ORIGINAL

OFFICIAL TRANSCRIPT PROCEEDINGS BEFORE

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

DKT/CASE NO.	50-247 SP and 50-286 SP
TITLE	CONSOLIDATED EDISON COMPANY OF NEW YORK (Indian Point Unit 2) - POWER AUTHORITY OF THE STATE OF NEW YORK (Indian Point Unit 3)
PLACE	White Plains, New York
DATE	January 25, 1983
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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3 BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

4 -x

5 In the Matter of: : Docket Nos.:

6 CONSOLIDATED EDISON COMPANY OF NEW YORK :
(Indian Point Unit 2) : 50-247 SP

7 POWER AUTHORITY OF THE STATE OF NEW YORK :

8 (Indian Point Unit 3) : 50-286 SP

9 -x

10 Ceremonial Courtroom
Westchester County

11 Courthouse
111 Grove Street

12 White Plains, N.Y.

13 Tuesday, January 25, 1983

14 The hearing in the above-entitled matter

15 convened, pursuant to notice, at 9:07 a.m.

16 BEFORE:

17 JAMES GLEASON, Chairman
Administrative Judge

18 OSCAR H. PARIS

19 Administrative Judge

20 FREDERICK J. SHON
Administrative Judge

21

22

23

24

25

1 APPEARANCES:

2 On behalf of Licensee, Consolidated Edison Company of New York:

3

BRENT L. BRANDENBURG, Esq.
4 Assistant General Counsel
STEVEN SOHINKI, Esq.
5 THOMAS J. FARRELLY, Esq.
Consolidated Edison Company of New York, Inc.
6 4 Irving Place
New York, N.Y. 10003

7

On behalf of Licensee, the Power Authority of the
8 State of New York:

9 JOSEPH J. LEVIN, Esq.
PAUL F. COLARULLI, Esq.
10 Morgan Associates, Chartered
1899 L Street, N.W.
11 Washington, D.C. 200361

On behalf of the Nuclear Regulatory
12 Commission Staff:
JANICE MOORE, Esq.
13 HENRY J. MC GURREN, Esq.
Washington, D.C.

14

West Branch Conservation Association:

15

ZIPPORAH S. FLEISHER
16 WALTER T. FLEISCHER443 Buena Vista Road
New City, N.Y. 10956

17

Union of Concerned Scientists:

18

JEFFREY M. BLUM, Esq.

19

Parents Concerned About Indian Point:

20

PAT POSNER

21

22

23

24

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1 P R O C E E D I N G S

2 JUDGE GLEASON: Shall we proceed, please?

3 If the parties or representatives would

4 identify themselves for the record.

5 MR. BRANDENBURG: Mr. Chairman, for

6 Consolidated Edison Company of New York, licensee of

7 Indian Point Unit Number 2, Brent L. Brandenburg. To my

8 left is Stephen Sohinki, and to Mr. Sohinki's left is

9 Mr. Thomas J. Farrelly.

10 MR. LEVIN: Mr. Chairman, on behalf of the

11 Power Authority of the State of New York, Joseph J.

12 Levin, Jr. To my left, Paul F. Colarulli.

13 MS. MOORE: Mr. Chairman, representing the NRC

14 staff, my name is Janice Moore, and to my left is Henry

15 J. McGurren.

16 MRS. FLEISHER: This is Zipporah S. Fleischer,

17 secretary, West Branch Conservation Association, and

18 with me today is Walter L. Fleischer, vice president of

19 West Branch Conservation Association.

20 MR. BLUM: I am Jeffrey M. Blum, of the Union

21 of Concerned Scientists.

22 JUDGE GLEASON: All right. This is a

23 continuation of the hearing authorized by the Nuclear

24 Regulatory Commission, and we are continuing our

25 considerations of contentions under Commission Question

1 2, and I believe we start today with the testimony on
2 Contention 2.2.A.
3 Mrs. Fleischer, would you proceed, please?
4 MR. BRANDENBURG: Point of information, Mr.
5 Chairman. This witness has submitted testimony on both
6 2.2.A and Board Question 2.2.1. You will recall he is
7 the only remaining witness who has not been subjecst to
8 cross examination on the latter issue, that is to say,
9 the Board Question 2.2.1, dealing with steam generator
10 tubes. Is it the Board's pleasure that we will first
11 deal with the brackish water subject matter, and then
12 proceed to the steam generator tubes, or what is the
13 Board's preference?
14 JUDGE GLEASON: I think we would do better by
15 proceeding with the contention of the party, and then
16 with the Board's question.
17 MRS. FLEISHER: Your Honor, he hasn't heard an
18 oath.
19 JUDGE GLEASON: Well, why don't you present
20 your witness?
21 MRS. FLEISCHER: You have before you testimony
22 of nine pages entitled Testimony of Walter L. Fleischer.
23 If you were to be asked the questions that are in there
24 today, would your answers be the same?
25 MR. FLEISCHER: Yes, they would be.

1 JUDGE GLEASON: Mrs. Fleischer, let me swear
2 the witness in first.
3 Would you start again, please?
4 Whereupon,
5 WALTER L. FLEISHER
6 was called as a witness, and having been first duly
7 sworn, took the stand, was examined, and testified as
8 follows:
9 DIRECT EXAMINATION
10 BY MRS. FLEISHER:
11 Q Mr. Fleisher, you have before you testimony of
12 nine pages, and an appendix of two pages, entitled
13 Testimony of Walter L. Fleisher. Did you prepare this
14 material yourself?
15 A (WITNESS FLEISHER) Yes, I did.
16 Q If you were to be asked the same questions
17 today, would you give the same answers?
18 A (WITNESS FLEISHER) Yes.
19 Q Have you any changes or corrections to make?
20 A (WITNESS FLEISHER) No, I have not.
21 Q Additionally, there are two pages of exhibits
22 entitled WLF 1, Page 1 of 2 and Page 2 of 2, which is a
23 letter from the Nuclear Regulatory Commission, signed by
24 Harold R. Denton, Director, Office of Nuclear Reactor
25 Regulation, dated May 15, 1981, written to Z. S.

1 Fleisher, Secretary, West Branch Conservation
2 Association.
3 Your Honor, we would like to submit that and
4 request a number for it as an exhibit.
5 JUDGE GLEASON: We will identify it first. Is
6 this your first exhibit?
7 MRS. FLEISHER: No, sir. I have a list of
8 exhibits. I will look it up.
9 JUDGE GLEASON: All right. This will be West
10 Branch Exhibit Number 6 for purposes of identification.
11 This is the letter of May 15, dated May 15?
12 MRS. FLEISHER: Yes, sir.
13 JUDGE GLEASON: All right. That letter, which
14 is comprised of two pages, will be marked as Exhibit
15 Number 6, and it will be placed in the record at this
16 point.
17 (The document referred to
18 was marked for
19 identification as WBCA
20 Exhibit Number 6.)
21 MRS. FLEISHER: I do have -- that is correct,
22 sir -- WBCA next will be Number 6.
23 Your Honor, the witness is ready for cross
24 examination.
25 MR. LEVIN: Your Honor, the Power Authority

1 will go first, if it please the Court.

2 JUDGE GLEASON: Excuse me. Mrs. Fleisher, are

3 you offering this letter into evidence?

4 MRS. FLEISHER: Yes, sir, we are offering it

5 as an exhibit.

6 JUDGE GLEASON: All right. Is there an

7 objection to receiving the letter into evidence?

8 MR. BRANDENBURG: None for Con Edison, Mr.

9 Chairman.

10 MR. LEVIN: None from the Power Authority.

11 JUDGE GLEASON: All right. The letter marked

12 Exhibit Number 6 -- Is there objection from the staff?

13 MR. MC GURREN: No objection.

14 JUDGE GLEASON: I am sorry. Will be received

15 into evidence.

16 (The document referred

17 to, previously marked for

18 identification as WBCA

19 Exhibit Number 6, was

20 received in evidence.)

21 JUDGE GLEASON: All right. The Power

22 Authority can proceed.

23 CROSS EXAMINATION

24 BY MR. LEVIN:

25 Q Good morning, Mr. Fleisher. How are you?

1 Mr. Fleisher, at Page --

2 MRS. FLEISHER: Excuse me, Your Honor. I

3 believe you allowed other witnesses to make a

4 preliminary statement.

5 JUDGE GLEASON: Go ahead, Mrs. Fleisher. I

6 thought you had turned the witness over.

7 Would you like to summarize your testimony?

8 MRS. FLEISHER: I think it will be all right

9 for them to proceed with the cross examination.

10 JUDGE GLEASON: All right, fine. Proceed.

11 BY MR. LEVIN: (Resuming)

12 Q Mr. Fleisher, on Page 1 of your testimony, and

13 for approximately a page going on to Page 2, you discuss

14 your lack of college degree, and your lack of a

15 professional engineering license, and suggest that that

16 issue has been raised on cross examination. I think you

17 mean in your previous cases, but implicit might be that

18 it has been raised in this case.

19 A (WITNESS FLEISHER) No, not in this case.

20 Q So that was not -- the criticism of your lack

21 of college degree or your lack of professional

22 engineering license was not criticized in your

23 deposition, was it?

24 A (WITNESS FLEISHER) No, it was not.

25 Q Mr. Fleisher, are you opposed to the use of

1 nuclear power for the generation of energy?

2 MRS. FLEISHER: Your Honor, I object. That is

3 not in his testimony. It is not germane.

4 MR. LEVIN: Your Honor, it is a question of

5 bias, and bias is always relevant.

6 MRS. FLEISHER: I would need a foundation,

7 please.

8 JUDGE GLEASON: We will let the question

9 stand. Go ahead.

10 WITNESS FLEISHER: I find the risks

11 unacceptable, and that is the basis for my opposition,

12 because I think it is inherently dangerous, and does not

13 offer any comparable or compensating advantages.

14 BY MR. LEVIN: (Resuming)

15 Q It is your view, is it not, that it cannot be

16 made safe. Is that correct?

17 MRS. FLEISHER: Excuse me, Mr. Witness.

18 Please pull the mike close, so we can hear you. You

19 will have to talk right into it. Pull it closer.

20 WITNESS FLEISHER: That is essentially true.

21 I believe it is one of the few things that I have ever

22 come up against in my life which if you push the panic

23 button or the stop button, you couldn't be sure it was

24 going to be turned off, and this is probably my major

25 objection. I have worked all my life on --

1 MR. LEVIN: We have an answer.

2 JUDGE GLEASON: What was the question? Could

3 you repeat it?

4 MR. LEVIN: The question I just asked, without

5 giving you literally the question, was, with respect to

6 the generation of energy through the use of nuclear

7 power, is it not Mr. Fleisher's position that it cannot

8 be made safe, and I believe his answer was, yes, that is

9 his position.

10 JUDGE GLEASON: All right.

11 BY MR. LEVIN: (Resuming)

12 Q Is that correct, Mr. Fleisher?

13 A (WITNESS FLEISHER) That is correct.

14 MR. LEVIN: I have no further cross

15 examination, Your Honor.

16 JUDGE GLEASON: Mr. Brandenburg?

17 CROSS EXAMINATION

18 BY MR. BRANDENBURG:

19 Q Mr. Fleisher, I believe you have before you a

20 copy of your testimony. I would like, if you would,

21 please, to turn to Page 8 of that testimony.

22 A (WITNESS FLEISHER) Page 8?

23 Q Page 8, yes.

24 A (WITNESS FLEISHER) All right.

25 Q At Page 8, you are asked if you would discuss

1 the risks associated with the containment cooling
2 systems and the proposed alternatives at Indian Point
3 Unit 2, that appearing on Lines 17 and 18. Do you see
4 that?
5 A (WITNESS FLEISHER) Yes, I do.
6 Q And your response is, yes, with difficulty.
7 Could you explain to us what difficulties you
8 encountered in attempting to address the risk issues
9 surrounding the containment cooling system at the Indian
10 Point units in your testimony?
11 A (WITNESS FLEISHER) I believe it is explained
12 in my answer. I don't know what amplification you
13 want. In essence, what I have said there, we were
14 proscribed from discussing the various measures that
15 were taken to supposedly alleviate it by the elimination
16 of our Contention 2.2.D, I think it was, and I cannot
17 discuss any more than the presence of the brackish water
18 within the containment.
19 Q Mr. Fleisher, over at the next page of your
20 testimony, on Page 9, at Lines 3 and 4, you refer to
21 something called the brackish water risk. Would you
22 explain to us what you perceive to be the elements of
23 the brackish water risk?
24 And in asking this question, sir, I am asking
25 you to set aside any concerns you may have about

1 equipment reliability, about unit availability, about
2 things of that sort, and address solely the risk to the
3 public as you see it flowing from the use of the
4 brackish water in the containment at the Indian Point
5 units.
6 A (WITNESS FLEISHER) The risk as I perceive if
7 of the brackish water is its corrosive properties. This
8 has been demonstrated to have caused leaks in the past
9 in the cooling systems within the containment building.
10 As such, it represents a risk because of the nature of
11 the water being corrosive not only to the piping but to
12 other elements within the containment building, and
13 seeing as this can be eliminated from the containment
14 building, it seems an unnecessary risk.
15 I won't go into the scenarios, because they
16 were not permitted, of what other types of accidents
17 might happen from the brackish water other than the one
18 we are all familiar with, which was the flooding of the
19 containment vessel pit, and the submergence of nine feet
20 of the containment vessel with water, and other possible
21 scenarios that did not take place.
22 Q Well, let's pursue your hypothetical, if you
23 will, that were indeed a leak in one of the systems in
24 the containment at one of the Indian Point units which
25 employs brackish water and a substantial accumulation of

1 brackish water in the containment building. Let us just
2 take that as a hypothetical assumption.
3 Would you explain to us under those
4 circumstances how such a condition in your judgment
5 could have the potential for creating a risk to the
6 public?
7 A (WITNESS FLEISHER) Well, there was the
8 serious question, although it did not get to that, of
9 the effect of the water on the reactor vessels which now
10 are supposedly embrittled from long exposure to
11 radiation, and if they were submerged suddenly in cold
12 water, I could envisage a serious accident. There is
13 the problem which was the consideration after the
14 flooding of the possible corrosion cracking of the
15 control conduits that went into -- they call it the
16 incore conduits, I believe it is.
17 There are also possibilities of a leak of the
18 system under pressure in which the water could be
19 sprayed on various electrical equipment within the
20 plant, sorting out vital either controls or even
21 possibly some of the pumps and other equipment within
22 the vessel. The scenarios were written by my only law
23 that I believe in, which is Mr. Murphy's law, which says
24 what can go wrong will go wrong at the most inopportune
25 time, and I believe in it more strongly than the laws of

1 physics at this point.

2 Q All right. Let's take the vessel wetting that

3 you referred to, Mr. Fleisher. Is it your position that

4 were the wetting of the reactor vessel to occur, that

5 the consequences that might flow from that vessel

6 wetting would be different if the vessel wetting were to

7 be accomplished by the use of fresh water on the one

8 hand versus brackish water on the other?

9 A (WITNESS FLEISHER) No, not because of the

10 difference in the water, but the difference in the

11 probability of the accident happening. I don't perceive

12 any reason for a system using fresh water failing in a

13 way brackish water would, and therefore flooding the

14 reactor vessel.

15 Q Mr. Fleisher, have you made any calculations

16 or conducting any study of the risk potential posed by

17 the hypothetical wetting of a reactor vessel such as you

18 referred to in your recent answers?

19 A (WITNESS FLEISHER) No, I have not.

20 Q Are you aware that various analyses were

21 performed by both the licensee and the NRC staff

22 following the incident to which you referred a moment

23 ago as to the potential for such an event, that is, a

24 vessel wetting event, creating a risk to the public?

25 A (WITNESS FLEISHER) I don't know of a

1 particular study other than the IPPSS study, which I am
2 familiar with somewhat.
3 Q Is it your understanding that the IPPSS study
4 refers to or evaluates the vessel wetting situation such
5 as you have referred to?
6 A (WITNESS FLEISHER) I am not certain of it,
7 no.
8 Q You referred to the wetting of electrical
9 equipment. Have you made a study, Mr. Fleisher, of the
10 various locations of electrical cable within the Indian
11 Point containment in reference to its proximity to the
12 fan cooler units?
13 A (WITNESS FLEISHER) I have not made a study,
14 but my memory was that the cable trays ran in the alley
15 right next to the fan cooler units, but I did not go
16 into that further.
17 Q Are you aware of any studies that have been
18 conducted of the potential effects that might flow from
19 the wetting of electrical cables in the Indian Point 2
20 or 3 containment?
21 A (WITNESS FLEISHER) I know of no studies, no.
22 Q You, I believe, indicated you are familiar
23 with the IPPSS study. Is that correct?
24 A (WITNESS FLEISHER) No, I didn't say I was
25 familiar with it. I said I knew of it, I had seen parts

1 of it, and unfortunately, the entire study was not
2 available enough for me to make a study of it or --
3 Q Is it your understanding that the IPPSS study
4 evaluated the risk potential posed by the wetting of
5 electrical equipment?
6 A (WITNESS FLEISHER) I would assume it would,
7 but I don't know it.
8 MR. BRANDENBURG: Mr. Chairman, I have no
9 further questions.
10 JUDGE GLEASON: All right.
11 CROSS EXAMINATION
12 BY MR. MC GURREN:
13 Q Mr. Fleisher, I just have one question. Would
14 use of highly purified water -- I think that is what you
15 are saying, that you should use high purified water in
16 your cooling system?
17 A (WITNESS FLEISHER) Yes, I said that it should
18 be high quality water, high purity.
19 Q Would the use of this water eliminate all
20 corrosion?
21 A (WITNESS FLEISHER) I believe that properly
22 maintained, it would reduce the corrosion to an almost
23 unmeasurable rate. I wouldn't say it would completely
24 eliminate it. My experience with not similar, but using
25 high purity water in the cyclotron was that we had no

1 corrosion, even under more severe conditions than could
2 be expected within the fan cooler system.
3 Q Have you studied what would have to be done,
4 what measures would have to be done to eliminate
5 corrosion with the use of highly purified water for
6 these plants?
7 A (WITNESS FLEISHER) I don't remember whether
8 it is in this testimony or in my part on 2.2.1. It
9 essentially is a closed system using a heat exchanger to
10 isolate the river water from the cooling water within
11 the plant, and then that would require a water treatment
12 system which would consist of de-ionizers and
13 de-aerators and other such things to produce high purity
14 water in a closed system in which you contain the
15 water. It is then comparatively simple to maintain it
16 at a high purity level.
17 Q Have you done a study for Indian Point 2 and
18 3?
19 A (WITNESS FLEISHER) No, I have not.
20 MR. MC GURREN: That is all the staff has.
21 JUDGE GLEASON: All right, Mr. Mc Gurren. Do
22 you have any redirect, Mrs. Fleisher?
23 MRS. FLEISHER: Just a minute, please.
24 (Pause.)
25 MRS. FLEISHER: Thank you, Your Honor. We do

1 not.

2 JUDGE GLEASON: All right. The members of the

3 Board have a few questions.

4 JUDGE PARIS: Mr. Fleisher, on Page 4 of your

5 testimony, you say that, beginning on Line 21, "Certain

6 things appear clear. Number One, Indian Point Number 2

7 was built by Westinghouse on a turnkey basis." Could

8 you elaborate on that and explain what you mean,

9 please?

10 WITNESS FLEISHER: A turnkey basis means that

11 a plant was sold at a lump sum price, guaranteed price,

12 and was to be turned over to the purchaser in an

13 operating condition.

14 JUDGE PARIS: Okay. Thank you.

15 JUDGE SHON: Mr. Fleisher, I had a couple of

16 details. On Page 6 of your testimony, you mention at

17 Lines 10 and 11 the black steel pipe is still there, the

18 coils are still copper nickel. As I understand the

19 applicant's position, it is that this copper nickel

20 alloy, C70600, is exceptionally resistant to corrosion

21 by saline aqueous media, and that the iron pipe is

22 protected by cement, a standard practice in this way.

23 Therefore, they shouldn't really corrode very much.

24 Why do you believe that they will corrode

25 under these conditions when other engineers apparently

1 believe that they won't?

2 WITNESS FLEISHER: I guess the best answer to

3 that is the proof of the pudding is in the eating. The

4 black pipe was there and corroded under the previous --

5 after about six or seven -- well, it was finally changed

6 after seven years of operation. The copper nickel coils

7 leaked. Now, they have made just several improvements

8 in the installation, but the same materials are still

9 there. They are still subject to the same corrosion,

10 and I don't know where they may have ameliorated the

11 condition somewhat by better design. They have gotten

12 rid of some braised joints and other things. They have

13 not changed the material.

14 I will have to make one correction here, since

15 you have raised it. I understand what they didn't know

16 at the time, that the Indian Point 3, they have changed

17 the material. In fact, they have gone to a copper

18 nickel melibdinum alloy, which I know very little about

19 it. I have some questions about that later on in the

20 cross examination. I don't know the qualities of that.

21 JUDGE SHON: I would like to pursue that a

22 little further. Perhaps you can tell me exactly where

23 did this leakage occur. There are a number of lines in

24 there, water boxes, and U-tubes, and there are headers,

25 and risers, and downcomers, and all kinds of things in

1 this system. Something leaked, and leaked
2 substantially. Exactly what was the source of the
3 leakage? And I mean, if it is a joint between two
4 things, tell me that.
5 WITNESS FLEISHER: There were leaks at the --
6 a lot of the leaks were at braised joints, where the
7 header joined the tubes, the actual cooling tubes. But
8 they also had leaks at the center of the tubes within
9 the coil, in other words, where there were no joints,
10 right through the material itself.
11 JUDGE SHON: And what was the nature of the
12 corrosion? We have been told that the corrosion rate of
13 this copper nickel alloy in saline solutions is on the
14 order of a mil per year, and that is not part of the
15 evidence yet, but this is the position that I believe
16 the licensee is taking.
17 When you mention mils per year, you are
18 usually talking about sort of a flat corrosion rate, not
19 cracking, not stress corrosion cracking or anything like
20 that. What was the nature of the corrosion that led to
21 the leakage both at the braising points and in the
22 middle of the U-tubes? Do you know?
23 WITNESS FLEISHER: I don't know the nature of
24 it in the body of the tubes, in the center of the coils,
25 because when I made the inspection in the plant, that

1 part was so radioactive that I was not permitted to see
2 it. This was at Indian Point 2. That is the only one I
3 did see the coils in.
4 The other was perforations actually at various
5 points in the braised joints, where they had actually
6 cut sections out, and most of it, I would say, was
7 pitting type corrosion they had.
8 JUDGE SHON: Pitting into a braised joint?
9 WITNESS FLEISHER: No, on the main tube, sir.
10 It was a pitting type corrosion that would perforate the
11 tubes. The tubes weren't destroyed. They weren't just
12 thinned out.
13 JUDGE SHON: And the tubes and the heat
14 exchanger U-tubes?
15 WITNESS FLEISHER: Well, they are straight
16 tubes where they go through in the air stream, and it
17 was in the center section of those where some of the
18 leaks occurred, and that would have been pitting type.
19 JUDGE SHON: And you say there was something
20 that you were not able to inspect.
21 WITNESS FLEISHER: That part I couldn't
22 inspect, actually. From the reports, I believe that was
23 the type.
24 JUDGE SHON: Perhaps you are the wrong person
25 to ask, but you said you were not able to inspect that

1 portion because it was so radioactive. I am sort of
2 surprised that something that exchanges river water
3 against containment air would be very radioactive. Why
4 was that? Do you know how the radioactivity got there?
5 Or was it just in some high radiation zone?
6 WITNESS FLEISHER: No, I believe that it must
7 be carried in the air stream, actually, when the reactor
8 is operating. There is enough radiation in the air that
9 it affects the copper alloys. Copper alloys, once
10 irradiated, hold that radiation for a very long period,
11 from my experience on my work on the cyclotron. I had
12 asked questions at one point on the radiation levels at
13 that point, but I never did get an answer, to my
14 knowledge, of what it was. But they had -- the coils
15 were in an isolation room. They were wrapped up in
16 plastic, and when I requested to look at the center of
17 the tubes, I was told that it wasn't possible because
18 the radiation levels, there was inspection of it at the
19 time of repairs back in 1980.
20 JUDGE SHON: The tubes had actually been
21 removed from the coolers?
22 WITNESS FLEISHER: No, the whole coil comes
23 out in a section. In other words, the tubes and the
24 whole coil section were removed as an entirety, and then
25 they were stacked up in a room for disposal, I guess,

1 ultimately.

2 JUDGE SHON: And they were extremely

3 radioactive?

4 WITNESS FLEISHER: I could see the ends. In

5 other words, the headers and the tube connections to the

6 headers, I could see, and some of those had been

7 sectioned so you could see them, but the center part of

8 the tubes could not be observed at that time.

9 JUDGE SHON: I see. Mr. Brandenburg?

10 MR. BRANDENBURG: Judge Shon, I might be able

11 to shed some light on your questions and Mr. Fleisher's

12 comments about the radioactivity, et cetera, surrounding

13 these units.

14 Mr. Fleisher last conducted a site visit to

15 the Indian Point site shortly before the March, 1982,

16 emergency planning drill. I forgot whether it was in

17 February or early March, but at that time Unit 2 was

18 under power. The temperature in containment and so on

19 was around 140 degrees, and so forth. Containment entry

20 is only rarely, if ever, performed when the unit is

21 under power, according to station policy.

22 So, at that time, Mr. Fleisher was not

23 conducted or escorted into the --

24 MRS. FLEISHER: Excuse me, Mr. Brandenburg.

25 He is talking about the inspection he made for the

1 Public Service Commission case. Is that not right, Mr.
2 Fleisher?
3 WITNESS FLEISHER: That is right. It was an
4 inspection in 1980 after the coils were removed from the
5 unit and had been stored in a room on the site. And
6 more people went on that inspection tour to look at the
7 reconstruction of the fan cooler units and also to look
8 at the materials that had been removed from the system,
9 to see the nature of the corrosion failures.
10 JUDGE SHON: I want to make certain that I
11 completely understand the situation. You say that there
12 were the fan cooler tubes that had been removed from the
13 fan coolers, that they were stacked in some place on the
14 site. Is that inside containment or outside
15 containment, or do you know?
16 WITNESS FLEISHER: I believe they were outside
17 containment.
18 JUDGE SHON: You were told that although you
19 could look at the ends of the tubes, you couldn't look
20 at the sides of the tubes, because they had become too
21 radioactive in use. Is that right?
22 WITNESS FLEISHER: That's correct, sir.
23 JUDGE SHON: I am afraid that your explanation
24 doesn't shed much light, Mr. Brandenburg.
25 MR. BRANDENBURG: It is indeed another

1 incident he is referring to.

2 JUDGE SHON: I would like to have some sort of

3 explanation of this. Intuitively, it seems to me

4 unlikely that fan coolers in this application would

5 become extremely radioactive. That is, too radioactive

6 to get near. If you have some witnesses coming on this,

7 if the licensees have witnesses coming on this, I would

8 like to have them address that.

9 MR. LEVIN: As I understand it, the witness's

10 testimony is with respect to Unit 2. Perhaps our

11 witnesses may know something about it.

12 JUDGE GLEASON: Well, we are talking about --

13 Mr. Brandenburg, you have witnesses coming, so perhaps

14 you can have them address that point.

15 MR. BRANDENBURG: We will attempt to do so,

16 Mr. Chairman.

17 JUDGE SHON: I didn't mean to look so intently

18 at you, Mr. Levin. You were looking at me.

19 MR. LEVIN: You were looking at me, Judge, and

20 I just wanted to make sure we were on the same track.

21 JUDGE SHON: I thought perhaps you had some

22 marvelous clarification that you were about to come out

23 with.

24 MR. LEVIN: I am sure we do. We will come up

25 with it.

