6 May. The reason I know that they hit off there is that I have
7 30 people down there studying an ocean site for a nuclear
8 plant and on any given day there were 30 or 40 boats out
9 there fishing for these striped bass, and many of these boats
10 were landing 100 to 200 bass. They consisted of bass anywhere
11 from school size, 12 to 15 inches, up to bass that were 50,
12 60 pounds in weight.

13 These bass continue up along the coast and you
14 can almost measure the progress -- they move at about 10 to
15 15 miles a day, although a school may be of a size that it may
16 extend over 50 miles of coast.

17 Then they next hit off the area of Sandy Hook and
18 then off of Jones Beach, Great South Bay area, Long Island,
19 then off Montauk, and a week later they hit off Connecticut
20 and then by late June, first of July, they are off Cape Cod.
21 They are a wonderful source of sport fishing.

22 Then in another week or so some have either gone
23 through the canal or around the cape and are caught in Maine.

24 A reverse migration occurs starting usually in
25 late September and as these fish come back down the coast,

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1 parts of these schools occasionally will peel off, so to
2 speak, enter the mouths of the rivers where there is no
3 spawning, and stay there over winter.

4 CHAIRMAN JENSCH: I think, Dr. Raney, we would like
5 to get the numerical size. I think he described migration.

6 THE WITNESS: First I was trying to give you some
7 concept of the size, if you see it, if you are there. If
8 you have never been there, you can't possibly appreciate
9 the thousands and thousands of bass that are in the water
10 feeding and slicing, many of them accompanied by other
11 fish such as bluefin.

12 Now as to actual numbers, I can't give you any
13 figures and no one else can.

14 BY MR. MACBETH:

15 Q Could you give a kind of range of figures?

16 A This is utter foolishness to even attempt to,
17 and the reason is obvious --

18 CHAIRMAN JENSCH: Just -- answer it then and
19 perhaps somebody else will develop your reason. I think we
20 will move along faster. Just limit your answer to the
21 question.

22 THE WITNESS: Thank you, sir.

23 BY MR. MACBETH:

24 Q Could you tell me what the numerical size of the
25 Hudson -- of the fisheries supported by the Hudson is?

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1 A No, sir.

2 Q Could you give me an estimate of the relative size
3 of the middle Atlantic fishery supported by the Chesapeake
4 as opposed to the Hudson?

5 A I have already done that, sir.

6 Q And the answer is --

7 A Basically the Hudson in 10 years may contribute
8 perhaps as much as five percent.

9 Q I have always had just a little trouble with the
10 areas.

11 A I am talking about the coastal fishery. I am
12 talking about the real fish, the important fishery.

13 Q What I am trying to get at now is if you take that
14 coastal fishery and you take the fishery in Long Island Sound
15 and the New York Bight which is -- has some Hudson fish in it --

16 A It is mostly Hudson fish.

17 Q Mostly Hudson fish?

18 And you can take that as those groups together,
19 what would be the relative numerical numbers -- what would be
20 the relation within that total between those supported by
21 the Chesapeake Bay and those supported by the Hudson?

22 MR. TROSTEN: Mr. Macbeth, let me see if I --

23 MR. MACBETH: It was a badly phrased question.

24 Let me see if I can do it again.

1 BY MR. MACBETH:

2 Q Take the middle Atlantic coastal fishery as you
3 described it this morning, take the area of Long Island
4 Sound, New York Bight, as discussed earlier, combine them.
5 Out of that total, what percentage of the striped bass popula-
6 tion is supported by the Chesapeake and what percentage is
7 supported by the Hudson?

8 A I can't answer that.

9 Q Okay. Dr. Raney, what kind of tags are used for
10 tagging striped bass nowadays?

11 A Nowadays, sir?

12 Q Nowadays.

13 A The type that's used varies with the size of the
14 fish that you are going to tag. The most commonly used tag
15 at the moment is one that's inserted by using a gun. It has
16 a fish-hook like structure on the end of it. It is inserted
17 under the dorsal fin, the fin on the back of the fish, by a
18 small gun, shot in. The hook presumably lodges between the
19 interhemal bones. The tag itself is like a piece of spaghetti.
20 It extends off to the side of the fish and will have an
21 inscription on it like return, U.S. Fish and Wildlife Service,
22 Reward, or some such thing.

23 Q What kind of tags were used 30 years ago?

24 A Well, a great many kinds of tags have been used.
25 Many of them were a button-like tag. They were inserted using

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1 a piece of thread, later nickel wire. This consisted
2 of two buttons, one on either side of the dorsal part of
3 the fish and there would be an inscription on one of these
4 tags, return to, and the number.

5 Q And the dorsal part of the fish would be the --

6 A The back part.

7 Q The tail?

8 A Not the caudal part, but on the dorsal, along
9 the back, below the dorsal fin.

10 Occasionally some people have tagged through the --
11 what we call the caudal peduncal of the fish which is just
12 an advance of the caudal fin. Basically now after these
13 years of experience those that hold best are those that
14 are inserted through the back, under the dorsal fin.

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1 Q What were the reasons for changing from these --
2 now am I right in thinking that these button-like tags are --
3 one has a kind of disk on it and -- like a tack, and you stick
4 that through the fish and you sort of put a -- the equivalent
5 of a nut or bolt on the other side. That is about the worst
6 description I can imagine, but does that convey the sense
7 of the button tag?

8 A I think so.

9 Q What were the reasons for changing from that kind
10 of a tag to the spaghetti-like dart tag you were describing?

11 A There were several reasons. A major reason is
12 that it is a very hard job to tag very many fish, tagging them
13 that way.

14 With the advent of this gun tag, you can tag a hundred
15 fish in a half hour, if you have several people working.
16 That was one reason.

17 One of the other reasons, of course, and an obvious
18 reason, if you are using the right size gill net to catch
19 these, the tags often get caught on the gill net. You may
20 either lose the tags or you have a proportion of the
21 population returned, which is not in accord with what you
22 would like to get. You would like to have it proportional,
23 the tagged phase proportional to the population which was
24 tagged.

The major reason is basically because the present tag

1 is so easy to insert and it holds better.

2 One other tag that I did not mention was the
3 internal tag. It is used to some extent now, to put a small
4 slit along the abdomen of the fish and insert this tag.
5 The obvious weakness of this, of course, is that usually it
6 is not returned after the fish gets into the market. You
7 don't get very good data.

8 Q Was that kind of tag being used 30 years ago?

9 A 25 years ago.

10 Q Where would you find these gill nets that you are
11 describing is one of the problems?

12 A You are likely to find the gill net any place
13 where there is a commercial fishery, although, particularly
14 in the Hudson River, it is basically a gill net fishery.
15 There are a lot of kinds of commercial areas. The gill net
16 is one of them and it is used everywhere, at times, in the
17 ocean, some will be used six to eight miles out in the ocean.
18 It is used in estuaries, used in rivers, used in any other
19 aquatic area.

20 Q You expect to find it used more frequently in the
21 Hudson, say, than in the ocean?

22 A The Hudson River fishery is a fishery for shad.
23 The striped bass that are taken in the Hudson River by
24 permit are taken only because they are taken in shad nets.
25 The season, of course, is closed in the Hudson River, between

or 3

1 December 1st and March 15th, open March 15th for the shad
2 fishery.

3 The Hudson River fishery, which is practically defunct,
4 is a gill net fishery of both the floating gill net type
5 and the stake net type.

6 The floating gill net, as the name indicates,
7 floats out the surface or is weighted along the bottom or
8 they are attached to stations and they are more or less
9 permanent for that season.

10 These can be seen easily in the spring as one
11 crosses the Tappan Zee Bridge.

12 Q In comparison to a coastal fishery in the ocean,
13 are more gill net -- are gill nets more usual in an area
14 like the Hudson River than they are in a coastal fishery?

15 A When you have described this process of the stake
16 nets and so on, it just struck me it might well be likely
17 you could do that much more easily in a river than you
18 could out on the surface.

19 A You can't do it more easily in a river than you
20 can outside. You can do it easily outside. Lots of gill
21 net fishermen fish many, many miles in the ocean. We see
22 them almost every day down off Atlantic City.

23 I would say this: Most of the spring fishery in
24 rivers by commercial fishermen depends to a large extent on
25 gill net fishery.

1 Q And how about the spring fishery along the coast?

2 A Well, the spring fishery along Long Island is
3 basically a haul seine fishery now. It used to be a pound
4 net fishery, pound, p-o-u-n-d, the big square nets, which are
5 expensive, usually run by families over several generations.
6 Most of these pound net sites have been abandoned for various
7 reasons, not because of scarcity of fish, however,

8 Most of the commercial fishery now off the south shore
9 of Long Island is a haul seine fishery.

10 Q How does a haul seine compare to a gill net?

11 A Well, a gill net depends upon the fish becoming
12 entangled. In other words, the fish swims into a gill net
13 and gets caught just behind the head or on the opercular flap.
14 A haul seine is a finer mesh, depending upon the size fish
15 that you would like to catch. Haul seine is set normally from
16 the boat, taken from the beach, you lead one end out, make
17 a semicircle, and then it is drawn to the beach either by
18 hand or by power, using winches or by using a couple of beach
19 buggies. It does not depend upon entangling the fish, it
20 depends upon entrapping the fish.

21 Q Now, on page 37 of your testimony, you gave a
22 summary, I think, repeated from Alperin, of the records of
23 striped bass tagged in the Hudson between 1940 and 1956.

24 With the 1940 sampling, would those fish have been
25 tagged with these button-like tags that you are describing?

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1 Aren't they also called Peterson tags?

2 A. Yes; I would have to look at his paper, sir.

3 I have it here, if you would like me to do it.

4 Q. Would you?

5 A. Yes.

6 MR. TROSTEN: Would this be an appropriate time
7 for a brief break, Mr. Chairman?

8 MR. MACBETH: Be fine with me.

9 CHAIRMAN JENSCH: What does the reporter say?

10 REPORTER: I am okay.

11 CHAIRMAN JENSCH: Well, if there is a reason for
12 it, but why don't we finish up with this tagging process.

13 CHAIRMAN JENSCH: Well, it may take some time to
14 review these papers.

15 We will accept Applicant's suggestion.

16 At this time let's recess to reconvene in this
17 room at 10:40 a.m.

18 (Recess.)

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CHAIRMAN JENSCH: Please come to order.

Did you have time to locate the material, Dr. Raney?

THE WITNESS: Yes, sir.

CHAIRMAN JENSCH: Can you answer the question as to ---

THE WITNESS: The tag used in the study by Alperin, 1966, entitled "Dispersal, Migration and Origins of Striped Bass from Great South Bay, Long Island", is what is called a disc dangler tag. And this tag is illustrated on page 85 in this paper and is further illustrated by a picture of a striped bass with a tag attached.

BY MR. MACBETH:

Q I am afraid I must have put the question improperly. What I wanted to know, let me ask you now, on -- in the summary that Alperin gives on page 37, he -- page 37 of your testimony, he describes a series of tagging experiences and he gives one for 1940 and do you know what tag was used in that 1940 tagging experience?

A I don't know which 1940 experience it was because in 1940, both Dan Merriman and William Neville tagged fish. I would suspect that it was a Peterson Disc type tag.

Q Would there be some way of finding -- for us to find out quickly?

A Yes, ask Mr. Alperin. He is presently chairman of the Atlantic States Marine Fisheries Commission.

1 Q Is that just around the corner down here (indicating)?

2 A Yes, sir.

3 Q Oh, thanks. Just an obvious point, looking at
4 the summary on page 37 of your testimony, it is true, is it
5 not, that 72 of a total of 82 fish reported in the five tagging
6 experiments came from the 1940 tagging experience, presumably
7 those of Merriman and Neville?

8 A Yes, there were 72 returns from those tagged in
9 1940 by whomever they were tagged.

10 Q And that -- when you really get down to it, that
11 is the important study in this summary, isn't it?

12 Isn't it? I mean 1942, they did not get any back.
13 That does not really prove too much. 1954 they tagged a hundred
14 and eight and did not get any back. That does not seem too
15 indicative.

16 1955 there were 28 tagged, and only one returned. 1956,
17 a hundred and forty-eight, none. But certainly the 1972 return
18 from -- out of 200 in 1940 is really the -- that is the
19 bulk of the experience, is that right?

20 A That is the bulk of the returns as indicated by the
21 Alperin summary on page 37.

22 Q Yes.

23 MR. MACBETH: I think that concludes my cross-
24 examination of this witness, Mr. Chairman.

25 CHAIRMAN JENSCH: Does the Staff have cross-examination?

8

1 MR. KARMAN: Just one or two questions, Mr. Chairman.

2 CHAIRMAN JENSCH: Proceed, please.

3 BY MR. KARMAN:

4 Q Dr. Raney, are you familiar with the recapture
5 locations of striped bass tagged by the Sandy Hook Marine
6 Laboratories in the Hudson River in March of 1968 as reported
7 in Hudson River ecology, the symposium which was edited by
8 Dr. Lauer and Dr. Howells?

9 A May I have the first part of the question?

10 Q Yes. Are you familiar with this study with respect
11 to the recapture locations of striped bass, 1968?

12 A I believe that this symposium was published in 1969. Dr.
13 Lauer mentioned it during the course of his cross-examination.

14 A Yes. I have seen the symposium.

15 Q And you have seen this figure?

16 (Indicating)

17 A I presume I have in passing. I see it now.

18 Q Does that figure in any way conflict with the
19 general statistical returns as evidenced on page 37? It is
20 consistent?

21 MR. TROSTEN: Could you identify the page and
22 the figure, Mr. Karman?

23 MR. KARMAN: This is page 30 of the symposium and
24 it is entitled figure 2, recapture locations of striped bass
25 tagged by the Sandy Hook Marine Laboratories in the Hudson River,

#8

1 March, 1968.

Reba 4

2 MR. TROSTEN: Is this figure taken from John
3 Clark's 1968 papers on seasonal distribution of striped bass,
4 Mr. Karman?

5 Do you know that?

6 MR. KARMAN: I don't believe so. I don't know
7 that. No, I have been advised that it is not.

8 MR. TROSTEN: Thank you.

9 ~~THE WITNESS: Is the question shall I compare~~
10 a figure with a table?

11 BY MR. KARMAN:

12 ~~Q~~ Is this figure consistent with the general average
13 as indicated in page 37 of your testimony with respect to the
14 recapture within what you might consider the mid-Atlantic
15 Fishery or what the commercial fishery people call the mid-
16 Atlantic Fishery?

17 Is there something which would change your thinking?

18 A I have seen several figures that are basically
19 like this including one in my 1954 paper.

20 Q I am talking about this one in particular, Dr.
21 Raney.

22 A No, it does not change my thinking.

23 Q Thank you.

24 MR. TROSTEN: May we see it?

25 MR. MACBETH: Mr. Karman, would it be possible

8 1 to give some kind of verbal summary of the figures so that
Reba 5 2 the record would reflect what it is that was shown to the
3 witness?

4 MR. TROSTEN: Mr. Karman, would you provide for
5 the record the figure for inclusion in the record?

6 MR. KARMAN: Why of course. May I consult with
7 my figure reader?

8 (Laughter)

9 MR. TROSTEN: May I confer with the witness, Mr.
10 Chairman?

11 MR. MACBETH: I wish I had somebody to confer with.

12 (Laughter)

13 MR. TROSTEN: Thank you, Mr. Chairman.

14 MR. KARMAN: While I will certainly provide a copy
15 of this, I think the best summary that I can give is that of
16 319 striped bass which were tagged and released in the Hudson
17 River, two were recaptured in the Hudson River and 20 were
18 recaptured in areas outside the Hudson River.

19 MR. TROSTEN: Dr. Raney, does Mr. Karman's summary
20 of the figure comport with your understanding of it and
21 your interpretation of it?

22 WITNESS RANEY: Yes, it should be pointed out
23 that what he calls outside of the Hudson River is in the area
24 of influence of the Hudson River race. In other words, it is
25 the western quarter of Long Island Sound with perhaps two

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Reba 6

1 exceptions. It is the South Shore of Long Island close to the
2 mouth of the Hudson River.

3 The North Shore of New Jersey near Sandy Hook. And inci-
4 dentally, there is no evidence that those fishes that were
5 tagged in the Hudson River were Hudson River race. As a matter
6 of fact, I don't know ^{where} whether they were tagged. It would be
7 nice to know.

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1 BY MR. KARMAN:

2 Q Just one more question. It is a simple one, I
3 believe and I am sure you can come up with a rather good
4 answer on this.

5 What proportion of the ^{landings}land goes reported in the
6 Mid-Atlantic Fishery Statistical Reports, come from the State
7 of Delaware? Do you know that?

8 A I would say that only a very small amount. I
9 don't recall a figure.

10 MR. KARMAN: Thank you, Dr. Raney. No further
11 questions.

12 CHAIRMAN JENSCH: Dr. Geyer has a question.

13 DR. GEYER: Dr. Raney, in the testimony, there has
14 at various times, been mention of what was formerly, I believe,
15 called the Hudson River Policy Committee, and is now a steering
16 committee.