1 JUDGE SHON: Thank you. I have no further
2 questions.
3 JUDGE GLEASON: That concludes the testimony
4 with respect to 2.2.A.
5 (Testimony of Walter Fleisher on Contention
6 2.2.A follows.)
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insert # 1
1/25/83

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Administrative Judges:

James Gleason, Chairman
Dr. Oscar H. Paris
Frederick J. Shon

In the Matter of

CONSOLIDATED EDISON COMPANY OF NEW YORK
(Indian Point, Unit 2)

Docket Nos. 50-247-SP
50-286-SP

POWER AUTHORITY OF THE STATE OF NEW YORK
(Indian Point, Unit 3)

December 30, 1982

WEST BRANCH CONSERVATION ASSOCIATION

TESTIMONY OF
WALTER L. FLEISHER

CONTENTION 2.2(a)

---

for West Branch Conservation Association
443 Buena Vista Road
New City, N.Y.
914/634-2327

Zipporah S. Fleisher

by Zipporah S. Fleisher
Secretary

1 Q. Please give your name and address.
2 A. Walter L. Fleisher, I reside at 443 Buena Vista Road,
3 New City, N.Y. 10956.
4 Q. For whom are you appearing?
5 A. I am appearing as a witness for the West Branch Con-
6 servation Association, New City, N.Y.
7 Q. What is the scope of your testimony?
8 A. My testimony will cover some problems of using brack-
9 ish water inside the containment building, alterna-
10 tive cooling systems and discussion of the relative
11 risks of using brackish water versus alternatives.
12 Q. Please list your work experience related to your
13 testimony.
14 A. I append a two page exhibit entitled "Appendix A
15 Walter L. Fleisher Resumé dated March, 1982."
16 Q. Is there anything you wish to add to the resumé?
17 A. Yes, the resumé is general. I would like to stress
18 my extensive involvement with the design, construc-
19 tion and rehabilitation of fluid piping and air
20 handling systems in which corrosion has been a con-
21 tinuing problem over a period of 40 plus years. I
22 will elaborate on this subject later on.
23 Q. Do you have any other comments on your resumé?
24 A. Yes. In testifying in previous cases my lack of a
25 college degeree has been raised on cross examina-

1 tion. While I do not have a degree I completed 164
2 credit hours including all required courses with the
3 exception of completing a thesis. To my knowledge
4 Polytechnic Institute of Brooklyn was the only college
5 in the U.S.A. requiring a thesis for a bachelor's de-
6 gree. The equipment I was using for my thesis broke
7 down; it was the year 1938, the depression era. I was
8 offered a job and took it. The question of a degree
9 was never raised until I started testifying in pro-
10 ceedings before the New York State Public Service Com-
11 mission only eight years ago.
12 Q. Do you have a professional engineering license?
13 A. No. The P.E. license went the way of my thesis. One
14 could not be eligible for the exam until after four
15 years of experience. I was transferred to Atlanta, Ga.
16 in 1940 and did not return to New York state until
17 1946. The P.E. license was never a need in the pro-
18 fessional work that I performed and the question was
19 never raised until I began testifying. I find the
20 question particularly odious because the P.E. license
21 is not a measure of ability but strictly a license re-
22 quired to sell certain types of engineering services.
23 In all the projects mentioned in my resumé and
24 in essentially every project I worked on water or
25 water solutions conveyed in piping systems. Many of
26 these systems had corrosion problems, which, due to

1 the structure of the construction industry,ended up
2 in the mechanical contractor's lap to diagnose, and in
3 many cases, to cure.
4 Over the years one accumulates a tremendous
5 amount of empirical data that is not available from any
6 other source. The empirical data is reduced to a set of
7 mental rules that are used in selecting materials of
8 construction and in designing systems to avoid problems
9 of corrosion, air binding, noise, vibration and many
10 other problems.
11 My various encounters with systems handling brack-
12 ish water have made me very conscious of its nasty pro-
13 perties. Of which my earliest recollection dates to
14 1934 - a project for the Beechnut Packing Company in the
15 Bush Terminal building in Brooklyn. The project included
16 the installation of three centrifugal water vapor re-
17 frigeration machines. The condensers were provided with
18 Brooklyn well water, which, due to overpumping, was brack-
19 ish. The condenser tubes lasted six months.
20 A job for Schaefer Brewing Company at Kent Avenue,
21 Brooklyn, replacing a stainless steel river water line
22 that perforated in less than a year. Work at Indian Point's
23 former neighbor, Standard Brands' river water cooling sys-
24 tem, and, six years experience at Columbia University's
25 Nevis Laboratory at Irvington, N.Y., with its primary

1 water cooling system using the Hudson River, and the
2 secondary high purity system used to cool the cyclotron
3 components and the primary and secondary beam line mag-
4 nets.
5 Q. What is your knowledge and position on the direct use
6 brackish Hudson River water for the cooling of the con-
7 tainment building?
8 A. Besides readin numerous articles in the newspapers des-
9 cribing the leaks, and ultimately the flooding of the
10 reactor vessel at Indian Point #2, I was requested to,
11 and appeared as a witness for WESPAC in the proceeding
12 before the New York State Public Service Commission,
13 Case #27869, Consolidated Edison Company Indian Point
14 #2 Outage.
15 In preparation for my testimony I made an inspec-
16 tion of the plant and viewed the components removed from
17 service, and the installation of replacement coils,
18 headers and portions of the mains.
19 I read various reports by the NRC and the Direc-
20 tor's Decision. There is no need to rehash the events.
21 Certain things appear clear:
22 1. Indian Point #2 was built by Westinghouse on a
23 "turnkey" basis.
24 2. Indian Point #3 was started on the same basis and
25 completed by PASNY after the take-over.
26 3. United Engineers and Constructors acted as the

AE and contract manager.

4. Both Westinghouse and United Engineers had extensive experience in the design and construction of steam powered generating plants.

5. Both plants use Hudson River water for cooling the containment buildings and for steam condenser service.

6. Leaks started to occur in IP#2 containment cooling system in 1973 and by 1980 the coils, the headers and sections of the mains had to be replaced.

7. The leak schedule and replacements were about two years behind at IP#3, but covered about the same time span of seven years.

8. The leaks at IP#2 ultimately led to the flooding of the reactor pit and immersion of the reactor vessel to a depth of about nine feet.

The conclusion must be that regardless of the qualifications or failings of the vendor and builder; the proper or poor selection of materials; the quality of workmanship; or even the final chain of failures of equipment and people, the overriding problem was the brackish Hudson River water.

In support of my position I quote below from a letter from Mr. Harold R. Denton, Director, Office of

1 Nuclear Reactor Regulation, dated May 15, 1981 and
2 addressed to Z. S. Fleisher, Secretary, West Branch Con-
3 servation Association (Exhibit WLF #1_____)

4 "We agree with Mr. Fleisher that introducing brackish water into containment is not the
5 optimum design."

6 Q. How do the modifications to the fan cooler systems
7 made by the Licensees affect the problems of brackish
8 water?

9 A. Essentially there is no change. The brackish water is
10 still there. The black steel pipe is still there. The
11 coils are still CuNi. The only change is some im-
12 provement in the design of the connections and the
13 workmanship. The changes are essentially a stopgap
14 action to allow resumption of operation at this time.
15 See third paragraph of Mr. Denton's letter (Exhibit
16 WLF #1_____).

17 From my personal experience with brackish water,
18 from the actual experience at IP#2 and #3, and with the
19 unique dangers posed by the nuclear reactor, there is
20 no solution other than removing the brackish water from
21 inside the containment building.

22 Q. What is your evaluation of the alternatives to the use
23 of brackish water directly inside containment?

24 A. The ideal system should consist of a closed circuit
25 using highly purified water within containment isolated

by an heat exchanger from the external cooling source. The river water being available and the use of a cooling tower being unavailable, under the Cooling Tower Agreement, the river water is the best choice.

The Bechtel "Feasibility Study For The Modification Of Containment Cooling System For Indian Point Unit 2 Consolidated Edison Company" Job 14596, January, 1981, is seriously skewed to make the installation expensive and difficult. With minor changes in design of the piping and heat exchangers the river water pump horsepower could be cut in half and on the clean water side by 25% without disturbing the piping and equipment inside containment.With this reduction no additional emergency generating capacity would be required.

With the closed loop there would be no need to replace the fan coolers and piping over the life of the plant. The saving in one rebuild of the fan coolers would pay for the closed loop system.

Even the hybrid system, in the "Evaluation of Alternate Containment Cooling System For Indian Point Unit No. 2" by the Consolidated Edison Company of January, 1982, could probably be made workable and reliable if the nonsense red herrings were removed. Chromates have not been used for water treatment for the past fifteen years and a host of inorganic and organic treatments

1 have been developed. If, as I would recommend, high
2 purity water is used, no chemical additives would be
3 required. With the demise of the chromate inhibitors
4 goes the 90,000 gallon holding tank and the related
5 complications.
6 The scenario of constant false alarms requiring
7 activation of the emergency cooling cycle and subse-
8 quent flushing of the system with fresh water is im-
9 plausible. However, if it were to be true, the compe-
10 tence of the Licensees would be in serious question and
11 the plants should be shut down until the operating
12 problems were solved. My conception is that there
13 would only be one use of the emergency cooling cycle on
14 a LOCA and the plant would be unlikely to return to
15 to operation so some brackish water would make no dif-
16 ference.
17 Q. Will you discuss the risk associated with the contain-
18 ment cooling systems and the proposed alternates?
19 A. Yes, with difficulty. The scope of our contentions
20 have been so seriously limited that the one that re-
21 mains, the brackish water, 2.2(a), is such a small
22 part of a large problem that it is difficult to con-
23 sider the risk of the brackish water alone.
24 There is a definite risk from the use of brack-
25 ish water in the containment building as shown earlier

in my testimony.

The elimination of brackish water from containment by use of a closed system will eliminate the brackish water risk. The magnitude of the risk is dependent on other factors such as surveillence, maintenance and function of the other equipment which is beyond the scope of the testimony allowed me.

Q. Does that conclude your testimony?

A. Yes it does.

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Bechtel Power Co. Job 14596 January 1981

Investigation 50-247/80-19
Nuclear Regulatory Commission December 4,1980

Director's Decision Under 10CFR 2.206
Nuclear Regulatory Commission, DD-80-5

Radiolysis of Water by M. H. Van de Voorde
MPS/Int. Co. 66-22
MHV/ab-30.8 1966

APPENDIX A

WALTER L. FLEISHER
443 Buena Vista Road
New City, N.Y. 10956

Resumé March, 1980

Resident of New City since 1923

Professional background:

1934-1936 Cornell University, Ithaca, N.Y.
Sibley School of Mechanical Engineering

1936-1938 Polytechnic Institute of Brooklyn (N.Y.)
School of Mechanical Engineering

1938-1946 Air & Refrigeration Corp.,New York,N.Y.
Atlanta, Ga. Branch and Plant Manager
Design, manufacture and installation of industrial ventilation equipment and systems.
Customers: U.S.Rubber Co.; Fisher Body Division of General Motors; Defense Plant Corp., synthetic rubber plants; Oak Ridge National Laboratory, uranium separation; and many others.

1945-1946 On leave for service in the United States Navy, Aircraft Electronics Technician Mate

1946-1951 Mance Corp., New York, N.Y.
Project Engineer primarily for design/build projects for Alexander Stores; J.P.Morgan and Co.; National Biscuit Co.; Schaeffer Brewing Co.; E. R. Squibb & Co.; Sperry Gyroscope, etc., mostly inductrial HVAC and special process work.

1951-1955 James H. Merritt Corp., New York, N.Y.
Chief Engineer of Air Conditioning Div. and Chief Engineer of Environmental Test Equipment division. HVAC IBM first Watson Research Lab; altitude simulator and explosive decompression chambers for U.S. Air Force; altitude test chambers (100,000 feet altitudes and -100°F) for Arma Corp; Mergenthaler; General Electric; RCA; Fairchild; etc.

1955-1968 Rowland Tompkins Corp., Hawthorne, N.Y.
Chief Engineer Air Conditioning Division
Design/build and plan and specification projects for: Grumman Aircraft including Lunar Module egineering building, hangar building, simulator and computer center. Union Carbide (4) laboratory building and central power plant; laboratories for

North American Phillips, Stauffer Chemical, Boeing-Vertol Div; industrial plants for IBM, Avon Products, Anaconda Copper.

1968-1972 Self-employed as a mechanical consultant. Major project, mechanical coordinator of $30,000,000 research center for Union Carbide Corp., including office, specialized labs (Linde Div.), general laboratories, shops, central power plant, site uitlities, and special services such as liquid nitrogen, liquid oxygen and hydrogen gas.

1972-1978 Columbia University, Nevis Cyclotron Laboratory, Irvington, N.Y.
Senior Engineer in charge of design and installation of primary and secondary high purity cooling water system for the cyclotron; beam lines and beam stop. Design of central extraction components; radio frequency power system; vacuum system; designed and built two computer rooms; design and installation of CO_2 and Halon fire protection system; and multi building fire alarm system.

1978- Segner and Dalton Consulting Engineers P.C. Valhalla, New York.
Senior Engineer. Design of HVAC and various process services for Resource Recovery plants at Brockton, MA and Bridgeport, CT. Energy conservation Study and Implementation Plan for three major laboratories for Mass. Institute of Technology. Also projects for General Foods, Stauffer Chemical (3), and State University At Purchase.

1945- Since 1980 - Rehabilitation and energy conservation modification for five buildings at Columbia University; Brabdeis University, Rosenstiel Lab; Brown University, Geo-Chem Lab.

1945- Member, American Society of Heating, Refrigerating and Air Conditioning Engineers.

1981 - Life member " " "

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Administrative Judges:

Chairman
Dr. Oscar H. Paris
Frederick J. Shon

In the Matter of

CONSOLIDATED EDISON COMPANY OF NEW YORK
(Indian Point, Unit 2)

Docket Nos. 50-247-SP
50-286-SP

POWER AUTHORITY OF THE STATE OF NEW YORK
(Indian Point, Unit 3)

December 28, 1982

CERTIFICATE OF SERVICE

This is to certify that I have this date placed in the first class U. S. mail a copy to each of those shown below of the TESTIMONY OF WALTER L. FLEISHER, APPENDIX A and EXHIBIT WLF#1.

Hon. James P. Gleason
Chairman
Administrative Law Judge
U.S.Nuclear Regulatory Com.
Washington,D.C. 20555

Mr. Frederick J. Shon
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commissio
Washington, D. C. 20555

r. Oscar H. Paris
dministrative Judge
tomic Safety and Licensing Board
.S. Nuclear Regulatory Commissior
ashington, D. C. 20555

Atomic Safety and Licensing Boar
U.S. Nuclear Regulatory Commissi
Washington, D. C. 20555

Atomic Safety and Licensing Appe
Board
U.S. Nuclear Regulatory Commissi
Washington, D. C. 20555

Ruthanne G. Miller, Esq.
Atomic Safety Licensing Board
Nuclear Regulatory Commission
Washington, D.C. 20555

Renee Schwartz, Esq.
Botein, Hays, Sklar & Herzberg
200 Park Avenue
New York, New York 10166

Judith Kessler, Coordinator
Rockland Citizens for Safe Ene
300 New Hempstead Road
New City, New York 10956

Br t L. Brandenburg, Esq.
Assistant General Counsel
Consolidated Edison Co.
4 Irving Place
New York, New York 10003

Charles M. Pratt, Esq.
Power Authority of the State
of New York
10 Columbus Circle
New York, New York 10019

Charles Morgan, Jr., Esq.
1899 L Street, N.W.
Washington, D. C. 20036

Jeffrey M. Blum, Esq.
New York University Law School
423 Vanderbuilt Hall
40 Washington Square South
New York, New York 10012

Charles J. Maikish, Esq.
The Port Authority of
New York and New Jersey
One World Trade Center
New York, New York 10048

Ezra I Bialik, Esq.
New York State Attorney
General's Office
Two World Trade Center
New York, New York 10047

Andrew O'Rourke
Westchester County Exec
148 Martine Ave.
White Plains, N.Y.10601

Andrew S. Roffe, Esq.
New York State Assembly
Albany,New York 12248

Lorna Salzman
Friends of the Earth, Inc.
208 West 13th Street
New York, New York 10011

Marc L. Parris, Esq.
County Attorney
County of Rockland
111 New Hempstead Road
New City, New York 10956

Doan R. Corren,
New York University
26 Stuyvesant Street
New York, New York 10003

Honorable Richard L. Brodsky
Member of the County Legislature
County Office Building
White Plains, NY 10601

Mayor
Village of Buchanan
236 Tate Avenue
Buchanan, New York 10511

Donald Davidoff
Empire State Plaza
Tower Building, RM 1750
Albany, New York 12237

Honorable Ruth Messinger
Member of the Council of the
City of New York
City Hall
New York, New York 10007

New York City Audubon Society
71 West 23rd Street, Suite 1828
New York, New York 10010

Jonathan Feinberg,Esq.
N.Y.S.Public Service Com.
3 Empire State Plaza
Albany, N.Y. 12223

Charles A. Scheiner,
P.O. Box 488
White Plains, NY 10602

Pat Posner, Spokesperson
Parents Concerned About
Indian Point
P.O. Box 125
Croton-on-Hudson, NY 10520

Craig Kaplan, Esq.
Natl. Emergency Civil Lib.
175 Fifth Avenue
New York, N.Y.10010-7770

David H. Pikus, Esq.
Richard F. Czaja, Esq.
330 Madison Avenue
New York, New York 10017

Ellyn R. Weiss, Esq.
1725 I Street, N.W., Suite 506
Washington, D. C. 20006

Mrs. Joan Holt
NYPIRG - 3rd Floor
9 Murray St
New York, N.Y. 10007

Janice Moore, Esq.
Staff Counsel
U.S. Nuclear Regulatory
Commission
Washington, D. C. 20555

Docketing and Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commissi
Washington, D. C. 20555

for West Branch Conservation Association
443 Buena Vista Road
New City, N.Y.
914/634-2327

Zipporah S. Fleisher

by Zipporah S. Fleisher
Secretary

1 JUDGE GLEASON: We will now proceed, Mrs.
2 Fleisher, to consideration of Board Question 2.2.1.
3 DIRECT EXAMINATION
4 BY MRS. FLEISHER:
5 Q Mr. Fleisher, you have in front of you a
6 two-page testimony entitled Testimony of Walter L.
7 Fleisher, Contention 2.2.1.
8 A (WITNESS FLEISHER) That is correct.
9 Q Did you prepare this testimony yourself?
10 A (WITNESS FLEISHER) Yes, I did.
11 Q If you were to be asked the same questions
12 today, would your answers be the same?
13 A (WITNESS FLEISHER) Yes, they would.
14 Q Have you any corrections or changes to make?
15 A (WITNESS FLEISHER) No.
16 MRS. FLEISHER: Your Honor, the witness is
17 ready.
18 JUDGE GLEASON: You are offering this to be
19 included into the record as if read?
20 MRS. FLEISHER: Oh, I am sorry, yes.
21 JUDGE GLEASON: The testimony of Mr. Walter
22 Fleisher entitled Contention 2.2.1, which really refers
23 to Board Question 2.2.1, will be received into evidence
24 as if read and bound into the record as if read.
25 (Test. of W. L. Fleisher, Contention 2.2.1 follows.)

wsent #2
1/25/82

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Administrative Judges:

James Gleason, Chairman
Dr. Oscar H. Paris
Frederick J. Shon

In the Matter of

CONSOLIDATED EDISON COMPANY OF NEW YORK
(Indian Point, Unit 2)

POWER AUTHORITY OF THE STATE OF NEW YORK
(Indian Point, Unit 3)

Docket Nos. 50-247-SP
50-286-SP

January 12, 1983

TESTIMONY OF

WALTER L. FLEISHER

CONTENTION 2.2.1

---

for West Branch Conservation Association
443 Buena Vista Road
New City, N.Y.
914/634-2327

Zipporah S. Fleisher
By Zipporah S. Fleisher
Secretary

WALTER L. FLEISHER

Q. Have you testified previously in this case?

A. Yes, on contention 2.2a. My resumé is attached to that testimony.

Q. What is the purpose of your testimony under contention 2.2.1?

My purpose is to discuss the secondary water chemistry program as proposed in the "Draft - Handouts For July 29, 1982 Meeting" (SGOG) page 26, under the subhead #II-7.

Q. Does the above comply with Board Question 2.2.1 which states that the failure of a steam generator tube is "significant from the standpoint of public health and safety " at page 23 of October 1 Order?

A. Yes.

Q. What are your recommendations?

A. A program such as, or similar to the recommendation on page 26 of the "Draft Handouts..." must be instituted as a condition of operating the plants, Indian Point units #2 and #3.

It is my opinion that such a program is long overdue. The corrosive properties of water in the presence of ionizing radiation has been recognized at least since 1966.

The direction to take for controlling the corrosion is in providing high purity water. The

critical properties to be controlled are pH, specific resistance and dissolved oxygen. In addition to the water quality is the correct selection of materials of construction.

Also of importance in the design is the prevention of any Hydrogen gas which is evolved, from escaping from the water so that the Hydrogen will recombine with the peroxide to produce neutral water.

Q. Does that conclude your testimony?

A. Yes, it does.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Administrative Judges:

James Gleason, Chairman
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CONSOLIDATED EDISON COMPANY OF NEW YORK
(Indian Point, Unit 2)

POWER AUTHORITY OF THE STATE OF NEW YORK
(Indian Point, Unit 3)

Docket Nos. 50-247-SP
50-286-SP

January 12, 1983

THIS WILL SERVE TO CERTIFY THAT I HAVE HAND-DELIVERED COPIES OF "TESTIMONY OF WALTER FLEISHER, CONTENTION 2.2.1" TO THOSE MARKED WITH AN ASTERISK AND MAILED TO OTHERS BY FIRST CLASS MAIL

---

* Mrs. Joan Hall
SPRING - 3rd Floor
9 Murray St.
New York, N.Y. 10007

* Janice Moore, Esq.
Staff Counsel
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Docketing and Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

* Hon. James P. Gleason
Chairman
Administrative Law Judge
U.S.Nuclear Regulatory Com.
Washington,D.C. 20555

* Mr. Frederick J. Shon
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

* Dr. Oscar H. Paris
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Atomic Safety and Licensing Appeal Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

* Ruthanne G. Miller, Esq.
Atomic Safety Licensing Board
Nuclear Regulatory Commission
Washington, D.C. 20555

Renee Schwartz, Esq.
Botein, Hays, Sklar & Herzberg
200 Park Avenue
New York, New York 10166

* Judith Kessler, Coordinator
Rockland Citizens for Safe Energy
300 New Hempstead Road
New City, New York 10956

* Craig Kaplan, Esq.
Natl. Emergency Civil Lib.
175 Fifth Avenue
New York, N.Y.10010-7770

* David F. Pikus, Esq.
Richard F. Czaja, Esq.
330 Madison Avenue
New York, New York 10017

Ellyn R. Weiss, Esq.
1725 I Street, N.W., Suite 506
Washington, D. C. 20006

* Brent L. Brandenburg, Esq.
Assistant General Counsel
Consolidated Edison Co.
4 Irving Place
New York, New York 10003

* Charles M. Pratt, Esq.
Power Authority of the State of New York
10 Columbus Circle
New York, New York 10019

* Charles Morgan, Jr., Esq.
1899 L Street, N.W.
Washington, D. C. 20036

* Jeffrey M. Blum, Esq.
New York University Law School
423 Vanderbilt Hall
40 Washington Square South
New York, New York 10012

Charles J. Maikish, Esq.
The Port Authority of New York and New Jersey
One World Trade Center
New York, New York 10048

Ezra I Bialik, Esq.
New York State Attorney General's Office
Two World Trade Center
New York, New York 10047

* Andrew O'Rourke
Westchester County Exec
148 Martine Ave.
White Plains, N.Y.10601

Andrew S. Roffe, Esq.
New York State Assembly
Albany,New York 12248

* Jonathan Feinberg,Esq.
N.Y.S.Public Service Com.
3 Empire State Plaza
Albany, N.Y. 12223

* Charles A. Scheiner,
P.O. Box 488
White Plains, NY 10602

* Pat Posner, Spokesperson
Parents Concerned About Indian Point
P.O. Box 125
Croton-on-Hudson, NY 10520

Lorna Salzman
Friends of the Earth, Inc.
208 West 13th Street
New York, New York 10011

* Marc L. Parris, Esq.
County Attorney
County of Rockland
111 New Hempstead Road
New City, New York 10956

Dean R. Corren,
New York University
26 Stuyvesant Street
New York, New York 10003

Honorable Richard L. Brodsky
Member of the County Legislature
County Office Building
White Plains, NY 10601

Mayor
Village of Buchanan
236 Tate Avenue
Buchanan, New York 10511

Donald Davidoff
Empire State Plaza
Tower Building, RM 1750
Albany, New York 12237

Honorable Ruth Messinger
Member of the Council of the City of New York
City Hall
New York, New York 10007

New York City Audubon Society
71 West 23rd Street, Suite 1828
New York, New York 10010

---

for West Branch Conservation Association
443 Buena Vista Road, New City, N.Y. 10956
914/634-2327

Zipporah S. Fleisher

by Zipporah S. Fleisher
Secretary

1 MRS. FLEISHER: May we make that Question?
2 it should say Board Question.
3 JUDGE GLEASON: That is all right. We have
4 already made it.
5 JUDGE GLEASON: All right. Who is going to
6 proceed? Mr. Brandenburg?
7 CROSS EXAMINATION
8 BY MR. BRANDENBURG:
9 Q Mr. Fleisher, on Page 1 of your testimony on
10 2.2.1, you refer to Page 26 of the draft handouts for
11 the July 29th, 1982, meeting. Do you recognize those as
12 the documents which appear as Attachment SR-2 to Con
13 Edison's testimony of Samuel Rothstein, concerning Board
14 Question 2.2.1, dated January 12?
15 A (WITNESS FLEISHER) No, this is a transcript
16 of the meeting which was sent to us by the staff. I
17 don't know the marked draft of this.
18 MRS. FLEISHER: I believe it is the same, Mr.
19 Brandenburg, if you copied that, but Mr. Fleisher did
20 refer to what he received from the staff, and not to Mr.
21 Rothstein's testimony, because he did not have it
22 earlier, so if you don't mind referring to the actual
23 document, rather than to the testimony.
24 BY MR. BRANDENBURG: (Resuming)
25 Q Just so we are sure we are talking about the

1 same document, Mr. Fleisher, does Page 26 of the
2 document that you have before you and that you are
3 referring to here, does the text begin, "Licensees shall
4 incorporate a requirement?"
5 A (WITNESS FLEISHER) That is correct. It is
6 headed, I think, II.7, Secondary and Water Chemistry
7 Programs.
8 Q We do indeed have the same document, sir.
9 Would you summarize for us, please, what you
10 understand to be the essential elements of the proposed
11 secondary water chemistry program that is referred to
12 here at Page 26 of the draft handout?
13 A (WITNESS FLEISHER) I don't believe it is a
14 fixed program as I read it. It means that it would be
15 plant specific. And it was to be worked out by the
16 licensees, if I remember in my reading of that section.
17 That was what I supported. I don't know that there is
18 only one solution, but it may vary by both problems of
19 design and materials and construction of the plant in
20 each case.
21 Q And what do you understand to be the essential
22 elements of this proposed secondary water chemistry
23 program?
24 A (WITNESS FLEISHER) I would expect it would be
25 a production of very high quality water, which I think I

1 go on to explain sort of in very simplified form later
2 on in my testimony. Water with very low conductivity,
3 low dissolved oxygen, and in general as close to pure
4 water as you can get.
5 Q Mr. Fleisher, will you describe for us what
6 you understand to be the secondary water chemistry
7 program that is currently in effect at the Indian Point
8 Unit Number 2?
9 A (WITNESS FLEISHER) I don't know the process
10 specifically. I, just after my testimony, received the
11 testimony on this subject from Con Ed, and it is rather
12 extensive and seemingly fairly effective treatment.
13 Q Are there elements of the proposed secondary
14 water chemistry program in the draft handout that we are
15 looking at here which you believe are not being
16 accommodated by the current program in place at the
17 Indian Point Unit Number 2?
18 A (WITNESS FLEISHER) I have no knowledge of
19 that.
20 Q Mr. Fleisher, have you read the testimony of
21 Samuel Rothstein concerning Board Question 2.2.1, dated
22 January 12, 1983?
23 A (WITNESS FLEISHER) Yes, I have.
24 Q Do you have a copy of that, sir?
25 A (WITNESS FLEISHER) Yes, I believe I do.

1 Q May I direct your attention to Page 19 of that
2 testimony?
3 A (WITNESS FLEISHER) I have it.
4 Q And in particular, if I may direct you to the
5 fourth line on that page, the sentence that reads as
6 follows: "The current program requirements exceed those
7 in the proposed draft requirements."
8 A (WITNESS FLEISHER) Yes.
9 Q Do you have any basis for disagreeing with
10 that conclusion?
11 A (WITNESS FLEISHER) No, I have none at this
12 time.
13 MR. BRANDENBURG: I have no further questions
14 of this witness, Mr. Chairman, on this topic.
15 JUDGE GLEASON: Mr. Levin?
16 CROSS EXAMINATION
17 BY MR. LEVIN:
18 Q Mr. Fleisher, did you review the Power
19 Authority's testimony on Board Question 2.2.1, that
20 would have been the testimony of Mr. Brons and Mr.
21 Josinger?
22 A (WITNESS FLEISHER) I believe so. Let me see
23 whether I have it. I am suffering from a sea of paper.
24 MRS. FLEISHER: We didn't bring it today, Your
25 Honor.

1 BY MR. LEVIN: (Resuming)

2 Q That is all right.

3 Do you have a recollection of reviewing that

4 at approximately the same time you reviewed the Con

5 Edison testimony?

6 A (WITNESS FLEISHER) I think I read it more

7 recently than that, but try me.

8 Q Do you have any recollection in there about

9 testimony which concerned the water chemistry program at

10 Unit 3?

11 A (WITNESS FLEISHER) I don't remember it

12 specifically. No, sir. You haven't got a copy for me

13 to look at? Oh. Well, I did have it. I am sorry. We

14 have a copy. I have a copy. What page?

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1 Q I'm not referring to any particular page right
2 now. I am just asking you if you recall any testimony
3 in that document with respect to the Power Authority's
4 water chemistry program at Unit 3.
5 A (WITNESS FLEISHER) Not specifically at this
6 moment.
7 MR. LEVIN: I have no further questions, Your
8 Honor.
9 JUDGE GLEASON: Mr. Levin, do you want to give
10 him a chance to look that document over?
11 MR. LEVIN: He can do it, Your Honor. The
12 testimony is in the record, and it speaks for itself.
13 JUDGE GLEASON: Well, I understand, but that
14 was testimony given several days ago. And if you are
15 asking a question, he certainly is entitled to look it
16 over.
17 MR. LEVIN: I did not address any further
18 questions to him, however, and I do not intend to. I've
19 concluded my cross examination.
20 JUDGE GLEASON: Well, you've already got the
21 question to him as to whether he's familiar with it.
22 (Pause.)
23 In any event, you have no followup questions
24 on the document?
25 MR. LEVIN: No, sir.

1 JUDGE GLEASON: Are you finished?

2 MR. LEVIN: Yes, sir.

3 JUDGE GLEASON: Does the Staff have cross

4 examination in this area?

5 MR. MC GURREN: We have none, Your Honor.

6 JUDGE GLEASON: Mrs. Fleisher, do you have any

7 redirect?

8 MS. FLEISHER: Just a question or two.

9 REDIRECT EXAMINATION

10 BY MS. FLEISHER:

11 Q Mr. Fleisher, didn't you offer to put in your

12 testimony without any -- just by certification -- I've

13 lost the word -- rather than to have to testify on it

14 for the reason you felt that you were applauding the

15 high purity water system suggested in that draft

16 handout, and that you had not read it because you could

17 not receive it in time to make your testimony in more

18 detail.

19 A (WITNESS FLEISHER) That is correct..

20 Q So that inspecting these particular plants was

21 not a part of your testimony nor even attempting to show

22 any familiarity with them.

23 A (WITNESS FLEISHER) No. The purpose of my

24 testimony really was to support the very stringent water

25 quality control program which I had actually suggested

1 in the past and had used in other projects myself.