17 What is its official title?

18 THE WITNESS: I don't really know, sir. I am not
19 associated with it.

20 MR. TROSTEN: Mr. Woodbury can respond to your
21 question.

22 DR. GEYER: Fine.

23 WITNESS WOODBURY: Its official title is the
24 Hudson River Policy Committee. It remains the Hudson River
25 Policy Committee, and its membership is the same as it has been

1 since 1965, with respect to the participating organizations,
2 the individuals have changed from time to time.

3 DR. GEYER: Are you a member?

4 WITNESS WOODBURY: I am not, no, sir. The member-
5 ship consists of the -- a representative from the Bureau of
6 Sports Fisheries, U.S. Bureau of Sports Fisheries; a repre-
7 sentative from what used to be the Bureau of Commercial Fisher-
8 ies, that is now the -- now NOAA, National Oceanographic and
9 Atmospheric Administration.

10 It is the same organization, however, just changed
11 the name; and a representative from the Department of Conser-
12 vation from the States of Connecticut, New York, and New
13 Jersey, and it is chaired by the Head of the Bureau of Fish
14 and Wildlife Service of the State of New York.

15 There are no members on it from Con Edison's
16 consultants.

17 DR. GEYER: Could I inquire just a little further?
18 Apparently you know something about its activities.

19 WITNESS WOODBURY: Yes, sir.

20 DR. GEYER: Is it interested just in fisheries or
21 in other aspects of the Hudson River? The title doesn't
22 suggest really, what they are concerned with?

23 WITNESS WOODBURY: It is an organization that was
24 put together in 1965 -- '66, following the Supreme Court
25 decision on the Cornwall Project.

1 MR. TROSTEN: Court of Appeals decision?

2 WITNESS WOODBURY: Yes, the Court of Appeals decision
3 on the Cornwall Project when the -- when the license was
4 remanded to the Federal Power Commission for reconsideration
5 of environmental matters. It was constituted at that time
6 and it was under the auspices of that committee, or that
7 policy committee; that the study which has been referred to
8 here, frequently, as the Carlson-McCann Study was undertaken.

9 We requested the continuance of that committee
10 to provide an overview of the studies that are underway at
11 Indian Point and they acquiesced in that regard with the
12 stipulation that they would not take the responsibility for
13 managing the studies as they did in the case of the Cornwall
14 Project, but would fulfill the role of a steering committee;
15 and so they meet periodically.

16 They have a subcommittee that meets about once a
17 month and that considers monthly reports of all of the work
18 that is going on at Indian Point.

19 DR. GEYER: Do they have cognizance of the impact
20 of any other activities on the Hudson River?

21 WITNESS WOODBURY: They do not.

22 DR. GEYER: So they are looking at Con Ed's request,
23 they are looking only at the Con Ed studies and plans with
24 regard to future possible effects on the fishery? And ways of
25 determining whether there are such effects?

1 WITNESS WOODBURY: The terms of the FPC license,
2 the current FPC license on the Cornwall Project, requires
3 a review of the impact of the Cornwall Project on the Hudson
4 River Fisheries and requires that by the Policy Committee and
5 names the Policy Committee as being responsible for that.

6 DR. GEYER: Yes.

7 WITNESS WOODBURY: So the Policy Committee remains
8 constituted in support of the Cornwall Project. Their work
9 at Indian Point is incidental to their original activation.

10 This is not to say, however, that they are uninter-
11 ested in matters other than Indian Point for they meet from
12 time to time to consider other matters.

13 DR. GEYER: I judge from what you say, they don't
14 function as a coordinating committee for all the studies that
15 might be made of all the different things that might be
16 going on which have an impact on the fishery?

17 WITNESS WOODBURY: Not as yet, sir. The proposition
18 of how to coordinate all the studies going on in the Hudson
19 River is getting a great deal of attention from the New York
20 Power Pool, NYU, ^{Boyc} Royce Thompson.

21 There is a special report in the Commissioner's
22 of Conservation Office, Mr. Diamond's office, making certain
23 recommendations, but no decision has been made yet, as to what
24 machinery to establish to effect this coordination, formally.

25 At the moment, it is being informally coordinated

1 by Con Edison.

2 DR. GEYER: Thank you, sir.

3 CHAIRMAN JENSCH: I wonder if I could ask a bit
4 about that organization? Does it keep records of the minutes
5 and its deliberations and are those minutes available for
6 review by the members of the public?

7 WITNESS WOODBURY: I cannot recall, sir.

8 CHAIRMAN JENSCH: Perhaps you will have an oppor-
9 tunity by recess to inquire about that.

10 Do they publish documents of what they are doing,
11 or have done, or suggest, or recommend, the results of what
12 they think could be done?

13 WITNESS WOODBURY: The only publication of which
14 I am aware, sir, is a report, entitled, "The Hudson River
15 Fisheries Investigation 1965 to 1968."

16 CHAIRMAN JENSCH: Is that the Carlson-McCann Report?

17 WITNESS WOODBURY: Yes, sir.

18 CHAIRMAN JENSCH: That is the only one you know of?

19 WITNESS WOODBURY: Yes, sir.

20 CHAIRMAN JENSCH: Does the meeting of this Policy
21 Commission provide for the attendance by members who are not
22 directly connected with the Commission, so that persons can
23 hear what they discuss and are the reports made that are sub-
24 mitted to the Hudson River Policy Commission available for
25 review?

1 WITNESS WOODBURY: I think you mean, Committee, sir,
2 rather than Commission. There is a Hudson River Commission
3 that is a different organization.

4 CHAIRMAN JENSCH: Excuse me, committee.

5 WITNESS WOODBURY: The Hudson River Policy Committee s
6 only report of which I am aware is this one to which I just
7 referred and that is a public document, was presented in a
8 symposium before it was published.

9 It is available to the public. I am sure any other
10 report that they would put out would similarly be available
11 to the public.

12 As to their meetings, I have been privileged to
13 attend only one of their meetings. At that meeting, in addi-
14 tion to the members of the Policy Committee, there must have
15 been 15 or 20 other people in the room.

16 I did not know who they all were but they were not
17 members of the Policy Committee. I know some who were in the
18 room were contractors who had submitted proposals for the
19 Indian Point Study, and the Hudson River Policy Committee,
20 evaluated each of those proposals, and reached conclusions
21 concerning the relative desirability of the various proponents.

22 CHAIRMAN JENSCH: Have you ever received any copies
23 of submittals of matters to the Policy Committee? By persons
24 other than Con Edison's contractors?

25 WITNESS WOODBURY: The Policy Committee has a

1 subcommittee, sir, which they call the Technical Committee,
2 and the Technical Committee meets, generally, once a month.

3 It prepares a report and submits their report to
4 the Policy Committee. That is the only one -- and I get a
5 copy of that. That is the only one that I am aware of, sir.

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1 CHAIRMAN JENSCH: And is that copy available
2 generally to members of the public, that technical report
3 to the Policy Committee?

4 WITNESS WOODBURY: Yes, sir, although to my
5 knowledge it is not issued as a public document.

6 Copies -- I believe copies of it are in the
7 document room and have been made available to Mr. Macbeth
8 for example, but I think that is the extent of the public
9 notice that there is associated with it.

10 CHAIRMAN JENSCH: Where does this Policy Committee
11 have its office? There is no place you can go knock on a
12 door and find out what they have in their files?

13 If it purports to have so many public representa-
14 tives on it, I would assume its reports are public. Maybe
15 I am in error about that.

16 WITNESS WOODBURY: The Policy Committee is a ---
17 it meets on the call of the chairman and it usually meets in
18 the office of the chairman, although it has met at other
19 locations.

20 CHAIRMAN JENSCH: Like what?

21 WITNESS WOODBURY: It has met at Indian Point, for
22 example.

23 CHAIRMAN JENSCH: Well, where does the Technical
24 Committee have their offices, and who are they composed of?

25 WITNESS WOODBURY: The Technical Committee, sir, is

1 composed of working biologists in the organization
2 represented on the Policy Committee. They are second or third
3 tier members of the organization. They usually meet in New
4 Paltz, which is the office of the -- the regional office of
5 the Department of Environmental Conservation that has cognizance
6 over the lower Hudson.

7 CHAIRMAN JENSCH: Newport?

8 WITNESS WOODBURY: New Paltz.

9 CHAIRMAN JENSCH: Oh, yes, New York State University
10 is located there.

11 Then I suppose these fishery representatives here
12 with the federal government might have copies of all
13 reports from the Technical Committee and maybe any Hudson
14 River Policy Committee memoranda or reports, do you suppose?

15 WITNESS WOODBURY: I would think so, but that is
16 speculation on my part, sir.

17 CHAIRMAN JENSCH: The reason I ask is this: If
18 the Hudson River Policy Committee purports to be an overall
19 steering committee or have an overall review and they are
20 composed of members of governmental units, one would expect
21 that they would record and report what they have done and pro-
22 pose to do and that sort of thing.

23 Now maybe I am in error, but I have the impression
24 that the question of governmental committees is kind of
25 under review about their records and reports. I wondered if

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1 this committee, which I take it doesn't have any funding
2 except insofar as its members are paid by governmental units,
3 is that correct?

4 WITNESS WOODBURY. The Hudson River Policy Committee
5 has an on-site representative, full time, at Indian Point.
6 He is a member of the Bureau of Sports Fisheries and he has
7 a secretary; and Consolidated Edison reimburses the Bureau
8 of Sports Fisheries for the salaries of those two individuals.

9 The other members of the committee are -- serve
10 at the cost of their respective sponsors.

11 CHAIRMAN JENSCH: And the work that is going on,
12 what does this representative of the Bureau of Sports
13 Fisheries have to do with that? Does he have any authority
14 to tell them when to drop the seines or do the trawling or
15 is he a collector of the documents that are prepared by
16 contractors doing the work, or what does this gentleman do at
17 Indian Point?

18 Is there some enumeration of his authority and so
19 forth?

20 CHAIRMAN WOODBURY: Yes.

21 He is a representative of the Policy Committee in
22 residence at Indian Point. His office is located in the
23 office -- in the same building where Texas Instruments has
24 its laboratories. He is in daily contact with Texas Instruments
25 and NYU and in frequent contact with QLM, these three

1 organizations being the ones doing the studies.

2 As the representative of the Hudson River Policy
3 Committee, he has no contractual authority over the three
4 contractors. He exercises technical authority over the
5 contractors on behalf of the Hudson River Policy Committee
6 by making recommendations to the Con Edison project management
7 who is also located on site and who does have authority as a
8 contracting officer's representative on site to direct
9 the work of the contractors.

10 CHAIRMAN JENSCH: Well, I am asking for perhaps too
11 much detail.

12 WITNESS WOODBURY: Not at all, sir.

13 CHAIRMAN JENSCH: I have had the impression that
14 a great deal of importance is ascribed to the work of the
15 Hudson River Policy Committee and I would kind of like to
16 know who they are, what they do, what authority they have,
17 and if they tell everybody what they have done.

18 If you do find out that their reports or records
19 are available for review, I would appreciate knowing this
20 at a later time.

21 WITNESS WOODBURY: I will be happy to furnish that.

22 I will also be happy to furnish, if you would care,
23 sir, a description of the role of the Hudson River Policy
24 Committee.

25 I might -- it might be helpful if I were to

1 explain that the plan of study which was described in part
2 yesterday by Mr. McFadden, was submitted by Consolidated
3 Edison to the Hudson River Policy Committee for their review
4 and approval and they did in fact review it or make recommen-
5 dations for modifications to it and did approve it before we
6 proceed.

7 When we took the plan of study and submitted it
8 as an invitation for proposals, the proposals came into
9 Consolidated Edison and were furnished without any review
10 by Consolidated Edison directly to the Policy Committee
11 for their review and evaluation and recommendations.

12 MR. MACBETH: Might it be helpful to the Board if
13 at some point perhaps the on-site representative from the
14 Department of the Interior came to the hearing and described
15 what he did?

16 That just seems to me --

17 CHAIRMAN JENSCH: I make no such request myself.
18 Whatever the parties desire to submit is up to them.

19 Let's see how it works out.

20 Are the reports of the Hudson River Policy Committee
21 or its Technical Committee in reference to the Cornwall
22 project filed with the Federal Power Commission, do you know?

23 WITNESS WOODBURY: Yes. There is but one.

24 CHAIRMAN JENSCH: This is just this one 1965 report?

25 WITNESS WOODBURY: Yes.

1 CHAIRMAN JENSCH: What have they been doing the last
2 seven years?

3 WITNESS WOODBURY: They review the periodic reports
4 of -- let me say what they have been doing in the last two,
5 three years, sir.

6 They have been reviewing the periodic -- for the
7 first part -- since 1969, they spent two years directing the
8 efforts of ^{Raytheon} ~~Rathen~~, who did the first two years of the
9 seven-year study on the effect of Indian Point on the Hudson
10 River. They selected the contractor and they provided
11 direction of his operation for two years.

12 Subsequent to that time, they have participated in
13 the development of the continuing plan of study; they have
14 reviewed periodic progress reports of the study contractors
15 and have made recommendations to Consolidated Edison for --
16 and to the contractors through Consolidated Edison for modifi-
17 cations of techniques, modifications on where certain operations
18 are underway in the river and have suggested changes in the
19 plan of study as data has come in and indicated some changes
20 were desirable.

21 CHAIRMAN JENSCH: Thank you very much.

22 MR. TROSTEN: Mr. Chairman, just one point of
23 clarification.

24 During his response to the Chairman's question,
25 Mr. Woodbury referred to a document room. I just wanted it

mm71 to be clear that he was referring to the facility that Con
2 Edison has made available to the Intervenors in this proceeding
3 where documents representing reports of studies and various
4 documents have been made available to the Intervenors.

5 That was the document room.

6 CHAIRMAN JENSCH: Thank you.

7 Mr. Briggs has some questions of Dr. Raney.

8 MR. BRIGGS: Dr. Raney, during the corss-examination

9 by Mr. Macbeth, he asked some questions concerning the size

10 of the mid-Atlantic fishery and the size of the -- call it

11 the Hudson River fishery that you discussed.

12 You indicated that you didn't have any idea of

13 the numerical size of either.

14 One would like to get some impression of the

15 importance of these two fisheries and there must be some

16 measure that can be made to judge the importance of those

17 fisheries. Could you suggest such a measure?

18 WITNESS RANEY: The difficulties arise sir,

19 because the only measurements of fisheries which are at all

20 adequate is the measure of the commercial catch which actually

21 comes to a recognized market.

22 For example, those fishes which come into the

23 Fulton Fish Market. There is a regular visit by a statistical

24 clerk and he makes compilations of data by day, actually, of

25 the landings.

mm8 1 Now in recent years it has become obvious that the
2 landings by sportsmen are very, very much greater than the
3 landings of commercial men. As a matter of fact, in some of
4 these states, there is no commercial fishing. Massachusetts,
5 for example.

6 In New Jersey, there is supposedly little
7 commercial fishing; most of this is late at night, sneaking
8 in on the beach, taking a few trawls and getting out with
9 \$4- or \$5000 worth of striped bass.

10 MR. BRIGGS: Is there --

11 WITNESS RANEY: So the only thing that we have are
12 the commercial statistics and anybody that knows anything
13 about how they are derived, knows that they are not really
14 much good, but the history has been increase in the commercial
15 catch with some fluctuations so that over the last 30 years,
16 for -- we have approximately had about a nine-fold increase
17 in the commercial catch, not for the sport catch.

18 There have been various estimates, but the bases
19 for these estimates are much worse than the estimates for the
20 commercial catch figures.

21 This is the reason that I can't give any data.
22 I would just be giving a wild guess. Some others have done
23 this.

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1 MR. BRIGGS: Can you give any idea of whether
2 in the last few years the size of the race of Hudson
3 Bass has been increasing, decreasing, or remains steady?

4 WITNESS RANEY: No, sir. At our present stage of
5 knowledge, we have no information on the fluctuations on the
6 year classes of striped bass in the Hudson River over a
7 period of years with are worth anything.

8 MR. BRIGGS: How about Chesapeake Bay?

9 WITNESS RANEY: Chesapeake Bay, we have much
10 better data because a great deal of the commercial catch in
11 Chesapeake Bay tributaries, particularly of Maryland, are
12 monitored and the commercial catch statistics there, I think
13 are pretty good.

14 MR. BRIGGS: Has it been increasing, decreasing, or
15 remaining steady?

16 WITNESS RANEY: It fluctuates with year classes
17 but there are many more striped bass in the Chesapeake Bay,
18 many more now, than there were back in 1934. Basically, there
19 has been an increase, but the year class fluctuations in the
20 Chesapeake Bay are controlled to some extent by year class
21 fluctuations in the various rivers which contribute to that,
22 of which there are some 20 or more which have spawning
23 populations of striped bass.