2 Q And that would be the one that is on page 26

3 of the draft handout for the July 29, 1982 meeting of

4 the SGOG, is that right?

5 A (WITNESS FLEISHER) Well, that is an outline

6 of the procedure without any specifics as to the actual

7 treatment to be used, yes. In that way it's true.

8 MS. FLEISHER: Thank you, Your Honor. I have

9 nothing further.

10 JUDGE SHON: I have just one or two questions.

11 BOARD EXAMINATION

12 BY JUDGE SHON:

13 Q I think Mr. Brandenburg covered quite a bit of

14 what I was interested in. That was -- and indeed, Mrs.

15 Fleisher mentioned something about it. That you are

16 aware of the fact and you do applaud the fact that the

17 secondary water treatment is such as to produce a rather

18 high purity water, is that right?

19 A (WITNESS FLEISHER) I believe that is true at

20 Indian Point 2 because their record now of corrosion or

21 lack of corrosion has been excellent. We have

22 indications of the importance by what happened at Indian

23 Point 3 in which they've had considerable degradation of

24 the tubes and even a problem with the steam generator

25 vessel. So maybe it is a good indication to us of just

1 how important that quality of the water is.

2 I understand that the Power Authority is

3 upgrading their water treatment plant, but I have no

4 specific of what they're doing.

5 Q Do you have any personal opinion as to what is

6 responsible for the difference in the corrosion state of

7 the steam generators in the two plants?

8 MR. LEVIN: Your Honor, I don't know that it

9 has been established that there is any corrosion

10 difference at the present time with respect to the two

11 plants, just for the record. Mr. Fleisher said he

12 doesn't know, I think.

13 WITNESS FLEISHER: Your Honor, you didn't say

14 "at the present time." Mr. Levin added that.

15 MR. LEVIN: If we're not concerned about the

16 present, Your Honor, I don't know what we are concerned

17 about.

18 JUDGE SHON: Perhaps I should rephrase the

19 question.

20 BY JUDGE SHON: (Resuming)

21 Q You have stated that Indian Point 3 seems to

22 have experienced some sort of corrosion that Indian

23 Point 2 did not experience as yet, is that correct?

24 A (WITNESS FLEISHER) That is correct, sir.

25 Q Do you have any idea what causes this

1 difference or what could have caused the difference?

2 A (WITNESS FLEISHER) I really don't know what

3 the difference in the treatment was. I can only make

4 some presumptions of it by what I heard that PASNY is

5 adding to their treatment system at this time, which was

6 a polisher for the feedwater. I don't know just how

7 this affected the overall quality, but I do know from my

8 own experience that you must continuously treat the

9 water, even after it has been introduced into the

10 system, because it does pick up ions from the materials

11 of construction. Otherwise -- it has to be continously

12 removed in order to maintain that quality.

13 Whether this is the exact mechanism I really

14 don't know because I'm not that familiar with the

15 details of that water treatment system.

16 Q If my memory serves me correctly, previous

17 witnesses presented by the licensees have said that in

18 their opinion the corrosion at Indian Point 3 had been

19 caused or had resulted from a single incident in which

20 some tubes were damaged by a rotor blade from the

21 turbine. And it was this, a single entry of brittle

22 mortar into the secondary system, that was responsible

23 for the bulk of the corrosion -- just one incident, not

24 a matter of faulty treatment but a matter of an

25 accident, in effect.

1 Does that sound reasonable to you, and have
2 you heard this, and what is your opinion of that
3 explanation?
4 A (WITNESS FLEISHER) I am trying to remember
5 now, but it seemed to me -- I am a little hazy -- that
6 there has been considerable denting, tube denting due to
7 corrosion, I guess, of the tube support sheets and some
8 corrosion pitting. But I couldn't -- in all the reading
9 I've done on this I really couldn't isolate the specific
10 instances, no, sir.
11 Q Lastly, on page 1 of your testimony at lines
12 21 and 22 you mentioned corrosive properties of water in
13 the presence of ionizing radiation. In your opinion and
14 from your experience is the radiation level in the steam
15 generator sufficiently high to have a very appreciable
16 effect upon corrosion rate at that point?
17 A (WITNESS FLEISHER) Without knowing exactly
18 the levels, though I believe they are high enough, it
19 could have because the ionizing radiation breaks down
20 the water, producing hydrogen peroxide which was a major
21 problem.
22 This premise, by the way, is from the
23 experience in the nuclear physics field in which I had
24 worked on cyclotron in which they had a serious problem
25 with corrosion. And some studies have been made, I

1 think particularly at Cern, of the mechanism. They have
2 found that to do with ionizing radiation and the quality
3 of the water. This is where this came from and was an
4 accepted, let's say, criteria in the work that I did on
5 designing cooling systems at the cyclotron at Columbia
6 University.
7 Q Were these cooling systems for targets in
8 cyclotrons?
9 A (WITNESS FLEISHER) These were for targets,
10 they were for the magnets in the beam lines. It was
11 used in the radio frequency system that fed the
12 cyclotron. It was all over the plant. We used the same
13 water or similar water systems.
14 Q Do you have any idea how the radiation level
15 in a steam generator in a power plant would compare with
16 the radiation level at a cyclotron power point?
17 A (WITNESS FLEISHER) I wouldn't think your
18 target areas -- actually, strangely enough some of the
19 major corrosion problems were in the magnets where the
20 water was used for cooling the windings. They were
21 conductors in which the water was run actually through
22 the windings to cool the very high currents carried, and
23 this had been a major problem of corrosion there. They
24 had some of them corrode so badly that water circulation
25 was actually cut off, and they exploded from the steam

1 pressure.

2 This is not particularly high because the beam

3 is pretty well columnated, and you only get secondary

4 radiation in the windings, and even there they are more

5 or less protected by the magnet structure as well.

6 JUDGE SHON: Thank you. I have no further

7 questions.

8 MS. FLEISHER: Your Honor, may I ask Mr.

9 Fleisher a question or two?

10 REDIRECT EXAMINATION

11 BY MS. FLEISHER:

12 Q I'd like to have him state have you or have

13 you not been in the Public Document Room in White Plains

14 to search for materials?

15 A (WITNESS FLEISHER) Yes, I was.

16 Q And did you find what you wanted there?

17 A (WITNESS FLEISHER) No, we did not find what

18 we were looking for.

19 Q I have another question, please. Are you

20 receiving any remuneration for your efforts in this case?

21 A (WITNESS FLEISHER) No. Strictly pro bono.

22 Q Thank you.

23 JUDGE GLEASON: Ms. Fleisher, what was it Mr.

24 Fleisher was looking for?

25 WITNESS FLEISHER: We were looking for the

1 reports, a whole series of reports, NUREG -- I can't
2 think of the numbers -- on the various studies of the
3 various problems that have occurred, and we did not find
4 them in the Public Document Room.
5 I can't tell you, sir, particularly what the
6 numbers were, but there were a whole series of numbers
7 that we looked for. I would have to get you those if
8 you really need them.
9 MS. FLEISHER: We could supply a list, Your
10 Honor, if you wanted. I believe I raised this issue
11 before.
12 JUDGE GLEASON: Well, I know it has been
13 raised before, and I thought it had been responded to
14 before. And I guess I just feel a little bit reluctant
15 to leave in the record just a question that asked him
16 whether he found what he was looking for without asking
17 him what he was looking for.
18 (Pause.)
19 WITNESS FLEISHER: I'm afraid it'll take a
20 little time. Could we either take a recess, sir, or
21 provide it to you?
22 JUDGE GLEASON: I think whatever information
23 you want to provide at some point, Ms. Fleisher, just
24 give it to the Board at that point.
25 WITNESS FLEISHER: I'm sorry that I don't know

1 offhand. There were a whole list of things that we were
2 sort of looking for.
3 JUDGE GLEASON: I understand.
4 All right. The witness is excused.
5 Thank you, Mr. Fleisher.
6 WITNESS FLEISHER: Thank you.
7 (The witness was excused.)
8 JUDGE GLEASON: I believe the Licensees have
9 witnesses to produce at this time. Would you please
10 proceed?
11 I'm a little confused. Perhaps I am confused
12 by this agenda, but are these to be two panels of
13 witnesses, one by each of the Licensees?
14 MR. LEVIN: Yes, Your Honor.
15 JUDGE GLEASON: All right.
16 Mr. Brandenburg.
17 MR. BRANDENBURG: Mr. Chairman, Consolidated
18 Edison calls to the stand Samual Rothstein and Arthur
19 Tuthill.
20 JUDGE GLEASON: I believe one of you has been
21 sworn. Mr. Rothstein, you have been sworn, and Mr.
22 Tuthill, you have not.
23 Whereupon,
24 ARTHUR TUTHILL
25 was called as a witness by counsel for Consolidated

1 Edison and, having been duly sworn, was examined and
2 testified as follows:
3 Whereupon,
4 SAMUEL ROTHSTEIN
5 was called as a witness by counsel for Consolidated
6 Edison and, having been previously duly sworn, was
7 examined and testified as follows:
8 MR. SOHINKI: Your Honors, I just would like
9 to point out to the Board that the original version of
10 this testimony that was sent out had a cover sheet which
11 read "Board Question 2.2(a)." There was an errata sent
12 out by letter of January 13, 1983 signed by Ms. Canizio
13 of our staff which made the correction on the cover
14 sheet. So that the current cover sheet reads
15 "Contention 2.2(a)" instead of "Board Question 2.2(a)."
16 JUDGE GLEASON: All right.
17 DIRECT EXAMINATION
18 BY MR. SOHINKI:
19 Q Gentlemen, could you please state your full
20 name for the record?
21 A (WITNESS ROTHSTEIN) My name is Samuel
22 Rothstein.
23 A (WITNESS TUTHILL) My name is Arthur Tuthill.
24 Q And could you both state your business address?
25 A (WITNESS ROTHSTEIN) My business address is

1 ConEdison, 4 Irving Place, New York, New York.

2 A (WITNESS TUTHILL) My business address is 3

3 Chapel Lane, Riverside, Connecticut.

4 Q And could you each give your present position?

5 A (WITNESS ROTHSTEIN) I am head of a chemical

6 and metallurgical engineering section of the engineering

7 studies section, ConEdison.

8 A (WITNESS TUTHILL) Since August when I retired

9 I am an independent corrosion and materials consultant.

10 JUDGE GLEASON: What were you before that, Mr.

11 Tuthill?

12 WITNESS TUTHILL: I retired as the manager of

13 sales development, International Nickel Company.

14 JUDGE GLEASON: Thank you.

15 MR. SOHINKI: I might point out for the record

16 that Mr. Rothstein's professional qualifications have

17 previously been incorporated in the record.

18 BY MR. SOHINKI: (Resuming)

19 Q Gentlemen, do you have before you a document

20 entitled "ConEdison's Testimony of Samuel Rothstein and

21 Arthur Tuthill Concerning Question 2.2(a)?"

22 A (WITNESS TUTHILL) Yes.

23 A (WITNESS ROTHSTEIN) Yes.

24 Q And was this document prepared by you

25 gentlemen or under your direct supervision?

1 A (WITNESS TUTHILL) Yes.

2 A (WITNESS ROTHSTEIN) Yes.

3 Q Do you have any additions or corrections to

4 make to the document at this time?

5 A (WITNESS TUTHILL) Yes.

6 Q Could you proceed to do that, Mr. Tuthill?

7 A (WITNESS TUTHILL) Page 3, the fourth line

8 from the bottom, the beginning of the sentence reads,

9 "PH fluctuates." The "p" should be a small "p," not a

10 capital "p."

11 JUDGE SHON: Even when it starts a sentence?

12 WITNESS TUTHILL: That is what confused the

13 typist.

14 Page 4, the fifth line down, the second word,

15 strike "in," substitute "of."

16 JUDGE PARIS: Excuse me. I didn't hear the

17 line.

18 WITNESS TUTHILL: The fifth line down, "rates

19 in the order of," strike "in" and substitute "of."

20 At the end of that sentence strike the period

21 and add "during the first year." That sentence will now

22 read, "The dissolved oxygen approaches saturation -- all

23 indicative of saline water in which copper alloys

24 exhibit very low corrosion rates of the order of 0.001

25 inches per year or less during the first year."

1 At the beginning of the next sentence insert
2 "After the first year corrosion rates," and after
3 "corrosion rates" strike "of 0.001." Insert "decrease
4 to even lower values of the order of 0.00005." That is
5 four zeroes after the decimal.
6 After "per year" --
7 JUDGE GLEASON: Excuse me. Could you go
8 slower? Rates decrease to what?
9 WITNESS TUTHILL: "Even lower values of the
10 order of 0.00005 inches."
11 JUDGE GLEASON: Per year?
12 WITNESS TUTHILL: "Per year."
13 After "per year" strike "or less" and
14 substitute "which." That sentence would now read,
15 "After the first year corrosion rates decrease to even
16 lower values of the order of 0.00005 inches per year
17 which translate into upwards of 40 years' life for
18 18-gauge tubing, the standard gauge and that in use in
19 the fan and motor coolers at Indian Point No. 2."
20 In the second paragraph, the fourth line,
21 insert a comma after "approach" in the middle of the
22 line.
23 In the fifth line, the second word should be
24 "those" rather than "these."
25 In the fourth line up from the bottom of page

4 after "why," "which is why," after "why" insert "coated carbon steel and." That sentence will now read, "The salinity during the minimum flow period, while low, is still high enough to arouse concern about the possibility of surface corrosion of stainless steels, which is why coated carbon steel and copper base alloys are so widely preferred for brackish and other saline waters.

On page 5, the first line in Section 3 starting "In September," the end of that line strike "four" and insert "eight."

At the bottom of the page, the fourth line up, "water box" should be plural, "water boxes," "es," add "es."

"Tube sheet" should be plural. Add "s," "tube sheets."

Strike "are" and substitute "were."

That sentence would now read, "We found that the good condition of the copper-nickel piping, water boxes and tube sheets were consistent with the earlier thinking on the low corrosivity of Hudson River water at Indian Point to copper alloys in two above.

Page 6, line 3, "water box" should be plural, add "es."

The references cited at the end of the

1 testimony, the second reference, the title should be
2 "Guidelines" rather than "Guidance." "Guidelines."
3 Change "Guidance" to "Guidelines."
4 BY MR. SOHINKI: (Resuming)
5 Q Does that complete your additions and
6 corrections?
7 JUDGE GLEASON: What page is that last
8 correction?
9 WITNESS TUTHILL: The page is not numbered.
10 It would be page 9.
11 JUDGE GLEASON: And the correction is what?
12 WITNESS TUTHILL: In the second reference the
13 title is written as "Guidance for Selection of Marine
14 Materials." It should read "Guidelines."
15 BY MR. SOHINKI: (Resuming)
16 Q Gentlemen, does that complete your additions
17 and corrections?
18 A (WITNESS ROTHSTEIN) Yes.
19 A (WITNESS TUTHILL) Yes, it does.
20 Q And with those changes is everything contained
21 in this document true and accurate to the best of your
22 knowledge, information and belief?
23 A (WITNESS TUTHILL) It is.
24 Q And do you adopt each and every sentence in
25 this document as your testimony in this proceeding?

1 A (WITNESS ROTHSTEIN) We do.

2 A (WITNESS TUTHILL) We do.

3 MR. SOHINKI: Mr. Chairman, copies of the

4 testimony of Messrs. Rothstein and Tuthill have been

5 provided to the Board and the parties and to the Court

6 Reporter. And ConEdison hereby moves that the testimony

7 be incorporated into the record as if read.

8 JUDGE GLEASON: Is there objection? Hearing

9 none, the testimoy of Messrs. Rothstein and Tuthill will

10 be received and bound into the record as if read.

11 (The prepared testimony of Mr. Rothstein and

12 Mr. Tuthill follows:)

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insert #3

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
James P. Gleason, Chairman
Frederick J. Shon
Dr. Oscar H. Paris

In the Matter of	)	Docket Nos.
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. (Indian Point, Unit No. 2)	)	50-247-SP 50-286-SP
POWER AUTHORITY OF THE STATE OF NEW YORK (Indian Point, Unit. No. 3)	)	January 12, 1983

CON EDISON'S TESTIMONY
OF SAMUEL ROTHSTEIN
AND ARTHUR TUTHILL
CONCERNING CONTENTION 2.2(a)

ATTORNEY FILING THIS DOCUMENT:

Brent L. Brandenburg
CONSOLIDATED EDISON COMPANY
OF NEW YORK, INC.
4 Irving Place
New York, New York
(212) 460-4600

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My name is Arthur Tuthill. I received a Bachelor of Chemical Engineering degree from the University of Virginia in 1940 and a Masters Degree in Metallurgical Engineering from Carnegie Institute of Technology in 1946. I have worked as a metallurgical and corrosion specialist for Standard Oil Company of New Jersey (now Exxon), E.I. DuPont and International Nickel Company until my retirement on August 1, 1982. Since 1964, at International Nickel, I was responsible for the development and use of nickel-containing alloys, in particular, condenser and heat exchanger tubing applications in saline water. At DuPont my responsibilities included material evaluation and the selection of equipment for use in high purity water systems for the Savannah River project. A detailed statement of my professional qualifications and publications is presented in Attachment BW-1 to this testimony.

My name is Samuel Rothstein. I am the head of the Chemical and Metallurgical Engineering subsection in the Mechanical Studies section at Con Edison. I received a Bachelor's Degree in Chemistry from City College of New York in 1940 and have completed a large number of graduate courses in metallurgy at several universities. I have been employed at Con Edison since 1971. During this time I have been involved in the analysis and evaluation of the fan cooler/service water system, and in the development of an in-service inspection program for the same. A more detailed listing of my background is appended to my testimony on Board Question 2.2.1.

The purpose of this testimony is to address contention 2.2(a) which reads as follow:

> "The cooling system at the plants should be changed so that it no longer uses brackish Hudson River water. This change is needed to combat safety-related corrosion problems."

I. Description of the Indian Point Unit 2 Fan Cooling System

The Indian Point Unit 2 fan cooling system has five air handling units, referred to as the fan cooler units. Each unit consists of a main heat exchanger formed by separate heat exchanger units which cool the air, a fan to draw the air through the heat exchangers and circulate it in containment, a demister to remove condensed moisture droplets from the air, and various filters to clean the air. In addition, each fan motor is cooled by a separate smaller heat exchanger referred to as a motor cooler.

These main air cooling heat exchangers as well as the smaller fan motor cooling heat exchangers (motor coolers) are cooled by Hudson River water provided by the essential service water system. This systems consists of three 5000 gpm service water pumps, each of which has an automatic self-cleaning strainer, that are connected to each of two 24" diameter cement-lined pipes which supply the fan coolers units.

Each fan cooler unit is then serviced by a separate 10" cement lined supply and discharge pipe. Each supply and discharge pipe is provided with motor operated shutoff valves outside containment, which allow each cooler to be isolated.

Each motor cooler is supplied with service water through a 2" pipe and a 2" flexible hose connected directly to the 10" header of its respective fan cooler unit inside the containment building. Water from each of the motor coolers is discharged through separate 2" pipes with shutoff valves outside containment for isolation.

The fan coolers have 3750 5/8" diameter 18 gage (0.049") C70600 alloy (90 copper 10 nickel) "U" tubes with external fins. The external fins provide increased surface to better cool the air passing over the outside. The tubesheets, water boxes and inlet piping are also C70600 alloy. The coolers are subdivided into ten sets, each set with its own inlet and outlet pipe, waterboxes and tube sheets. Figure I is a block type flow diagram which shows the system. The motor coolers are smaller but of similar construction.

II. Corrosiveness of Hudson River Water

Hudson River water at Indian Point is a well aerated estuarine river water of low salinity. The biological oxygen demand (B.O.D.) is low, 4.6 ppm maximum. Dissolved oxygen approaches saturation ranging from 5.5 to 11.5 ppm. PH fluctuates within a narrow range from 7.1 to 7.5. Salinity during the minimum flow period, August, is about 4,000 ppm but did reach 7,020 ppm, 20% of seawater, during the drought year of 1964.

The low B.O.D. indicates minimal organic pollution. The pH is normal, indicating minimal industrial waste pollution. The dissolved oxygen approaches saturation - all indicative of saline water in which copper alloys exhibit very low corrosion rates ~~in~~ of the order of 0.001" per year or less, DURING THE FIRST YEAR. AFTER (1) Corrosion rates of ~~0.001"~~ per year or less translate into upwards of 40 years life for 18 gage tubing, the standard gage and that in use in the fan and motor coolers at Indian Point No. 2.

Carbon steel on the other hand corrodes at low but significant rates in the same saline waters. The corrosion rates increase as the flow velocity increases. These corrosion rates for unprotected carbon steel may approach, but would be unlikely to exceed those for sea water, i.e. 0.006 to 0.022 inches per year.(2) Although carbon steel piping will survive for several years at these corrosion rates, such piping is normally cement or epoxy lined for brackish or saline water service, as was done at Indian Point Unit 2. The salinity during the minimum flow period, while low, is still high enough to arouse concern about the possibility of crevice corrosion of stainless steels, which is why copper base alloys are so widely preferred for brackish and other saline waters.

There is nothing unusual about the use of brackish or other saline waters for cooling. In addition to ships, there are

numerous industrial plants as well as power plants that sucessfully use brackish and saline waters for cooling provided, as at Indian Point, the proper materials for saline waters are used. We note that 15% of domestic power plants and 33% of domestic nuclear plants are on brackish estuaries or sea coast locations and saline water is routinely used for cooling purposes.

III. Inspections of Fan Cooling System During 1982 Refueling/Maintenace Outage

In September, 1982, Messrs. Tuthill and Rothstein examined ~~four~~ EIGHT C70600 5/8" tubes removed from the coolers at Indian Point Unit No. 2. Mr. Tuthill reviewed the drawings, general arrangement diagrams, and prior experience, and made recommendations for improvements during the planned outage. These recommendations were for cleaning, improving flow distribution, clean water circulation prior to startup and control of biofouling growth.

In November 1982, Mr. Tuthill visited Indian Point Unit No. 2 during the outage for the purpose of inspecting the intake system, the fan coolers, their piping and the main condensers. We found that the good condition of the copper-nickel piping, waterbox~~es~~ and tubesheet~~s~~ ~~are~~ were consistent with the earlier thinking on the low corrosivity of Hudson River water at Indian Point to copper alloys in 2 above. The flush cleaning of the fan coolers and motor coolers had been completed by this time.

The Zurn strainers had been cleaned and overhauled. New distribution plates to improve flow distribution and reduce turbulence were in place in the waterbox[65]. Subsequent to this visit, chemical cleaning to remove the poorly formed corrosion product film and circulation with clean water to reform a good film were completed. Chlorination to reduce biological growth was reinitiated on startup.

IV. Conclusions

Based on the foregoing, it is our opinion and position that:

1) Hudson River water at Indian Point is corrosive to uncoated carbon steel, but not to cement lined steel or copper base alloys, such as those at Indian Point Unit 2, at flow velocities typical of Indian Point Unit 2 operation.

2) Although Hudson River water at Indian Point might well be classified as fresh water for most of the year, the materials in use are those appropriate for saline brackish waters.

3) The inspection ports installed adjacent to the welds in the cement lined pipe during the 1980/81 outage have not only permitted the cement lining in the area of the welds to be repaired but also permit inspection during outages to maintain surveillance on the condition of the cement lining.

4) The corrective measures taken to improve the performance of the fan and motor coolers are those found desirable and recommended to minimize the localized corrosion found in some of the tubing. These should permit C70600 alloy tubing to closely approach the normal long term durability of this alloy in saline waters.

5) The C70600 alloy used in the Indian Point Unit 2 fan coolers is the normal and usual choice for both naval and commercial vessels as well as power and industrial plants for heat exchangers and coolers of the fan cooler type using saline water for cooling.

V. Alternate Cooling Systems

In 1981 Con Edison forwarded to the NRC a report prepared by the Bechtel Power Corporation which provided a feasibility study of various containment cooling system alternatives utilizing both closed and hybrid closed/open system concepts. Con Edison committed at that time to developed a detailed design of the alternative recommended in the study, the so-called "hybrid" closed-loop cooling system and perform further evaluation. By letter dated February 11, 1982 from J.D. O'Toole (Con Edison) to V. Stello (NRC), Con Edison provided its assessment of the "hybrid" system to NRC. We concluded that the "hybrid" system-although possessing the advantages of a closed system during normal plant operation-is complex in comparison with the present fan cooling system.

While Con Edison has decided against the Bechtel alternative system, a review of "hybrid" as well as other alternative systems is continuing and future actions will be guided by the performance of the present fan cooling system and the results of the surveillance program of the fan cooler units and service water piping. However, one must carefully weigh the benefits of an alternative system which does not use river water against the complexities and associated potential for reduced system reliability of such alternatives.

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(2) Tuthill, A.H., and Schillmoller, C.M. "~~Guidance~~ Guide Lines for Selection of Marine Materials." Inco Technical Publication A404, 1965.

Block Flow Diagram
Fan Cooling System
Indian Point No. 2

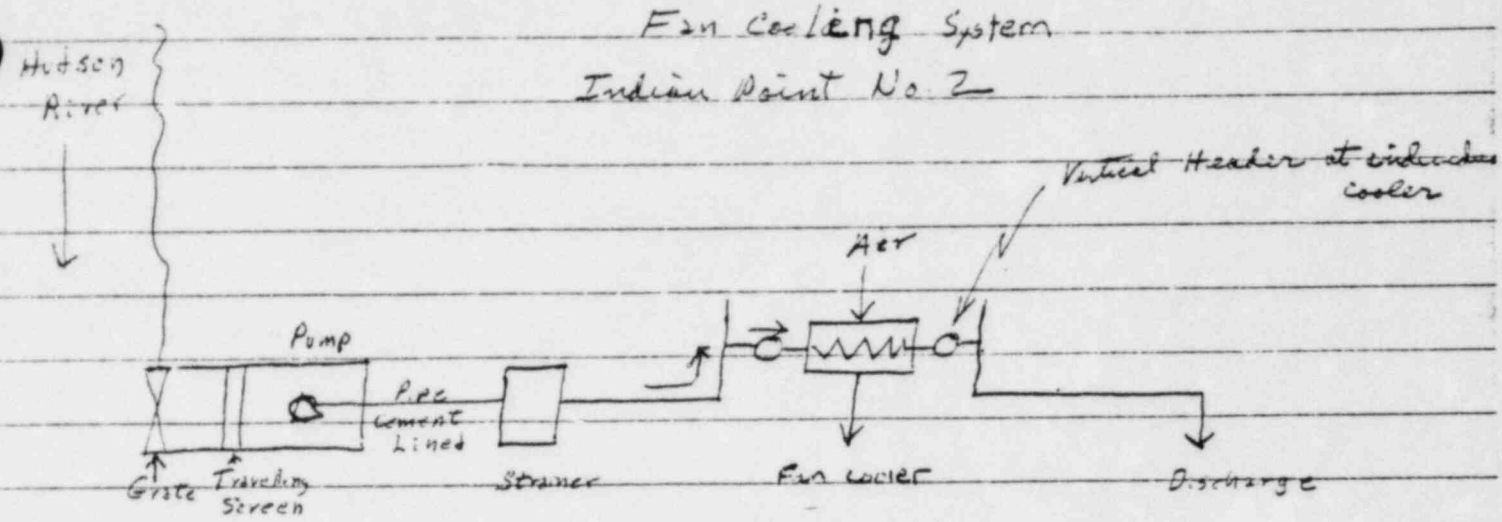

FIGURE I

ARTHUR H. TUTHILL, P.E.
3 CHAPEL LANE
RIVERSIDE, CT 06878

MANAGEMENT EXPERIENCE

Managed group of nationally recognized professional materials and corrosion specialists responsible for developing markets and projects that directly supported sales function and kept nickel markets growing despite aggressive promotion of competitive materials (Inco).

Organized, financed and operated small business enterprise manufacturing high alloy spare parts for refineries, chemical plants and paper mills in Gulf Coast area (Valco Engineering).

Supervised team of engineers and technicians in inspection of safe operating condition of refinery equipment (Exxon).

Commended by Office of Defense Mobilization for excellent services rendered while in charge stainless steel section Iron and Steel Division - procurement of stainless steel to industry and Savannah River Plant (DuPont - Government: National Production Authority).

EMPLOYMENT

1940 - 1941 - Tennessee Eastman Corporation, Kingsport, TN
1941 - 1946 - U.S. Navy, Naval Gun Factory, Cramp Shipyard, Pacific Theater
1946 - 1950 - Standard Oil (NJ), Baton Rouge, LA
1950 - 1954 - E. I. DuPont, Wilmington, DE
1954 - 1959 - Valco Engineering, Baton Rouge, LA
1959 - 1982 - International Nickel Company, Hartford, CT and New York City

EDUCATION

MS. Met. Eng. - Carnegie Tech., 1946
B. ChE. - University of VA, 1940
Numerous AMA Management and Financial Educational Courses

PROFESSIONAL

National Association of Corrosion Engineers
Society of Naval Architects and Marine Engineers
Technical Association of Pulp and Paper Industry
Professional Engineer (Metallurgy), LA License No. 4580
Accomplished public speaker and discussion leader on corrosion and materials

PERSONAL

Born March 27, 1919, Staunton, VA, Married - 5 Children; Health - Excellent
Lt. Cdr. USNR WWII Pacific
Application Mountain Club - White Water and Wilderness Canoeing
Rotary International

PUBLICATIONS

1. LaQue, F.L. and Tuthill, A.H., "Economic Considerations in the Selection of Materials for Marine Applications", Transactions of the Society of Naval Architects and Marine Engineers, Vol. 69, 1961, pp. 619-639.

2. Weldon, B.A. and Tuthill, A.H., "The Cupro-Nickels in Desalination Plant", Proceedings of Conference, "Role of Copper and Its Alloys in Desalination Equipment", London, 1966, Copper Development Association, 1968, Paper #5, pp. 39-47.

3. Tuthill, A.H. and Schillmoller, C.M., "Guidelines for Selection of Marine Materials", Presented at Ocean Science Engineering Conference, Marine Technology, Washington, D.C., June 14-17, 1965.

4. Tuthill, A.H. and Sudrabin, D.A., "Why Copper-Nickel Alloys for Desalination", Metals Engineering Quarterly, Vol. 7, August 1967, pp. 10-26.

5. Tuthill, A.H., "Marine Corrosion", Machine Design, Vol. 40, December 19, 1968, pp. 117-122.

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7. Todd, B., Tuthill, A.H., Bailie, R.E., "Desalination Lower Cost Water by Proper Materials Selection", Presented at Third European Symposium on Fresh Water from the Sea, Dubrovnik, Yugoslavia, September 14-17, 1970.

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9. Tuthill, A.H., "Design and Installation of 90-10 Copper-Nickel Sea Water Piping Systems", Inco publication.

10. Manzolillo, J.L., Thiele, E.W., Tuthill, A.H., "CA706 Copper-Nickel Alloy Hulls: The Copper Mariner's Experience and Economics", Trans., SNAME Vol. 84, 1976, pp. 408-432.

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12. Rushton, J.D., Geisler, J.J., Heasley, R.H., Tuthill, A.H., Edwards, L.L., "Statistical Analysis of Effects of Chloride, Residual Chlorine Temperature and Exposure Period on Corrosion of Bleach Plant Materials", TAPPI Engineering Conference, New Orleans, November 1979, TAPPI Press Report-84.

13. Tuthill, A.H., "Performance of Types 316L and 317L Stainless Steels in C and D Stage Bleach Plant Environments", Third International Symposium on Corrosion in Pulp and Paper Industry Corrosion Problems, Atlanta, May 1980.

14. Tuthill, A.H., Rushton, J.D., Geisler, J.J., Heasley, R.H., Edwards, L.L., "Corrosion Resistance of Alloys to Bleach Plant Environments, TAPPI Journal, Vol. 62, No. 11, November 1979.

15. Tuthill, A.H., "Performance of Types 316 and 317L Stainless Steels in C and D Stage Bleach Plant Environments, Part II TAPPI Engineering Conference, Washington, D.C., September 1980.

16. Tuthill, A.H., "Corrosion of Types 316/316L and 317/317L Specimens in Aggressive Environments Compared to Actual Performance", Presented at Corrosion '81, Houston, Texas.

17. Lee, T.S., Tuthill, A.H., "Guidelines for the Use of Carbon Steel to Mitigate Crevice Corrosion of Stainless Steels in Sea Water", Paper #63, NACE Corrosion '82.

ATTACHMENT BW-1

ARTHUR H. TUTHILL, P.E.
3 CHAPEL LANE
RIVERSIDE, CT 06373

Materials and Corrosion Consultant

Extensive experience in fabrication, use and performance of cast and wrought alloy steels in submarines, naval, commercial and fishing vessels, nuclear and fossil power plants, desalination plants, pumps, offshore oil and waterflood, refineries and sour gas well production, chemical and pulp and paper plants.

Marine

Assisted Naval architects, owners and shipbuilders in evaluation and selection of materials of construction for, and the solution of, troublesome galvanic and other corrosion problems on nuclear submarines, Alvin, deep submergence rescue vessels, aircraft carriers, destroyers, LNG tankers, chemical tankers, deep tanks, offshore oil platforms, fishing vessels and pleasure craft. Organized and led two shipbuilding industry materials seminars.

Authored "Guidelines for Selection of Marine Materials", "Materials for Sea Water and Brine Recycle Pumps" and "CA706 Copper-Nickel Alloy Hulls: The Copper Mariner's Experience and Economics".

Initiated reports from shipowners summarizing experience with materials usage to provide better feedback to marine industry on service experience.

Inspection and quality assurance of naval ordnance-gun mounts, guns and turrets at Naval Gun Factory and assembly and alignment aboard CVLs during construction. Combat experience USS Miami - Pacific.

Desalination

Initiated and coordinated materials test programs and inspection of OSW demonstration plants and operating desalination plants at Freeport, Chula Vista, Key West and Caribbean. Persuaded OSW to fund and undertake the four A.D. Little Surveys of materials usage in actual operating plants to provide this industry with better feedback on service experience.

Assisted domestic, European and Japanese design firms and manufacturers in selection of materials and in solution of corrosion problems on shipboard and land based desalination plants for mid-east and western hemisphere. Co-authored "Desalination, Lower Cost Water by Proper Materials Selection" and other papers on materials for desalination.

Power

Provided design engineering firms, utilities and equipment manufacturers with feedback of overall industry experience, individual case histories and pertinent research data on materials for, and solution to, corrosion problems on condenser tubing, feedwater heaters, cooling towers and other plant components.

Developed and stimulated use of guidelines for designing new condensers to take full advantage of the properties of each different tubing alloy. Guidelines were fundamental to the successful introduction and promotion of Type 304 stainless steel for inland power plants, C70600 alloy for coastal plants and AL6X for severely polluted waters.

Developed practical solutions to galvanic corrosion and biofouling problems in cooling water systems.

Pulp and Paper

Assisted in organizing cooperative alloy producer - pulp and paper mill corrosion test program to identify materials needed to meet more aggressive corrosion conditions arising from current government regulations regulating effluent water quality.

Analyzed and reported data for Metals Subcommittee of TAPPI in five technical papers on bleach plant materials and corrosion.

Organized and conducted two pulp and paper industry corrosion and materials seminars.

Nuclear (DuPont)

Developed welding procedures and evaluated materials for high purity and reactor grade water.

Developed procedures for minimizing and removing contamination (embedded iron) from surface of stainless steel that were the forerunner for ASTM A380.

Evaluated and developed materials for water lubricated bearings and components of machinery for slitting and handling spent fuel elements in submerged processing and storage area.

Chemical (DuPont)

Developed welding procedures for stainless steels and nickel base alloys. Inspected and made initial analysis and reported on stress corrosion cracking of jacketed stainless steel pipe under insulation.

Evaluated materials and corrosion problems in nylon, neoprene, HF and explosives plants.

Refinery (Standard Oil, NJ)

Initiated cathodic protection of pipe coolers, deep well pump casings and heat exchangers and use of tantalum tubes in sulfuric acid reboilers.

Qualified steels for low temperature service - leading to ASTM A300.

In charge welder qualification and refinery weld quality.

Responsible for solution of refinery corrosion and materials problems.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
James P. Gleason, Chairman
Dr. Oscar H. Paris
Frederick J. Shon

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CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. (Indian Point, Unit No. 2)	:	Docket Nos. 50-247-SP 50-286-SP
POWER AUTHORITY OF THE STATE OF NEW YORK, (Indian Point, Unit No. 3)	:	January 12, 1983

----------x

CERTIFICATE OF SERVICE

I certify that I have served copies of CON EDISON'S TESTIMONY OF SAMUEL ROTHSTEIN AND ARTHUR TUTHILL CONCERNING BOARD QUESTION 2.2(a) by deposit in the United States mail, postage prepaid, this 12th day of January, 1983.

Docketing and Service Branch
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

James P. Gleason, Esq., Chairman
Administrative Judge
513 Gilmoure Drive
Silver Springs, Maryland 20901

Dr. Oscar H. Paris
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. Frederick J. Shon
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Janice Moore, Esq.
Office of the Executive
Legal Director
U.S. Nuclear Regulatory
Commission
Washington, D. C. 20555

Paul F. Colarulli, Esq.
Joseph J. Levin, Jr., Esq.
Pamela S. Horowitz, Esq.
Charles Morgan, Jr., Esq.
Morgan Associates, Chartered
1899 L Street, N.W.
Washington, D. C. 20036

Charles M. Pratt, Esq.
Stephen L. Baum
Power Authority of the State
of New York
10 Columbus Circle
New York, New York 10019

Ellyn R. Weiss, Esq.
William S. Jordan, III, Esq.
Harmon & Weiss
1725 I Street, N.W., Suite 506
Washington, D. C. 20006

Joan Holt, Project Director
Indian Point Project
New York Public Interest
Research Group
9 Murray Street
New York, New York 10007

Melvin Goldberg
Staff Attorney
New York Public Interest
Research Group
9 Murray Street
New York, New York 10007

Jeffrey M. Blum
New York University Law School
423 Vanderbilt Hall
Washington Square South
New York, New York 10012

Charles J. Maikish, Esq.
Litigation Division
The Port Authority of
New York and New Jersey
One World Trade Center
New York, New York 10048

Ezra I. Bialik, Esq.
Steve Leipsiz, Esq.
New York State Attorney
General's Office
Two World Trade Center
New York, New York 10047

Alfred B. Del Bello
Westchester County Executive
148 Martine Avenue
White Plains, New York 10601

Andrew S. Roffe, Esq.
New York State Assembly
Albany, New York 12248

Renee Schwartz, Esq.
Paul Chessin, Esq.
Laurens R. Schwartz, Esq.
Botein, Hays, Sklar & Herzberg
200 Park Avenue
New York, New York 10166

Stanley R. Klimberg
New York State Energy Office
2 Rockefeller State Plaza
Albany, New York 12223

Ruth Messinger
Member of the Council of the
City of New York
District #4
City Hall
New York, New York 10007

Marc L. Parris, Esq.
County Attorney
County of Rockland
11 New Hempstead Road
New City, New York 10010

Joan Miles
Indian Point Coordinator
New York City Audubon Society
71 W. 23rd Street, Suite 1828
New York, New York 10010

Greater New York Council on Energy
c/o Dean R. Corren, Director
New York University
26 Stuyvesant Street
New York, New York 10003

Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Atomic Safety and Licensing Appeal Board Panel
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Richard L. Brodsky
Member of the County Legislature
Westchester County
County Office Building
White Plains, New York 10601

Phyllis Rodriguez, Spokesperson
Parents Concerned About Indian Point
P.O. Box 125
Croton-on-Hudson, New York 10520

Charles A. Scheiner, Co-Chairperson
Westchester People's Action Coalition, Inc.
P.O. Box 488
White Plains, New York 10602

Stewart M. Glass
Regional Counsel, Room 1347
Federal Emergency Management Agency
26 Federal Plaza
New York, New York 10278

Alan Latman, Esq.
44 Sunset Drive
Croton-on-Hudson, New York 10520

Richard M. Hartzman, Esq.
Lorna Salzman
Friends of the Earth, Inc.
208 West 13th Street
New York, New York 10011

Zipporah S. Fleisher
West Branch Conservation Association
443 Buena Vista Road
New City, New York 10956

Mayor F. Webster Pierce
Village of Buchanan
236 Tate Avenue
Buchanan, New York 10511

Judith Kessler, Coordinator
Rockland Citizens for Safe Energy
300 New Hempstead Road
New City, New York 10956

David H. Pikus, Esq.
Richard F. Czaja, Esq.
330 Madison Avenue
New York, New York 10017

Amanda Potterfield, Esq.
Johnston & George
528 Iowa Avenue
Iowa City, Iowa 52240

Ruthanne G. Miller, Esq.
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Donald Davidoff, Director
Radiological Preparedness
Group
Empire State Plaza
Tower Building - Room 1750
Albany, New York 12237

Jonathan D. Feinberg
New York State Public
Service Commission
Three Empire State Plaza
Albany, New York 12223

Steven C. Sholly
Union of Concerned
Scientists
1346 Connecticut Ave., N.W.
Suite 1101
Washington, D.C. 20036

Craig Kaplan, Esq.
National Emergency Civil
Liberties Committee
175 Fifth Avenue-Suite 712
New York, New York 10010

David B. Duboff
Westchester Peoples'
Action Coalition
255 Grove Street
White Plains, N. Y. 10601

Spence W. Perry
Office of General Counsel
Federal Emergency
Management Agency
500 C Street, Southwest
Washington, D.C. 20472

Dated: January 12, 1983
New York, New York

Candida Canizio

1 BY MR. SOHINKI: (Resuming)

2 Q Gentlemen, before I turn you over for cross

3 examination, could you give us a brief summary of your

4 testimony?

5 A (WITNESS ROTHSTEIN) Yes. In our testimony we

6 describe the cooling system in the containment at the

7 Indian Point 2 plant and the use of Hudson River water

8 in cooling.

9 We describe our examination of the cooling

10 system and associated piping during the recent

11 maintenance refueling outage. We conclude that the

12 Hudson River is not particularly corrosive and that the

13 remedial measures that were implemented, namely the

14 elimination of the brazed joints from the earlier

15 version of our containment coolers and increasing the

16 flow velocity in the containment coolers, and I guess

17 improvement of the cement coating of our steel pipe have

18 all been effective in eliminating or reducing

19 corrosion. And we now conclude that our system is an

20 efficent, durable one.

21 MR. SOHINKI: Thank you, gentlemen. We have

22 no further questions.

23 Mr. Chairman, the witnesses are available for

24 cross examination.

25 JUDGE GLEASON: Mrs. Fleisher?

1 MS. FLEISHER: Your Honor, I believe it was
2 December 2nd, 2nd or 4th, 1981, we presented our
3 credentials at a prehearing conference, and at that time
4 Mr. Fleisher was certified to represent as vice
5 president the West Branch Conservation Association, and
6 he will do the cross examining. Thank you.
7 JUDGE GLEASON: Mr. Fleisher.
8 CROSS EXAMINATION
9 BY MR. FLEISHER:
10 Q Gentlemen, starting on page 4 of your
11 testimony, Section 2, corrosiveness of the Hudson River
12 water -- these are general questions, not too any
13 specific line --
14 MR. SOHINKI: Excuse me, Mr. Fleisher. I
15 think you said Section 2. I don't see that at page 4 of
16 the witnesses' --
17 MR. FLEISHER: Well, it actually starts on
18 page 3, but it is continued on page 4. And I believe my
19 question more will be directed to what's on page 4 than
20 what is on page 3.
21 BY MR. FLEISHER: (Resuming)
22 Q Were all the fan cooler coils, headers and
23 branch piping recently replaced at Indian Point 2?
24 A (WITNESS ROTHSTEIN) They were replaced in
25 1980.

1 Q Thank you.

2 How many years was this equipment in service

3 before being replaced in 1980?

4 A (WITNESS ROTHSTEIN) Approximately seven years.

5 Q Of what material were the coils constructed?

6 A (WITNESS ROTHSTEIN) The original coils were

7 copper-nickel.

8 Q What material was the later piping constructed

9 from; that is, from the headers to the connections of

10 the coils?

11 A (WITNESS ROTHSTEIN) The small diameter pipe

12 was either copper-nickel or cement-lined steel. The

13 large diameter pipe was essentially all cement-lined

14 steel.

15 Q What was the reason for replacing the coils?

16 A (WITNESS ROTHSTEIN) The principal reason for

17 replacing the coils was that the old coils were built up

18 out of several short sections. There was a header to

19 which was brazed a short copper-nickel stub. To that

20 stub in turn there was a braze of a straight length of

21 tubing, and then a short U-section was brazed to that

22 straight length, a second straight length brazed to the

23 other end of the U back to another stub and finally back

24 to the header. So that in one U-bend there were four

25 brazes in the U-tube plus two brazes where the U-tube

1 was going to the header.

2 JUDGE SHON: Mr. Rothstein, before you go any

3 further, you are describing this in words rather than

4 pictures, and you have used the word "header"

5 consistently. Is that the same in this case as the

6 water box?

7 WITNESS ROTHSTEIN: No. In the design of the

8 earlier coolers there was no true water box. There was

9 not a box to which all the tubes led which could be

10 opened for examination of tubes. But instead the tubes

11 led into a pipe, and the pipe is what I referred to as a

12 header. In the wall of the pipe there was simply a

13 drilled hole in which the stubs were inserted and brazed

14 to the pipe.

15 JUDGE SHON: That is what I thought the usual

16 distinction is between the pipe as a header and a water

17 box, but now the new coolers have water boxes instead of

18 simple headers, is that right?

19 WITNESS ROTHSTEIN: That is correct. In the

20 new coils the tubes are U-tubes. These are one-piece

21 U-tubes. The U-tubes are rolled into a tube sheet, and

22 the tube sheet is part of a water box. There is a frame

23 around the tube sheet and a cover plate over that frame

24 making a cubic arrangement. That water box is split so

25 that one side of the U is the inlet, and the other side

1 of the U is the outlet portion of the assembly.

2 JUDGE SHON: How are the seams in the water

3 box made, by brazing or by some other means?

4 WITNESS ROTHSTEIN: No. The seams -- the

5 frame of the water box, which is a rectangular shape

6 that is open at top and bottom, the sides of the

7 rectangle are welded together so that essentially the

8 rectangle is one piece. The joint between that

9 rectangulage shape and the tube sheet is made up with a

10 gasket, as is the joint between that rectangular frame

11 and the cover plate made up with a gasket, and the hole

12 is bolted together.

13 JUDGE SHON: Thank you.

14 I am sorry to have interrupted, Mr. Fleisher,

15 but I wanted to get the physical arrangement clear in my

16 own mind.

17 BY MR. FLEISHER: (Resuming)

18 Q I think we got a little astray from what the

19 intent of my question was. Maybe I should rephrase it

20 really.

21 Weren't the coils removed because they were

22 leaking and were beyond reasonable repair?

23 A (WITNESS ROTHSTEIN) That is correct. The

24 leaks were principally --

25 Q That's enough.

1 MR. SOHINKI: I think the witness is entitled
2 to explain the answer, Mr. Chairman.
3 WITNESS ROTHSTEIN: The leaks were principally
4 in the brazed joint. There were some leaks in the
5 mid-body of the tube, and at the time we had no
6 technique for examining the tubes to determine -- that
7 is, for nondestructively examining the tubes to
8 determine whether or not there were other areas of
9 potential leaks.
10 BY MR. FLEISHER: (Resuming)
11 Q Were the leaks caused by corrosion?
12 A (WITNESS ROTHSTEIN) Yes.
13 Q Was the corrosion due to the Hudson River
14 brackish water?
15 A (WITNESS ROTHSTEIN) The corrosion was due to
16 water. Whether the water was brackish or not I don't
17 believe entered into the rate of corrosion that we saw
18 in the assembly.
19 Q You are stating then that this same corrosion
20 would have taken place at the same rate with pure water?
21 A (WITNESS ROTHSTEIN) Essentially the same
22 rate, yes.
23 Q Going to page 5 of your testimony,
24 paraphrasing, you testify that the saline water is used
25 in 33 percent of the domestic nuclear plants, is that

1 correct?

2 A (WITNESS TUTHILL) That is correct.

3 Q How many of these plants use the saline water

4 inside containment building for cooling purposes?

5 A (WITNESS TUTHILL) I have no specific

6 knowledge on that point. The 30 --

7 Q Do you have any idea about it? Is it 1 or 20?

8 A (WITNESS TUTHILL) You have to ask the

9 designer of the plant as to whether he put it inside the

10 containment or outside. That was not within the scope

11 of the question I addressed.

12 MR. SOHINKI: Mr. Tuthill, can I caution you

13 to speak into the microphone? I think some people are

14 having difficulty.

15 WITNESS TUTHILL: Certainly.

16 BY MR. FLEISHER: (Resuming)

17 Q Also, on page 5, under Section 3, Inspection

18 of Fan Cooling System, when you made the inspection, how

19 many hours had the fan coolers been used since the

20 replacement until the time of your inspection?

21 A (WITNESS ROTHSTEIN) I would approximate the

22 length of service as approximately 18 months, 18 to 20

23 months.

24 Q In that time what was the operating factor or

25 how much of that time were the system on line?

1 A (WITNESS ROTHSTEIN) As far as I know, the fan
2 coolers were on line continuously.
3 Q What was the capacity factor of that system
4 during that 18 months, do you know?
5 A (WITNESS ROTHSTEIN) I don't recall. It was
6 fairly high, if you are talking the capacity of the
7 power plant itself.
8 Q Of that Indian Point 2 unit.
9 A (WITNESS ROTHSTEIN) It was fairly high, but I
10 don't recall precisely.
11 Q In your study did you make a detailed
12 comparison of the chemistry of the water during the
13 period of the prior use -- that is, up until the time
14 the coils -- the seven years the coils were used before
15 replacement, and with the year and a half that they were
16 in use after the replacement?
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1 A (WITNESS ROTHSTEIN) The river water is
2 sampled daily. We run analyses regularly. I don't
3 believe that there has been any significant change in
4 the composition of the water.
5 Q Doesn't the composition of the water vary with
6 the rainfall, the rainfall for the year?
7 A (WITNESS ROTHSTEIN) Yes, it does, but the
8 variation that we saw during the last year and a half of
9 operation was no different than the variation that we
10 had previously seen.
11 Q That was the question I asked you
12 originally -- whether you had compared them -- and you
13 said "no", from the seven years prior to the year and a
14 half post.
15 A (WITNESS ROTHSTEIN) I would say substantially
16 they were the same.
17 Q Substantially no change?
18 A (WITNESS ROTHSTEIN) That's right.
19 MR. FLEISHER: That is all the questions I
20 have.
21 JUDGE GLEASON: All right. Any redirect?
22 MR. SOHINKI: I just have one question, Mr.
23 Chairman.
24 REDIRECT EXAMINATION
25 BY MR. SOHINKI:

1 Q Mr. Tuthill, you earlier stated you were not
2 aware of how many of that 33 percent of nuclear plants
3 on brackish estuaries used brackish water inside
4 containment. How dependent is the corrosion rate on a
5 given material, depending on whether it is used inside
6 or outside containment?
7 A (WITNESS TUTHILL) There is no difference
8 whether it is inside or outside containment as far as
9 the corrosivity of the water is concerned. The water
10 does not know where it is.
11 MR. SOHINKI: Thank you. I have no further
12 questions.
13 JUDGE GLEASON: Mr. McGurren?
14 MR. MC GURREN: The Staff has no questions.
15 JUDGE GLEASON: All right. Does the Board
16 have questions?
17 BOARD EXAMINATION
18 BY JUDGE SHON:
19 Q Gentlemen, I would like to get a little closer
20 notion of the actual change in the situation pre and
21 post when the leakage occurred and the window coolers
22 were replaced.
23 First of all, the leakage was, as we have
24 heard, due to corrosion, was it not?
25 A (WITNESS ROTHSTEIN) Yes, sir.

1 Q What was the nature of that corrosion, and by
2 that I mean the kind of corrosion rates you have quoted
3 are the sort of uniform corrosion rates in mils per year
4 that people talk about, but there are many other kinds
5 of corrosion. There is stress corrosion cracking and
6 pitting, and there is galvanic action and things like
7 that.
8 What was the nature of the corrosion where the
9 leakage took place? Was it simple uniform corrosion?
10 A (WITNESS ROTHSTEIN) There were two types of
11 corrosion. The braised joints were much less than
12 perfect and contained significant amounts of voids or
13 porosity in the joint. The leaks in those braised
14 joints was essentially a corrosion of the braised
15 material along regions of prior porosity or prior voids
16 so that the leak path or the amount of braised material
17 that had to be corroded away in order to form a leak
18 path was minimal. Those were the joints that leaked
19 early.
20 The other form of corrosion was a form of
21 pitting resulting from the deposition of silt on the
22 surface of the tubing and under the silt pitting
23 develops because you have a slightly different
24 composition of water under the silt as compared to the
25 water surrounding that silt deposit.

1 You get an aggravated corrosion in a very
2 local spot and in our destructive examination, for
3 example, we found pits that were half to three-quarters
4 of the way through the tube wall and yet no later than a
5 sixteenth of an inch in diameter.
6 Q Then there were, in effect, two kinds of
7 corrosion -- corrosion at the braised points and
8 corrosion away from the braised points due to silting
9 and a change in concentration, is that right?
10 A (WITNESS ROTHSTEIN) That is correct.
11 Q Now you had said that the braising was
12 eliminated in the new design in summarizing your
13 testimony. I didn't actually see that in your
14 testimony, though it may have been there. I may have
15 missed it. It was partly because of that that I
16 questioned you so closely on the design and structure of
17 the water boxes and U-tubes. I wanted to find out if
18 all the braises had been eliminated. That seems to take
19 care of that one matter.
20 How about the matter of silting? Has anything
21 been done about that?
22 A (WITNESS ROTHSTEIN) Yes. We have increased
23 the rate of flow of cooling water through the coils.
24 The initial rate of flow was approximately one foot per
25 second, which is adequate to remove the heat from

1 containment, but at that rate of flow silt is not
2 carried by the river water as it flows through the
3 tubes. It deposits on all surfaces.
4 In our current practice, we have increased
5 that rate of flow to approximately three to four feet
6 per second. At three to four feet per second silt does
7 not deposit.
8 Q You don't, then, meet the other horn of the
9 dilemma by having erosion of some sort take place
10 because of the increased flow rate, do you?
11 A (WITNESS ROTHSTEIN) Well, the amount of
12 erosion that you see at four feet per second is
13 insignificant. Copper-nickel can tolerate flow rates
14 well above eight feet per second safely.
15 Q That is what I wanted to hear you say. The --
16 Mr. Fleisher had also mentioned, although I think he did
17 not specifically say this, that there was also
18 substantial corrosion in portions of the system made of
19 mild steel. You told us that the mild steel is
20 generally protected with concrete.
21 Is it true that substantial leaking and
22 corrosion occurred there and what has been done to
23 change that?
24 A (WITNESS ROTHSTEIN) The corrosion in the mild
25 steel occurred principally -- or, I should say,

1 entirely -- at welded joints. The mild steel is
2 cement-coated and when the weld joints were made the
3 coating spolled off at the joint and was not replaced,
4 leaving bare carbon steel exposed to the river water.
5 During the outage in 1980-81, we examined each
6 and every one of those weld joints and where we found
7 that the cement coating was incomplete we cleaned up the
8 surface, built it up as necessary with weld deposits,
9 and then coating the inside surface with cement so as to
10 protect it against future corrosion.
11 Q So in effect it is all covered now by cement,
12 is it?
13 A (WITNESS ROTHSTEIN) Yes. If I can just offer
14 this, during the recent refueling maintenance outage we
15 reexamined those joints and found in every case that the
16 cement coating was still intact and that no corrosion
17 had taken place.
18 Q As a final question on this, on page five you
19 mentioned having examined these tubes after their use
20 for about 18 months or something on that order. Did you
21 find at that time that the radiation levels were so high
22 as to give you difficulties in examining them? Mr.
23 Fleisher has testified that the radiation levels around
24 the previously-removed tubes were extremely high and
25 that he couldn't look at them.

1 A (WITNESS ROTHSTEIN) The radiation level, the
2 activity develops from the fact that in service, as
3 containment air is drawn over the cooler, dust in that
4 air deposits on the fins around the tubing. That dust
5 becomes slightly radioactive. In the examination of the
6 tubes, the destructive examination of the tubes, we cut
7 tubes out of the cooler, cut away the fins and removed
8 the tubes. The tubes themselves are not radioactive at
9 all.
10 BY JUDGE PARIS:
11 Q Can I interject a question here? How does the
12 dust become slightly radioactive?
13 A (WITNESS ROTHSTEIN) Well, the dust in the
14 plant generally is radioactive. It picks up activity
15 from exposure during operation of the plant.
16 Q Neutron bombardment?
17 A (WITNESS ROTHSTEIN) Yes.
18 Q Okay.
19 BY JUDGE SHON: (Resuming)
20 Q One last question. I direct this specifically
21 to you, Mr. Rothstein. Since you did testify previously
22 on Question 2.2.1, which had to do with steam
23 generators, this question is not strictly applicable to
24 2.2(a) but concerns something you said about that. We
25 have heard something from Mr. Fleisher about that, and

1 I just wanted to compare the information we are getting
2 from two sources -- the same question I asked Mr.
3 Fleisher a while ago.
4 In the steam generator, is the radiation level
5 high enough to appreciably influence corrosion of
6 stainless steel?
7 A (WITNESS ROTHSTEIN) I don't believe so, sir.
8 The activity in the steam generator is of the order of
9 100 MR per hour -- 150 MR per hour -- extremely low, and
10 I don't believe any ionization takes place.
11 JUDGE SHON: Thank you. I have no further
12 questions.
13 BY JUDGE PARIS: (Resuming)
14 Q I have a question to direct to the panel -- to
15 both of you. On page seven and eight you discuss the
16 hybrid closed loop cooling system that Bechtel proposed
17 or recommended as an alterative to what you were using,
18 and you say you rejected the hybrid closed loop cooling
19 system because the complexities and associated potential
20 for reduced system reliability of such a system made it
21 less desirable from what you were using.
22 It sort of sounds to me like you invoked, like
23 Mr. Fleisher, Murphy's Law in your reasoning there, and
24 I wonder if you could explain to us in somewhat more
25 technical terms why you think that the hybrid closed

1 loop system would be less reliable than what you are
2 using.
3 A (WITNESS ROTHSTEIN) The hybrid system, to
4 begin with, requires dual heat exchangers, if we
5 consider that portion of the hybrid system, that would
6 operate under normal operating circumstances. That
7 would be a closed loop system. We would require a heat
8 exchanger inside containment, as we now have, and we
9 would require another heat exchanger outside of
10 containment to cool the water as it circulates in that
11 closed loop, thereby introducing, let's say, another
12 system.
13 And that system could be any one of a number
14 of different kinds of heat exchangers, either a tubular
15 device or an evaporative cooler, but it is still another
16 system that has to be factored into our consideration.
17 During the open loop portion of operation of this hybrid
18 system, we would have to switch over from the closed
19 loop to the once-through river cooling that we now have
20 and that would require a system of valving which is not
21 necessary at the present.
22 Q Under what circumstances would you switch from
23 the closed loop to the open loop system?
24 A (WITNESS ROTHSTEIN) Well, that switch would
25 be required when there is a safety injection signal, say

1 in the event of a LOCA.

2 Q Is that because the closed loop system does

3 not cool as efficiently as the open loop system?

4 A (WITNESS ROTHSTEIN) That is correct. It is a

5 smaller system than the open loop system.

6 Q Okay. Go ahead. Anything else?

7 A (WITNESS ROTHSTEIN) That is essentially the

8 complexities that we see in the hybrid system.

9 JUDGE PARIS: I see. Okay. Thank you.

10 JUDGE GLEASON: All right, gentlemen. You may

11 step down, please. We will now take a ten-minute

12 recess.