24 MR. BRIGGS: You say the population is much
25 greater now than it was in 1934?

1 WITNESS RANEY: Yes, sir.

2 MR. BRIGGS: Is it greater now than it was in,
3 say, 1960, do you know?

4 WITNESS RANEY: Yes, it is. It was greater than
5 this, probably, than any other year in the last 20 years,
6 largely because the 1970 year class in Chesapeake Bay was a
7 *tremendous* tremendous year class and it gave rise to a very pronounced
8 increase in both sport and commercial activity along the
9 Atlantic Coast both in this past *spring* spring, the ~~sprint~~ of '72,
10 and this past fall, the fall of '72.

11 MR. BRIGGS: In your testimony on page 9, you had
12 indicated that -- and in the cross-examination, you had
13 indicated that there was not a very good bases for the
14 numbers that were discussed with you by Mr. Macbeth. Are
15 you acquainted with Dr. Lawler's testimony?

16 WITNESS RANEY: Only in a superficial way. I
17 leafed through it. I am not a model man. This is outside
18 my specialty.

19 I am anxious that anybody that constructs and uses
20 the model uses adequate data. Unfortunately, sir, these
21 data are not presently available for most fisheries.

22 MR. BRIGGS: The question was going to be: Dr.
23 Lawler calculates and reports in Table 24, which is after
24 page 78, or in that vicinity, that there would be a three to
25 to five percent decrease in the Hudson River striped bass

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1 population after five years. The question then becomes one,
2 are the data adequate to support a conclusion like that, or
3 does your comment that applies to the Staff's calculations
4 apply to these -- to the data used for these calculations
5 also?

6 WITNESS RANEY: I believe the same data were used,
7 sir. I think both the Staff and Dr. Lawler used the
8 Carlson-McCann data in the Cornwall site.

9 CHAIRMAN JENSCH: The question was, does your
10 comment that you made about the Staff data apply to the
11 Lawler data?

12 WITNESS RANEY: If Lawler actually used the same
13 data, obviously, yes.

14 CHAIRMAN JENSCH: Thank you.

15 MR. BRIGGS: The Board has expressed some concern
16 about the ability that one will have after a five-year study
17 to decide whether there has been an increase or a decrease
18 or no change in the Hudson River population.

19 I believe you indicated a need for five to ten
20 years of study to tell the distribution of striped bass,
21 eggs, and larvae. I believe this was in your cross-examination
22 yesterday.

23 How well do you think that one will be able to
24 decide whether there has been an effect on the population
25 after the five years of study that the Applicant has proposed?

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1 WITNESS RANEY: This is a very difficult thing
2 to determine because you are dealing with a population
3 that has year class fluctuations, and up until the present
4 time, no one has had the economic base which would sustain
5 the type of study which is needed in order to get adequate
6 information in order to be able to even understand what the
7 problems are.

8 I am advised that under Dr. McFadden's guidance and
9 with the specialists that have been acquired by Texas
10 Instruments, that after five years of study, they are going to
11 have a very good concept first of the distribution of eggs
12 and larvae throughout the Lower River, throughout those
13 years; secondly, they have inaugurated an excellent
14 tagging program which is going to, in my opinion, show what
15 the real contribution of the Hudson River is to the -- what
16 I call the Mid-Atlantic fishery, the coastal fishery.

17 In doing this, they have tagged some 11,000 young
18 striped bass within the last couple of weeks. This is also
19 something that all of us had hoped might have been done
20 sometime in the past.

21 It means that the white perch population can be
22 evaluated as it also is being tagged. It also means that
23 we are going to be able to get a system of recovery of
24 marked and tagged fish worked out.

25 One of the -- the very great difficulties in

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1 working with the Hudson River was that you never had adequate
 2 coverage in the river during the fishing season or you could
 3 never assure that you were getting any but a very small
 4 number of the tags that were actually taken on the bass.

5 I know this from personal experience. During
 6 the saltwater sportsman tagging program between 1949 and
 7 1952, I tried to contact commercial fishermen working on the
 8 Hudson River and I asked them personally, "Have you seen
 9 any tags?" and sooner or later, they would admit that they
 10 had and actually had some in their possession. They are
 11 always reticent to give you these because they think,
 12 first of all, this might affect their livelihood, and their
 13 future. They are a strange and wonderful bunch, but they
 14 think mostly of themselves first.

15 Now, with this well-financed study, for the first
 16 time we are going to be able to go out there and fish. Not
 17 only are we going to tag, but we can do our own -- I say
 18 "our own," it is Consolidated Edison's fish, and incidentally,
 19 I am not involved in these studies, Dr. McFadden is -- so
 20 that I think for the first time, we are going to be able to
 21 get the kind of data, at least, over a five-year period,
 22 which will give us solid information.

23 Now, one of the reasons I am convinced that
 24 Consolidated Edison is on the right track with their studies
 is that I have had some experience now in studying, for

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1 example, the Salem nuclear generating site at Artificial Island,
2 which is at River Island 50 on the Delaware. We have been
3 there since 1968, "we" meaning my group, Ichthyological
4 Associates.

5 You always wonder when you set up a tagging
6 or a sampling program as to whether this is going to be
7 adequate to actually measure changes which might occur.

8 Well, fortunately, since we have been there, we
9 have had some natural catastrophes, including Hurricane
10 Agnes, where the salinities are changed greatly. We have
11 had other local storms. We have had eight or nine inches
12 of storms in the marsh where you have great changes in the
13 marsh associated with this site on the Delaware.

14 Immediately our sampling has been able to pick
15 up these very great changes in organisms which have occurred.
16 This is the reason that I am confident that these studies
17 that are being done on the Hudson are ^{now} not being set up in
18 great enough detail as far as sampling is concerned so that
19 if there is a ^{minor} catastrophe of any sort, or if there is
20 an effect by a thermal plume or if there is an effect by
21 chemicals, that the sampling will be able to determine it.

22 But it is a long-term proposition when you are
23 dealing with estuarine organisms that have a fairly long
24 life up to 25, 30 years. Some of the members of that 1934
25 year class just passed on recently.

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1 (Laughter.)

2 MR. BRIGGS: Dr. Raney, in the sport fishing, is
3 there surf fishing as well as fishing from boats for striped
4 bass?

5 WITNESS RANEY: Yes, sir.

6 MR. BRIGGS: Is it good surf fishing?

7 WITNESS RANEY: It is good at some places like
8 the Montauk Point is one of the best known surf fisheries,
9 Cape Cod is another. The whole Jersey seacoast in season
10 is good surf fishing.

11 MR. BRIGGS: Sometimes the Board likes to make
12 field trips to test the evidence.

13 (Laughter.)

14 MR. BRIGGS: Is there a particular place on the
15 Jersey seacoast that you would recommend?

16 WITNESS RANEY: Yes, I would recommend that you
17 visit Obsequa and we will be glad to take you out to the
18 ocean site when the blue fish and striped bass are running
19 this spring. I am sure that you would enjoy a weekend out
20 there.

21 MR. BRIGGS: I don't think that would be quite
22 appropriate. Do you say that the fish run along Atlantic
23 City the first to the third week in May? I suppose earlier
24 in May then they are down further along the coast?

25 WITNESS RANEY: Yes, sir.

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MR. BRIGGS: I don't believe I have any more questions.

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1 CHAIRMAN JENSCH: I don't think I have any questions.

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2 I would just -- I was interested in your test, your study

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3 that you made in 1934, you made some seine hauls?

4 WITNESS RANEY: Yes, sir.

5 CHAIRMAN JENSCH: Are those data useful at all?

6 WITNESS RANEY: They were extremely useful for us,
7 sir, but this illustrates a very, very important point. Those
8 specimens which were young-of-the-year, which varied from two
9 to five inches long taken from June through November, were
10 taken only to get at various places a sufficient number for a
11 sample to do our racial studies. We tried to get twenty,
12 ~~twenty-five~~ specimens which we had previously determined through
13 counts on fishes taken in other years was an adequate sample
14 so that the only value of these fishes are for scientific
15 purposes.

16 That is they are specimens which have been preserved and
17 which anybody can examine. They are in the Cornell fish
18 collection or in the collections of the U. S. National Museum.

19 CHAIRMAN JENSCH: You say they would represent
20 the samples, representative of what?

21 WITNESS RANEY: They are representative of the pop-
22 ulation of young striped bass as they exist on the beach
23 at the time we hit it at high tide on the various dates.

24 CHAIRMAN JENSCH: On the various what?

25 WITNESS RANEY: Dates.

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Reba 2

1 CHAIRMAN JENSCH: Dates?

2 WITNESS RANEY: Yes, sir.

3 CHAIRMAN JENSCH: What I have in mind is that I have
4 always understood it was somewhat difficult to get an inven-
5 tory of a species of fish. Do you agree?

6 WITNESS RANEY: No, sir, it is very, very easy
7 to get an inventory of a species of fish, but you have to have
8 adequate personnel. In other words, if you are going to do
9 it right, you have to have an adequate number of boats, you have
10 to have adequate coverage of the river, and until recent years
11 this has never been available.

12 For example, in my studies, if I might just spend a moment
13 on it, I did this with graduate students. I took my own car,
14 paid my own expenses and we went down every week or two weeks,
15 as often as I could get away, during the season, and sometimes
16 through the University of Michigan a grant of \$50 or \$100 to
17 pay for ---

18 CHAIRMAN JENSCH: In those days you could buy a
19 car for that, couldn't you?

20 (Laughter)

21 WITNESS RANEY: Oh, no, sir.

22 The basic point is that there were -- we were
23 limited to the number of kinds of things that we could do and
24 we still are. If we are going to run this tagging program
25 now, and John Clark, took a -- I was going to say took advantage

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Reba 3

1 he took advantage of the opportunity that these fishes had been
2 tagged. My recent study that I put together, the American
3 Littoral Society group had tagged and recaptured fish. These
4 are data.

5 So we take them and we see where they lead and the data
6 are in here and anybody else can make their analysis of it.
7 But now, you see, with the advent of nuclear power plant
8 these studies are now tied to a base, an economic base, that
9 justifies the kind of studies the biologists always should have
10 been making but never had the funds to do.

11 CHAIRMAN JENSCH: Let me -- excuse me.

12 MR. TROSTEN: Mr. Chairman, excuse me. Dr. Raney
13 used the term "inventory" a moment ago in response to your
14 question. Could I just ask for him to clarify what he meant?

15 CHAIRMAN JENSCH: I will get into that in a little
16 while.

17 MR. TROSTEN: All right.

18 CHAIRMAN JENSCH: I want you to take the opportunity
19 to expand or clarify, whatever should be done. We get back
20 to your seine hauls that you undertook in 1934, thereabouts.

21 WITNESS RANEY: 1949 to 1954.

22 CHAIRMAN JENSCH: 1949?

23 You say there were representative samples. I was asking
24 representative of what and you said of the population of the
25 species.

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WITNESS RANEY: As it existed at that time and
at that place.

CHAIRMAN JENSCH: Now how did you determine the
totality or the inventory of those -- that species of fish
at that time?

WITNESS RANEY: Well, first we had to determine where
we could get into the Hudson with an automotive vehicle.

CHAIRMAN JENSCH: I am not thinking so much of
your seine haul, whatever preceded that so you could determine
that the 20 or 25 were representative.

WITNESS RANEY: The way you do this is very simple,
sir. You go out and you collect five or six hundred.

CHAIRMAN JENSCH: And you did this?

WITNESS RANEY: Oh, yes. There are places in the
Chesapeake, in those days and today, where you could -- you
can catch a thousand young striped bass.

CHAIRMAN JENSCH: Let's stay with the Hudson
River. I have a little difficulty jumping to the others.

WITNESS RANEY: You get these and you make these
meristic counts that we made. You sub-sample and you come to
the conclusion of how much information you can get from a
smaller sample which will give you the same information you
can get from counting all the thousands.

We came up with the fact that a sample of 20 or 25 would
give you basically as much information as a hundred or two

#12 1 hundred or three hundred.

Reba 5 2 CHAIRMAN JENSCH: Let me inquire. When did you
3 carry on this inventory?

4 WITNESS RANEY: Beginning in 1949.

5 CHAIRMAN JENSCH: How did you do that?

6 WITNESS RANEY: We went to the tributaries
7 of the Chesapeake.

8 CHAIRMAN JENSCH: Stay with the Hudson, would you?

9 WITNESS RANEY: You asked me how I arrived at the
10 methods. I am trying to describe it.

11 CHAIRMAN JENSCH: I would like to see what you did
12 on the Hudson. As I understand you were running ahead of the
13 tide there and I did not want to get into that fast a race.

14 WITNESS RANEY: We went to the Hudson and collected
15 fish and took them back and made counts and measurements.

16 CHAIRMAN JENSCH: When did you do that in reference
17 to 1949?

18 WITNESS RANEY: I can't tell you what I did before
19 1949 because you cut me off from the Chesapeake.

20 CHAIRMAN JENSCH: Well, how did you determine
21 the total inventory of a species of white striped bass?

22 WITNESS RANEY: I did not ---

23 CHAIRMAN JENSCH: In the Hudson River?

24 WITNESS RANEY: I did not do anything about the total
25 inventory in the Hudson River on striped bass then, or since,

12 1 and no one else has.

Reba 6 2 CHAIRMAN JENSCH: Then how did you determine, if
3 you took 20 or 25, they would be representative of the totality?

4 WITNESS RANEY: I already told you how I did that.
5 I went down to the Chesapeake Bay and got very large samples
6 and made the counts and made sub-samples and made counts. We
7 got a size of the sub-sample and it showed there was no statis-
8 tical difference between that sample and the largest one.

9 Therefore when we went to the Hudson River we were
10 satisfied that a sample of around 25 specimens was statistically
11 a satisfactory one.

12 CHAIRMAN JENSCH: Well, I thought there was some
13 difference in the inventory in the Chesapeake Bay and the in-
14 ventory of the striped bass in the Hudson River so that you ---

15 WITNESS RANEY: I don't understand what you mean
16 by inventory.

17 CHAIRMAN JENSCH: Well, totality, the entire number.
18 Is there some other meaning? Can you tell me what is the
19 meaning of inventory if it does not mean the totality of your
20 species?

21 WITNESS RANEY: Sir, you are dealing with something
22 that I know nothing about. I don't understand you.

23 CHAIRMAN JENSCH: Okay.

24 What -- do you ever try to arrive at a totality of a
25 specie before you determine whether you can take a representative

12 1 sample?

reba 7 2 WITNESS RANEY: By -- by totality you mean the

3 total population?

4 CHAIRMAN JENSCH: Yes.

5 WITNESS RANEY: No, sir.

6 CHAIRMAN JENSCH: I am having trouble learning
7 how you get a few to be representative of the total population.

8 You told me you went down to the Chesapeake. I said I under-

9 stood there was a difference of total population in the Chesa-

10 peake as compared with the total population in the Hudson

11 River.

12 WITNESS RANEY: This is true but I did not determine

13 the total population in either place, sir.

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1 MR. BRIGGS: Excuse me for a second.
2 Dr. Raney, by inventory do you mean a list of the
3 various species that you find without regard to the numbers?

4 Is that --

5 WITNESS RANEY: That is a definition of inventory.
6 This was not the kind of thing that I was alluding to with
7 reference to the Chairman's question, no, sir. I thought he
8 was trying to get out how do you know that you have an
9 adequate sample as far as size is concerned.

10 MR. BRIGGS: We are interested in knowing how do
11 you have an adequate sample to determine the total population,
12 the total number of a particular species?

13 WITNESS RANEY: Oh, that's an entirely different
14 problem. That's a problem basically of mark and recapture.
15 The kind of things which Dr. McFadden is directing as far as
16 the Hudson is concerned.

17 I was never involved in any such studies as that.

18 CHAIRMAN JENSCH: I see.

19 Did you tell us how many times you stopped to take
20 this seine haul on the Hudson River in 1949 to get these
21 samples? How many times -- how many car stops did you make?
22 Is that in your testimony?

23 WITNESS RANEY: Yes, sir.

24 CHAIRMAN JENSCH: Then I'll find it. I am sorry.

25 WITNESS RANEY: The points we collected are stated

1 here.

2 CHAIRMAN JENSCH: Very well. That's adequate.
3 Thank you, very much. I have no further questions. Do
4 you have any further questions?

5 DR. GEYER: Dr. Raney, you talked about the
6 different races, the Chesapeake race and the Hudson race.
7 Is there any ready way to make the distinction between
8 these two?

9 WITNESS RANEY: No, sir. We first determined it on
10 the basis of morphological characteristics. We tried to do
11 this biochemically also. We worked for three years on amino
12 acids, getting samples from various areas. We were never
13 able to use this approach in separating races.

14 However, with the present sophistication and gear,
15 there is the possibility always that there may be
16 physiological differences or biochemical differences between
17 these races that can be picked up by further research.
18 Because of lack of funds, we got off this.

19 DR. GEYER: There is no hope then of looking at
20 a fish and saying, "This is Chesapeake fish," and plugging
21 it with a blue tag and a red one because it came from the
22 Hudson?