13 (A brief recess was taken.)

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1 JUDGE GLEASON: Can we proceed, gentlemen?

2 The Power Authority will call its witnesses

3 next.

4 MR. LEVIN: Yes, Your Honor. The Power

5 Authority calls John C. Brons, Kenneth R. Chapple, and

6 William Spataro.

7 Whereupon,

8 JOHN C. BRONS,

9 KENNETH R. CHAPPLE,

10 and

11 WILLIAM SPATARO

12 were called as witnesses by counsel for the Power

13 Authority of the State of New York and, having been duly

14 sworn by the Chairman, were examined and testified as

15 follows:

16 DIRECT EXAMINATION

17 BY MR. LEVIN:

18 Q Mr. Brons, would you state your full name,

19 business address and your position with the Power

20 Authority?

21 A (WITNESS BRONS) I am John C. Brons. My

22 business address is Indian Point-3 Nuclear Power Plant,

23 Buchanan, New York. I am the Resident Manager at the

24 Indian Point Unit 3 station.

25 Q Mr. Chapple, would you do the same?

1 A (WITNESS CHAPPLE) I am Ken R. Chapple. I am
2 Acting Director/Nuclear Operations and Maintenance, and
3 I work out of the White Plains office at 123 Main
4 Street.
5 Q And you, Mr. Spataro, will you also do the
6 same?
7 A (WITNESS SPATARO) My name is William H.
8 Spataro. I am Supervisory Metallurgist in Mechanical
9 Design Analysis Engineering Division, stationed at 123
10 Main Street, White Plains.
11 Q Gentlemen, do you have before you a document
12 entitled "Power Authority's Testimony of John C. Brons,
13 Kenneth R. Chapple, and William Spataro, Contention
14 2.2(a)", dated January 12, 1983?
15 A (WITNESS BRONS) We do.
16 Q Do you have any corrections or additions to
17 that testimony?
18 A (WITNESS SPATARO) I do.
19 Q Would you state those, please?
20 A (WITNESS SPATARO) Page two, second paragraph,
21 first line, after my name I should like to change the
22 word "senior" to the word "supervisory".
23 Page five, second paragraph, second line, I
24 shall read the second line. "Now manufactured from a
25 family of iron-nickel-chromium-molybdenum alloys."

1 Strike 904-L, and on the third line change the range of
2 molybdenum to read "four to six percent".
3 Q Could you give that to us one more time just
4 to make sure the court reporter, the Board and the
5 parties have that accurately?
6 A (WITNESS SPATARO) The new fan cooler units
7 and associated piping are now manufactured from a family
8 of iron-nickel-chromium-molybdenum alloys (23 to 28
9 percent nickel, 19 to 23 percent chromium, 4 to 6
10 percent molybdenum)."
11 MR. LEVIN: Does everyone have that change?
12 BY MR. LEVIN: (Resuming)
13 Q Gentlemen, with those corrections, is this
14 your testimony?
15 A (WITNESS BRONS) It is.
16 A (WITNESS CHAPPLE) It is.
17 A (WITNESS SPATARO) It is.
18 Q Was it prepared under your direction and
19 supervision?
20 A (WITNESS SPATARO) It was.
21 A (WITNESS CHAPPLE) It was.
22 A (WITNESS BRONS) Yes.
23 Q Is it true and correct to the best of your
24 information, knowledge and belief?
25 A (WITNESS BRONS) Yes.

1 A (WITNESS CHAPPLE) Yes.

2 A (WITNESS SPATARO) Yes.

3 MR. LEVIN: Your Honor, at this time the Power

4 Authority offers the testimony of Mr. Brons, Mr.

5 Chapple, and Mr. Spataro on Contention 2.2(a) into the

6 record as if read in full.

7 JUDGE GLEASON: Is there objection?

8 Hearing none, the testimony -- the statement

9 of Mr. John Brons, Chapple and Spataro will be bound

10 into the record as the testimony of these gentlemen, as

11 if read.

12 [The testimony of Messrs. Brons, Chapple and

13 Spataro follows:]

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Insert #4

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD
Before Administrative Judges:
James P. Gleason, Chairman
Frederick J. Shon
Dr. Oscar H. Paris

In the Matter of	)	
	)	
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. (Indian Point, Unit No. 2)	)	Docket Nos. 50-247 SP 50-286 SP
	)	
POWER AUTHORITY OF THE STATE OF NEW YORK (Indian Point, Unit No. 3)	)	Jan. 12, 1983

POWER AUTHORITY'S TESTIMONY OF
JOHN C. BRONS, KENNETH R. CHAPPLE, AND
WILLIAM SPATARO ON CONTENTION 2.2(a)

ATTORNEY FILING THIS DOCUMENT:

Charles Morgan, Jr.
MORGAN ASSOCIATES, CHARTERED
1899 L Street, N.W.
Washington, D.C. 20036
(202) 466-7000

I. INTRODUCTION

My name is John C. Brons, Resident Manager of Indian Point Unit No. 3, owned and operated by the Power Authority of the State of New York. Prior to joining the Power Authority in 1980, I had 21 years of experience in the United States Navy. My duty assignments included Commanding Officer of a nuclear submarine, Deputy Submarine Squadron Commander, and senior member of the Nuclear Propulsion Examining Board. In this third assignment, my last in the Navy, my duties included conducting intensive inspection of Atlantic Fleet nuclear-powered ships and setting standards of continued safe reactor operation.

As an employee of the Power Authority, I am senior Power Authority Manager at the Indian Point Unit No. 3 site, and have overall responsibility for the safe, efficient, and dependable operation of the unit. A statement of my professional qualifications is attached.

My name is Kenneth R. Chapple, Acting Director, Nuclear Operations and Maintenance, Indian Point Unit No. 3, owned and operated by the Power Authority of the State of New York. During my employment at the Power Authority, I have been assigned to Indian Point Unit No. 3 in the capacity of Outage Coordinator and Acting Superintendent of Training. I am presently assigned

the responsibility for reviewing the operations and maintenance practices at Indian Point Unit No. 3. A statement of my professional qualifications is attached.

My name is William Spataro, Senior Metallurgist, Mechanical Design and Analysis Department of the Power Authority of the State of New York. I have over 14 years experience in nuclear power plant design, construction, and operation. My responsibilities include material selection and evaluation, welding, nondestructive evaluation, protective coatings, corrosion resistance, interpretations of industry codes and standards, as well as implementation of quality control procedures. A statement of my professional qualifications is attached.

The purpose of this testimony is to addresss Contention 2.2(a) of this proceeding which reads as follows:

> 2.2: The following additional specific safety measures should be required as conditions of operation:
> a) The cooling system at the plants should be changed so that it no longer uses brackish Hudson River water. This change is needed to correct safety-related corrosion problems.

It is the position of the Power Authority that the current cooling water system in use at Indian Point Unit No. 3 is acceptable, as it does not pose an undue risk to the public health and safety.

II. DESCRIPTION OF COOLING WATER SYSTEM

A. Service Water System

The Service Water System was designed to supply cooling water from the Hudson River to various heat loads in both the primary and secondary portions of the plant. Provision was made to ensure a sufficient flow of cooling water during normal operation and under accident conditions to those systems and components necessary for plant safety, such as the containment fan cooler units and motor coolers. Sufficient redundancy of active and passive components was provided to ensure that cooling is maintained to vital loads for short and long periods in accordance with the single failure criterion.

B. Containment Air Recirculation Cooling and Filtration System

The Containment Air Recirculation Cooling and Filtration System was designed to remove the normal heat loss from equipment and piping in the reactor containment during normal plant operation, and to remove sufficient heat from the reactor containment following a design basis loss-of-coolant accident, in order to keep the containment pressure within the design limits.

The air recirculation system consists of five air handling units. The cooling water requirements for all

five fan cooling units and motor coolers during a major loss of primary coolant accident and recovery are supplied by two of the three nuclear service water pumps.

The cooling water which discharges from the cooling coils is monitored for radioactivity by routing a small bypass flow from each coil through a common radiation monitor. Upon indication of radioactivity in the effluent, each cooler discharge line is monitored individually to locate the defective cooling coil which, when identified, would remain isolated. Operation would continue with the remaining units. Local flow and temperature indication is provided outside containment for service water flow to each cooling unit. Abnormal flow alarms are provided in the Control Room.

III. STATUS OF CORROSION IN SERVICE WATER SYSTEM AT INDIAN POINT UNIT NO. 3

During the early operating experience of Indian Point Unit No. 3, certain corrosion mechanisms were identified in the containment fan cooler system. As a result, the Power Authority conducted a materials compatability study for the containment fan cooling coils. Based upon the findings of the study it was decided to change the materials used in the containment fan coolers.

The original material used for the Containment Fan Coolers was a cupronickel alloy called 90/10Cu Ni (90% copper, 10% nickel). Due to several factors, including low flow and silt conditions, anaerobic bacteria were able to thrive in the Cooler Units and cause a pitting type of corrosion. Research began on how to guard against this type of corrosion. The result was a decision to rid the system of copper.

The new fan cooler units and associated piping are now manufactured from a Nickel alloy--904L (23-28% Nickel, 19-23% Chromium, 4-5% Molybdenum). The Power Authority believes that these material changes eliminate any further corrosion problems from brackish water inside containment.

IV. MODIFICATIONS MADE AT INDIAN POINT UNIT NO. 3

In addition to the above-mentioned equipment changes, the following modifications were all installed in 1980, and are designed to improve the ability to detect water leakage inside the containment.

- Reactor Pit Water Level Alarm

  This modification consisted of the installation of level switches at the Reactor Pit to provide two (2) water level alarms in the Control Room. The first alarm point is activated when the water level reaches 2.5", and the second at 6".

- Containment Sump Overflow Indication

  This modification consisted of the installation of a level sensor at the containment sump to provide an alarm in the Control Room of containment sump overflow.

- Replacement of Reactor Cavity Sump Pumps

  The purpose of this modification was to replace the existing two Reactor Cavity Sump Pumps with pumps of improved reliability.

V. SUMMARY

As detailed in the above testimony, there exist no current safety concerns with regard to the use of Hudson River water for cooling purposes.

Mr. Fleisher, in his testimony, has stated that a closed loop cooling system could use high purity water and no chemical additives would be required. This is not the case because without proper additives there would be no significant difference between the untreated high purity water and brackish water as far as corrosivity to materials is concerned.

The Power Authority believes that this testimony, in conjunction with the testimony presented on Board Question 2.2.1, provides the Board with sufficient and adequate information such that the Board may recommend to the Commission that the current use of Hudson River

water is the acceptable and preferable source of cooling water for Indian Point Unit No. 3.

NAME: JOHN C. BROWS

PROFESSIONAL RECORD January 1981 to Present:

POWER AUTHORITY OF THE STATE OF NEW YORK
Resident Manager - Indian Point 3 Nuclear Power Plant
Buchanan, New York 10511

Senior Power Authority Manager at the site, having overall responsibility for safe, efficient and dependable operation of Indian Point 3 Nuclear Power Plant. Implement all administrative controls in conformance with applicable regulatory requirements regarding the facility and responsible for coordination of all station functions through the Superintendent of Power, Plant Superintendents and other key personnel. Serve as chairman of the Plant Operations Review Committee and as a member of the Safety Review Committee.

June 1959 to January 1981: UNITED STATES NAVY

June 1978 to January 1981: Senior Member, Nuclear Propulsion Examining Board reporting to Admiral H. G. Rickover, USN and to Commander-in-Chief, U. S. Atlantic Fleet. Conduct annual inspections of all Atlantic Fleet nuclear powered ships to set standards of continued safe reactor operation. These intensive inspections, requiring from two to four days per ship, are conducted by a senior member supported by a group of officers who have served as Engineer Officer of a nuclear powered ship. Each examination includes: observation of casualty drills, maintenance evaluations, water chemistry and radiochemistry analyses; verification of adequate maintenance of systems affecting reactor protection; administrative reviews of training, qualification, technical documentation, radiological controls, chemistry controls, waste disposal and radiation health; verification of adequate operator level of knowledge through oral and written examinations. It is within the authority of the Senior Member, based upon examination results, to allow license for continued reactor operation to remain with the ship or to revoke this license if deviations from the standard require it.

Conduct similar inspections with emphasis on radiological controls practices, on nuclear ship maintenance facilities. Inspect training facilities ashore for adequacy of training support for nuclear operators. Observe and evaluate drills demonstrating home port sites' preparedness for emergencies associated with the shipborne nuclear reactors.

Assignment entails briefing of the Commanders of the Air, Surface and Submarine Forces, Atlantic, the technical staff of the Division of Naval Reactors, Department of Energy, and Commanding Officers on the performance of their ships in the reactor safeguards area.

Authored a technical article concerning the audit of all aspects of radiological controls operations and a nuclear fleet wide procedure for obtaining consistent, reliable radiochemistry samples. Contributed to other articles and procedures dealing with reactor plant training and operation.

Duties required extensive travel on the eastern seaboard and in Western Europe.

May 1977 to June 1978:

Deputy Commander, Submarine Squadron Six. Responsible for the training and readiness of thirteen nuclear fast attack submarines of this Norfolk based squadron. Worked with the individual Commanding Officers to train their crews in the areas of weapons employment, use of tactical sensors, communications equipment, deployed operations and nuclear propulsion plant matters. Prepared operation plans and schedules to evaluate the results of this training and to measure the ship's readiness. Plans frequently required coordination of naval air and surface forces supporting these operations. Conducted various inspections to insure high standards were maintained in reactor plant and weapons safety. Played a prominent role in the development of operating doctrine for the advanced digital sonar and underwater fire control systems of the SSN 688 class submarine following delivery of the lead ship and subsequent ships to this squadron. Authored a major article on weapons employment tactics and several monographs on tactical sensors which were adopted for submarine force wide use. Restored a World War II submarine for use as a submersible, expendable target.

June 1973 to April 1977:

Commanding Officer, USS RICHARD B. RUSSELL (SSN 687). Assignment consisted of two distinctly different phases. Initially formed the crew during the ship's construction at Newport News Shipbuilding, a division of Tenneco, at Newport News, Virginia. Developed ship's procedures and trained watch standers to conduct reactor plant testing and startup. Operated the ship on builder's and government trials. Represented the Navy in monitoring the quality and rate of construction. Acted as the government agent in the acceptance of all ship's systems preparatory to delivery. Coordinated the efforts of several government agencies and the civilian ship builder in a complex military-industrial effort. Achieved an unusual rapport between the crew and the shipbuilder which resulted in a highly successful

government acceptance trial with a record low number of construction deficiencies, and in delivery of the ship to the Navy somewhat earlier than expected. Efforts won wide praise from both the government and the ship builder.

Following commissioning, USS RUSSELL was assigned to the Submarine Development Squadron in New London, Connecticut for shakedown and deployed operations. Developed operating procedures for the Navy's first digital underwater fire control system. Deployed the first submarine satellite communications system and a broad band digital system for over-the-horizon targeting. Directed the preparation of several digital programs to mechanize cruise missile control algorithims and anti-submarine warfare search proccedures for shipboard use. Briefed senior Navy and DOD officials on these and other state of the art systems.

Throughout both phases managed all aspects of ship's operation and maintenance including personnel and fiscal matters.

June 1971 to June 1973:

Executive Officer, USS JACK (SSN 605). Supervised crew training, ship's administration, maintenance operations and personnel matters during a thirteen month overhaul at the Portsmouth Naval Shipyard, Kittery, Maine. Heavily involved with the unusual aspects of maintenance and operation associated with this ship's unique steam propulsion plant. Resolved numerous difficult personnel situations arising from the relocation of the ship's crew from the overhaul yard to a new home port in the midst of an accelerated schedule to deploy for high priority operations. Coordinated this home port shift, several major inspections, intensive training requirements and a change of command in one-fourth the normal allotted time. Managed a pilot program which permitted nearly 50 percent of the crew to return to the United States from the Mediterranean for leave and advanced schooling, which resulted in retention and advancement statistics for the crew which were well above the fleet average in spite of the ship's demanding operational schedule.

June 1970 to June 1971:

Graduate student, Rensselaer Polytechnic Institute. Awarded Master of Science in Management. Elected member Epsilon Delta Sigma Management Honor Society for achieving a grade point average of 3.87 over 45 graduate hours. Offered a teaching fellowship in accounting but Navy commitments precluded acceptance. Selected by the Dean to participate in a management consulting effort at the MTI Corporation, Schenectady, New York. Directed the financial management and accounting portion of the study. Author of the complete management study.

March 1968 to June 1970:

Executive Officer, Nuclear Power Training Unit at West Milton, New York. Training unit consisted of two prototype

reactor plants with associated classroom, maintenance and administrative facilities is operated for the Navy by the Knolls Atomic Power Laboratory (KAPL) of the General Electric Company. Position of Executive Officer required a high degree of coordination between Navy, Atomic Energy Commission (AEC), and KAPL personnel. Managed personnel administration for a combined staff and student population of 900 to 800. Monitored all aspects of training operations. Assisted KAPL personnel in the development of new training programs. Monitored reactor plant operations including a refueling and accelerated core depletion for safety and procedural compliance reporting to the senior AEC representative. Participated in qualification examinations for nuclear propulsion plant operators including Chief Operators as the AEC representative.

May 1965 to March 1968:

Chief Engineer, USS STURGEON (SSN 637). This ship built at the Electric Boat division of the General Dynamics Corporation in Groton, Connecticut is the lead ship of the Navy's largest class of nuclear submarines. Initially working with quarter scale wooden mock-ups well before the ship was launched, participated in many design developments which have become standard in all follow on ships of this versatile and highly successful class. Prepared all ship's system operating procedures. These procedures were adopted as standards for remaining ships of the class and in some cases for other classes of ships with similar systems. Trained the propulsion plant crew. Accomplished reactor plant pre-core, post core and critical testing in less time than had ever been done at that shipyard. Assumed additional duties as the ship's sonar officer during its first deployment following commissioning.

October 1963 to May 1965:

Supply Officer and Main Propulsion Assistant, USS DACE (SSN 607). Established Supply Department procedures as a member of the pre-commissioning detail of this new construction submarine at Ingalls Shipbuilding, a division of Litton Industries, at Pascagoula, Mississippi. Supervised initial load out and continued repair parts support. Managed a three million dollar (1963 dollars) inventory and a $400,000 annual operating budget. Accountable for all commissary and food service operations. Following delivery of the ship to the Navy in April 1964, assumed concurrent duties as Main Propulsion Assistant. Supervised operation and maintenance of all fluid and mechanical systems in the propulsion and reactor plants.

March 1962 to October 1963:

Submarine and nuclear training. Graduated in the top ten percent of these officer's advanced courses.

October 1960 to February 1962:

Communications Officer, USS SIRO (DLG 10). Member of the pre-commissioning detail on this new construction

frigate built at Puget Sound Naval Shipyard, Bremerton, Washington. Supervised the installation, testing and initial operation of the first shipborne computer controlled, high capacity communication system. Worked closely with representatives of the vendor and the Navy to develop this system which is now in widespread use.

July 1959 to October 1960: Navigator and Communications Officer, USS L. K. SWENSON (DD 729). Supervised ship's navigation and communications during a wide variety of operations throughout the Pacific Ocean.

MISCELLANEOUS: Vice Chairman, Saratoga County (New York) Red Cross 1969-1971, Chairman Industrial Fund Raising Campaign Saratoga County Red Cross 1970-1971, Member Committee to evaluate and select mathematics textbooks for Hampton, Virginia elementary and junior high schools (1974). Member, Parish Council of various Roman Catholic churches. Designated by the Navy as a proven subspecialist in engineering and in weapons system acquisition management.

EDUCATION: U. S. Naval Academy, B. S. General Engineering 1959
Rensselaer Polytechnic Institute, M. S. Management, 1971.

Kenneth R. Chapple

EDUCATION: B.S. Degree in Nuclear Science
State University of New York
Maritime College at Fort Schuyler

PROFESSIONAL LICENSES: U.S. Coast Guard Third Assistant Engineer - Steam and Diesel of Unlimited Horsepower (Active)

Senior Reactor Operator
Indian Point Nuclear Generating Station, Unit No. 2 (Inactive)

Senior Reactor Operator
Indian Point 3 Nuclear Power Plant (Active)

EXPERIENCE: POWER AUTHORITY OF THE STATE OF NEW YORK

October 1981 - Present
Acting Director Nuclear Operations
& Maintenance IP #3

Responsible for providing direction and controlling the development, implementation and assessment of operations, maintenance and inservice inspection policies and standards for the Indian Point Nuclear Facility to insure safe and efficient operations.

August 1980 - September 1981
Nuclear Operations Engineer

Responsible for supervising and coordinating operations and maintenance activities related to the operation, maintenance and modification of nuclear power plant equipment and systems.

January 1980 - July 1980
Acting Superintendent of Training

Responsible for implementing and supervising all NRC required licensed training at the Indian Point #3 Nuclear Facility.

December 1976 - January 1980
Outage Coordinator

Responsible for overseeing and coordinating all activity conducted during major outages including planning and scheduling of all maintenance, surveillance and testing activity required to maintain the Indian Point #3 Nuclear Facility.

EXPERIENCE: (Cont'd)

CONSOLIDATED EDISON OF NEW YORK

September 1976 - May 1977
(Overlapping duties Dec.-May with PASNY)
License Training Instructor for Indian Point #2

Responsible for the License Operator Training program for Indian Point #2. Duties included giving lectures and examining liscensed operators in accordance with NRC regulations.

March 1976 - August 1976
Shift Outage Coordinator

Responsible for supervising all outage activities in the field on a rotating shift.

August 1975 - February 1976
Shift Supervisor

Responsible for the operation of the Indian Point #2 Nuclear Facility in accordance with NRC regulations.

January 1975 - August 1975
Shift Supervisor in Training

Responsible for learning the duties and qualify as a Shift Supervisor on the Indian Point #2 Nuclear Facility.

December 1973 - December 1974
Assistant Engineer

Participated in a Senior Reactor Operators Licensed Training Program.

July 1972 - November 1973
Assistant Engineer in Training

Assigned to various departments at the West 59th Street oil fired generating plant.

R E S U M E

William H. Spataro
Senior Metallurgist
Mechanical Design & Analysis Dept.
PAGNY

BACKGROUND

Over fourteen years experience in nuclear power plant design, construction and operation. Responsibilities included material selection and evaluation, welding, non-destructive evaluation, protective coatings, corrosion resistance, interpretations of industry codes and standards and implementation of quality control procedures.

Familiarization with NRC Regulatory Guides; ASME Boiler and Pressure Vessel Code Sections I,II,III Division 1 and 2, V, VIII, Division I and IX; ANSI B31.1 and AWS D1.1 Codes; and ASTM and ANSI Standards.

List of Nuclear Power Plant Assignments

Allens Creek	1200MW BWR	Oyster Creek	620MW BWR
Cooper Nuclear Unit #1	778MW BWR	St. Lucie Unit #1	810MW PWR
Forked River Unit #1	1120MW PWR	Salem Unit #1	1090MW PWR
Fort. St. Vrain Unit #1	330MW HTGR	Shearon Harris Unit #1	900MW PWR
H. B. Robinson Unit #2	652MW PWR	Three Mile Island #2	880MW PWR
Indian Point #3	965MW PWR	Vermont Yankee	514MW BWR
James A. FitzPatrick	800MW B W	WPPSS Hanford Unit #2	1100MW BWR
Millstone Unit #1	652MW BWR	Clinch River	375MW LMR

SPECIAL ASSIGNMENTS

Supervise fabrication and nondestructive examination of pressure vessel and piping components used in the Three Mile Island Nuclear Power Plant Recovery Effort.

Participate in material and fabrication feasibility study for Princeton University for a Tokamak fusion reactor power plant.

Author and lecturer of "Practical Metallurgy And Welding For Engineers" Course.

Author "Analysis and Monitoring of Condenser Tube Fouling", presented at Joint Power Generation Conference, Denver, October 1982.

RESUME

BACKGROUND SUMMARY

Fourteen years experience in Welding and Metallurgical Engineering, welding research, welding and repair welding procedure and specification development, non-destructive examination methods, corrosion evaluation, failure analysis and supervision of on-site fabrication and repair in nuclear, fossil-fueled and hydro electric power plants, transmission towers, gas transmission lines and industrial manufacturing facilities. Guest lecturer at manufacturing facilities, BOCES welding classes and local area welding shows.

Over twenty years practical welding experience utilizing shielded metal arc (SMAW), gas tungsten arc (GTAW), gas metal arc (GMAW), flux cored (open arc MIG) and oxy-acetylene welding, brazing, soldering and flame spray processes on ferrous and stainless steels, copper, nickel, aluminum and magnesium alloys and cast iron.

EXPERIENCE RECORD

POWER AUTHORITY OF THE STATE OF NEW YORK - September 1980 to Present

As Senior Metallurgist my responsibilities include supervision of the Metallurgy Subgroup on research and development projects, metallurgy, welding, non-destructive evaluation, and failure analysis to assist the Authority in the construction of a 700 MW fossil fueled plant and the operation of 2 nuclear, 1 fossil fueled, 2 pumped storage and 4 hydro electric units plus transmission lines connecting the projects to the New York State power grid, to Vermont and to the Canadian provinces of Quebec and Ontario.

The following were special assignments:

Direct failure analysis and repair program for PWR steam generators and LP turbines.

Develop a biofouling/heat transfer test program to obtain data on the service of stainless steel in Hudson River water at a low flow condition .

Present engineer and welder oriented training courses in welding and metallurgy to home office and site personnel.

BURNS & ROE, INC. - October 1977 to September 1980

As Senior Metallurgist my responsibilities included heat treating, metallurgy, welding, failure analysis, materials test programs, non-destructive examination and code interpretation for the liquid metal fast breeder nuclear reactor project. Authored and presented annual training program titled "Practical Welding and Metallurgy

for Engineers." Cited by company President for service on the Three Mile Island Recovery Effort, April-May 1979.

EUTECTIC CORPORATION - February 1977 to October 1977

As Applications Engineer, my responsibilities included the application and evaluation of the weldability of alloys, staff instructor for the Eutectic-Castolin Institute Welding School, assisting customers in the application of welding processes and alloys for production and repair problems and the writing and implementation of a quality assurance manual and procedures for welding electrode manufacturing operations.

BURNS & ROE, INC. - May 1973 to February 1977

As Metallurgical Engineer my responsibilities included materials selection and evaluation, welding, non-destructive examination, corrosion resistance evaluations and protective coatings, application and interpretation of industry codes and standards, and the implementation of quality assurance procedures for six nuclear power, five fossil fueled power and two desalination projects.

The following were special assignments:

Supervise welding procedure and non-destructive examination development for a combined stack for Units 1, 2 and 3, William F. Wyman Station, Yarmouth, Maine.

Perform corrosion survey of St. Croix and St. Thomas Desalination Plants, U. S. Virgin Islands.

Develop a Welding Inspector's Training course for company inspectors and lecture on welding metallurgy at various project sites throughout the country.

EBASCO SERVICES, INC. - July 1968 to May 1973

As Welding Engineer, my responsibilities included materials selection, welder and welding procedure qualifications, welding process development and failure analysis studies.

The following were special assignments:

As Inspection Welding Engineer, supervised and coordinated three construction companies performing inspection, repair and replacement operations on the 10" Tuxedo-Poughkeepsie gas transmission line for Central Hudson Gas and Electric Corporation.

As Supervising Welding Engineer established and supervised a materials engineering laboratory, casting upgrading and manufacturing facility at Kearny, NJ. My responsibilities included the estimation and supervision of contract repairs on all types of castings and the supervision of eleven welders.

As Welding Supervisor assigned to the Fort St. Vrain Nuclear Power Plant construction site at Plattesville, Colorado supervised on-site welding construction and established a welding school to assist the training and qualification of area welders in the latest welding processes and techniques.

EDUCATION

New York University (School of Engineering and Science), Bronx, New York, B.E. (in Metallurgy) 1968.

PROFESSIONAL AFFILIATIONS

American Society for Metals - Member
American Welding Society - past New York Chapter Executive Board Member
National Association of Corrosion Engineers - Member

PROFESSIONAL CERTIFICATIONS

Engineer-in-Training (prerequisite to professional licensure)- New York State

American Welding Society - Certified Welding Inspector

American Society for Nondestructive Testing - Level II Certification in Liquid Penetrant, Magnetic Particle and Ultrasonic Test Methods.

Welder Certification - AWS D1.1 and ASME Section IX Codes.