23 WITNESS RANEY: I think there is hope here and I
24 think these studies may be carried out on the Hudson of
25 trying to determine some easy physiological way so you could

1 take a hunk of muscle out of the back of a fish and using
2 the electroferreting gear, say, "Yes, this is a Hudson River
3 fish compared with a Chesapeake Bay fish," and in this case
4 we could go into the Haverstraw Bay area in the winter when
5 there are large numbers of over-wintering fish, at least some
6 years, and you could get a large sample of them and then you
7 could actually determine whether they were Chesapeake or
8 Hudson; but before you can do that, you have to have the
9 basic research that gives you the answer to whether there is
10 a simple way of telling the races. As of yet, none has done
11 that.

12 DR. GEYER: Thank you.

13 MR. BRIGGS: I had gotten the impression from
14 reading your testimony or scanning the testimony that by
15 number of fins or some such thing, you could tell the
16 difference?

17 WITNESS RANEY: Yes, sir, that's what we did. We took
18 the totality of the counts of the fins and you get a 70 to
19 80 percent separation between population between in the
20 upper Hudson River from those in the Chesapeake.

21 Then in turn, within the Chesapeake, there are
22 three subraces and then in turn the Chesapeake is different
23 from the Albemarle race, and those in the Gulf of Mexico
24 are different from those in South Carolina.

25 These are on a racial or a subracial difference

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1 which means on a relatively low level; but what this
2 indicates, of course, is that these fishes return most of the
3 time at least to the area of their birth and freely
4 intermingle at times of spawning within a given river.

5 CHAIRMAN JENSCH: To the counters of the fish of
6 these distinctions and the number of spikes on the fins to
7 be able to tell whether they are dealing with a Hudson
8 River --

9 WITNESS RANEY: Everything that we found out with
10 regard to our racial studies, and there were seven or eight
11 different papers, was published. The methods are clearly
12 outlined and anybody that wants to do this in the future,
13 of course, can do it.

14 In other words, Erwin Alperin is the only one
15 that I know that tried this. At times of low population
16 in the Chesapeake Bay race, in Great Bay, Long Island, he
17 came to the conclusion that the small bass probably came from
18 the Hudson. He made some meristic counts on these, that is
19 counts of the fins, and he concluded that indeed this was
20 probably correct, that they were Hudson River fish at that
21 time.

22 This method is available, but is laborious. It
23 takes a fish taxonomist, somebody who is willing to sit and
24 do this kind of detailed work.

25 CHAIRMAN JENSCH: And if you don't have a fish

1 taxonomist doing the count on the commercial landings that
2 are occurring, you probably aren't getting too close.

3 WITNESS RANEY: This is right. This is not suggesting
4 you can ^{turn the} turn over to just any biologist, God bless them.

5 CHAIRMAN JENSCH: Yes, yes. To be sure.

6 (Laughter.)

7 CHAIRMAN JENSCH: I just wondered how good your
8 counts are if you don't have one of these specialists out
9 there with a counting device checking off the number of
10 spikes on the fins to know whether you have a Hudson River
11 fish or you have a Chesapeake Bay fish.

12 WITNESS RANEY: Well, obviously, sir, no scientific
13 work is worth anything unless your counts or measurements
14 are done accurately.

15 CHAIRMAN JENSCH: And if you are not sure they
16 are done accurately, you cannot really rely on the data.

17 WITNESS RANEY: That's the reason I know our data are
18 good, because I did most of the counts.

19 (Laughter.)

20 CHAIRMAN JENSCH: I just wish you could have kept
21 your car running. We were relying on some data other than
22 yours. I wonder if you feel the same confidence in these
23 other data as you obviously do in your own.

24 DR. RANEY: You approach this in our field the
25 same way that you approach problems in your own field, sir.

1 You evaluate the person who is doing the work.

2 CHAIRMAN JENSCH: Well, I appreciate that. Let
3 me try my question again: Do you have the same confidence
4 in these other data developed by other persons as you do
5 in your own?

6 WITNESS RANEY: I do in the data that have been
7 gathered on striped bass because they were all done by
8 doctoral students at Cornell that worked with me.

9 (Laughter.)

10 CHAIRMAN JENSCH: Well, that's something we will
11 have to examine, I guess, about each device that -- I mean
12 data that comes in to find out who did it.

13 WITNESS RANEY: Who did it and what their
14 qualifications are.

15 CHAIRMAN JENSCH: All right. Thank you, very
16 much, Doctor.

17 MR. MACBETH: Could I just put one more question to
18 Dr. Raney?

19 BY MR. MACBETH:

20 Q Among the total number of studies in which fish
21 were tagged and recaptured which concerned the Hudson and the
22 Chesapeake, in how many of those studies were examinations
23 of the meristic characteristics made, these counts of
24 the morphological differences that you have been discussing
25 with the Chairman?

1 A My recollection, Irwin Alperin attempted to use
2 this method; Donald de Silva used it for Delaware Bay striped
3 bass. One of the difficulties --

4 Q Just -- before you go on, are those the only two?

5 A These are the only two. The difficulties are
6 that unless you have the wherewithal, you couldn't find the
7 striped bass to do this with.

8 Q Sure, sure. I know it is difficult.

9 CHAIRMAN JENSCH: I think the question was how
10 many counts were made. Can you put a number on that?

11 WITNESS RANEY: Yes, to my -- to the best of my
12 knowledge, outside of my own group working with me, Don de
13 Silva and Erwin Alperin.

14 CHAIRMAN JENSCH: Thank you.

15 Any further questions of this witness?

16 MR. TROSTEN: May we confer for a moment, Mr.
17 Chairman?

18 CHAIRMAN JENSCH: Certainly. Would you like a
19 recess.

20 MR. TROSTEN: Yes, I'd like a brief recess.

21 CHAIRMAN JENSCH: At this time let's recess to
22 reconvene in this room at 12 o'clock.

23 (Recess.)

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25 End 13

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CHAIRMAN JENSCH: Please come to order.

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The Board has no further questions of Dr. Raney.

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Anybody else?

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MR. KARMAN: No, Mr. Chairman.

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MR. MACBETH: No, Mr. Chairman.

6

CHAIRMAN JENSCH: If not, thank you, Dr. Raney.

7

You are excused.

8

(Witness Raney excused.)

9

CHAIRMAN JENSCH: What witness will be called?

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MR. TROSTEN: Mr. Newman, would you come forward,

11

please?

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Whereupon,

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CARL L. NEWMAN

14

was called as a witness on behalf of the Applicant and,

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having been previously duly sworn, was examined and

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testified as follows:

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DIRECT EXAMINATION

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BY MR. TROSTEN:

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Q On transcript pages 6858 and 6859, Mr. Jensch

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asked a question concerning the construction cost estimate for

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the Vermont Yankee, the Palisades, and the Indian Point 2

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plant. Mr. Newman, have you compared the construction cost

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estimates for the mechanical draft cooling towers for the

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Vermont Yankee and Palisades Nuclear Power Plants with the

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construction cost estimates you have presented for the natural

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1 draft cooling towers for Indian Point 2?

2 A Yes, I have.

3 Q What are the comparative costs for the three
4 plants, please?

5 A If I may use the chart to explain our method of
6 comparison.

7 CHAIRMAN JENSCH: And if you can explain why you
8 are not going for the less expensive mechanical draft, you can
9 do that.

10 MR. TROSTEN: Yes, Mr. Newman can explain.

11 WITNESS NEWMAN: Let me list three columns: Vermont
12 Yankee, Indian Point, Palisades (indicating).

13 Direct costs as published for Vermont Yankee,
14 these are in millions of dollars, 6.0. Direct costs for
15 Palisades, 14.1.

16 Now --

17 CHAIRMAN JENSCH: Will you tell us the source of
18 your figures?

19 WITNESS NEWMAN: This has been direct communica-
20 tion with the utilities involved and they have given us
21 permission -- as I understand, these numbers have been published
22 in the literature.

23 CHAIRMAN JENSCH: They are probably filed with the
24 Federal Power Commission.

25 WITNESS NEWMAN: My particular information came

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1 through direct contact between our staff and their staff.

2 CHAIRMAN JENSCH: Very well. Thank you.

3 MR. TROSTEN: It is my understanding, Mr. Chairman,
4 from consultation with Mr. Karman, that the numbers given to
5 the Board at the last hearing session by the Staff were
6 numbers presented by the Applicant in these proceedings,
7 the Vermont Yankee and Palisades proceedings.

8 CHAIRMAN JENSCH: Before construction or after
9 construction? It doesn't make any difference. We will find
10 that out later.

11 Go ahead. Thank you, Mr. Newman.

12 WITNESS NEWMAN: In all events these are the numbers
13 we looked at and attempted to ^{reconcile} reconciliation with the numbers
14 that we are using for Indian Point No. 2.

15 Vermont Yankee's centroid of activity was in 1969.
16 Since we are working in 1972 dollars, we escalated the
17 Vermont Yankee up to 1972. That's a multiplication factor
18 of 1.31. There has been a 31 percent escalation. That moves
19 this number up to 7.86 million.

20 We made no escalation of Palisades. That is a
21 1972 number. That remains at 14.1.

22 Now recognizing that there is a labor index
23 differential and we used the Robert Snowmean's Company building
24 construction cost data which is a published construction-
25 labor index, the index, factor relative to New York labor for

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1 Palisades is 20 percent which carries this number as a
 2 labor index and I will give you a hand-out on these numbers
 3 for your persual when I complete this presentation. 20 per-
 4 cent carries this to 16.9 million; and moving from Vermont
 5 Yankee to New York, the index is 29 percent, which takes this
 6 number then to 10.14 million.

7 We recognized that there is a difference in the
 8 power rating of these units. We are designed for a 906 mega-
 9 watt; Palisades is 800 megawatt; there is a 13 percent size
 10 differential correction.

11 CHAIRMAN JENSCH: Is that actual or is this just a
 12 kind of a calculated difference? What difference does it
 13 make so far as the amount of thermal release?

14 WITNESS NEWMAN: It is the amount of heat rejec-
 15 tion which is virtually linear. Actually this is a conserva-
 16 tive approach taken on the power ratio. If we look at the
 17 ratio of gallons per minute, we have a much higher ratio
 18 because we designed for a low rise across our condensers
 19 and therefore we are getting more gallons per minute, and I
 20 could elaborate on that, if you like.

21 CHAIRMAN JENSCH: No. That's all right. Thank you.

22 WITNESS NEWMAN: Taking into account the power ratio
 23 at Palisades, our unit is 13 percent larger which carries
 24 this -- this power ratio carries Palisades to 19.14 million.
 25 The power ratio for Vermont Yankee is a difference of 70

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1 percent. They are a 530 megawatt nominal unit. That takes
2 this number to 17.24 (indicating).

3 Now the question was the difference in cost between
4 a mechanical draft and a natural draft tower.

5 CHAIRMAN JENSCH: Yes. I am interested in knowing
6 why you selected the more expensive.

7 WITNESS NEWMAN: Well, I will put down the number
8 and then explain why we selected it.

9 CHAIRMAN JENSCH: All right. Thank you.

10 WITNESS NEWMAN: We estimate the difference
11 between a mechanical draft tower itself at our site is
12 \$1.96 million for the Vermont Yankee type of tower, which
13 would carry this to 19.2 million. So that's rated here --
14 1.96 (indicating).

15 That accounts for the difference in the selection.

16 The additional cost of the cooling element compared
17 to the Palisades number we estimate at \$4 million delta
18 which carries this number 23.14 (indicating).

19 The other major estimate we had to make to convert
20 from the Vermont-Palisades sites was the cost of excavation
21 which, as I explained yesterday, is 360,000 yards of excava-
22 tion and we estimate that that incremental excavation, or
23 the excavation itself for the tower site, is \$9 million,
24 which would have added -- cooling element, adding excavation
25 on Palisades would come to 32.14, and at Yankee, would come

1 to 28.2. That is our reconciliation of the directs and that
2 compares with our Indian Point directs of 32 -- \$31.27
3 million.

4 By the time we take into consideration these
5 elements we have about the same order of magnitude.

6 The question is --

7 CHAIRMAN JENSCH: Before you go any further, I
8 understand your mathematics, but I don't understand your
9 reason. Did Palisades tell you their total cost was 14.1
10 million?

11 WITNESS NEWMAN: Yes, sir.

12 CHAIRMAN JENSCH: Direct costs?

13 WITNESS NEWMAN: Direct costs.

14 CHAIRMAN JENSCH: Why do you add any more? That's
15 all they had.

16 WITNESS NEWMAN: But they didn't build their tower
17 on our site. I can't use a tower at Palisades to cool Indian
18 Point.

19 CHAIRMAN JENSCH: I understand that, but they
20 can't use your tower out there, either. You get a lot of
21 factors that you add in here that maybe the water that goes
22 by the Hudson is at a little different component than Lake
23 Michigan; and maybe it will corrode the tubes or do something
24 one way or the other in the condenser. All these things just
haven't happened, and you could add, well, let's put the water

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1 factor in here of 26 percent, and 49 percent. You know it
 2 only cost them 14 million in Palisades, and isn't that where
 3 we should start? You have 31 million set up for yourself.
 4 Different factors, excavation.

5 WITNESS NEWMAN: The question is are we estimating
 6 our units at the same reasonable level or is there some great
 7 mistake that we have made in making our estimate.

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1 CHAIRMAN JENSCH: I think there is no mistake at
2 all. I think we would be interested in why you picked the
3 expensive -- more expensive of the two types in the mechanical
4 draft is supposed to be more efficient?

5 WITNESS NEWMAN: The mechanical draft is the
6 least versus capital costs.

7 If one takes into account the total revenue require-
8 ment for a mechanical draft versus a hyperbolic, they
9 come out to about a standoff. The hyperbolic has no fans.
10 The mechanical draft does have fans and that replacement
11 power must be paid for over the course of 26 years of operation
12 in our case -- 25 years from here. 6 to the year 30, the life
13 of this plant.

14 We are comparing here only capital costs. In my
15 testimony I presented the revenue requirement calculations also
16 But basically that was not the reason that we selected the
17 hyperbolic.

18 The land areas required for mechanical draft
19 towers are just not available adjacent to the Indian Point
20 plant. Also, the terrain is not suitable and the proximity
21 of the Indian Point site to the village of Buchanan is not
22 suitable because of the noise that would be coming from the
23 fans.

24 The possibility of fog from a mechanical draft
25 tower is much higher from mechanical draft which releases its

mm2

1 plume roughly about 100 feet above the ground as opposed
2 to 470 feet above the ground.

3 it was our conclusion and also the conclusion in
4 the Burns & Roe study we discussed yesterday, and we
5 arrived at these conclusions independently and I believe the
6 Staff -- well, I don't know what the Staff believes. I will
7 withdraw that.

8 ~~it was our conclusion that if one considers alter-~~
9 ~~nate cooling for the physical site at Indian Point, there is~~
10 ~~only one choice and that is the natural draft cooling tower.~~

11 ~~To build a natural draft cooling tower at the Indian~~
12 ~~Point site, we have an entirely different problem than they~~
13 ~~had at Palisades or Vermont. Palisades is a sand foundation~~
14 ~~with no excavation, or literally very little excavation.~~

15 CHAIRMAN JENSCH: Would it need greater support
16 in view of the sand base?

17 How far down did they put supporting posts?

18 WITNESS NEWMAN: ~~Virtually on grade, virtually on~~
19 grade.

20 Let me illustrate it, if I may -- one of our
21 problems.

22 This is a contour map of the location immediately
23 adjacent to Indian Point unit number 2.

24 We are placing the tower at elevation 10, which
25 minimizes the excavation for the basin.

mm3

1 We must cut down into the mountain to allow air
2 to come into the tower. The tower operates on the principle
3 that the air flowing through the tower reaches a saturation
4 pont and flows out through the top of the chimney like matter.

5 These contours go as high as elevation 100. They
6 are right in this area here. (Indicating.)

7 The 50-foot contour is in this area here. (Indicating.)

8 This map here indicates we have 300,000 yards of
9 excavation. At \$30 a yard, which is a number that we think
10 is perhaps low, but which we took out of the Dodge Construction
11 book -- and our recent experience, by the way, has been \$180
12 per yard. Granted it has been a smaller quantity, but within
13 the last two months, we have been excavating with the unit one
14 operating, not with unit two -- unit one is further away --
15 we have been excavating for a simulator and visitor center
16 structure up in this area. We have paid \$180 a yard for
17 that excavation.

18 CHAIRMAN JENSCH: There is certainly no sand in that
19 excavation?

20 WITNESS NEWMAN: No, sir. There is no sand -- our
21 records dating back to 1965 when the survey was done in this
22 area, indicate that there is approximately a foot and a half
23 of cover and the rest of this is rock.

24 Now, in our detailed backup we have that amount
25 of money in also. But our experience indicates that we are

mm4

1 not going to do anything less than \$30 a yard.

2 Our experience indicates that our escalation is
3 31 percent, bringing up the units to 1972. Our estimate in
4 this reconciliation is somewhat lower than presented in
5 Engineering News Record.

6 The principal cities around the country have an
7 experience of anywhere from 10 to 11 percent escalation. New
8 York we estimated about 7 percent, so that in our reconcilia-
9 tion we probably have been a little conservative in saying
10 what would it cost to take that same facility that was built
11 at Vermont Yankee, or the same facility that was built at
12 Palisades, and assuming that their published dollars -- if
13 we had to build or could build that facility at this site --
14 and that is the purpose of reconciliation, to say, well, yes,
15 there is the same kind of facility, conserve a unit, it would
16 have to be larger.

17 To illustrate the facts that you can't compare
18 them directly, Vermont Yankee, for example, has an 11-cell
19 cooling tower and they are putting 32 1/2 gallons per cell
20 on their tower.

21 On the other hand, Palisades are using 22 1/2
22 gallons per minute. They have different climatology than
23 we do. Palisades is designed to a 65-degree weather bulb,
24 Vermont Yankee has designed to a 75-degree weather bulb.

25 So you just can't take a number and say, well, if

mm5] 1 they could do it for six, that is a cheaper installation
.... 2 and you are estimating 32 million.

3 Another interesting fact we are designed for a
4 14-degree range, or we were until we dropped the ^{GPM} GPM on
5 this latest optimization.

6 Vermont Yankee is also designed for a 14.2-degree
7 range.

8 Palisades was designed for a 30-degree range.

9 So you just can't take these numbers and say, well,
10 if they could do it, could you do it. The answer is obviously
11 no, we are in a different area, different labor, different
12 existing condenser. They had the advantage when they laid
13 out their plant, their outfall had an area close by where they
14 could locate towers.

15 Our outfall is going in this direction, but the
16 area where we can locate a tower is in the opposite direction.
17 Therefore, we have a lot of -- more modification to do in
18 tying in our system than the two more fortunate people who
19 had a flat plain and large site on which to construct
20 their towers.

21 CHAIRMAN JENSCH: I don't know what your meteorologi-
22 cal studies will show, and I imagine -- my recollection of your
23 site is it is just solid rock all around it and it must be a
24 terrific excavating job, but I have wondered if you didn't
25 flatten out enough for mechanical draft towers.

mm6

1

2 While it does shoot up quite a bit of plume,
3 don't you have enough hillside toward the village of Buchanan
4 so it won't go over toward that direction at all,
5 would it?

6

7 WITNESS NEWMAN: Well, our consideration here is
8 that we would be fogging the Hudson Valley considerably.

9

10 CHAIRMAN JENSCH: Well, in that region -- you mean
11 it is your thought it would extend over to the west shore?

12

13 WITNESS NEWMAN: Yes, sir, yes, sir.

14

15 CHAIRMAN JENSCH: Well, I think -- I think the people
16 up in Vermont would like to know what kind of meteorological
17 studies you have and whether they could be translated into
18 that region.

19

20 The Connecticut River is much narrower up there.

21

22 WITNESS NEWMAN: Unfortunately, I don't have the
23 Vermont papers, but I saw a headline not too far back that
24 apparently said they were fogging the valley up there.

25

26 CHAIRMAN JENSCH: That will be of no importance
27 for the initial decision.

28

(Laughter.)

29

30 *Newman*
31 MR. TROSTEN: It might be of concern to the people
32 in Vermont, Mr. Chairman.

33

34 CHAIRMAN JENSCH: I appreciate your presentation.

35

36 WITNESS NEWMAN: What we have done here is said to
37 ourselves, and we always ask these questions of ourselves,

25

mm7

1 when you see a figure like \$6 million, and we are estimating
2 32 million, why are my numbers for doing this work so much
3 higher than these other people experienced?

4 The answer is that all these factors really are
5 involved and we are pricing at about the same level.

6 CHAIRMAN JENSCH: Those figures show that.

7 I think I would like to study them a little more.

8 MR. TROSTEN: We will provide for the record these
9 breakdowns Mr. Newman has given.

10 CHAIRMAN JENSCH: Can you give any different
11 showing of the river than contour designations?

12 Some sort of a cross section so we can see what
13 kind of a flat bed you do have available around the site
14 of the --

15 WITNESS NEWMAN: This is the river bank right
16 here -- (Indicating). That is the bank of the river. We are
17 right down in our excavation on the bank of the river.

18 We do find that the gradient is pretty uniform
19 and the reason for moving out to the edge of the river is
20 not necessarily to minimize the excavation, but to minimize
21 the pumping head. We are now siphon-set in the condenser
22 and we have the pumping water up over the cooling tower. That
23 is the purpose of the booster pumps.

24 So we get the minimum evaluation of horsepower
25 required for pumping over the cooling tower by moving out just

mm8 1 as far as we possibly could towards the edge of the river.
2 So this line here is the river bank and as you see, we are right
3 on the edge of the river with our excavation.

4 CHAIRMAN JENSCH: Can you build a cement dock
5 along the river and put your tower up there?

6 WITNESS NEWMAN: We looked at that and the answer
7 is yes, you can. The river drops off very rapidly with about
8 the same kinds of contours and the underwater work -- in
9 essence what you are building is a hole in the river rather
10 than a hole in the rock. This rock building is less costly
11 than building a hole in the river.

12 We have looked at alternates of -- when we were
13 first looking at mechanical draft towers, and we investigated
14 them rather extensively, we had a study done of barge mounting.
15 There would have been a barge --

16 CHAIRMAN JENSCH: Like this Tenneco offshore
17 Jersey arrangement, build an island in the river?

18 WITNESS NEWMAN: No, we were going -- Tenneco is
19 building a breakwater in their concept and then floating a
20 pre-assembled power plant into it.

21 We don't have the wave, that requires the breaking
22 water, but we looked at barge mounted at our gas turbine
23 job, at our narrows barges, and we found it is technically
24 feasible.

25 There are difficult problems of getting the

mm9

1 circulating water piping to float with the tide and we came
2 up with the schemes that put a -- sheet pile cells in there,
3 we built ponds and pumped out of them, all of which were
4 more costly than this arrangement.

5 We looked at spray ponds. They are not more costly
6 but they are not practical with the fogging aspects in the
7 village and in the valley.

8 I should say -- correct that.

9 We calculated the acreage required for cooling
10 ponds and we found it would have to take several miles of
11 river to -- and reserve for our rights to use as a cooling
12 pond. We have investigated all of these things. We find they
13 are just not practical for this site.

14 We do find them less costly, but they are hypotheti-
15 cal numbers; if you could do it, it would cost you less.

16 CHAIRMAN JENSCH: Well, thank you very much.

17 Anybody have any questions for the gentleman?

18 If not --

19 MR. MACBETH: The figures will be included in the
20 record?

21 MR. TROSTEN: Yes.

22 MR. MACBETH: I have no questions.

23 CHAIRMAN JENSCH: If there are no questions,
24 thank you Mr. Newman, you are excused.

(Witness excused.)

1 MR. TROSTEN: We are prepared for resumed cross-
 2 examination of Dr. Lawler, or if the Board wishes to
 3 recess, we could do that. Whichever the Board --

end 15 4

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1 CHAIRMAN JENSCH: As I recall, in the off-the-record
2 discussion, the interrogation for today would not take more
3 than thirty minutes, if the reporter can hang on, let us
4 proceed.

5 Dr. Lawler, resume the stand.

6 Whereupon,

7 JOHN P. LAWLER

8 resumed the stand, and having been previously duly sworn, was
9 examined, and testified further as follows:

10 CHAIRMAN JENSCH: Which attorney desires to interro-
11 gate? Staff? Very well.

12 MR. TROSTEN: Mr. Chairman, I beg your pardon, I
13 see we do have copies of -- several cost estimates and
14 breakdowns from which Mr. Newman was speaking.

15 I can offer these for inclusion in the record, at
16 this time. Would that be satisfactory.

17 CHAIRMAN JENSCH: Yes.

18 MR. TROSTEN: Mr. Newman, let me show you three
19 documents, the first of them is entitled, "Capital Cost
20 Estimate, Palisades (Mechanical) versus Indian Point (Natural
21 Draft)."

22 The second of these is entitled, "Capital Cost
23 Estimates, Vermont Yankee (Mechanical) versus Indian Point
24 (Natural Draft)."

25 And the third is entitled, "Capital Cost Comparisons,

ter-2

1 Vermont Yankee and Palisades versus Indian Point."

2 Are these three documents true and correct to the
3 best of your knowledge.

4 WITNESS NEWMAN: Yes, they are.

5 MR. TROSTEN: Do you desire to have these three
6 documents included in the transcript as your testimony?

7 WITNESS NEWMAN: Yes, I do.

8 MR. TROSTEN: Mr. Chairman, I now offer in evidence
9 in this proceeding, the three documents to which I have just
10 referred.

11 CHAIRMAN JENSCH: Any objection.

12 MR. MACBETH: No objection.

13 MR. KARMAN: No objection.

14 CHAIRMAN JENSCH: The request of Applicant's counsel
15 is granted, and the three documents to which Counsel has
16 referred may be physically incorporated within the transcript.

17 (DOCUMENTS REFERRED TO, FOLLOW.)

18

19

20

21

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25

CAPITAL COST ESTIMATES
PALISADES (MECHANICAL)
VS
INDIAN POINT (NATURAL DRAFT)

Direct Costs	\$14.1*
Construction Cost index factor (labor) = 20%	16.9
Power Ratio = 906/800 (MWe) = 113%	19.14
Additional Cost for Cooling element = 100% (\$4.0 million)	23.14
Excavation at Indian Point = (\$9.0 million)	32.14

*Millions of Dollars

CAPITAL COST ESTIMATES
VERMONT YANKEE (MECHANICAL)
VS
INDIAN POINT (NATURAL DRAFT)

Direct Costs	\$6.0*
Escalation - 31% PEAK Activity (late '69)	7.86
Construction Cost Index Factor (labor) - 29%	10.14
Power Ratio = $906/530 = 170\%$	17.24
Additional Cost for Cooling Element = 100% (\$1.96 million)	19.2
Excavation at Indian Point = (\$9.0 million)	\$28.2

*Millions of Dollars

Capital Cost Comparisons

Vermont-Yankee and Palisades vs. Indian Point

	Vermont Yankee	Palisades	*Indian Point
Direct Cost	**6.0	14.1	31.27
Escalation	7.86	---	---
Construction Cost Index Factor (labor)	10.14	16.1	---
Power Ratio	17.24	19.14	---
Cooling Element Additional Costs	19.20	23.14	---
Excavation at Indian Point	28.20	32.14	---

* One tower concept

** Millions of Dollars

ter-3

1 MR. TROSTEN: Thank you, very much. We will also
2 provide for the record, the contours for the cooling tower
3 that Mr. Newman was describing.

4 CHAIRMAN JENSCH: I think that would be helpful.
5 Thank you.

6 Very well, thank you, Mr. Newman. You are excused.
7 Proceed.

8 CROSS-EXAMINATION (continued)

9 xxxxxx BY MR. KARMAN:

10 Q Most of my questions will be directed to your
11 October 30th testimony?

12 A Thank you.

13 CHAIRMAN JENSCH: Proceed.

14 If we could have a little attention directed to
15 the witness, now.

16 BY MR. KARMAN:

17 Q Dr. Lawler, on page twelve of your October 30th

18 testimony, you state that the model that was used is "Basic-
19 ally *an unsteady* state, *dimensional* *longitudinally*
20 segmented. *model*"

21 What do you mean by unsteady state, Dr. Lawler?

22 A By unsteady state, we mean that the model is built
23 to respond to changes that take place in the parameters that
24 describe the river system such as flow and also to input
25 parameters such as the rate at which spawning occurs.

1 In other words, the concentration of, in this case,
2 fishes at various stages of their life cycle keeps changing
3 and is changing in response to changes in the -- both the
4 input parameters and the parameters that describe the river.

5 Q Does your model take into account, variation
6 within a tidal period?

7 A No, it does not. I might amplify on that. It
8 does in this sense -- well, it averages over the tidal period,
9 that would be the proper statement to make.

10 Q Is your model a truly, time dependent model?

11 A Yes, I would say it is a time-dependent model.

12 The time variable that we have used here is the tidal average.

13 Q Could you explain to us what you mean by longi-
14 tudinally segmented?

15 A By longitudinally segmented, I am referring to the
16 fact that we have taken the river from its northern extremus
17 as far as what is believed to be the northern extremus where
18 striped bass, eggs, and larva are found,; namely, the general
19 vicinity of Coxsackie, and split the river up into a series
20 of segments or reaches moving from Coxsackie all the way
21 down to Haverstraw Bay.

22 Q Does this longitudinally segmented model take
23 into account, variations in river parameters and geometry
24 all along its length?

25 A Yes, it does.

ter-5

1 Q Dr. Lawler, I call your attention now to the --

2 A I might comment on one point in your last question
3 in the particular runs that have been made so far, the flow
4 in the river, although in fact, it does increase as you move
5 from the northern area downstream, due to the tributaries
6 that come in has not -- has used the average flow that exists
7 in the estuary rather than the -- than incremental flows
8 as you move down.

9 It is capable of taking the incremental flows.

10 We did not increment those flows in this particular run. The
11 geometry characteristics are definitely different in each
12 segment.

13 Q I call your attention, now, to the Carlson-McCann
14 Report, and on page 42 thereof, Table 21 --

15 CHAIRMAN JENSCH: Does Applicant have one that
16 could be tendered to the witness?

17 MR. TROSTEN: Page 42 of the body of the report,
18 Table Ten, Mr. Karman?

19 MR. KARMAN: This is Table 21, on page 42 of the
20 Carlson-McCann Report.

21 THE WITNESS: I have that table, Mr. Karman.

22 BY MR. KARMAN:

23 Q Fine. Dr. Lawler, in looking at the table, you
24 will see, at the very last two locations which are Peekskill,
and Croton; and one states 11.0, and the other, 20.0, which

1 will be miles, length of area, miles.

2 Now, do you consider the choice of these two loca-
3 tions, 11 miles and 20 miles as capable of reflecting in
4 anyway, these variations that you have indicated were included
5 in the model?

6 A Yes, sir.

7 Q Will it reflect such variations in the vicinity
8 of Indian Point?

9 A Well, the Peekskill section describes a section
10 of the river from the mouth of Newbergh Bay, which is on the
11 northern end of that reach in the general vicinity of Mile
12 Point 50, or so, and then it runs down to the head of
13 Haverstraw Bay, as I described, two days ago, I think, when
14 Mr. Macbeth showed me the U.S. Coast and Geodetic map.

15 If you recall, Mile Point 40.1 was immediately
16 below the Stoney Point, which is the entry to Haverstraw Bay.

17 Then, on the other hand, the Croton section
18 describes a much wider, shallower section of the river which
19 extends from the Stoney Point at its head, down to approximately
20 the Piermont Pier, at its southern end.

21 Q What pier was that?

22 A The Piermont Pier. This is a -- it is a little
23 below that. This is a spit of land that extends well out
24 into the body of water known as the Tappan Zee. Most people
25 generally distinguish or most maps distinguish between

1 Haverstraw Bay and the Tappan Zee.

2 Others just use the general expression Haverstraw
3 Bay to include that entire area. That wide, shallow area of
4 the river, across which the Tappan Zee Bridge crosses, all
5 include^d in this segment, marked Croton.

6 Croton Point is right about in the middle of it.
7 Croton Point distinguishes probably the dividing line between
8 the Tappan Zee on the south and Haverstraw Bay on the north.

9 Q I call your attention, now, Dr. Lawler to Table
10 Seven of your testimony, which should be just before page 48.

11 A I have Table Seven.

12 Q And my question is, was your Delta X in increments
13 in the actual numerical model the same as that specified in
14 Table Seven of your testimony, as indicated on this Table
15 Seven, just prior to page 48 in your testimony?

16 A The length term which is used in the model extends
17 from the midpoint of each segment to the following midpoint.
18 So that is how you could compute what you are referring to
19 as Delta X.

20 Q Is this the normal or proper way of handling a
21 matter such as that on a model?

22 A Well, this particular model which I have described
23 as a segmented model of the Hudson River, in order to handle
24 the longitudinal variations, rather than handling it in a
25 differential equation form, we took the basic differential

1 equation that describes movement down the river and then the
2 longitudinal dimension of that equation, which is the X
3 variable was -- the equation was converted to the so-called
4 segmented model, and you end up with what is known as a diff-
5 erence-differential equation where the difference portion of
6 the equation reflects the changes that take place from one
7 segment to the next in the longitudinal dimension.

8 The Delta X does not actually occur in the -- it
9 is not a solid differential equation. let me put it that
10 way.

11 Q Can you give us any level of confidence that you
12 might have in utilizing the large Delta X that you do in this
13 model?