PUBLICATIONS

Analysis and Monitoring of Heat Transfer Tube Fouling- N. Zelver, J. R. Flandreau, W. H. Spataro, et at., Presented at ASME Joint Power Generation Conference, Denver, CO, October 1982

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
James P. Gleason, Chairman
Frederick J. Shon
Dr. Oscar H. Paris

In the Matter of	)	
	)	
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. (Indian Point, Unit No. 2)	)	Docket Nos. 50-247 SP 50-2[illegible] SP
	)	
POWER AUTHORITY OF THE STATE OF NEW YORK (Indian Point, Unit No. 3)	)	Jan. 12, 1983

CERTIFICATE OF SERVICE

I hereby certify that on the 12th day of January, 1983, I caused a copy of Power Authority's Testimony of John C. Brons and William Josiger on Board Question 2.2.1 and Power Authority's Testimony of John C. Brons, Kenneth R. Chapple, and William Spataro on Contention 2.2(a) to be served first class mail, postage prepaid, on the following:

James P. Gleason, Chairman
Administrative Judge
Atomic Safety and Licensing Board
513 Gilmoure Drive
Silver Spring, Maryland 20901

Mr. Frederick J. Shon
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Mr. Oscar H. Paris
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Docketing and Service Branch
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Joan Holt, Project Director
Indian Point Project
New York Public Interest Research
Group
9 Murray Street
New York, New York 10007

Jeffrey M. Blum, Esq.
New York University Law School
423 Vanderbilt Hall
40 Washington Square South
New York, New York 10012

Charles J. Maikish, Esq.
Litigation Division
The Port Authority of New York
and New Jersey
One World Trade Center
New York, New York 10048

Charles M. Pratt, Esq.
Stephen L. Baum, Esq.
Power Authority of the
State of New York
10 Columbus Circle
New York, New York 10019

Janice Moore, Esq.
Counsel for NRC Staff
Office of the Executive
Legal Director
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Brent L. Brandenburg, Esq.
Assistant General Counsel
Consolidated Edison Company
of New York, Inc.
4 Irving Place
New York, New York 10003

Ellen R. Weiss, Esq.
William S. Jordan. III, Esq.
Harmon and Weiss
1725 I Street, N.W., Suite 506
Washington, D.C. 20006

Charles A. Scheiner, Co-Chairperson
Westchester People's Action
Coalition, Inc.
P.O. Box 488
White Plains, New York 10602

Alan Latman, Esq.
44 Sunset Drive
Croton-On-Hudson, New York 10520

Ezra I. Bialik, Esq.
Steve Leipzig, Esq.
Environmental Protection Bureau
New York State Attorney
General's Office
Two World Trade Center
New York, New York 10047

Alfred B. Del Bello
Westchester County Executive
Westchester County
148 Martine Avenue
White Plains, New York 10601

Andrew S. Roffe, Esq.
New York State Assembly
Albany, New York 12248

Marc L. Parris, Esq.
Eric Thorsen, Esq.
County Attorney
County of Rockland
11 New Hempstead Road
New City, New York 10956

Phyllis Rodriguez, Spokesperson
Parents Concerned About Indian Point
P.O. Box 125
Croton-on-Hudson, New York 10520

Renee Schwartz, Esq.
Paul Chessin, Esq.
Laurens R. Schwartz, Esq.
Margaret Oppel, Esq.
Botein, Hays, Sklar and Hertzberg
200 Park Avenue
New York, New York 10166

Honorable Ruth W. Messinger
Member of the Council of the City of New York
District #4
City Hall
New York, New York 10007

Greater New York Council on Energy
c/o Dean R. Corren, Director
New York University
26 Stuyvesant Street
New York, New York 10003

Joan Miles
Indian Point Coordinator
New York City Audubon Society
71 West 23rd Street, Suite 1828
New York, New York 10010

Richard M. Hartzman, Esq.
Lorna Salzman
Mid-Atlantic Representative
Friends of the Earth, Inc.
208 West 13th Street
New York, New York 10011

Stanley B. Klimberg, Esq.
General Counsel
New York State Energy Office
2 Rockefeller State Plaza
Albany, New York 12223

Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Atomic Safety and Licensing Appeal Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Honorable Richard L. Brodsky
Member of the County Legislature
Westchester County
County Office Building
White Plains, New York 10601

Zipporah S. Fleisher
West Branch Conservation Association
443 Buena Vista Road
New City, New York 10956

Mayor George V. Begany
Village of Buchanan
236 Tate Avenue
Buchanan, New York 10511

Judith Kessler, Coordinator
Rockland Citizens for Safe Energy
300 New Hemstead Road
New City, New York 10956

David H. Pikus, Esq.
Richard F. Czaja, Esq.
Shea & Gould
330 Madison Avenue
New York, New York 10017

Amanda Potterfield, Esq.
Johnson & George
528 Iowa Avenue
Iowa City, Iowa 52240

Ruthanne G. Miller, Esq.
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. Donald Davidoff
Director, Radiological Emergency
Preparedness Group
Empire State Plaza
Tower Building, Rm. 1750
Albany, New York 12237

Craig Kaplan, Esq.
National Emergency Civil
Liberties Committee
175 Fifth Avenue, Suite 712
New York, New York 10010

Michael D. Diederich, Jr., Esq.
Fitgerald, Lynch & Diederich
24 Central Drive
Stony Point, New York 10980

Steven C. Sholly
Union of Concerned Scientists
1346 Connecticut Avenue, N.W.
Suite 1101
Washington, D.C. 20036

Spence W. Perry
Office of General Counsel
Federal Emergency Management Agency
500 C Street, S.W.
Washington, D.C. 20472

Stewart M. Glass
Regional Counsel
Room 1349
Federal Emergency Management Agency
26 Federal Plaza
New York, New York 10278

Melvin Goldberg
Staff Attorney
New York Public Interest
Research Group
9 Murray Street
New York, New York 10007

Jonathan L. Levine, Esq.
P. O. Box 280
New City, New York 10958

Joseph J. Levin, Jr.
Joseph J. Levin, Jr. by sk

1 BY MR. LEVIN: (Resuming)

2 Q Mr. Brons, would you please provide for the

3 Board and the parties a brief summary of your testimony?

4 A (WITNESS BRONS) Yes, sir. Our testimony

5 includes a brief description of the cooling water system

6 at Indian Point-3, particularly as it relates to the

7 portion of the cooling water system inside containment.

8 We then offer a description of our efforts to study and

9 understand various corrosion mechanisms which were

10 apparent in the cooling systems at Indian Point-3 and

11 present the modifications which we have made to the

12 system as a result of our analysis of those corrosion

13 mechanisms.

14 Specifically, we address the replacement of

15 the fan cooler units. In addition, we offer a brief

16 description of various other modifications that were

17 made in the containment at Unit 3 as a result of an

18 incident which occurred at Unit 2 in the fall of 1980.

19 We conclude our testimony with a summary which states

20 that we do not believe there is any current safety issue

21 related to the use of these cooling units in the

22 containment.

23 MR. LEVIN: Your Honor, these witnesse are now

24 ready for cross examination.

25 JUDGE GLEASON: Mrs. Fleisher -- or Mr.

1 Fleisher. I am sorry.

2 CROSS EXAMINATION

3 BY MR. FLEISHER:

4 Q On page five of the testimony, in the second

5 paragraph is a reference to associated piping. Does

6 this include the piping main supplying the fan cooler

7 coils?

8 A (WITNESS CHAPPLE) This includes the piping up

9 to the headers.

10 Q So do I understand the existing steel-cement

11 line as steel mains were left in place?

12 A (WITNESS CHAPPLE) That is correct.

13 Q That is correct.

14 Going on in that paragraph, there was a

15 reference to 904-L alloy, but we will assume it is the

16 nickel-chrome-molybdenum alloy you are talking about.

17 Has this been used in piping systems in Indian Point-3

18 handling Hudson River water prior to this replacement?

19 A (WITNESS SPATARO) No, it was not.

20 Q This is the first-time use, then?

21 A (WITNESS SPATARO) Yes.

22 Q Has this alloy been used in other

23 installations that you have knowledge of for handling

24 Hudson River water?

25 A (WITNESS SPATARO) Not for handling Hudson

1 River water. However, if I may clarify, the Salem
2 Nuclear Generating Station does use alloys of the same
3 family type in their containment cooling system, and
4 they are on the Atlantic Ocean.
5 Q That is, then, ocean water, not brackish
6 water. Is that correct?
7 A (WITNESS SPATARO) I would classify it as
8 saline water.
9 Q How long has the system been in use in Salem?
10 JUDGE GLEASON: Excuse me, Mr. Fleisher. What
11 was that question again?
12 MR. FLEISHER: How long has this fan cooler
13 system been in use in the Salem plant, as he referred to
14 in his prior answer?
15 WITNESS SPATARO: May I have a clarification
16 as to what you mean by the fan cooler system?
17 BY MR. FLEISHER: (Resuming)
18 Q We are talking about, I believe, as I
19 questioned you, that the fan cooler systems in Salem
20 where this alloy had been used and where the experience
21 was, is that correct, as I understood your answer?
22 A (WITNESS SPATARO) It has been used for
23 several years with this alloy.
24 Q Several years. Is that two years, or five
25 years, or one year?

1 A (WITNESS SPATARO) Two to three.

2 Q Two to three. Do you have any knowledge of

3 any studies that have been made of that corrosion to

4 date of that system after its two or three years of

5 use?

6 A (WITNESS SPATARO) Our latest information from

7 contacting plant personnel is that they have no

8 indications of corrosion to date.

9 JUDGE GLEASON: "Latest" being what?

10 WITNESS SPATARO: The latest being

11 approximately four months ago.

12 JUDGE GLEASON: Thank you.

13 BY MR. FLEISHER: (Resuming)

14 Q Is the Salem fan cooler system similar in

15 general design to the Indian Point-3 system?

16 A (WITNESS SPATARO) We don't know.

17 Q You don't know.

18 Do you state or believe that the properties of

19 the saline water at Salem is the same as the Hudson

20 River water?

21 A (WITNESS SPATARO) I would judge them to be

22 worse.

23 Q Where?

24 A (WITNESS SPATARO) At Salem.

25 Q Do you mean by that "worse" more corrosive or

1 more saline?

2 A (WITNESS SPATARO) More corrosive.

3 Q Do you have any basis for believing that

4 saline water is more corrosive than brackish water? Do

5 you have any histories or general knowledge of this, or

6 is this just an opinion?

7 A (WITNESS BRONS) I don't think that there is

8 any specific statement that can be made relative to the,

9 as you pointed out, Mr. Fleisher, relative to the

10 corrosiveness of any water system in any given

11 application. And, as you so frequently pointed out, it

12 is the result of a multi-disciplinary study which

13 involves not only the flow rates but relative

14 oxygenation of the water, silt and bacterial content,

15 temperatures. All of those things come into play, which

16 may make extremely pure water highly corrosive and may

17 make sea water relatively mild.

18 The reverse can exist under a similar set of

19 variables.

20 Q Going on to page six, under "summary", what

21 experience have you had with a closed cooling system

22 using high purity water which would be comparable to

23 that use which would be required for the fan cooler

24 units at Indian Point-3?

25 A (WITNESS BRONS) We have two installed plant

1 systems, one called the plant cooling water system, the
2 other called the closed cooling water cooling system,
3 both of which satisfy this description.
4 Q I'm sorry. I don't quite -- you have systems
5 inside the containment using what I would call pure
6 water for cooling purposes?
7 A (WITNESS BRONS) Well, most certainly inside
8 the containment the reactor coolant system is a closed
9 cooling system that uses high purity water. However, I
10 had understood the relevant portion of your question to
11 not be in consideration of whether the closed cooling
12 system was inside or outside the containment, but,
13 rather, dealt with an experience with closed cooling
14 water systems, and we have several.
15 The reactor coolant system is one, which I
16 suppose the obvious example I overlooked in my answer.
17 We have two more classical cooling systems -- the
18 component cooling water system and the closed cooling
19 water system -- which are closed cooling water systems
20 of the type which you addressed in your testimony.
21 Q Well, what corrosion problems have you had,
22 then, comparable to the corrosion of the cooling system
23 in those closed systems? Have you had any failures of
24 systems due to corrosion in the closed systems?
25 A (WITNESS BRONS) Yes. Those systems which I

1 described have had some leakage, tolerable within the
2 expected design of the system.
3 Q What materials are those systems constructed
4 from?
5 A (WITNESS BRONS) I think we would only be
6 guessing at an answer to that question. One particular
7 aspect of it is that the system serves many components
8 and minor heat exchangers, or the systems do, and I
9 think that it would probably be safest to say that in
10 the course of their cooling experience a wide variety of
11 materials.
12 Q Are they made of mixed materials in the common
13 systems -- say black steel pipe and possibly copper heat
14 exchanger tubes -- things of that nature?
15 A (WITNESS BRONS) Things of that nature I think
16 leaves it pretty open to discussion.
17 Q Well, dissimilar metals in the common flow
18 system.
19 A (WITNESS BRONS) Yes. There are instances of
20 dissimilar metals in the common closed system.
21 Q Do you consider that comparable construction
22 to the construction of the fan cooler systems?
23 A (WITNESS BRONS) No, not at all.
24 Q So we are not comparing, really, apples with
25 apples, are we?

1 MR. LEVIN: Objection, Your Honor -- comparing
2 apples with apples for what purpose?
3 JUDGE GLEASON: What kind of apples are you
4 talking about, Mr. Fleisher?
5 MR. FLEISHER: We are considering a fan cooler
6 system which was made up originally of copper-nickel,
7 with a cement-lined steel pipe, and other systems we are
8 using high purity water or clear water, which are now
9 made up of a different material, being maybe black steel
10 pipe with no lining, copper tubes, or possibly brass or
11 bronze tubes, which are not -- although I am asking the
12 question whether you consider them comparable systems
13 from the viewpoint of protection against corrosion due
14 to selection of the materials.
15 JUDGE GLEASON: Do you understand?
16 WITNESS BRONS: No, sir. I am afraid I don't.
17 JUDGE GLEASON: They have the apples confused,
18 I gather. Could you restate the question? Let's start
19 all over again.
20 MR. FLEISHER: All right. We'll start all
21 over again.
22 BY MR. FLEISHER: (Resuming)
23 Q The purpose is to find out whether the two
24 systems that we are comparing, one with brackish water
25 and one with pure water, are comparable in design and

1 particularly design for resistance to corrosion, because
2 the comparison is made here that brackish water is no
3 more corrosive than pure water, and I think we have
4 established that the fan cooler system used
5 originally -- the one that failed, at least,
6 copper-nickel tubing and cement-lined steel pipe -- I
7 think we have established that the other systems were
8 not designed as such, possibly a mixture of materials,
9 none of which are the same as were used in the fan
10 cooler system.
11 Now I would like, gentlemen, to tell me
12 whether this is a fair comparison of the corrosive
13 properties of brackish water as against pure water.
14 And, if so, why?
15 A (WITNESS BRONS) I think I understand the
16 thrust of Mr. Fleisher's question and since it is drawn
17 from our testimony in summary, perhaps if we get back to
18 that we can clarify it. It was not our intention to
19 offer comparisons against those closed cooling systems
20 which exist at Indian Point Unit 3 and the fan cooler
21 system on an apples to apples or any other basis.
22 The original question was whether or not we
23 had experience with closed cooling systems, and the
24 answer was yes, and I described a few. To expand upon
25 that, we have found, within our experience in those

1 systems, that whether you use or even with the use of
2 relatively high purity water various other techniques
3 must be taken or accounted for in inhibiting corrosion,
4 whether it be sacrificial annodes, careful attention of
5 the adjacency of dissimilar metals -- those types of
6 things -- that are necessary to be considered even with
7 high purity water systems than have been.
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1 MR. FLEISHER: Just a moment, please.

2 (Pause.)

3 BY MR. FLEISHER: (Resuming)

4 Q Do you know of any plans comparable to Indian

5 Point Number 3 in size that do not use brackish water

6 that have had corrosion problems in the fan cooler

7 systems?

8 A (WITNESS BRONS) I was sort of waiting for an

9 objection. It is not clear to me how it is relevant

10 whether or not I know a plant that is comparable in size

11 that doesn't have what we have that doesn't have a

12 problem.

13 JUDGE GLEASON: Could you kind of straighten

14 that question out a little bit, Mr. Fleisher?

15 MR. FLEISHER: I am trying to find whether

16 this is a generic problem of fan cooler systems inside

17 of containment, or whether it is related to the use of

18 brackish water inside containment. We have comparable

19 systems in other plants that do not have a problem, so

20 it would be very important to know, and would give some

21 light to the problem of the corrosive properties.

22 So, I would like, if they have knowledge of

23 other plants, which I know there are many, using

24 non-brackish water, what the experience is as compared

25 to the experience at Indian Point 3.

1 WITNESS BRONS: No, sir, I am not aware of
2 details of how a different plant of similar size, what
3 kind of problems they are experiencing.
4 JUDGE GLEASON: On corrosion?
5 WITNESS BRONS: On corrosion.
6 JUDGE GLEASON: All right.
7 BY MR. FLEISHER: (Resuming)
8 Q As a hypothetical, assuming there was a
9 serious leak or spill from a system using high purity
10 water, what would be the risk to the plant components in
11 comparison to a leak or a spill of brackish water?
12 MR. LEVIN: Your Honor, the witness will give
13 an objection this time.
14 JUDGE GLEASON: Would you rephrase the
15 question or restate it, please? I was commenting to a
16 fellow judge up here, and I didn't hear the question.
17 (Pause.)
18 MR. FLEISHER: Well, strike that question. I
19 am sorry.
20 That will be all. Thank you.
21 JUDGE GLEASON: Any redirect?
22 MR. LEVIN: No -- Well, one question, Your
23 Honor.
24 REDIRECT EXAMINATION
25 BY MR. LEVIN:

1 Q Gentlemen, Mr. Fleisher in discussing some
2 existing steel steam lines, I believe, asked you whether
3 those lines were left in place, and I believe your
4 response was, yes, they were. Is that correct?
5 A (WITNESS CHAPPLE) Yes, that is correct.
6 Q And could you describe where those lines are
7 once again?
8 A (WITNESS CHAPPLE) They run from outside
9 containment through the containment wall, up to each
10 individual fan cooler unit. From there, these new
11 materials take over into the headers.
12 Q Do you have any reason to be concerned about
13 leaving those particular lines in place?
14 A (WITNESS CHAPPLE) No, we do not.
15 MR. LEVIN: That is all, Your Honor.
16 JUDGE GLEASON: Does the staff have any cross
17 examination?
18 MR. MC GURREN: The staff has no cross.
19 JUDGE SHON: Gentlemen, you will have to
20 excuse me if I ask some pretty naive questions. You
21 corrosion experts have me a little confused in certain
22 ways, and I would like to straighten some things out
23 with my own previous understanding of certain matters.
24 First of all, on Page 5, the sentence you
25 corrected, a family of iron, nickel, chromium,

1 melibdinum alloys, the description of the alloys
2 suggests that they are something pretty close to
3 stainles steel. Is that right?
4 WITNESS SPATARO: No, that is wrong. The
5 reason I changed it to a family is that we used a number
6 of different alloys of the same family type in order to
7 make our manufacturing. If I can elaborate on that just
8 a little, the coolers themselves are made of an alloy
9 called AL6X. It is Allegheny Ludlum's alloy. It has 6
10 percent melibdinum. It gives the maximum resistance to
11 pitting corrosion.
12 However, that alloy cannot be made in large
13 sheet or piping form because of the high melibdinum
14 content. The water boxes of the fan coolers and the
15 attendant piping are made of an alloy called alloy 20
16 modified, manufactured by Cabbott Corporation. This
17 alloy is approved for us by the ASME Boiler and Pressure
18 Vessel Code.
19 The rest of the piping system, however, is
20 made of an alloy called 904L. Both 904L and alloy 20
21 mod have approximately 3 and a half to 4 percent
22 melibdinum in them. The reason for 904L, which is
23 manufactured by the Utahome Corporation in Sweden, and
24 by Inco here in the United States, was the relative
25 availability of the material in large quantities, such

as elbows, tees, straight runs, or piping.

We could not get the Cabbott alloy in large quantities quickly enough to put our systems in, so we changed over to a very similar alloy, and that is the reason why I mentioned them as a family of alloys.

Your basic question was whether or not they were equivalent to stainless steel. As I understand you to mean stainless steel, this would be the straight 18 chrome, 8 nickel alloys. The answer would be no, because these have an appreciably large amount of nickel, of the range of at least 23 to 28 percent. The chromium is comparable, if slightly higher.

However, the melibdinum content coupled with the nickel is what gives us our pitting corrosion resistance.

JUDGE SHON: I guess the way in which I thought they might be similar to stainless is, are they or are they not subject to intergranular stress corrosion cracking when exposed to aqueous solutions of chloride ion? That is the reputation of stainless steel.

WITNESS SPATARO: No, they are not. If I may elaborate, stainless steels have that problem due to something which we call sensitization. The carbon content in the stainless steel during welding and heat

1 treating operations migrates to the grain boundaries,
2 where it then ties up with chromium in the neighboring
3 grains.
4 This leads to a depletion of the neighboring
5 grains from the chromium content. When that chromium
6 content drops below 11 and a half percent,
7 approximately, the alloy becomes less than stainless, if
8 I can use that term, and is subject to the intergranular
9 attack, chloride ions being the most prevalent ions
10 which can then break down the chromium oxide layers on
11 the surface of the stainless steel, and attack these
12 depleted areas.
13 The use of high nickel and high melibdinum
14 alloys prevents this particular degradation of the
15 material during fabrication from a clearing. Hence, we
16 do not feel that we should have any intergranular attack
17 during the operation or lifetime of the alloys.
18 JUDGE SHON: Thank you. That was going to be
19 my next question, whether they could have been
20 sensitized in any way during the process.
21 WITNESS SPATARO: No.
22 JUDGE SHON: No. With regard to the portions
23 of the system which originally were cement lined mild
24 steel, have these portions been inspected and
25 protected? Mr. Rothstein told us that in the other

1 plant, this cement had come off in the process of
2 fabrication, and had had to be replaced. Has that been
3 done here also?
4 WITNESS SPATARO: No, it has not. We, when we
5 changed out the copper nickel alloys, we also performed
6 an inspection on a number of the cement lined carbon
7 steel joints. We did find some corrosion occurring, as
8 would be expected with this system. However, we did not
9 find the corrosion to be detrimental to the surface of
10 the alloy. Any system of this type is usually designed
11 with a corrosion allowance already in the material. The
12 joints that we examined had not lost that corrosion
13 allowance. They had lost some of it.
14 We are at present under a monitoring system
15 and will periodically check these joints and determine
16 whether or not at that time replacement seems necessary,
17 but at the present time it does not.
18 JUDGE SHON: I see. At Page 6, you again had
19 an interchange with Mr. Fleisher concerning the term
20 "high purity water." Actually, I think it is not simply
21 high purity, but if one had a closed system of the type
22 that he has suggested, you would be able to use water of
23 known characteristics, that is, properly treated water.
24 You could add to it what you cared to and take out of it
25 what you cared to, and make it the kind of water you

1 would best like to use.

2 Would one find a major advantage in stopping

3 corrosion by simply controlling the composition of the

4 water, whether one calls it high purity or properly

5 conditioned or what?

6 WITNESS BRONS: No, sir, we don't believe that

7 would be a major advantage, either in our discussion, as

8 we pointed out in our testimony, if we were

9 investigating various corrosion mechanisms in the

10 previous fan cooler units. The amount of corrosion and

11 the types of leakage were not what I would term major

12 significance. We talked about really major headaches,

13 weepage, leakage where none was desirable.

14 It is certainly true that if you had a closed

15 system, you could control the water qualities in that

16 system. I don't believe that any advantage over the

17 amount of leakage that may occur during operation would

18 occur.

19 JUDGE SHON: There is one other possible

20 advantage to a closed system that only occurred to me a

21 short while ago. I noticed that at Pages 5 and 6 of

22 your testimony, the modifications that you made to the

23 unit in general, reactor pit, water level alarm,

24 containment sump overflow indication, and so on, were

25 largely to prevent a repeat of the sort of incident that

1 happened at Unit 2 when the reactor pit filled with
2 water.
3 If one had a closed system, the system would
4 necessarily be of quite limited, finite volume. That is
5 not true of the Hudson River. Thus, even if everything
6 leaked out of the system into the reactor pit, one could
7 perhaps design it so that you wouldn't have to take all
8 of these precautions. You would know it would never
9 amount to an awful lot of water in a place where it
10 shouldn't be. Just the limited volume might be an
11 advantage in preventing what you try to prevent.
12 Have you thought of that?
13 WITNESS BRONS: That same advantage, of
14 course, is a disadvantage in the sense that the system
15 then requires more components and so on for cooling. It
16 is certainly an advantage that it does limit the volume
17 which can leak. We have not had any reason to question
18 the reliability of the monitoring systems that we have
19 for this event at Unit 3.
20 What we have listed here are the improvements
21 which we made. There were a number of components in
22 these systems that were in place beforehand, and they
23 were functioning satisfactorily, and they are relatively
24 simple devices.
25 JUDGE SHON: So your answer is, although that

1 might be true, you don't feel it is necessary. Is that
2 essentially it?
3 WITNESS BRONS: Yes, sir.
4 JUDGE SHON: Thank you. I have no further
5 questions.
6 JUDGE PARIS: Being a biologist, I was
7 intrigued by the anerobic bacteria that were thriving in
8 your cooling units. You talked about it on Page 5. You
9 didn't mean to imply there that the anerobic bacteria
10 would only cause corrosion, did you?
11 WITNESS SPATARO: The studies we performed
12 seemed to indicate that they were a major contributor to
13 our pitting corrosion attack.
14 JUDGE PARIS: They are the major cause of
15 corrosive pitting then?
16 WITNESS SPATARO: That is true.
17 JUDGE SHON: Excuse me. That is pitting in
18 the general area, and occasioned by silt, as we were
19 told before? Is that it?
20 WITNESS SPATARO: Yes, that's true.
21 JUDGE PARIS: Have you done anything to get
22 rid of the bacteria in your new fan cooler units?
23 WITNESS SPATARO: We have increased the flow
24 rates in the new design.
25 JUDGE PARIS: Can you indicate how much you

1 have increased the flow rates?

2 WITNESS CHAPPLE: We have increased it from

3 approximately one foot per second to 1.7 feet per

4 second, almost.

5 JUDGE PARIS: One foot to 1.7. Is 1.7 great

6 enough to prevent silt deposit?

7 WITNESS CHAPPLE: Our test program that we

8 have indicates that is the case, that silt deposits will

9 be removed.

10 JUDGE PARIS: And I take it that the new

11 alloys that you are using will be more resistant to

12 bacterial corrosion than the old alloys.

13 WITNESS SPATARO: Yes, our test program has

14 indicated that to us.

15 JUDGE PARIS: The testimony of the witnesses

16 from Con Edison indicated that the dissolved oxygen in

17 the river water ranged from 5.5 to 11.5 parts per

18 million. I take it that in your fan cooler units, or at

19 least in the old fan cooler units, the oxygen content

20 was lower than this?

21 WITNESS SPATARO: No, it should have been

22 comparable. However, as you will realize, once you get

23 a silt buildup due to a low flow condition, you wind up

24 with an oxygen depletion under that silt. This would

25 then allow your anerobic bacteria to then thrive.

1 JUDGE PARIS: What causes the oxygen depletion
2 under the silt? Is the metal oxidizing, or what?
3 WITNESS SPATARO: The anerobic bacteria, as I
4 understand, are sulfate producing or sulfate reducing.
5 This sulfate combines with the copper oxide, which is
6 the main passive protection for the copper alloys. It
7 changes this to copper sulfate. The copper sulfate then
8 becomes cathartic with respect to the remaining copper
9 oxide.
10 This reaction reduces the amount of -- well,
11 actually, increases the amount of oxygen necessary to
12 keep the protection of the alloy consistent. Once I
13 have depleted the oxygen under the silt, because it
14 cannot be replenished from the flowing water above the
15 silt level, I then do not have any more protection for
16 my copper alloy, meaning I do not have any more copper
17 oxide, or in various patches I do not.
18 This small cell, if we can call it that,
19 causes the pitting reaction to proceed such that I
20 continue to break down the copper oxide until I get to
21 the virgin material underneath. Once I do that, the
22 pitting proceeds at some corrosion rate.
23 JUDGE PARIS: Okay. I think that is the kind
24 of detail we need. Thank you.
25 JUDGE GLEASON: All right, gentlemen. The

1 witnesses can step down.

2 MR. LEVIN: Thank you, Your Honor.

3 (Witnesses excused.)

4 JUDGE GLEASON: We are moving a little faster

5 in our schedule than we anticipated. The staff has a

6 witness, as I understand, that can proceed at this

7 time. And unless the parties object, I would just as

8 soon proceed. Which witness, and which issue are we

9 going to be talking about?

10 MS. MOORE: Your Honor, the staff is ready to

11 proceed with its testimony on Commission Question 2

12 itself. That would be the testimony of Frank Rowsome

13 and John Hannon.

14 JUDGE GLEASON: All right. Is there an

15 objection?

16 MRS. FLEISHER: Your Honor, may we have a list

17 of staff witnesses in at least the order that they

18 expect them to be. If we are going to start them

19 tomorrow, we don't even know what witnesses will be on.

20 At least I am not aware of any order.

21 JUDGE GLEASON: I think they were supplied

22 prior to this point, and all we are talking about now is

23 taking one -- is it out of order?

24 MS. MOORE: No, we are proceeding in the order

25 in which the testimony was filed in the package.

1 JUDGE GLEASON: So we are proceeding, Ms.
2 Fleisher, with the testimony.
3 MR. LEVIN: Your Honor, there is no objection
4 from the Power Authority, but we would like to establish
5 an order of cross examination, if we could. We would
6 request that the licensee, at least, on behalf of the
7 Power Authority, be permitted in this instance to cross
8 examine last.
9 JUDGE GLEASON: Yes, I see no objection to
10 that. All right, gentlemen, would you please raise your
11 right hands?
12 Whereupon,
13 FRANK ROWSOME and
14 JOHN N. HANNON
15 were called as witnesses, and having been first duly
16 sworn, took the stand, and were examined and testified
17 as follows:
18 DIRECT EXAMINATION
19 BY MS. MOORE:
20 Q Mr. Rowsome, would you state your name and
21 business address, please?
22 A (WITNESS ROWSOME) Frank K. Rowsome, III,
23 Nuclear Regulatory Commission, Washington, D.C., 20555.
24 Q Mr. Hannon, would you please state your name
25 and business address?

1 A (WITNESS HANNON) My name is John M. Hannon,
2 Nuclear Regulatory Commission, Washington, D.C. 20555.
3 Q Mr. Rowsome, what is your position with the
4 NRC?
5 A (WITNESS ROWSOME) I am deputy director of the
6 Office of Risk Analysis in the Office of Research.
7 Q Mr. Hannon, would you please state your
8 position in the NRC?
9 A (WITNESS HANNON) I am a project manager in
10 the Division of Licensing, Office of Nuclear Reactor
11 Regulation.
12 Q Gentlemen, do you have before you a copy of a
13 document entitled Direct Testimony of Frank Rowsome and
14 John Hannon Concerning Commission Question 2?
15 A (WITNESS HANNON) I do.
16 A (WITNESS ROWSOME) I do.
17 Q Was this testimony prepared by you, or did you
18 participate in its preparation?
19 A (WITNESS HANNON) Yes.
20 A (WITNESS ROWSOME) Yes.
21 Q Do you have any additions or corrections to
22 this testimony?
23 A (WITNESS HANNON) There is one typographical
24 error on Page 5. The sentence beginning, "The
25 improvements in safety system design and in surveillance

1 tests and technical specifications." The word should be
2 "have" instead of "has."
3 Q With this change to your testimony, is it true
4 and correct to the best of your knowledge, information,
5 and belief?
6 A (WITNESS ROWSOME) Yes, it is.
7 A (WITNESS HANNON) Yes, it is.
8 Q Do you adopt this as your testimony in this
9 proceeding?
10 A (WITNESS ROWSOME) Yes, I do.
11 A (WITNESS HANNON) Yes, I do.
12 MS. MOORE: Copies of this testimony have been
13 delivered to the Board, the parties, and the Court
14 Reporter. I now ask that this testimony, with the
15 attached professional qualifications, be received into
16 evidence and bound into the record as though read.
17 JUDGE GLEASON: Is there objection?
18 (No response.)
19 JUDGE GLEASON: Hearing none, the testimony of
20 Mr. Rowsome and Mr. Hannon and their technical
21 qualifications will be bound into the record as if read.
22 (The testimony of Mr. Rowsome and Mr. Hannon
23 follows.)
24
25

Witness #5

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CONSOLIDATED EDISON COMPANY OF NEW YORK (Indian Point, Unit 2)	)	Docket Nos. 50-247-SP 50-286-SP
	)	
POWER AUTHORITY OF THE STATE OF OF NEW YORK (Indian Point, Unit 3)	)	

DIRECT TESTIMONY OF FRANK ROWSOME AND JOHN N. HANNON
CONCERNING COMMISSION QUESTION 2

Q.1 Mr. Rowsome, state your name, position and general responsibility with the NRC.

A.1 My name is Frank H. Rowsome, III. I am Deputy Director of the Division of Risk Analysis in the Office of Nuclear Regulatory Research.

Q.2 Have you prepared a statement of your professional qualifications?

A.2 Yes, a copy of my professional qualifications is attached.

Q.3 State your name and position with the NRC.

A.3 My name is John N. Hannon. I am Project Manager in the Operating Reactors Branch No. 1 of the Division of Licensing, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission.

Q.4 What are your responsibilities in that position?

A.4 In this capacity I have responsibility for managing the safety and environmental reviews of actions concerning operating nuclear power plants. This includes the responsibility for planning and coordinating the efforts of other NRR personnel involved in the reviews.

Q.5 Have you prepared a statement of your professional qualifications?

A.5 Yes, a copy of my professional qualifications is attached to this testimony.

Q.6 What is the purpose of this testimony?

A.6 The purpose of this testimony is to respond to Commission Question 2 which reads,

"What improvements in the level of safety will result from measures required or referenced in the Director's Order to the Licensee, dated February 11, 1980?"

Q.7 What is meant by the Director's Order to the Licensee, dated February 11, 1980?

A.7 A number of changes in the operation of Indian Point Units 2 and 3 were mandated in the Confirmatory Orders issued to Consolidated Edison and the Power Authority of the State of New York on February 11, 1980. These Orders were issued by the Director of the Office of Nuclear Reactor Regulation. Hence, they are called the Director's Orders.

Q.8 What was the purpose of the Director's Orders of February 11, 1980?

A.8 The Director issued the Confirmatory Orders of February 11, 1980 to provide additional assurance of safe operation of these facilities while additional studies were under way to investigate their safety.

Q.9 Please highlight the content of the Director's Orders.

A.9 The Orders mandate changes of the following kinds.

1. Conduct of operations, surveillance testing, and maintenance

   These orders are intended to make transients less frequent, selected safety systems more reliable, and emergency response more comprehensive and reliable.

2. Staffing

   These requirements mandate that two rather than one senior reactor operator be on each shift in each plant, and that the pool of safety consultants available to the utility be expanded.

3. Staff Training

   Operators and onsite emergency response teams are required to undergo expanded and accelerated training for severe reactor accidents as well as for normal operations.

4. Engineering Margins

   The margin by which the emergency core cooling system can limit core temperature excursions during large LOCA accidents is increased.

5. Specific Studies

   A variety of special studies of the susceptibility of the plant to severe accidents was ordered to assure that the licensees are fully apprised of the ways their plant might be vulnerable to severe accidents and to explore options for further risk reduction.

Q.10 Have the risk reduction benefits of the Director's Orders been achieved yet or are further improvements expected?

A.10 The risk estimates to be provided in response to Commission's Questions 1 and 5 reflect the plants as they are designed and operated since the

Director's Orders were implemented. We expect that the benefits of the Director's Orders will continue, but since the Orders have been implemented, we expect no further improvements from them.

Q.11 Please summarize your findings on the improvements in the level of safety resulting from the Director's Order.

A.11 We believe that the Director's Orders have achieved risk reduction, but we are unable to give a quantitative measure of the difference in risk. There are two principal reasons we do not have a quantitative measure of the risk reduction:

1. Some of the measures contained in the Orders, particularly those dealing with staffing and staff training, cannot be evaluated by existing risk assessment techniques. The state of the art in PRA is inadequate to relate the likelihood of operator error under accident conditions to the details of staffing or staff training.
2. Many other improvements in the design and operation of the plants have been implemented during and after the imposition of the Director's Orders. Thus, the difference in risk between the plants as they are designed and operated today and as they were designed and operated in 1979 or 1980 originates in many other complex changes, not just the Director's Orders.

Q.12 What can be said about the risk-reduction effectiveness of the Director's Orders?

A.12 It is our judgment that the improvements in staffing, staff training, the pool of technical experts available to the utilities, and the special

studies have improved the capabilities of the licensees to operate the plants safely. The likelihood that operators might fail to diagnose a severe reactor accident promptly and correctly is smaller today than it was three or four years ago, although we cannot devise a reliable quantitative measure for the change in risk.

The improvements in safety system design and in surveillance tests and technical specifications ~~has~~ have improved the reliability of some engineered safety features, particularly the essential ac power system and the auxiliary feedwater system, and the pressure boundary valves on the low pressure safety injection system. These changes have lowered the likelihood of core-melt accidents originating in loss of all ac power, loss of feedwater, and some interfacing system loss-of-coolant accidents. This reduction was estimated in NUREG-0715 to be roughly a factor of three. This estimate is consistent with our updated analyses of the risk posed by Indian Point Units 2 and 3 for these accident sequences. However, the Indian Point Probabilistic Safety Study and the Staff risk assessment have identified other accident sequences, particularly those triggered by earthquakes, fires, and hurricanes for which these changes make little or no difference. Therefore, the overall risk reduction attributable to the changes in safety system design is less than a factor of three.

Q.13 Does this conclude your testimony concerning Commission Question 2?

A.13 Yes.

PROFESSIONAL QUALIFICATIONS
FRANK H. ROWSOME, 3rd
U.S. NUCLEAR REGULATORY COMMISSION

I am Frank H. Rowsome, 3rd, Deputy Director of the Division of Risk Analysis in the Office of Nuclear Regulatory Research. I have served in that capacity since joining the NRC in July 1979. The work entails planning, budgeting, managing and staffing the Division. Much of the work of the Division is devoted to research in reactor accident risk assessment. The remainder entails risk assessment applied to non-reactor aspects of the nuclear fuel cycle and to standards development related to system reliability or risk.

I received a bachelor's degree in physics from Harvard in 1962. I studied theoretical physics at Cornell, completing all requirements for a Ph.D except for the dissertation in 1965. From 1965 to 1973, I taught and engaged in research in theoretical physics at several colleges and universities.

In 1973 I joined the Bechtel Power Corporation as a nuclear engineer. My initial assignment was to perform accident analyses for nuclear plant license applications. After six months in that job, I was transferred to a newly formed group of systems engineers charged with developing for Bechtel a capability to perform risk assessments and system reliability analyses of the kind the NRC was then developing for the Reactor Safety Study. In that capacity I performed reliability analyses of nuclear plant safety systems, developed computer programs for system reliability analyses, performed analyses of component reliability data, human reliability analyses, and event tree analyses of accident sequences. I progressed from nuclear engineer, to senior engineer, to group leader, to Reliability Group Supervisor before leaving Bechtel to join the NRC in 1979. In this last position at Bechtel, I supervised the application of engineering economics, reliability

engineering, and analysis techniques to power plant availability optimization as well as nuclear safety analysis.

While serving as Deputy Director of the Division of Risk Analysis (and its anticedent, the Probabilistic Analysis Staff), I also served as Acting Director (7 months), acting chief of the Reactor Risk Branch (9 months) and acting chief of the Risk Methodology and Data Branch (4 months).

This experience has given me the practitioner's view as well as the manager's view of those facits of reactor risk assessment entailing the classification of reactor accident sequences, system reliability analysis, human reliability analysis, and the estimation of the likelihood of severe reactor accidents. I have the manager's perspective but not the practitioner's experience with those facits entailing containment challenge analysis, consequence analysis, and risk assessment applied to other parts of the nuclear fuel cycle.

My role in the development of testimony for this hearing has been as coordinator of the preparation of testimony on risk and one of the coordinators of the technical critique of the licensee's "Indian Point Probabilistic Safety Study." I am not an expert on the design or operation of the Indian Point plants.

List of Publications

1. "The Role of System Reliability Prediction in Power Plant Design," F.H. Rowsome, III, Power Engineering, February 1977.

2. "How Finely Should Faults be Resolved in Fault Tree Analysis?" by F.H. Rowsome, III, presented at the American Nuclear Society/Canadian Nuclear Association Joint Meeting in Toronto, Canada, June 18, 1976.

3. "The Role of IREP in NRC Programs" F.H. Rowsome, III, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

4. "Fault Tree Analysis of an Auxiliary Feedwater System," F.H. Rowsome, III, Bechtel Power Corp., Gaithersburg Power Division, F 77 805-5.

PROFESSIONAL QUALIFICATIONS OF

JOHN N. HANNON

OPERATING REACTORS BRANCH NO. 1

DIVISION OF LICENSING

I am a Project Manager in Operating Reactors Branch No. 1 of the Division of Licensing, Office of Nuclear Reactor Regulation, U. S. Nuclear Regulatory Commission. In my present position, I have the responsibility of managing the safety and environmental reviews of actions concerning operating nuclear power plants. This includes the responsibility for planning and coordinating the efforts of other NRR personnel involved in the reviews.

I graduated from the United States Naval Academy in 1967 and the Naval Nuclear Power School in 1968. From 1969 to 1972 I served in various positions of responsibility on board a Fleet Ballistic Missile Submarine, including Engineer Officer of the Watch, Officer of the Deck Surfaced, and Officer of the Deck Submerged.

From 1972 to 1974 I was employed by Combustion Engineering, Inc. as a Project Engineer responsible for the technical and administrative direction for design, specification, and procurement of instrumentation, control and electrical systems for assigned projects. I was also involved in the coordination of planning, engineering, and development of an advanced control room design for proposal plants.

In 1974 I accepted a position as Reactor Inspector for the Office of Inspection and Enforcement, Region I. In this capacity I was responsible for conducting inspections of facilities in the preoperational testing phase, power ascension phase, and operations phase. From 1974 to 1977 I performed an average of 30 inspections per year. I have had the opportunity to observe control room operations and plant response under both normal steady-state conditions and transient conditions. I have witnessed self-induced transients under preoperational testing conditions, and reviewed procedures governing operator response to anticipated operational events.

In 1977 I accepted a position as Operating Reactor Project Manager with the Division of Operating Reactors in the Office of Nuclear Reactor Regulation.

I received training in the operational technology associated with Boiling Water Reactors (BWRs) and served as a BWR Project Manager until being assigned to the Indian Point Project in August 1981.

I have accumulated over 30 hours of math, computer, mechanical engineering, and nuclear engineering graduate courses at various universities since 1973. I am currently enrolled in a Systems Engineering Masters Degree Program offered by the University of Southern California.

1 BY MS. MOORE: (Resuming)

2 Q Mr. Rowsome, would you please give a brief

3 summary of your testimony?

4 A (WITNESS ROWSOME) Yes. The director's order

5 has tended to improve the level of safety, although we

6 are unable to give a quantitative measure in the change

7 in risk. In particular, the improvements in staffing,

8 staff training, and the pool of technical experts

9 available to the utilities have improved the

10 capabilities of the licensees to operate the plants

11 safely.

12 In addition, the changes in surveillance,

13 maintenance, and technical specifications have lowered

14 the projected frequency of some accident sequences,

15 although our current understanding of the risk profile

16 of the plant suggests that these particular sequences

17 are not among the dominant contributors to risk.

18 MS. MOORE: Your Honor, the witnesses are now

19 available for cross examination.

20 JUDGE GLEASON: All right. Mr. Blum, would

21 you like to proceed?

22 Let's go off the record.

23 (Whereupon, a discussion was held off the

24 record.)

25 JUDGE GLEASON: Proceed, Mr. Blum.

1 MR. BLUM: Your Honor, I am pleased to go
2 first with cross examination. I did want to reserve one
3 point, that if the licensee's examination is of the type
4 of friendly examination somewhat analogous to redirect,
5 I would like to reserve some right to do recross on
6 points raised in friendly cross examination possibly.
7 JUDGE GLEASON: We will reserve judgment on
8 that until we see how things go.
9 MR. BLUM: Thank you.
10 CROSS EXAMINATION
11 BY MR. BLUM:
12 Q Gentlemen, do you have with you a copy of the
13 director's order?
14 A (WITNESS ROWSOME) Yes.
15 A (WITNESS HANNON) Yes.
16 MR. BLUM: I have one exhibit which is a
17 partial transcript of a Commission meeting dated
18 February 5th, 1980, which I would like to distribute and
19 have marked as UCS Exhibit 7.
20 JUDGE GLEASON: How would we refer to this,
21 again, Mr. Blum? How is this described, this document?
22 MR. BLUM: This is a partial transcript, that
23 is, pages of the transcript from the meeting of the NRC
24 Commissioners on February 5th, 1980.
25 JUDGE GLEASON: And are the pages

1 consecutive.

2 MR. BLUM: Some are and some are not.

3 JUDGE GLEASON: So they are not consecutive.

4 All right. The document referred to will be

5 identified as UCS Exhibit Number 7.

6 (The document referred to

7 was marked for

8 identification as UCS

9 Exhibit Number 7.)

10 BY MR. BLUM: (Resuming)

11 Q Gentlemen, you stated that --

12 MS. MOORE: Mr. Chairman, we would like a

13 moment for the witnesses and ourselves to look at this

14 document.

15 MR. BRANDENBURG: Mr. Chairman, maybe I can

16 cut this somewhat short. At this time, in anticipation

17 of Mr. Blum's asking these witnesses some questions

18 relating to this transcript passage, I would like to

19 direct the Board's attention to the provisions of 10 CFR

20 Section 9.103, which specifically addresses the use of

21 Commission transcripts, and we object to this on the

22 grounds of the following provision of that section.

23 JUDGE GLEASON: What section are you referring

24 to?

25 MR. BRANDENBURG: This is 10 CFR Section

1 9.103. In pertinent part, with respect to such
2 transcripts, Mr. Chairman, it states that "Such
3 statements may not be pleaded, cited, or relied upon
4 before the Commission or in any proceeding under Part 2
5 of these regulations, except as the Commission may
6 direct."
7 JUDGE GLEASON: Could we at least get an
8 understanding or let people read the document before we
9 make these objections? Because I would like to read it
10 myself. Everybody take a few minutes to read the
11 documents.
12 (Pause.)
13 MR. BLUM: If it would help --
14 JUDGE GLEASON: Well, I am waiting until the
15 staff is finished their perusal.
16 Do you have a general idea of what this is,
17 Ms. Moore?
18 MS. MOORE: Yes, Mr. Chairman.
19 JUDGE GLEASON: All right, Mr. Blum.
20 MR. BLUM: The document is intended primarily
21 for the next staff witness, actually, Dr. Meyer. There
22 is only one small point in here that is going to be
23 raised for these witnesses. Also, this is not being
24 introduced as a technical study for the truth of the
25 points asserted. It is more to document an apparent

1 shift in opinion going on within the NRC in order to --
2 just by way of background, to clarify the context of
3 questions that are going to be asked.
4 JUDGE GLEASON: I don't think we can consider
5 it in that view. I think we could let it be used for
6 purposes of impeachment.
7 MR. BLUM: That is the purpose which I
8 intended.
9 JUDGE GLEASON: Mr. Levin?
10 MR. LEVIN: Your Honor, we join in Mr.
11 Brandenburg's objection, and the only exception cited in
12 here can't be relied upon, and the only exception is if
13 the Commission directs otherwise. And to even use it
14 for impeachment purposes would be questionable, and that
15 isn't even an instance here that would be possible. We
16 don't have a witness on the stand, I assume, who has
17 said anything that is quoted in this particular
18 document. I don't think it can be used even for
19 impeachment purposes, because there is no such exception
20 in the rules.
21 MS. MOORE: Mr. Chairman, staff would join in
22 that objection. In addition, this is portions of a
23 transcript that was obviously much lengthier, and in
24 just a brief reading of it, it is very difficult to tell
25 exactly what was being spoken about at any given time

1 during the transcript, and therefore I would object to
2 it mainly on the ground that it cannot be used in this
3 context in any form, and the Commission's permission was
4 not sought and was not received.
5 MR. BLUM: Dr. Meyer will not be speaking
6 simply as an individual, but will be presenting the
7 staff's position or part of the staff's position on
8 filtered vented containments and compartment venting,
9 and to the extent that there are prior inconsistent
10 statements by the agency itself regarding these
11 specifically by the same individual who Dr. Meyer has
12 identified as making decisions upon which his testimony
13 would be based, that that should be relevant for
14 purposes of impeachment.
15 MS. MOORE: Mr. Chairman, I would disagree
16 with that. In the first place, I will start with the
17 last statement. And that is that we would argue that
18 Dr. Meyer has not stated --
19 JUDGE GLEASON: You know, Dr. Meyer is not
20 here now.
21 MS. MOORE: He is not on the stand, and that
22 is another objection.
23 JUDGE GLEASON: I think that is a very good
24 objection, Ms. Moore, but how does this question or how
25 do these witnesses relate to this document, assuming

1 that it can be used for any purpose?

2 MR. BLUM: If it would help the Board, I

3 suppose I could delay the presentation of this until Dr.

4 Meyer is on the stand. There is one very small

5 peripheral point which I can ask the witnesses without

6 pointing them to the transcript.

7 JUDGE GLEASON: I think that would be very

8 helpful currently, and then let's wait until Dr. Meyer

9 is around, and then we will consider the document at

10 that point, depending on the way he asks the question.

11 MR. LEVIN: Yes, sir. I am interested in the

12 small peripheral question Mr. Blum has.

13 JUDGE GLEASON: Go ahead, Mr. Blum.

14 MR. BLUM: Well, since everyone is so

15 interested in the small peripheral question, I will

16 bring that to the fore and do that one first.

17 BY MR. BLUM: (Resuming)

18 Q It is my belief that there was once a time

19 when Commissioner Ahearne interrupted Director Denton to

20 make the point that a study by itself could not reduce

21 risk, that risk could only be reduced if the measures

22 referenced in the study were then implemented. Do you

23 agree with this point once made by Commissioner

24 Ahearne?

25 MR. LEVIN: Your Honor, objection.

1 JUDGE GLEASON: The objection is granted.

2 BY MR. BLUM: (Resuming)

3 Q Gentlemen, do you agree with the point that a

4 study by itself does not reduce risk, that it only does

5 so if the measures referenced in the study are

6 implemented?

7 A (WITNESS ROWSOME) It may or may not. I would

8 not agree as a simple principle. Learning about the

9 susceptibility of a plant to accidents might help to

10 avoid them through, say, better operator training or

11 something of that kind. Therefore, merely doing a study

12 could in fact improve the safety of a plant.

13 Q That is correct, if the study is translated

14 into better operator training, as you suggest, which

15 would be the implementation of a measure in the study,

16 but the study itself with nothing more would not reduce

17 risk, would it?

18 MS. MOORE: Mr. Chairman, counsel seems to be

19 testifying at this point.

20 JUDGE GLEASON: I kind of gathered that

21 myself, Ms. Moore. Would you want to ask the question

22 rather than making speeches within questions, please?

23 BY MR. BLUM: (Resuming)

24 Q You have just raised the example of a study

25 producing better operator training, have you not?

1 A (WITNESS ROWSOME) I did indeed.

2 Q And you pointed out that better operator

3 training could reduce risk.

4 A (WITNESS ROWSOME) I did indeed.

5 Q However, a study which did not then result in

6 a specific implementation such as better operator

7 training, that study would not reduce risk, would it?

8 A (WITNESS ROWSOME) I can imagine studies which

9 would not reduce risk of that kind, yes.

10 Q As a general matter, studies that are not

11 translated into implementation of specific safety

12 improvements, those do not reduce risk?

13 A (WITNESS ROWSOME) Many do not.

14 Q Are you aware of some that do?

15 A (WITNESS ROWSOME) Well, simply having gone

16 through the process of doing a study educates the people

17 who did it, and the people who did the study and who

18 read the study -- I will try to reconstruct my answer.

19 People who perform studies and people who read studies

20 presumably learn something from the process that could

21 in fact lower risk, but I am perfectly willing to

22 stipulate that there are some studies which, if not

23 implemented, will do nothing to alter the risk profile

24 of the plant.

25 Q Thank you.

1 Now, you gentlemen have testified that the
2 amount of risk reduction attributable to the director's
3 order is something less than three, but you can't
4 quantify it. Is that correct?
5 A (WITNESS ROWSOME) That applies only to the
6 specific changes in system technical specifications and
7 surveillance, which were estimated to be worth a factor
8 of three for the relevant accident sequences. It is
9 quite true that they represent less than a factor of
10 three overall. I cannot give a reliable bound or
11 estimate for the effect of the changes in staffing,
12 staff training, and the like. I did not mean the factor
13 of three statements to be applicable to the effect of
14 training.
15 Q So you don't know whether this is closer to
16 three or closer to zero.
17 A (WITNESS ROWSOME) I don't know. I have a
18 feeling that it is small compared with a factor of
19 three.
20 Q When you say small compared to a factor of
21 three, you mean closer to zero?
22 A (WITNESS ROWSOME) If you mean by closer to
23 zero less than 1.5, yes, I do think it is less than
24 1.5.
25 Q Do you have a feeling of how much less than

1 1.5?

2 A (WITNESS ROWSOME) I believe the effect of

3 better operator training and staffing and the like may

4 have a significant influence, a substantial influence on

5 the frequency of core melt, though I do not know that it

6 does. I think it unlikely to have a large influence on

7 the likelihood or severity of the particularly severe

8 accident scenarios which dominate risk.

9 Q Do you translate this into any specific

10 quantitative figure less than 1.5?

11 A (WITNESS ROWSOME) No.

12 Q Do you have a feeling whether it is less than

13 one?

14 A (WITNESS ROWSOME) I don't think that is a

15 meaningful attribution.

16 Q Do you have anything to add, Mr. Hannon?

17 A (WITNESS HANNON) No, I do not.

18 Q Thank you.

19 Now, the estimates of risk reduction

20 attributable to the director's order are based on the

21 assumption that all parts of the director's order will

22 be complied with, are they not?

23 A (WITNESS HANNON) That is correct.

24 Q And it is also assumed that each part of the

25 director's order represents something new, that is, some

1 specific action taken as a result of the director's
2 order, as opposed to be something that existed prior to
3 the director's order. Is that correct?
4 A (WITNESS ROWSOME) Not necessarily.
5 Q Does that mean that in calculating the risk
6 reduction due to the director's order, credit was given
7 for things that had already existed that the director
8 simply referenced the existence of?
9 A (WITNESS ROWSOME) We have testified to them
10 not formally calculating the risk reduction attributable
11 to the director's order at all except for some discrete
12 accident sequences.
13 Q Well, for those discrete accident sequences,
14 let me repeat the question. That is, are there
15 particular items of the director's order that simply
16 reference the status quo for which credit is given for
17 reducing risk?
18 A (WITNESS ROWSOME) No, not to my knowledge.
19 Q Then it is assumed that anything in the
20 director's order for which credit is given for reducing
21 risk represents something new undertaken as a result of
22 the director's order?
23 A (WITNESS ROWSOME) Yes, I think that is --
24 well, wait a minute. There is one in here that is risk
25 relevant which simply accelerates the implementation of

1 something which would be in the pipeline anyway, so to
2 attribute to that something new or different, I think,
3 would be to overstate the case.
4 Q Would you identify that one for us, please?
5 A (WITNESS ROWSOME) B-4 is an example. I
6 believe there may be others.
7 Q But this does represent something new in that
8 it, I believe, accelerates implementation.
9 A (WITNESS ROWSOME) Yes.
10 Q Thank you.
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1 Q Are there any which do not even accelerate
2 implementation, that do nothing other than reference the
3 status quo?
4 A (WITNESS ROWSOME) It is my understanding that
5 one of them was already complied with but not required.
6 Q Which one is that?
7 A (WITNESS ROWSOME) The one on the LOCA peak
8 temperature, A1, yes, A1; that it was de facto there
9 already but not a formal requirement.
10 JUDGE GLEASON: You mean at the time of the
11 Director's order?
12 WITNESS ROWSOME: At the time of the
13 Director's order.
14 BY MR. BLUM: (Resuming)
15 Q When the Staff initially calculated a factor
16 of 3 risk reduction was that factored in as part of the
17 risk reduction?
18 A (WITNESS ROWSOME) No. The factor of 3
19 originates from changes in accident sequences involving
20 intersystem LOCA, loss of offsite power, and reliability
21 of the auxiliary feedwater system.
22 Q All right. What I would now like to do is go
23 through the different features of the Director's order
24 -- I count that there are 39 -- and ask your opinion on
25 a couple of different points.

1 When I use the term "make weight," what this
2 refers to is something that had already existed anyway
3 or was simply bringing the plant into compliance with
4 existing regulations as opposed to some new fix that was
5 specific to Indian Point. Is that clear?
6 JUDGE GLEASON: What is the reference?
7 MR. BLUM: To the term "make weight."
8 JUDGE GLEASON: "Make weight?"
9 MR. BLUM: Yes. When we ask is something a
10 make weight, this will be a shorthand of asking whether
11 this is something that was already in existence or
12 already required by NRC regulations.
13 JUDGE GLEASON: Is this a term of art?
14 MR. BLUM: No. I believe it is a term of
15 slang.
16 JUDGE GLEASON: All right. We'll try to keep
17 up with it.
18 JUDGE SHON: The implication is it simply made
19 the order weightier without actually doing anything?
20 MR. BLUM: Yes, Judge Shon.
21 JUDGE GLEASON: Thank you, Judge Shon.
22 MR. SOHINKI: Your Honor, could get something
23 clarified? I think there were several elements that Mr.
24 Blum listed.
25 JUDGE GLEASON: Would you review the

1 understanding that goes behind the use of those words?

2 MR. BLUM: This was something that was either

3 already in existence or already required by NRC

4 regulations.

5 JUDGE GLEASON: It is nothing new, in other

6 words.

7 JUDGE PARIS: You wouldn't try to slip

8 something in as a make weight if it weren't a make

9 weight, would you, Mr. Blum?

10 MR. BLUM: No. Well, it will be up to the

11 witnesses what is a make weight anyway.

12 MR. LEVIN: If it's such a common term -- it

13 is such a common term, I'm sure they won't have any

14 trouble with it, Your Honor. I hear it on the streets

15 all the time.

16 BY MR. BLUM: (Resuming)

17 Q Now, the specific items of the Director's

18 order are contained in Appendix A of the Director's

19 order, is that correct?

20 A (WITNESS ROWSOME) That is correct.

21 Q All right. Could you now please turn to

22 Appendix A, and we will go through beginning with A1.

23 Could you read what A1 consists of under the category

24 the Licensees shall: one.

25 A (WITNESS ROWSOME) "One, maintain reactor

1 power level as necessary such that calculated fuel peak
2 clad temperature does not exceed 2000 degrees Farenheit
3 under large break LOCA conditions."
4 Q Now, isn't it true that maintaining reactor
5 power at this level represents no restriction below
6 normal operating levels, so that this item is a make
7 weight --
8 MR. LEVIN: Object to the use of the term
9 "make weight," Your Honor. It is a term that Mr. Blum
10 has employed here in order to characterize in some way
11 in a derogatory fashion the efforts that may have been
12 undertaken by the Licensees. And if Mr. Blum has some
13 word or series of words he wishes to use which do not so
14 characterize it and do not ask the witness to adopt that
15 characterization, then, at least speaking for the Power
16 Authority, we would have no objection.
17 JUDGE GLEASON: I think, Mr. Blum, that
18 everybody except Judge Shon needs help with the use of
19 these terms that you've come up. Then is there some
20 other way that you could translate this, some other use
21 of words that you can use that will make it clear as to
22 what condition you are referring to?
23 MR. BLUM: Would it help the Board if the term
24 "illusory improvement" was used instead of "make weight?"
25 JUDGE GLEASON: I'm not sure if that is a

1 substantive change.

2 MR. LEVIN: Obviously, it does not cure the

3 objection.

4 MR. BLUM: What we need is a word that

5 accurately conveys the meaning of something that is in

6 there that on the surface looks like it is doing

7 something, but it's not really doing something.

8 MR. LEVIN: Your Honor, the witnesses are on

9 the stand. If Mr. Blum wants them to characterize

10 something, why doesn't he just use that question?

11 JUDGE GLEASON: Why don't you just use words

12 like "nothing new" or something like that, something

13 that we can all grab a hold of. Just try to eliminate

14 the words "make weight" and see where we go.

15 JUDGE SHON: Mr. Blum, you might ask as you

16 come to each thing whether that requirement would entail

17 a substantial change in operating procedures or

18 equipment. Would that not pretty much mean --

19 MR. BLUM: I would then have to clarify

20 "substantial change" in either existing operating

21 procedures or in procedures as mandated by NRC rules.

22 JUDGE GLEASON: Well, let's just start and see

23 how we go.

24 What is your first question in connection with

25 the first requirement of Appendix A?