14 A Yes, we have tested the -- this notion of, as
15 you describe it, the large Delta X, we have looked at -- we
16 have broken the river up into a whole variety of segments,
17 smaller segments, if you will.

18 We find that the behavior of the response term,
19 the concentration that you are looking for, does not vary
20 significantly when you increase this Delta X; the reason why
21 we use large Delta Xs here is because this model gets horribly
22 expensive to run when you use smaller increments of distance.

23 We find the time variable is more important to
24 stability of model than the distance variable. So, we have
tested this notion that you are describing and found that as

1 far as the distance variable is concerned for the kind of
2 thing we are trying to do here, we have confidence in it,
3 in the models ability to properly reproduce a longitudinal
4 profile.

5 Q Thank you, Dr. Lawler.

6 On this Table Eight, which, again, should precede
7 page 48, you have that?

8 A Yes, I do.

9 Q All right. You specify the choice of the longi-
10 tudinal dispersion coefficient E as being twelve square miles
11 per day for the last two segments of the model, is that not
12 so?

13 A That is correct, sir.

14 Q In a report submitted by your firm in December of
15 1970, to the State of New York, Department of Environmental
16 Conservation, entitled, "Hudson River Water Quality and Waste
17 Assimilated Capacity Study, Final Report, December 1970;
18 Quirk, Lawler, and Mattuskey," you would not happen to have
19 a copy of that, would you?

20 A No, sir, I don't.

21 Q Now, am I correct that in this work that was
22 prepared for the State of New York, on this particular model,
23 you reported that the longitudinal dispersion coefficient at
24 Indian Point site is about eight square miles per day, for
25 fresh water flow of three thousand cubic feet per second?

1 A That is correct, sir.

2 Q I see, and prior to that, in the references -- I
3 believe it is in your October 30th testimony to reports
4 which were submitted in '65 and '68, you had the twelve
5 square miles per day figure. Could you explain the differences
6 that -- if any -- that arise as a result of using twelve on
7 certain occasions and eight on other occasions?

8 A Yes, sir, I can explain the differences, and I
9 can also explain why there are different numbers used.

10 Let me take the latter, first.

11 The numbers that you have seen in the series of
12 our reports have reflected a continuing attempt on our part
13 to get as good an overall evaluation of the manner in which
14 mixing occurs in the Hudson River, particularly along its
15 longitudinal axis.

16 Generally, we have relied on salinity profiles
17 to do this. The figure that you refer to was a particular
18 salinity profile which we had developed ourselves some years
19 prior. As I recall, in 1964, late 1964.

20 The dispersion coefficients used here reflect our
21 best estimate today of the dispersion coefficients that exist
22 in the Hudson River, for a variety of flows.

23 There have been a sequence of changes made in this
24 value. I think the -- several things took place. The early
25 information we obtained from the U.S.G.S. had a -- the only

1 place we can measure the fresh water flow in the Hudson is
2 at Troy Lock, up Mile Point a hundred and fifty-two. From
3 that point on, you have to rely on estimates of what the flow
4 is in the lower river.

5 This is not an easy thing to do and one of the
6 complications is, you have a whole series of tributaries,
7 some of which are gauged, and some of which are not.

8 The original computed values for the longitudinal
9 dispersion coefficient reflected too low an increase in flow
10 for the tributaries. So that correction is inherent in here.

11 I think we submitted to the Staff, a rather com-
12 prehensive report on the ^{Bowling} Bowling Station, which, among other
13 things, contained estimates of a longitudinal dispersion
14 coefficient, using something like 25 different sets of
15 salinity profiles.

16 Now, secondly, what effect does it have? We have
17 found that the response of various characteristics in the river
18 river -- of various concentration variables, water quality
19 parameters, and what have you, to the longitudinal dispersion
20 coefficient is not too great.

21 The response to the longitudinal coefficient at
22 this level is weaker than to any of the other parameters
23 that one used in this model, such as mortality rates and
24 flows, and things of this nature.

25 For example, I might describe to you a study that

1 was done by our firm, some years ago in New York Harbor
2 where the longitudinal rates are, of course, higher so
3 therefore, the response would even be less; but there we found
4 that in trying to predict the ^{dissolved} ~~solid~~ oxygen concentrations,
5 that a change in the -- well, let me put it this way; a
6 onefold change in the longitudinal dispersion coefficient would
7 only change the response of dissolved oxygen in that part of
8 the river which is the -- off Manhattan Island by approximately
9 one-sixteenth.

10 Now, the response is not that flat as you drop
11 off in your values of the longitudinal dispersion coefficient
12 but still, we have found that the response to the longitudinal
13 dispersion coefficient is not very severe.

14 I might also add that the longitudinal dispersion
15 coefficient used in Section Eight was -- or shown in Section
16 Eight, don't actually come into play in the model because we
17 do not permit -- or to date, we have not permitted the bass,
18 in whatever stage of their life they happen to be, to leave
19 Section Eight.

20 Okay? So we can't move them out of Section Eight.
21 We don't permit them to be moved out of Section Eight other
22 than back upstream.

23 Q As of now, Dr. Lawler, which of those two estimates
24 do you believe is the correct one, the eight percent or the
25 twelve?

1 A I believe the twelve is the correct estimate, at
2 this time.

3 Q And what kind of a level of confidence do you have
4 in these so-called "best estimates," of the longitudinal
5 dispersion coefficient?

6 A I have never applied a statistical analysis of the
7 type we have talked about, with respect to data to this
8 coefficient. I would estimate that this value for flow, used
9 is probably accurate within -- less than 20 percent, plus or
10 minus 10 to 15 percent, I would say, on that order.

11 In other words, if I put a bound of ten to 14
12 on it, I would be pretty confident that I was within the
13 correct boundary for that value.

14 Q Dr. Lawler, is it correct to say that the dispersion
15 coefficient is expected to be lower outside of the zone of
16 salt intrusion?

17 A Yes, sir, it is.

18 Q And that values of dispersion coefficient might
19 be normally less than .5 square miles per day, even if it
20 is under tidal influence?

21 A I don't agree. We have generally used a value
22 from one to two square miles per day, to reflect the total
23 tidal mixing, without salt.

24 Q Could it be said, Dr. Lawler, that one of the
25 reasons that the rather high values of dispersion coefficient

ter-14

1 being used in your model is to compensate for various corrective
2 or convective phenomena which cannot be taken into account
3 in a tidal, average, one-dimensional model?

end-16

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1 MR. TROSTEN: I object to the use of the phrase
2 "rather high". Would Mr. Karman rephrase the question?

3 MR. KARMAN: I was going to use "huge."

4 (Laughter.)

5 CHAIRMAN JENSCH: Well, I think counsel can
6 select the particular word. Do you mean rather high in a
7 sense that this Table 8 shows an arrangement from 1.0 to
8 12.0? Is that why the 12.0 figure seems high, and with those
9 statistics, would that be within the definition of what you
10 meant by "rather high"?

11 WITNESS SIMAN-TOF: The reasons for these questions
12 is to show that the coefficient method as it is used in the
13 model Dr. Lawler is proposing is that the dispersion coefficient
14 here is used in what I would call a ^{"fudge factor"} number which is trying to
15 take into account many phenomena other than truly diffusional
16 dispersion phenomena, which it means convective phenomena
17 of the tidal movement and what is called in the reference
18 as connected to the Indian Point density induced flow.

19 Therefore, the complexities of evaluating the
20 dispersion coefficient are coming from this effect, and that
21 is the reason for the question.

22 CHAIRMAN JENSCH: With that explanation and the
23 previous inquiry about the range from 1.0 to 12.0, do those
24 statistics in that explanation indicate why you selected
25 "rather high"?

1 WITNESS SIMAN-TOF: It might range in my opinion to
2 factors of 2, depending upon the type of model you are using.

3 CHAIRMAN JENSCH: Well, we are back to the objection
4 that has been stated by the Applicant, that the "rather high"
5 might not be a correct characterization. I was trying to
6 get a definition of how you use the word "rather high."

7 I take it it is based on this explanation
8 and the variation of statistics.

9 With that definition, does that not overcome your
10 objection?

11 (Laughter.)

12 MR. KARMAN: Mr. Trosten is in the same position
13 I am.

14 CHAIRMAN JENSCH: Consider the objection over-
15 ruled and will the witness answer, bearing those factors in
16 mind.

17 Can you do that?

18 MR. TROSTEN: Does the witness accept the
19 characterization of "very high"?

20 WITNESS LAWLER: I think I can clarify several
21 points.

22 CHAIRMAN JENSCH: Try not only the objections, but
23 the questions, too, if you will.

24 WITNESS LAWLER: We are not -- the kind of thing
we are talking about here, Mr. Chairman, I don't think is

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1 whether one is right or twelve is right. I would object
2 to the use of the word "fudge factor." That is not what
3 this longitudinal dispersion coefficient is at all.

4 Secondly, I would clearly distinguish the words
5 "dispersion" and "diffusion." This is not a dissusion or
6 simple diffusion phenomena we are referring to.

7 What it is, and Mr. ^{Kormann} ~~Korman~~ is correct in this
8 characterization of it, it is a parameter that recognizes
9 that one cannot simply define movement in the estuary by
10 knowing the fresh water flow. That convective movement is
11 the flow movement, any type of flow.

12 In any estuary there are a whole series of flows.
13 There are flows due to the tide, there are flows due to the
14 fresh water flow. There are flows due to density differences
15 that exist because of the salt.

16 What one is doing here -- and now to completely
17 characterize these flows, one starts with a very basic set
18 of equations that describe flow phenomena in three dimensions
19 on a very microscopic scale, if you will, not on a molecular
20 scale, but on a very small scale. These sets of equations
21 purport to define the way in which flow changes as one moves
22 from one point to another.

23 Now it is -- you can't solve these equations, not
24 in their three dimensional form with all terms included. It
25 is unbelievably difficult and the coefficients that apply

1 are too difficult to measure with any kind of real confidence
2 in them.

3 In these modeling approaches, in this particular
4 modeling approach, what we have done is to -- the correct
5 mathematical term is to integrate. I have integrated out
6 the effect of changes in the flow from top to bottom and
7 from side to side and over the tidal cycle. When you perform
8 that integration process on your basic equations, you end up
9 with additional terms. You can't simply throw those terms
10 out.

11 The final thing that you end up with is an
12 equation which has two flow terms in it. One flow term is
13 the freshwater flow and the other term is a term that
14 contains all of the residue of this manipulative mathematical
15 process.

16 In that other term, you have the effect of the
17 tide and the effect of the density currents and whatever
18 else you may have, all lumped together, and that is what this
19 longitudinal dispersion coefficient is measuring. It is not
20 a fudge factor, it is a term that describes an over-all
21 effect; it is lumping a whole variety of real things that
22 happen in the estuary.

23 That is the best way of answering that question.

24 CHAIRMAN JENSCH: Would you reread that question
25 you last read and see if we can try it without the words

1 "rather high"?

2 Mr. Karman, will you reread your last question?

3 MR. KARMAN: The question was: Is not one of
4 the real reasons that such values of high dispersion
5 coefficients are being used in your model is to compensate
6 for various convective phenomena which cannot be taken into
7 an average model?

8 MR. TROSTEN: If you strike the word "high" out --

9 MR. MARMAN: I think with the explanation, we
10 can take the word "high" out. The record will speak for
11 itself.

12 CHAIRMAN JENSCH: Proceed.

13 MR. MACBETH: If you take the word "high" out,
14 you don't have much of a sentence left.

15 CHAIRMAN JENSCH: Well, as I understood your
16 question, if the word "high" were taken out, would
17 you explain why you used 12.0 for segments numbered 7 and 8?

18 WITNESS LAWLER: Well, the reason why I used it
19 is because the manner in which one estimates this parameter
20 is to use salinity profiles and in using the salinity
21 profiles that we have available to us for the Hudson River,
22 this is the approximate -- this is the number that one ends
23 up with in that segment of the river. I think it is by no
24 stretch of the imagination a number that you come out with
as one, no matter how you slice it.

1 MR. KARMAN: Dr. Lawler, as a result of your
2 last answer, is it correct that using the longitudinal
3 diffusion coefficient in the manner in which you just
4 described it, does this make the dispersion term an important
5 term in the model relative to the convective term?

6 WITNESS LAWLER: Yes, sir, it is quite important.
7 I indicated that the response of whatever it is you are
8 looking for, in this case, the fish, doesn't change dramatically
9 with the changes in the longitudinal dispersion coefficient
10 or doesn't change as rapidly as a concomitant change in
11 dispersion coefficient.

12 If it is not there and the only thing you are
13 dealing with is the fresh water flow, what you have done is
14 characterized the Hudson River as a stream rather than an
15 estuary.

16 MR. KARMAN: Would it be a correct evaluation
17 for you to evaluate that longitudinal dispersion coefficient,
18 as used in your one-dimensional tidal average model, might
19 be considered amongst those in the field as being a difficult
20 type model in the field of fluid mechanics?

21 MR. TROSTEN: What do you mean by the word
22 "difficult," Mr. Karman?

23 MR. KARMAN: A complex problem.

24 WITNESS LAWLER: I still don't follow the
25 question.

or 7

1 MR. TROSTEN: Would the reporter --

2 MR. KARMAN: Let me -- could you read the
3 question back, please, Mr. Reporter?

4 (Whereupon, the reporter read the record as
5 requested.)

6 MR. KARMAN: "Possibly complex," would that be
7 a more understandable word?

8 WITNESS LAWLER: Well, any of these models are
9 complex. The complexity increases as the variation in the
10 parameters that describe the system increases.

11 In other words, the more things that you put
12 into the model that you can characterize as existing in, in
13 this case, the estuary, the more difficult or the more
14 complex the model becomes.

15 I would not characterize this as either a
16 particularly simple description of the estuary, nor, on the
17 other hand, an extraordinarily complex description of the
18 estuary.

19 MR. KARMAN: Mr. Chairman, there are just two
20 other questions based upon Dr. Lawler's testimony, and some
21 of the cross-examination which took place a couple of days
22 ago. I must admit that it deals with some type of
23 calculation which is beyond my expertise as an interrogator.

24 I wonder if at this time whether one of our
25 experts, a member of our panel, who has been sworn in as a

1 witness in this particular hearing, could conduct the cross-
2 examination on these one or two questions and then we will
3 be finished with our cross-examination.

4 This would be Dr. Robert Geckler.

5 CHAIRMAN JENSCH: Any objections, Applicant?

6 MR. TROSTEN: No. I have no objection.

7 MR. KARMAN: You have a copy of his professional
8 qualifications.

9 MR. TROSTEN: May I review it, please?

10 Do you have a copy of it?

11 And may I inquire as to the scope of the cross-
12 examination, the interrogation?

13 I have no objection, Mr. Chairman, to the
14 interrogation. I might add that I did not realize until
15 this moment that we were going to be interrogated on the
16 subject and had I known that, we might have had some other
17 people present.

18 MR. KARMAN: If you feel that Dr. Lawler is not,
19 there will be other times here.

20 MR. TROSTEN: Let me confer and perhaps it would
21 be more appropriate to do that later.

22 MR. KARMAN: We are not insisting on an answer now.

23 (Conference between the witness and counsel.)

24 MR. TROSTEN: Mr. Chairman, Mr. Karman has advised
25 me that the subject of the technical interrogation by

or 9

1 Dr. Geckler is to be the Table 19, which was the table having
2 to do with the F-2 factors which Dr. Lawler corrected the
3 other day.

4 Also, the F factors generally, and also the
5 table in the document which deals with the impingement, I
6 really prefer -- we had a number of witnesses here, one
7 in particular, Mr. Alevras, who is the person responsible for
8 the impingement table, I really would prefer if that witness
9 were here for the impingement table.

10 Dr. Lawler is ^{proffered} preferred to be examined on the
11 interrogation on Table 19. I wonder if we could reschedule
12 ^{those others} these for a time when Dr. Lawler might also be present at
13 the same time.

14 MR. KARMAN: We have no objection.

15 CHAIRMAN JENSCH: Let us proceed upon that basis
16 then.

17 YOU mentioned the F factors. Are those the
18 fudge factors?

19 (Laughter.)

20 MR. TROSTEN: No, sir.

21 CHAIRMAN JENSCH: What is an F factor?

22 WITNESS LAWLER: Mr. Jensch, maybe I shouldn't
23 have used the letter F, but if you recall, in my testimony,
24 I tried to recognize that the plant would not necessarily
25 see the same concentrations that the model would predict on

dor 10
1 an over-all section average basis, so to recognize that
2 factor, I introduced a series of fractions, really, and
3 that is why I call them F. They are all fractions of what you
4 would see at the intake if you simply used the section average
5 concentration.

6 MR. TROSTEN: When you see F, if you would read
7 fraction instead of F fudge, Mr. Chairman.

8 MR. MACBETH: Mr. Chairman, feel free to read
9 it any way you like.

10 CHAIRMAN JENSCH: Any further interrogation?

11 MR. KARMAN: One question, Mr Chairman.

12 DR. GECKLER: The question deals with Table 19,
13 which follows page 60 and was corrected two days ago.

14 What would be your conclusion, Dr. Lawler, if the
15 statistical comparison which you intend to carry out would
16 -- indicated there were no significant differences among
17 the various numbers and, therefore, no reason for believing
18 them to be different?

19 WITNESS LAWLER: Well, the first thing I would
20 have to know is what particular test of significance was
21 to be used and what significance level was to be used to
22 determine whether or not there was a significant difference.

23 DR. GECKLER: What would be your normal
24 procedure?

25 WITNESS LAWLER: What would be my normal procedure?

1 DR. GECKLER: Yes.

2 WITNESS LAWLER: Well, one could -- first of all,
3 I would turn it over to my statistical people.

4 (Laughter.)

5 WITNESS LAWLER: But what I would want to do is
6 select a -- well, let me go back to Dr. McFadden's comments
7 yesterday. You would be testing here to determine whether
8 there was a statistically significant difference or whether
9 there was not, and I suppose that you would set up as a
10 null hypothesis that there was no statistically significant
11 difference, and you might set up as the alternate hypothesis
12 that there was a statistically significant difference.

13 DR. GECKLER: Would an adequate technique be
14 to take the means and standard deviations and make the
15 comparison according to ordinary statistical tests?

16 MR. TROSTEN: Mr. Chairman, at this point, I am
17 afraid I would have to object. I think that we have
18 released from the hearing room here the statistician Dr.
19 Lawler brought down here to consult with on questions of this
20 sort, I will consult with Dr. Lawler about this matter, but
21 I believe it would have been helpful -- it is simply a matter
22 of having the right people here.

23 MR. KARMAN: We only want to get the best answer
24 from the best qualified witness.

25 MR. TROSTEN: Perhaps the best thing to do would

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1 be to defer this type of questioning.

2 MR. KARMAN: No objection.

3 CHAIRMAN JENSCH: Very well. Any other -- I
4 think the Board has some questions.

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1 MR. MACBETH: I have a couple of questions on the
2 dispersion factor.

3 CHAIRMAN JENSCH: Proceed.

4 BY MR. MACBETH:

5 Q Dr. Lawler, is it true that if the dispersion
6 coefficient in segment 7, the Peekskill segment, is -- let
7 me rephrase that. Is it true that the higher the dispersion
8 coefficient for the Peekskill segment, the shorter the period
9 during which organisms would be vulnerable to entrainment
10 by Indian Point?

11 MR. TROSTEN: Would the Reporter read the question,
12 please?

13 (The record was read by the Reporter.)

14 THE WITNESS: I think that the opposite is probably
15 true. It is an interesting phenomena. When you are exposing
16 organisms to the operation of the plant at Indian Point, at
17 least as described in this model, you are drawing down toward
18 the plant, I could describe, the concentration of organisms
19 and the -- and that drawdown is being fed by organisms from
20 either direction, both north of the plant and south of the plant,
21 okay?

22 And the way in which this model operates -- all your --
23 the dispersion moves the material faster and mixes it around,
24 but it moves the material in the direction of a decreasing
25 concentration gradient.

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reba 2

1 In other words, as your concentrations goes down,
2 the material, the dispersion factor, forces the material into
3 it. So the answer to your question would be forget -- I forget
4 how you worded it, but the higher the dispersion coefficient
5 here, possibly the higher would be the plant impact, at least
6 from that standpoint.

7 On the other hand, the dispersion coefficient also in ef-
8 fect acts as a dilutant. It says the net effect of plant
9 flow by comparison to total flow in the vicinity is lower. So
10 you probably have some-kind-of offsetting effect there and
11 I would really have to investigate it with a series of different
12 values for the dispersion coefficient which I have not done
13 to see which way it goes.

14 That was why, for instance, we introduced this notion of
15 *fresh factor* because this phenomena that I have just described
16 was probably pretty good when you are talking about something
17 that is distributed in the manner in which sewage effluent
18 or something like that is distributed.

19 It is not a fish. It is just going to go with the
20 movement of the tide. But you know, I think it is shaky grounds
21 to say that when you draw this down, you draw the concentration
22 down in front of a plant, for this to occur, the -- to assume
23 that from other vicinities in the normal fashion as described
24 by the dispersion coefficient which is really developed from
25 particle data rather than a substance or thing which has an

#18 1 ability of its own to move, to assume that that organism
Reba 3 2 just moves in the pure manner in which the dispersion coef-
3 ficient says it should move is really questionable.

4 That is why I introduced the three factor^F.

5 MR. MACBETH: I have no further questions.

6 CHAIRMAN JENSCH: Let me see if I can follow that
7 a bit. In other words, based on your studies so far, at least,
8 you would not want -- it would not be a correct use of your
9 model in your opinion to assume that the higher the dispersion
10 -- the -- either the shorter or the longer time available for
11 entrainment. You would have to work out some studies to
12 answer that phase of it, is that right?

13 WITNESS RANEY: That is right, Mr. Jensch, yes.

14 CHAIRMAN JENSCH: Do you think it would be quite
15 important to know that? Applicant's counsel, could we ask
16 Dr. Lawler to develop these studies?

17 It seems to me he has used a high dispersion
18 coefficient there and it might lead some people to believe that
19 it would affect the time for entrainment. I think it would be
20 important to know that, would you not?

21 MR. TROSTEN: Doctor -- let me just answer, Mr.
22 Chairman. I believe that if the Chairman desires to have
23 the result of such an analysis, I believe it could be provided.
24 Dr. Lawler has indicated that we have not performed it, but
25 I will let him speak for himself in this respect.

hawley

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WITNESS ~~RANEY~~: The first comment I would like to

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make is that I don't believe this dispersion coefficient

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that I have used is high. I believe it is the right number for

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this particular section of the estuary. The point I am trying

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to make, secondly, yes, we can evaluate the performance of the

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model for higher and for lower dispersion coefficients.

7

More importantly, what we intend to do is to evaluate the

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whole notion of how well the dispersion coefficient at least

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~~as described so far, that is something that was generated~~

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from salinity profiles, is in fact a good description of what

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is happening to the larvae.

12

~~The larvae are doing different things. They have some~~

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degree of self-movement on their own. Now what we are investi-

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gating in the -- just from a conceptual standpoint in the model,

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not necessarily from the standpoint of data, but we are investi-

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gating how best to describe the joint effect of a tidal movement

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back and forth over a day and the vertical migration of the

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larval organisms, which has been described earlier, which to

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some extent is independent of the tidal motion, at least in

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the vertical direction.

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So I would like to point out to the board that I don't

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want -- and I think I pointed out that -- fairly well

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pointed this out very clearly in the summary, that I don't

24

consider either the data used in this model or the -- some

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of the conceptualizations applied to describe behavior as the

#18 1 last word in this framework that we are trying to construct.

Reba 5 2 We are trying to construct a framework to describe the way
3 in which the things happen in the river, particularly with
4 respect to the questions of striped bass.

5 The whole model study -- the whole study Dr. McFadden
6 described will have as a framework within which data can be
7 evaluated, a structure something like this, but that is not
8 to say it will be identical to this.

9 I think this should be considered as a step in a series
10 of steps to come out with ultimately what I would hope to be
11 a rather good description of behavior.

12 CHAIRMAN JENSCH: Let me ask you then, I will use
13 the language in a layman's way, but you said the larvae have
14 some movement. How long was the larvae in your judgment that
15 has movement?

16 WITNESS RANEY: Well, the -- I think there has been
17 quite a bit of testimony on this, but ---

18 CHAIRMAN JENSCH: Just the way I use it.

19 WITNESS RANEY: Well, you begin to see the movement
20 when the larvae is on the order of a half an inch. Then as
21 his age increases and as his size increases, this ability to
22 move becomes stronger.

23 CHAIRMAN JENSCH: Now how far out does the -- I use
24 the term correctly, the suction from the pump have their
25 effect and particularly with reference to whether the larvae
can avoid it.

#18 1 I have reference to this dispersion coefficient you
Reba 6 2 mention here, the suction of the pumps, if it goes half way
3 out in the river, for instance, you don't believe that the
4 larvae are able to resist the force of the pumps, do you, by
5 having some movement capability, do you?

6 WITNESS RANEY: No, but I don't believe the suction
7 of the pumps is felt half way out.

8 CHAIRMAN JENSCH: How far is it felt out?

9 WITNESS RANEY: Well, you feel less and less
10 velocity as you move farther and farther from the actual
11 intake structure.

12 CHAIRMAN JENSCH: I appreciate that.

13 WITNESS RANEY: ^{hauled} We made some -- we made some cal-
14 culations, for example, that showed that during the average
15 movement of the tide, 90 percent of the water that is coming
16 into the plant is coming from a point 150 feet out in front of
17 the plant or less. That really does not address itself com-
18 pletely to the problem you are describing either because of
19 this mixing and dispersion in the river.

20 CHAIRMAN JENSCH: Well, it may not to you, but
21 I have problems in thinking about that if you -- you say
22 that the average tidal flow. How about saying ebb tide?
23 How far out -- when -- or maybe that is not -- the neutral,
24 the halfway point? How far out can you go with the force of
25 the pump into the river?

hawler
1 WITNESS RANEY: You would have to perform a flow

2 net analysis on that. We have not done that as of yet. I
3 would say this that the slack tide lasts for something like --
4 less than half a foot per second, as I recall, a half a foot
5 per second, as I recall approximately a half an hour on either
6 side of true slack which is when -- the point at which the
7 tide is reversed.

8 CHAIRMAN JENSCH: And you don't know how far out
9 the force of the pumps would be felt from the slack tide?

hawler
10 WITNESS RANEY: You would really have to define the
11 level of what you mean by force, what you are referring to
12 as the velocity that the pump flow induces in the -- you know,
13 where it is coming from. Like this and coming in like this
14 (indicating).

15 CHAIRMAN JENSCH: That is right.

hawler
16 WITNESS RANEY: I don't know the numbers, but the
17 farther out you go the lower and lower those numbers are.

18 CHAIRMAN JENSCH: Yes. Well, my only point was if
19 you are using a great dispersion factor, it seems to me that
20 you are -- I know -- let's say like the difference between
21 1 point zero and 12 point zero, when you are using the 12 point
22 zero figure for a dispersion coefficient, you are really, in
23 effect, are you not, at slack tide especially, lessening the
24 time that the fish would be available for entrainment?

hawler
25 WITNESS RANEY: That is correct. If I was describing

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Reba 8

1 the behavior from point to point on the tidal cycle, but
2 as of this point we are not. In other words, the model simply
3 says on the average all these things taken into consideration,
4 this is what we expect will be the net result.

5 I agree with your point, that particular point on the tide

6 ---

7 CHAIRMAN JENSCH: I have always a great deal of
8 trouble with average because the high and the low sometimes
9 really low, do the damage. I don't know about this fish
10 situation, but it seems to me that if you are taking the conser-
11 vative approach, as the radiological safety people do, they
12 generally take the worst condition as I understood in order to
13 test the safety of these things.

14 I just wondered whether the fish analysis shouldn't be
15 on the same type of theory that you take the worst condition
16 and see what the effect would be under those circumstances
17 and I take it you have not made any, as you say, study of the
18 dynamics of the rivers, just made these calculations and used
19 averages, is that right?

20 WITNESS *Raney* RANEY: It is not correct to say we *have not*
21 made any study of the dynamics of the river. In fact, because
22 of having studied the dynamics of the river from a lot of
23 different ways, it is my belief that with respect to the
24 question that we have tried to address ourselves to, namely
25 the approximate percentage reduction that may occur due to

#18 1 operation of the plant, I think using the notion of tidal
Reba 9 2 average is quite valid.

3 If I did not think it was I would not have used it.

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CHAIRMAN JENSCH: I appreciate that. My only
2 thought was did you make any studies of the worst conditions,
3 that is the slack tide type of situation or the -- whatever
4 you would construe to be the worst type of condition rather
5 than the average condition? Whatever figures you used to
6 derive at the average, if you used the worst of those, to see
7 what the effect on entrainment could be?

8 WITNESS LAWLER: I couldn't answer the question by
9 just using the worst condition. If we concede -- I am not

10 even willing to concede the worst condition is in slack,

11 although for many situations it may be; but even if it is,

12 that period lasts, say, one hour out of 12; and I can't

13 address the problem I have been asked to address by not

14 considering the entire time period.

15 CHAIRMAN JENSCH: What was the problem that you

16 were directed to assess?

17 WITNESS LAWLER: The problem that I have been asked

18 to assess is to make an estimate of the possible reduction

19 in the numbers of eggs and larvae and juvenile fishes, first-

20 year fishes, that may take place due to the operation of the

21 plant; and to do that, you have to take into account the fact

22 that the plant is drawing water continuously at a certain rate

23 and the water on a continuous basis in the river is moving

24 back and forth.

I think -- I think the manner in which we have

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1 attacked this problem in the proper manner. I don't think it
2 would have been proper to simply address ourselves to what
3 would occur on a single phase of the tide.

4 CHAIRMAN JENSCH: Well, your last answer said just
5 to do that simply on that basis. I agree with you; but the
6 alternatives, rather the several variations of the river flow,
7 slack tide, and the variations that grow out from the reverse
8 of the flow and that sort of thing might be some of the
9 variables that you might consider as to worst conditions.

10 If there is a school of fish that just happens to be in front
11 of Indian Point at slack tide and you have your velocity
12 induced by the pumps, pulling it into the pump, you might get
13 a much different condition than using the average, would you
14 not?

15 WITNESS LAWLER: That might be a different condi-
16 tion, I agree.

17 CHAIRMAN JENSCH: Then it might have a different
18 effect, different entrainment, isn't that correct?

19 WITNESS LAWLER: Over a short period of time.

20 CHAIRMAN JENSCH: A short period of time, but maybe
21 the greatest concentration of fish or eggs or larvae, so your
22 damage might be the greatest even though it is at slack time.

23 WITNESS LAWLER: If you are postulating, Mr.
24 Jensch, that the entire population of the river might be
25 construed to all be in the east side of Indian Point at a

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1 particular time when the plant was running at a slack tide,
2 then perhaps that would be a severe effect.

3 *Chairman Jensch*
~~WITNESS LAWLER:~~ You said assuming the entire
4 population of the eggs that were there, that may be a rash
5 assumption. If you had a pretty substantial accumulation
6 of your eggs and larvae, you might get a different result.

7 As I understand it, the net result of your study is
8 you come out with a projection now of two fish being entrained?
9 Is that what this figure in nine comes out? One fish is dead
10 and one is alive?

11 MR. TROSTEN: Mr. Chairman, are you referring to
12 the percentage reduction estimates or -- I am not sure which
13 part you are referring to.

14 CHAIRMAN JENSCH: Table 19 is the measure of
15 entrainment. Is that it?

16 MR. TROSTEN: Dr. Lawler, would you care to address
17 yourself to the meaning of table 19, please?

18 DR. GEYER: The two fish were involved in the
19 intake concentration on which some of these ratios are based.

20 WITNESS LAWLER: That's right, they were. As
21 I described, table 19 represents one day of data. By the
22 way, in answer to, I think your question, Mr. Briggs, there
23 were -- there have been approximately 10 other runs made.
24 Unfortunately they were all made subsequent to July 25th. I
25 don't have the results, but as you suggested the other day,

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1 Dr. Geyer, I don't expect to see anything other than zeroes
2 in those tows as far as the striped bass is concerned.

3 DR. GEYER: While we are on this subject, you
4 have given the results of some of the runs on table 24 just
5 before page 79, and you said that you had made additional
6 runs using other ^F factors. Could you supply those at some
7 future time so we will have them when we are talking about
8 the ^F factors?

9 WITNESS LAWLER: Yes, sir, I certainly can. I
10 introduced some of that into the testimony toward the end of
11 Wednesday.

12 DR. GEYER: Yes. I don't have them in my notes,
13 so it would be nice. If table 24 could be expended.

14 WITNESS LAWLER: Fine. I can definitely do that.
15 I think it is the most appropriate thing to do because we
16 are all recognizing that any single one of these values such
17 as the F-2 value, for instance, may very well be different
18 than the number we have used here. ^{We} You have done a sensitivity
19 analysis or are in the process of doing it, varying all of
20 the F factors, varying the migration rate. I will now vary the
21 dispersion coefficient since this has come into the conversa-
22 tion, and varying the levels of compensation. As I indicated
23 to you the other day, that what we are finding so far is that
24 the F factors are important and the level of compensation is
25 also important.

1 MR. BRIGGS: A question related to this and to
2 the research program, there has been quite a bit of discus-
3 sion about the efficiency of trawls and of the nets used in
4 the intake, and it indicates here that an echo-sounder will
5 be used for making some measurements. Is there someone here
6 who is an expert on the echo-sounder? Are you --

7 WITNESS LAWLER: I have used the echo-sounder,
8 but I wouldn't classify myself as being an expert on it.

9 MR. BRIGGS: Is the echo-sounder to be used in
10 the intake and is it expected it would give more accurate
11 results than use of nets for determining the fish?

12 MR. TROSTEN: Mr. Woodbury can attempt to answer
13 your question, Mr. Briggs.

14 WITNESS WOODBURY: I have never operated an echo-
15 sounder and I know very little about the operation of one.
16 I am responsible for directing the operation of this
17 particular echo-sounder and I am familiar generally with what
18 we are doing and generally what the results are, if that
19 will be helpful, sir.

20 MR. BRIGGS: I think that might be helpful.

21 WITNESS WOODBURY: We started using the echo-
22 sounder two years ago as a new way to try to locate the
23 groups of fish that were in the vicinity of Indian Point, to
24 see if they were collecting in one location or in another,
25 and to try to ascertain why they were being collected there.

1 While we had some difficulty keeping the thing
2 running, because it is a sensitive instrument, it is part of
3 our five-year study and it does involve taking measurements
4 of fish densities as close to the screens as we can get
5 with it. We have had difficulty getting in front of the
6 screens from Indian Point 1 because of the dock and all of
7 the pilings that are under the dock. We have gotten very close
8 to Indian Point 2 and Indian Point 3, and very close to the
9 discharge canal. We have been out in the center of the river
10 as well, and we have been up as far as Cornwall with it.

11 MR. BRIGGS: Does it just indicate masses of fish
12 or can it be used for small individual fish?

13 WITNESS WOODBURY: No, the operators of the
14 instrument indicate they can pick up individual fish.

15 MR. BRIGGS: Small?

16 WITNESS WOODBURY: Yes, small fish. We see them
17 on this in front of the screens. It was on the basis of the
18 studies, of the runs that were done with the echo-sounder
19 that we modified the bottom in front of Indian Point 2. In
20 front of Indian Point 2, when the thing was built, the
21 excavation was left uneven and we found -- there were deep
22 holes out there in front of the screens, and we found with
23 the echo-sounder that those holes were just jammed full of
24 fish. So we smoothed out the bottom and made a rock bottom
25 there instead of a bottom that was a natural place for fish

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1 to collect.

2 MR. BRIGGS: Thank you.

3 MR. KARMAN: Mr. Chairman, may I have just one
4 word? No questions.

5 During the course of the proceeding there have
6 been occasions when Mr. Macbeth would ask Mr. Trosten if he
7 could furnish certain documents, copies of certain documents.
8 I would request when he does that he furnish the Staff as
9 well.

10 MR. TROSTEN: Yes. As a matter of fact, I think

11 it would be well for all parties to adopt that procedure.

12 We'd be glad to do that.

13 MR. MACBETH: So would I.

14 MR. KARMAN: My submissions are to the Board and

15 all the parties.

16 CHAIRMAN JENSCH: I think as Applicant's counsel

17 suggested, it would be a good procedure to have an exchange.

18 If there are no further questions of Dr. Lawler,

19 thank you. You are temporarily excused.

20 (Witness Lawler excused.)

21 MR. TROSTEN: Might I make an observation about

22 table 19? It is a feature of Dr. Lawler's model that has --

23 that we have paid close attention to in this session of the

24 hearing. I think it would be worthwhile to consider that

25 this is one of the areas *where we believe it should be helpful* where additional information were

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1 available. The Applicant would like to be able to collect
2 more information which would enable more refined estimates
3 to be made with regard to the F-2 factor, and this is one
4 of the areas where we certainly feel that it would be
5 desirable to proceed with additional research to obtain more
6 information.

7 CHAIRMAN JENSCH: I think your comment is well
8 taken. I think concerning my own impressions from hearing
9 the presentations at this session that there is a desire for
10 further information. I think the parties may be in some
11 dispute, however, as to the time that is needed to get these
12 data. I suppose a scheme of analyzing the Hudson River
13 would be so refined and expanded that it might take generations
14 tions to really know what the molecules are and where the
15 eggs are going and that sort of thing. It seems to me that
16 we have to approach this from a practical point of view, that
17 if there is a contention that -- and I infer that there is,
18 that there is a great need to get this plant operating to
19 generate electricity, then to accommodate that practical
20 requirement, kind of a practical regard has to be made for
21 what we can do, what we can learn in a reasonable period of
22 time.

23 I say this without any reflection on any of the
24 testimony that's been presented and how elaborate a model should
25 be, and I am sure that Dr. ^{Lauer}Lauer has devised a model and his

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1 judgment reflects the situation as he believes the data can
2 do that. The appraisal of that is certainly for persons
3 other than myself in that field. I do believe that a lot of
4 this search for data has to have a tagging on it that we
5 have to deal with practicality and urgency, and when we get
6 the requests for prompt action from the Applicant to get
7 this plant operating, they want to keep that thought in mind
8 about data, too. I think the parties in this proceeding
9 have indicated that they will accommodate any prompt and
10 reasonable collection program, but I infer that they don't
11 feel that they should tolerate something that's devised to
12 the nth degree, no matter how wonderful and desirable it
13 maybe and how delightful will be the evidence when it is
14 accumulated. I think to me what the Staff has recommended
15 here is a situation that deserves some pretty careful
16 evaluation and study in this proceeding and -- to see whether
17 their judgment of the time period is a reasonable one; and
18 I think that the Staff in a sense is obligated to justify their
19 time period, just as I understand the Applicant is endeavoring
20 to justify his time period.

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1 There is one thing the Board would like to direct
2 to the Staff the Board has considered this Roseton-Bowline
3 situation and the Board concludes and requests the Staff to
4 prepare data to reflect its calculations on the effects of
5 the operations of the Roseton and Bowline plant.

6 What those plants are and what they can do must
7 be within the range of some technology. They are fossil
8 plants, as I understand, and certain velocities of water
9 will be involved and certain calculations.

10 The Board desires the effects of those to be
11 reflected in our next session of hearings.

12 I don't know just whether that time schedule is a
13 feasible one or not. I think that the initial presentation
14 perhaps should come from the Staff in view of the fact that
15 they have prepared the Final Environmental Impact Statement,
16 but I think the Applicant should have an opportunity to
17 review it, perhaps, prepare its own evaluation.

18 MR. TROSTEN: Mr. Chairman, I assume from your
19 remarks that you are asking for information from the Staff
20 in the same vein that the Board requested information from
21 the Applicant.

22 I further understand that -- I do not understand
23 the Chairman's remarks to indicate a ruling that the
24 Final Environmental Statement is deficient.

25 CHAIRMAN JENSCH: I think we will just let the

mm2 1 record speak for itself. We have made our request.

2 We are making no ruling at the moment, and if the
3 data are supplied not only from the Staff but the Applicant
4 as well, we perhaps can proceed to a consideration of the
5 real matters at issue.

6 MR. KARMAN: Mr. Chairman, I have been advised
7 that it may be somewhat difficult to have it completed by the
8 commencement of the next session of the hearing, which will
9 be, perhaps -- approximately three weeks. The best I can do
10 at this time, Mr. Chairman, is indicate that the Staff will
11 certainly take under advisement the request of the Board and
12 do whatever we can to see to it that we comply with the
13 Board's request.

14 CHAIRMAN JENSCH: I am sure the Staff will be
15 able to approach the matter in a reasonable manner, and the
16 Board will be guided accordingly.

17 MR. TROSTEN: Mr. Chairman, you realize we have
18 submitted the information to the Board in response to the Board's
19 request. There was something that you said --

20 CHAIRMAN JENSCH: My thought was that we would like
21 to have the comment of the Applicant on what the Staff
22 prepares.

23 MR. TROSTEN: I see.

24 CHAIRMAN JENSCH: If you feel it should be done in
25 your view, we would be glad to have your resubmittal.

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1 MR. BRIGGS: Possibly the Applicant has made studies
2 and calculations that would indicate the effects of the
3 Bowline and Roseton plants in the same way they have done for
4 Indian Point Two.

5 If they have --

6 MR. TROSTEN: I can say, Mr. Chairman and
7 Mr. Briggs, that -- I beg your pardon -- excuse me, may I
8 confer for a moment?

9 MR. BRIGGS: Yes, certainly.

10 MR. MACBETH: Just a small point, Mr. Chairman,
11 I assume the processes of comment on the various submittals
12 includes the intervenors as well as the Staff?

13 CHAIRMAN JENSCH: Indeed. Indeed.

14 The only situation that we are asking for
15 preparation of the data are for those two parties. The
16 opportunity to comment is always available.

17 If you desire to resubmit a study of your own in
18 that regard, we would be glad to have you do that.

19 MR. MACBETH: We did in the form of the affidavit
20 attached to the motion.

21 CHAIRMAN JENSCH: You have any modifications or
22 refinements or additions or supplements, we would be
23 glad to have those.

24 MR. MACBETH: Thank you.

25 MR. TROSTEN: I just wish to point out, Mr. Briggs,

mm4 1 that there may be an environmental statement prepared with
2 respect to the Bowline plant which has been -- by an environ-
3 mental statement, at this moment I was referring to the
4 statement that was prepared by the Corps of Engineers.

5 There has also been an environmental report
6 prepared with respect to the Bowline plant by the Orange
7 and Rockland Utility Company on behalf of the Orange and
8 Rockland Utility Company. This document has been made
9 available to the Regulatory Staff and the Intervenors and
10 could certainly be made available to the Board if the Board
11 so desired.

12 ~~MR. BRIGGS:~~ MR. BRIGGS: My question was -- I related to the
13 following: Dr. Lawler has provided some testimony here
14 that shows that he has used his model and made several
15 calculations and it comes out that the population of fishes
16 in the Hudson will be reduced by a certain percentage at cer-
17 tain -- for certain lengths over certain lengths of time.

18 The thought was that possibly they have done the
19 same sort of thing that included the Bowline and the Roseton
20 plant, and if they have, one might like to compare those
21 calculations with the calculations that the Staff made.

22 MR. TROSTEN: Mr. Woodbury can address your
23 question.

24 WITNESS WOODBURY: In asking Dr. Lawler to prepare
25 his model, we asked him to prepare it in such a way that

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1 should the data from other water users become available
2 in the form that they are available from Indian Point, that
3 his model would be able to accommodate those data. He has so
4 constructed the model.

5 The Orange And Rockland Company, I believe it was
6 indicated at the hearing we had, is undertaking a study
7 effort that is integrated with the effort at Indian Point
8 and will collect data on impingement and entrainment and
9 populations in the intake pond and other data that would be
10 necessary in order to develop "f" factors and things
11 relating to that plant.

12 MR. BRIGGS: As I look at the model it seems to
13 incorporate everything except the "f" factors and the impinge-
14 ment. Some of the "f" factors, I suppose, would be nearly
15 the same for these other plants. That was the reason I thought
16 possibly they had done so.

17 WITNESS WOODBURY: The mechanisms from the other
18 plants are each very different from the intake mechanism at
19 Indian Point.

20 MR. BRIGGS: That would affect the "f" factor of
21 the avoidance factor, I suppose?

22 WITNESS WOODBURY: In the case of Bowline, for
23 example, the intake is through an old flooded excavation
24 area from an old brick factory.

25 MR. BRIGGS: That would make an interesting "f"

mm6 1 factor.

2 (Laughter.)

3 WITNESS WOODBURY: And the water enters into this
4 pond through a narrow shallow opening something like 16 feet
5 deep or something like that.

6 On the other hand, the intake to Roseton is at
7 the end of an intake canal, a very -- each of which are
8 very different in characteristic from Indian Point.

9 As Dr. Lawler indicated, the "f" factors are
10 important numbers in the operation of his model and so it
11 is important that we get data which -- with which we can relate
12 those to the actual conditions in the river and we are under-
13 taking to do that for both plants.

14 MR. BRIGGS: Coming back to the importance of the
15 "f" factors, this was a question that occurred to me the other
16 day that I didn't ask, for some stages, the "f" factors are
17 taken as one, although it is considered that they would be
18 much less than one and the product of several "f" factors as
19 I remember varies from, what, .1 to maybe .4 or so?

20 Suppose all the "f" factors were one. How much
21 would that affect your result?

22 I believe you indicated you made such studies
23 where -- is that right, where all the "f" factors were taken
24 as one?

WITNESS LAWLER: Yes.

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MR. BRIGGS: Did that increase the percentage reduction by a factor of two or factor of four or some number like that?

WITNESS LAWLER: I introduced the numbers into the testimony the other day in response to Mister --

MR. BRIGGS: Did you? I thought you might have but I don't remember them.

WITNESS LAWLER: Yes, I did and I don't recall the exact numbers offhand but there was a substantive difference depending on whether you had incorporated the compensation or whether you had not.

MR. BRIGGS: Well, I remember you said there was a substantive difference. The numbers that I remember don't seem to have gone above, let's say, ten percent.

WITNESS LAWLER: By substantive difference, I mean before the case of compensation by comparison to the case without compensation. That's all I meant by substantive difference.

MR. BRIGGS: It seemed to me you mentioned there were cases where you used one for the F factor for everything.

WITNESS LAWLER: Right.

MR. BRIGGS: With compensation.

WITNESS LAWLER: Right.

MR. BRIGGS: And the differences didn't appear to be very large.

1 WITNESS LAWLER: That's correct. With
2 compensation functioning for the variety of runs that we
3 have made to date, the -- at the end of ten years the
4 percentage effect of the plant has not exceeded ten percent.
5 It has been less than ten percent in every case.

6 Now, when I take out compensation, then I exceed
7 that as you described the other day. I have -- furthermore
8 you recall I described the other day that the level at
9 which compensation is -- or density dependent, kinetics, let's
10 say, is incorporated into the model is also important. We
11 find that we don't need much to get the system to maintain
12 control, is the expression I used.

13 MR. BRIGGS: In Table 23 you use -- you show
14 fish live stage and mortality parameters and I am curious
15 about juvenile stage two here where you show a first order
16 mortality rate and a minimum mortality rate. Is there an
17 error in the -- one of those two numbers?

18 WITNESS LAWLER: Yes, there is. The number under
19 the column first order mortality rate -- I'll have to
20 check the numbers. One should be 50 percent of the other.

21 Offhand, I think the -- the number that's in error
22 is the number in the column minimum mortality rate. It
23 should probably be point-two-zeros, two-five. I will check
24 that.

25 MR. BRIGGS: This table gives one information on

1 the way in which you incorporated compensation into each
2 one of these life stages, is that right?

3 WITNESS LAWLER: That's correct.

4 MR. BRIGGS: All right. Thank you.

5 WITNESS LAWLER: In particular it is that
6 comparison of minimum mortality rate to the first order
7 mortality rate that we are really focusing on now. You find
8 that with something on the order of 80 percent of the
9 assumed first order rate, rather than as far down as 50
10 percent, we still get the compensation, which is important
11 because what it is saying is you are not really introducing
12 a ~~what could be considered to be a very significant amount~~
13 of compensation; yet the system still stays in balance.

14 CHAIRMAN JENSCH: Is there any other matter we
15 can take up?

16 MR. TROSTEN: Yes.

17 Dr. Lawler, is it correct that the computer runs
18 that you responded to Dr. Geyer about, that you said you would
19 perform, are these the ones that we furnished to Mr. Macbeth
20 for his perusal?

21 WITNESS LAWLER: Which response? Just recently?

22 MR. TROSTEN: Just earlier this afternoon.

23 DR. GEYER: With regard to Table 24.

24 MR. TROSTON: The reason I am asking is that if
25 that was the set of computer runs we showed to Mr. Macbeth

1 we could get these to the Board very quickly.

2 WITNESS LAWLER: The set of computer runs Mr.
3 Macbeth got was the data on the 24-hour run that made up
4 the famous Table 19.

5 CHAIRMAN JENSCH: Any other matter we can take up
6 at this time?

7 MR. TROSTEN: Yes, just one final point, Mr.
8 Chairman. If we are to reconvene on the tenth, I would
9 think it would be desirable, and I will talk further with Mr.
10 Macbeth during the interim, if we could start out with Mr.
11 Clark. I think by the nature of Dr. Aynsley's testimony it
12 is rather generalized and it may be that we can -- that
13 it will not take too long to go through it. I think that --
14 I would, however, like to be able to start with Mr. Clark and
15 then we can fit Dr. Aynsley in at some point in the latter
16 part of that week.

17 CHAIRMAN JENSCH: All of those arrangements can
18 be taken up by your folks off the record.

19 Any other matter we can take up?

20 If not, at this time the hearings in this
21 proceeding, in the matter of Consolidated Edison Company of
22 New York Inc., Indian Point Generating Unit Number Two,
23 Docket 50-247, will recess to reconvene at 9 a.m. on
24 Wednesday, January 10, 1973 in Room 532, Main Building for
25 the Federal Trade Commission at Sixth and Pennsylvania Avenue,

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Washington, D.C.

This session of the hearing is now concluded.
Off the record.

(Whereupon, at 1:55 p.m., the hearing was
adjourned, to reconvene at 9 a.m. on Wednesday, January 10,
1973.)

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