1 BY MR. BLUM: (Resuming)

2 Q Isn't it true that maintaining reactor power

3 at this level as mandated by A1 represents no

4 restriction below normal operating level: therefore,

5 this item presents no substantial improvement over and

6 above that which either was existing procedure before or

7 was mandated by NRC rules?

8 A (WITNESS ROWSOME) The peak clad temperature

9 is a function not only of power level but many other

10 parameters in the plant. It may well have been, and it

11 was my understanding that it was at that time that the

12 plant in its normal power generation did not violate

13 this criterion. On the other hand, they were under no

14 legal obligation not to operate in a mode that would

15 have brought the peak clad temperature up to 2200

16 degrees F. And so in that sense there is a regulatory

17 constraint here which was not already in place.

18 Q Right. But this is something that was there

19 in the normal plant operation at the time.

20 A (WITNESS ROWSOME) That is my understanding.

21 Q Going on to A2, would you please read A2?

22 A (WITNESS ROWSOME) "Revise plant operating

23 procedures as necessary to require a base load mode type

24 of operation only without load following."

25 Q Now, isn''t it true that this item prohibits a

1 mode of operation load following which is not used
2 anyway?
3 A (WITNESS ROWSOME) I don't know.
4 Q Do you know, Mr. Hannon?
5 A (WITNESS HANNON) I know that in order to
6 implement this item it did require changes to procedures
7 at the facilities.
8 Q So you are saying that you know they were
9 using this mode of operation at Indian Point, mode
10 following?k
11 A (WITNESS HANNON) No, I did not say that. I
12 said in order to implement this provision of the order
13 it did require changes to plant procedures.
14 Q Well, do you know whether they were using load
15 following at Indian Point prior to this?
16 A (WITNESS HANNON) No, I do not.
17 Q Do you know what changes in procedures were
18 made that were required by this?
19 A (WITNESS HANNON) Not specifically. I can
20 refer you to the reactor inspection report where the
21 implementation of the order item was documented. It
22 does not go into great detail.
23 Q Does that report mention whether or not the
24 load following was used at Indian Point?
25 A (WITNESS HANNON) No, it does not.

1 Q Let's go on to A3. Could either of you please
2 read A3 out loud?
3 A (WITNESS ROWSOME) "Conduct a low pressure
4 gross leak test of containment prior to any startup from
5 cold shutdown conditions. If other means can be found
6 to verify containment integrity, the Licensee may
7 propose such procedures to the Commission for its review
8 and approval."
9 Q Isn't it true that this test does nothing more
10 than confirm containment integrity which is supposed to
11 be assured at all times?
12 A (WITNESS ROWSOME) It does verify it, yes.
13 Q And it does nothing more than that?
14 A (WITNESS ROWSOME) That is correct.
15 Q And, for example, containment integrity is
16 assumed in IPPSS, for example, is that correct?
17 A (WITNESS ROWSOME) I don't remember the
18 treatment of containment penetrations in the IPPSS. In
19 the Staff analysis we have a finite probability that a
20 containment isolation valve might be open.
21 Q Now, this does suggest that there might be
22 some problem with containment integrity in the Staff's
23 view, does it not?
24 A (WITNESS ROWSOME) It suggests that we believe
25 that one would have greater reliability in the assurance

1 that no valves or other penetrations are open.

2 Q Let's go on to A4. Could one of you read A4,

3 please.

4 A (WITNESS ROWSOME) "Maintain at least to

5 senior reactor operations, SROs, one of whom may be the

6 shift supervisor in the control room at all times during

7 power operations or hot shutdown, except that the shift

8 supervisor shall be allowed to leave the immediate

9 vicinity of the control room as duties may require,

10 provided he is available to respond to an emergency by

11 returning to the control room within ten minutes. The

12 shift or watch supervisor's office is considered part of

13 the control room.

14 Q And this is one of the significant changes

15 that is contained in the Director's order, I assume, is

16 that correct?

17 A (WITNESS ROWSOME) I believe it is.

18 Q But this, of course, would not compensate for

19 design efficiencies.

20 A (WITNESS ROWSOME) That is much too general a

21 statement to be meaningful to me.

22 Q Okay. Let's go on to A5. Would one of you

23 read A5, please?

24 A (WITNESS ROWSOME) "Five, conduct testing to

25 assure that the LPI/RHR check valves are in fact

1 installed correctly and functioning as pressure
2 isolation barriers when the plant is at pressure and
3 producing power. Verification of valve operability
4 shall be performed prior to plant restart, if shutdown
5 at time of issuance of the order and thereafter whenever
6 RCS pressure has decreased to within 100 psig of RHR
7 system design pressure.
8 Q Isn't it true that the most this does is to
9 verify that the valves are in the condition that they
10 were assumed to be in when the plant was licensed and
11 when the valves were licensed?
12 A (WITNESS ROWSOME) Well, the valves are
13 operable. The license doesn't presume they are in just
14 one condition. It does provide assurance of operability
15 and of sealing of the reactor coolant pressure boundary.
16 Q Well, let me use the wording that the Board
17 suggested. This provides no substantial improvement
18 over and above what was assumed in licensing, is that
19 correct?
20 A (WITNESS ROWSOME) Licensing was not based
21 upon an analysis of measured reliability. This clause
22 is included in the Director's order to affect the
23 reliability of the pressure boundary, to improve the
24 reliability.
25 Q So licensing is done without knowing about the

1 reliability of the valves?

2 A (WITNESS ROWSOME) It is done in terms of

3 qualitative requirements intended to assure public

4 health and safety, but not on the basis of quantitative

5 assessments of functional reliability.

6 Q Thank you.

7 Well, let me ask you another question on A5.

8 The qualitative assessments, are those designed to

9 achieve a certain level of functioning, or are they

10 simply a general subjective feeling of whether things

11 are okay?

12 A (WITNESS ROWSOME) A5 is intended to lower the

13 probability that one of the valves might have stuck open.

14 Q I'm sorry. I don't mean A5. I mean normal

15 licensing of the valves. Is that done in such a way as

16 to try to meet certain specifications?

17 A (WITNESS ROWSOME) There are specifications

18 having to do with the number of pressure boundary valves

19 and the quality control, the levels of quality control

20 that are active between them.

21 Q Wouldn't this in A5 be going to the issue of

22 quality controls in the valves?

23 A (WITNESS ROWSOME) The regulations do entail

24 some requirements for surveillance.

25 Q But couldn't A5 simply be formalizing that

1 which the normal regulatory requirements seek to arrive
2 at, perhaps by a different means?
3 A (WITNESS ROWSOME) The normal requirements do
4 not require testing so often as this requirement does.
5 This does require more frequent testing.
6 Q But the purpose of the testing is to ensure
7 that the valves are in the same shape that they are
8 assumed to be in for purposes of licensing, is it not?
9 A (WITNESS ROWSOME) I think that is correct.
10 Q Let's go on to A6. Could one of you read A6,
11 please.
12 A (WITNESS ROWSOME) "Submit not later than
13 March 1, 1980, the results of a review of possible
14 permanent plant modifications and procedures to further
15 reduce the potential for a severe reactor accident and
16 resultant radiation releases.
17 Q And were the results of such a review
18 submitted?
19 A (WITNESS HANNON) Yes, they were, by a letter
20 dated February the 25th, 1980.
21 Q Thank you.
22 What were the possible permanent plant
23 modifications that were referenced in that review?
24 A (WITNESS HANNON) I'd like to defer that
25 question to the following witness because I do not have

1 the entire report with me.

2 Q Was filtered vented containment one of them?

3 A (WITNESS HANNON) I don't know.

4 A (WITNESS ROWSOME) Neither of us have a copy

5 of that report here.

6 MR. BLUM: Does the Staff have a copy

7 available?

8 MS. MOORE: I'm afraid one of our witnesses

9 has our only copy that was provided by the Board.

10 MR. BLUM: Is this the witness?

11 BY MR. BLUM: (Resuming)

12 Q Could you take a minute to look at that and

13 tell us whether filtered vented containments is one of

14 the improvements referenced?

15 MR. SOHINKI: Mr. Chairman, could we have that

16 document identified for the record?

17 JUDGE GLEASON: If I'm not mistaken, is this

18 UCS Exhibit No. 6, or is this some other?

19 MR. SOHINKI: That was basically my problem.

20 I wasn't sure whether it was the 60-day report we were

21 talking about.

22 JUDGE GLEASON: Is this the 60-day report

23 you're referring to?

24 WITNESS HANNON: No. This is a later report.

25 What we are looking for is the near-site study that came

1 in in February. This is one that came in later, in
2 March.
3 JUDGE GLEASON: So I gather they do not have
4 the document in front of them, Mr. Blum, that you
5 referred to or that the question refers to.
6 MR. MC GURREN: Mr. Chairman, just so the
7 record is clear, I think the document they have before
8 them is UCS No. 6.
9 JUDGE GLEASON: Then it is a different
10 document than the question refers to.
11 MS. MOORE: Yes.
12 JUDGE GLEASON: That is my understanding. So,
13 Mr. Blum.
14 BY MR. BLUM: (Resuming)
15 Q So it is correct that neither of you knows one
16 way or the other whether filtered vented containments
17 were one of the improvements referenced?
18 A (WITNESS ROWSOME) In the submittal that
19 preceded the March 1 deadline, that is correct.
20 Q How about compartment venting, do either of
21 you know whether that was included?
22 A (WITNESS HANNON) No. Without referring to
23 that document I would not be able to answer that.
24 Q Do you have any sense of what some of the
25 significant plant modifications were from this review

1 that was submitted to the Director?

2 A (WITNESS ROWSOME) I have never seen it or

3 read it myself.

4 Q Mr. Hannon, do you?

5 A (WITNESS HANNON) I can refer you to the

6 introduction to NUREG-0850 which gives a synposis of the

7 history of the mitigation features assessment, and in

8 there it does discuss a meeting where the utilities

9 reported to the Staff on the 60-day study. However, it

10 does not go into any detail on what the considerations

11 were at that time.

12 Q Mr. Hannon, have you read the report submitted

13 February 25, 1980?

14 A (WITNESS HANNON) Yes. But I read it several

15 months ago, and I don't recall it.

16 Q Thank you. Let us go on to A7. A7 has a

17 bunch of subparts, A through J, but if you could first

18 just read the A7 itself without going through the A

19 through J.

20 A (WITNESS ROWSOME) "Require that all reactor

21 operators and senior reactor operators conduct simulator

22 training and in-plant walkthrough of the following

23 emergency procedures. The in-plant walkthrough shall be

24 completed prior to the next reactor startup following

25 issuance of the order or within 30 days of the date of

1 issuance, which ever occurs first. Those reactor
2 operators and senior reactor operators who've not
3 received simulator training within the past three months
4 on these items shall be given such simulator training
5 within 60 days of the date of the order." And it then
6 follows with the list to which you referred.
7 Q Right. A through J. It is your position, is
8 it not, that the amount of risk reduction attributable
9 to the simulator training cannot be quantified, is that
10 correct?
11 A (WITNESS ROWSOME) I am not aware that it
12 could be quantified in a reliable fashion.
13 Q Is it your belief that it could not be
14 quantified in a reliable fashion?
15 A (WITNESS ROWSOME) I don't know that it could
16 be. If it were to be, it would be a surprise to me.
17 But I can quite plausibly be surprised in such things.
18 Q Mr. Hannon?
19 A (WITNESS HANNON) I don't have an opinion on
20 that issue.
21 Q But I assume the Staff has not made an effort
22 to quantify the risk reduction attributable to this.
23 A (WITNESS ROWSOME) That is correct. The staff
24 does have research under way to better our capability to
25 do such calculations, but we have not yet done such a

1 calculation.

2 Q Could you explain why you would be surprised

3 if it could be quantified reliably?

4 A (WITNESS ROWSOME) There is a great variety of

5 complex phenomena that shape the performance of

6 operators, and the richness of a model capable of

7 portraying all of those effects, all of those

8 contingencies, all of those factors that influence human

9 performance, would require a massive amount of data in

10 order to be tied to actual measurement of people's

11 performance to be calibrated, as it were.

12 I don't believe there is enough data available

13 in relevant contexts to quantify such a model in a

14 reliable fashion.

15 Q By "data" you mean actual observed experience?

16 A (WITNESS ROWSOME) That's right.

17 Q You would not mean general estimates of

18 likelihood based on subjective judgment?

19 A (WITNESS ROWSOME) Certainly subjective

20 estimates could be made.

21 Q But your use of the term "data" refers to

22 actual experience.

23 A (WITNESS ROWSOME) That's right, that's right.

24 JUDGE GLEASON: Mr. Blum, I think, unless you

25 object, this will be an appropriate place for us to

1 recess for lunch.

2 MR. BLUM: Certainly.

3 JUDGE GLEASON: Let us come back in about an

4 hour, lease.

5 (Whereupon, at 12:32 p.m., the hearing was

6 recessed for lunch, to be reconvened at 1:44 p.m., the

7 same day.)

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1 AFTERNOON SESSION

2 (1:44 p.m.)

3 JUDGE GLEASON: All right. If we could start

4 again, please.

5 Whereupon,

6 FRANK ROWSOME

7 AND

8 JOHN HANNON

9 resumed the stand and were further examined and

10 testified as follows:

11 CROSS EXAMINATION -- Continued

12 BY MR. BLUM:

13 Q Gentlemen, as you might guess, we didn't

14 arrive at any stipulations over lunch, but there is one

15 thing that might speed things up a little bit, which is

16 instead of making you read every point first, I will ask

17 the question the other way, and I will use kind of an

18 amalgam of what Judge Gleason and Judge Shon suggested

19 as wording. Judge Gleason used the words "anything

20 new," Judge Shon "anything substantial."

21 So for each of these beginning with B1 I'm

22 going to ask is there anything new or substantial here,

23 and that refers to anything new and substantial over and

24 above the plant's operation prior to the order and the

25 existing regulations of the NRC. And you can answer

1 either no, there's nothing new or substantial here, or
2 if you feel there might be, then you should go ahead and
3 read off the point, and we'll discuss it.
4 MR. LEVIN: I assume in order to be a positive
5 response, Your Honor, it has to be both new and
6 substantial?
7 JUDGE GLEASON: Let's see how we go.
8 MR. BLUM: No, that's not correct.
9 MS. MOORE: Mr. Chairman, I'd like to ensure
10 that whatever way we proceed on this, the witnesses have
11 an opportunity to explain what they mean by the terms
12 that are being used and what they mean by their answers.
13 JUDGE GLEASON: We're going to assure that the
14 witnesses have opportunity to respond.
15 BY MR. BLUM: (Resuming)
16 Q Do you now understand what I mean by the
17 phrase "new or substantial?"
18 A (WITNESS ROWSOME) I'll define my
19 understanding of it as it arises if you wish.
20 To proceed, B1, vendor representative, the
21 presence of a --
22 JUDGE GLEASON: Excuse me. Is that the
23 question?
24 MR. BLUM: Yes.
25 BY MR. BLUM: (Resuming)

1 Q The first question will be with regard to B1
2 is there anything new or substantial here?
3 A (WITNESS ROWSOME) B1, what is new is the
4 requirement for the physical presence at the site of a
5 representative of the reactor vendor.
6 Shall I proceed with B2?
7 Q Is B1 substantial?
8 A (WITNESS ROWSOME) Some members of the Staff
9 thought that the physical presence of a vendor
10 representative would provide perspectives and an ease of
11 communication with the larger pool of experts at the
12 vendor's organization than might otherwise be the case.
13 So that under accident conditions or for that matter
14 simply in the interpretation of experiences, learning
15 the lessons of experience in plant operations, that
16 better communications might obtain and that that might
17 in fact make a difference in some scenarios.
18 Q Could you describe what kind of person this
19 would be, the vendor's representative?
20 A (WITNESS ROWSOME) That isn't stipulated
21 here. That is not part of the requirement.
22 JUDGE GLEASON: Mr. Rowsome, I guess the first
23 question you answered demonstrates the problem in
24 proceeding like this. You indicated in your response
25 what was new was a presence of a representative from a

1 vendor. If I read B1, it says a representative from the
2 vendor, architect engineering or startup engineering
3 firm.
4 WITNESS ROWSOME: That is correct.
5 JUDGE GLEASON: I know that that is correct.
6 What I am trying to find out, is that correct as far as
7 your answer is concerned?
8 WITNESS ROWSOME: I believe so.
9 WITNESS HANNON: The actual implementation of
10 this item has resulted in a Westinghouse representative
11 being stationed at both sites.
12 JUDGE GLEASON: All I am trying to suggest to
13 you is that as you answer the question just be as
14 complete as the question calls for, and the answer
15 should indicate. Because in my mind if you have three
16 categories of people, three categories that
17 representatives are supposed to come from, that may or
18 may not be the vendor.
19 WITNESS ROWSOME: That's true.
20 JUDGE GLEASON: Then, you see, your answer was
21 not responsive or your answer was not complete because
22 you just said the vendor. And that is all I am asking
23 is to make it complete so at least when we read the
24 record we know what you are saying.
25 All right.

1 JUDGE PARIS: I'd like to follow up a question
2 on that. You said that at both sites. You mean a
3 Westinghouse representative at each of the two sites,
4 each of the two plants, or one representative divided
5 between the two plants?
6 WITNESS HANNON: My understanding is that
7 there is one Westinghouse representative stationed at
8 the Indian Point site, and he is available for
9 consultation to both utilities.
10 JUDGE PARIS: Thank you.
11 BY MR. BLUM: (Resuming)
12 Q Is there any particular level of scientific
13 expertise or operating experience required of the
14 vendor's representative or the representative of whoever
15 it is?
16 A (WITNESS ROWSOME) The Director's order does
17 not include any particular credentials.
18 Q Going on to B2, is there anything new or
19 substantial here?
20 A (WITNESS ROWSOME) It is a review in that
21 sense of -- it is merely an inquiry to identify whether
22 something needs attention. In that sense it is not
23 necessarily new or substantial.
24 Q Do you know whether it is discovered that the
25 problem of control room habitability did require

1 attention?

2 JUDGE GLEASON: Mr. Blum, I guess the Board

3 would prefer that these questions get read into the

4 record. A lot of us do not have the -- we have one copy

5 here, but we have three judges, and some others may not

6 have it here. So would you mind, Mr. Rowsome, reading?

7 WITNESS ROWSOME: Be happy to.

8 B2: "To ensure control room habitability

9 under accident conditions the Licensee shall re-examine

10 ventilation intakes, location of potential plant leakage

11 (ingress and egress) and control room filter

12 capabilities, and submit the results of this review to

13 the NRC."

14 WITNESS HANNON: This particular item resulted

15 in a safety evaluation which was issued to both

16 facilities in separate letters dated January 27, 1982,

17 and there were physical plant modifications that were

18 required as a result of the review of control room

19 habitability for both units. I do not have the details

20 of those modifications with me, so I don't have

21 specifics. But there were hardware modifications.

22 BY MR. BLUM: (Resuming)

23 Q Does either of you know in what sense the

24 control room was deemed not to be sufficiently habitable?

25 A (WITNESS ROWSOME) I do not.

1 A (WITNESS HANNON) There was a concern that
2 radioactive releases occurring outside the facility may
3 not be properly detected, and as a result, radiation
4 detectors and ventilation modifications were required.
5 Q This is something that would also be required
6 by the emergency planning regulations, is it not?
7 MS. MOORE: Objection, Mr. Chairman. These
8 witnesses have not talked and are not here to talk about
9 emergency planning regulations.
10 MR. BLUM: Well, the witnesses can answer they
11 don't know if they don't know, but it is relevant
12 whether these things are new requirements or whether
13 they are simply redundant of existing regulations.
14 JUDGE GLEASON: Well, let them answer if they
15 can.
16 WITNESS ROWSOME: In fact I do not know,
17 though it is my understanding that the emergency
18 preparedness regulation followed this order.
19 BY MR. BLUM: (Resuming)
20 Q Followed this order?
21 A (WITNESS ROWSOME) Chronologically.
22 JUDGE PARIS: Do you want to add to that, Mr.
23 Hannon?
24 WITNESS HANNON: No, I do not.
25 MR. LEVIN: Your Honor, just so our silence

1 does not constitute in the Board's mind an assent to Mr.
2 Blum's remarks as to relevancy, we are not at all
3 certain that this line of testimony has any relevancy to
4 anything.
5 JUDGE GLEASON: Mr. Blum, proceed.
6 MR. BLUM: Thank you.
7 BY MR. BLUM: (Resuming)
8 Q B3, could you read that into the record,
9 please?
10 A (WITNESS ROWSOME) "Emergency action levels
11 shall be revised to require notification of the NRC for
12 all events in the emergency classes described in
13 NUREG-0610, September 1979."
14 Q And this is required of all plants, is it not?
15 A (WITNESS ROWSOME) I am not an authority on
16 this. My understanding is that it is now but was not at
17 the time this order was issued.
18 Q This was something that came out of the TMI
19 experience, wasn't it?
20 A (WITNESS ROWSOME) Yes.
21 Q B4, would you read that, please?
22 A (WITNESS ROWSOME) "The Licensee shall comply
23 with the NRC's 'interim position for containment purge
24 and vent valve operation pending resolution of isolation
25 valve operability' as contained in the October 1979

1 letter to the Licensee.

2 Q Now, am I correct that this orders the

3 Licensee to comply with something that the Licensee had

4 been ordered to comply with five months previously, is

5 that correct?

6 A (WITNESS ROWSOME) I don't know.

7 John, do you know?

8 A (WITNESS HANNON) My understanding is that the

9 interim position was at first presented to the Licensees

10 in a letter in October 1979, and that the result of this

11 order simply expedited the compliance to that

12 requirement.

13 Q Let me clarify that. The Licensees were

14 ordered to comply with it in October of 1979, is that

15 correct?

16 A (WITNESS HANNON) I don't recall whether that

17 was an order or just a generic letter. I don't think it

18 was an order.

19 Q Do you have a copy of that letter?

20 A (WITNESS HANNON) No, I do not.

21 Q So your testimony is you don't know whether

22 they were ordered to comply in October 1979.

23 A (WITNESS HANNON) That is correct.

24 Q But they were at least advised of the

25 importance of this particular measure in October 1979,

1 is that correct?

2 A (WITNESS HANNON) Yes. They were made aware

3 of the Staff's interim position on this issue by that

4 letter in October of '79.

5 Q And then the Director's order expedited

6 compliance with this five months later.

7 A (WITNESS HANNON) That is my understanding,

8 yes.

9 Q Thank you.

10 Let's go to B5 now.

11 A (WITNESS ROWSOME) I infer you wish me to read

12 it.

13 "Plant personnel shall be trained and

14 retrained in the following areas within 30 days or prior

15 to startup if required by the Lessons Learned

16 implementation schedule. Plant personnel shall also be

17 retrained in the following areas within 30 days of the

18 time that there are significant changes to the

19 procedures or requirements applicable to these areas:" --

20 Q You don't have to read all the specific things

21 unless the Board wants it. I just have one general

22 question: that it is your position that you are not

23 able to quantify the amount of risk reduction

24 attributable to this training, is that correct?

25 A (WITNESS ROWSOME) That is correct.

1 Q Prior to this training and retraining was it
2 presumed that the plant personnel were familiar with
3 these various items?
4 A (WITNESS ROWSOME) I am not aware of the
5 thinking at the time. Many of these are procedures that
6 emerged from the learning of the lessons of the accident
7 at Three Mile Island, so they were quite recent. They
8 were not, for the most part, procedures that existed
9 prior to the accident.
10 Q So this type of training and retraining was
11 being required around the country in different plants,
12 was it not?
13 A (WITNESS ROWSOME) I believe so, but whether
14 on this schedule I cannot say.
15 Q Do you know how thoroughly this was conducted
16 at Indian Point?
17 First, let me ask does either of you have
18 personal knowledge of how thoroughly it was conducted?
19 A (WITNESS ROWSOME) I do not.
20 A (WITNESS HANNON) I have indirectly knowledge
21 of this by having read the resident inspector's report
22 where this item was closed out, and I understand from
23 that that the inspector selectively reviewed training
24 records and interviewed training personnel to come to
25 this judgement that this particular order item had been

1 complied with adequately.

2 Q Thank you. Let's go to number 6.

3 A (WITNESS ROWSOME) "The Licensee shall perform

4 diesel generator testing in accordance with Regulatory

5 Guide 1.108 with a corresponding change in the allowable

6 outage times stipulated in the limiting conditions of

7 operations as follows," and there is a table that

8 follows that lists a number of diesel generator failures

9 and the corresponding test interval and the

10 corresponding allowable outage time.

11 I presume you don't need the table read.

12 Q That is correct.

13 Now, it appears from this item that plants are

14 allowed to continue to operate after diesel generator

15 test failures, is that correct?

16 A (WITNESS ROWSOME) Some of the time, yes.

17 Q It is true, is it not, that the testing in and

18 of itself does not increase the reliability of the

19 diesels or compensate for the fact that a single fire or

20 explosion could disable all of the Unit 2 diesels, does

21 it?

22 A (WITNESS ROWSOME) That is correct.

23 Q Let us go on to number 7.

24

25

1 Q I'm trying to see if there is a way that you
2 don't have to read all this. Yes, maybe if you just
3 read the top part before A, and give everyone a chance
4 to look over the lower parts, A through F.
5 A (WITNESS ROWSOME) "Seven: Requirements
6 regarding reactor operator qualifications shall be
7 revised to incorporate the following for applications
8 submitted after June 1, 1980."
9 (Pause.)
10 Q Now, for these generally, this applies only to
11 applications submitted after June 1, 1980. Is that
12 correct?
13 A (WITNESS ROWSOME) That is what it says.
14 Q And is it known how many operators presently
15 lack the qualifications that are going to be required
16 for applications submitted after June 1, 1980?
17 A (WITNESS ROWSOME) I have trouble with your
18 tenses.
19 Q Okay. There are a set of qualifications that
20 are being required for applications submitted after June
21 1, 1980, but there are some employees who were there
22 before June 1, 1980, who are not being required to meet
23 these qualifications. Is it known how many such
24 employees there are?
25 A (WITNESS ROWSOME) Not by me personally.

1 Q Do you know whether the staff has attempted to
2 ascertain how many such unqualified employees there are?
3 A (WITNESS ROWSOME) I don't know.
4 A (WITNESS HANNON) Not to my knowledge.
5 Q All right. This concludes Section B, and I am
6 now going to ask you a question regarding Sections A and
7 B as a whole. That is, all the specific items we have
8 gone through. Is it known by you that the licensees
9 have in fact complied with each and every one of these
10 requirements?
11 MR. LEVIN: Objection, Your Honor. I thought
12 that he had asked that question with respect to each
13 one.
14 JUDGE GLEASON: No, he hasn't asked each one.
15 MR. LEVIN: Well, apparently for some and not
16 others.
17 JUDGE GLEASON: I think it is a summary type
18 question, so I would like to hear the answer.
19 WITNESS ROWSOME: My information on the
20 subject comes from John Hannon. He will address the
21 question.
22 WITNESS HANNON: I have determined that there
23 is documentation that demonstrates the satisfactory
24 compliance with Part A and B of the director's orders
25 with one exception, and that being A-6, and that is in

1 the review of the mitigation features as an ongoing
2 process that has not been concluded, and so there is no
3 documentation that exists which acknowledges the
4 licensee's submittal of February, 1980.
5 JUDGE PARIS: Could you read A-6 so we can
6 have in the record what that is?
7 WITNESS HANNON: Yes. "Six: Submit not later
8 than March 1, 1980, the results of a review of possible
9 permanent plant modifications and procedures to further
10 reduce the potential of a severe reactor accident and
11 resultant radiation releases."
12 BY MR. BLUM: (Resuming)
13 Q So it is your testimony that you do not know
14 whether the required submittals were in fact made?
15 A (WITNESS HANNON) No, all required submittals
16 were made. What I was saying is that there is no staff
17 documentation indicating that Item 6 has been resolved.
18 That is, Item A-6.
19 Q And you have testified earlier you were not
20 familiar with the specific measures involved in this
21 order. That is correct, I assume.
22 MS. MOORE: I would object to the question on
23 the grounds that it shouldn't need clarification. What
24 order are we talking about?
25 JUDGE GLEASON: It should be clarified, Mr.

1 Blum.

2 MR. BLUM: Well, with respect to A-6 of the

3 director's order, this was something we had gone through

4 earlier in the hearing when I was asking what measures

5 were included here, was filtered vented containments

6 included, was compartment venting included, do you know

7 what all was included, and the answer to each of those

8 was, I don't know, and I am simply asking, is that still

9 your testimony?

10 MS. MOORE: It is my understanding that that

11 went to what was included in the submittal made with the

12 letter of February 25th, and not whether the order

13 itself referred to specific mitigation measures.

14 JUDGE GLEASON: Why don't we clarify by having

15 the witness just respond to it as an original question?

16 WITNESS HANNON: I am not sure I understand

17 the original question.

18 JUDGE GLEASON: Mr. Blum, try again.

19 BY MR. BLUM: (Resuming)

20 Q A-6 requires that the licensees present a

21 submittal listing various plant modifications, does it

22 not?

23 A (WITNESS HANNON) It requires a review of

24 possible permanent plant modifications and procedures,

25 yes.

1 Q And it is your testimony, is it not, that you
2 do not know what modifications were in fact included in
3 the plant submittal pursuant to A-6?
4 A (WITNESS HANNON) That is correct.
5 Q Do you know of particular modifications that
6 the licensees were ordered by the NRC to include in
7 their submittal pursuant to A-6?
8 A (WITNESS HANNON) No, I do not.
9 Q Mr. Rowsome?
10 A (WITNESS ROWSOME) Remind me of your
11 question. I didn't track it all.
12 Q Maybe I will just go on, if that is all
13 right.
14 Okay. Now, let's go on. Oh, yes. Mr.
15 Hannon, you had said that with the exception of A-6, you
16 had evidence of satisfactory compliance. Could you read
17 the specific passage that you are alluding to?
18 JUDGE GLEASON: Is there a specific passage?
19 WITNESS HANNON: That was a summary of my
20 investigation into the status of compliance with these
21 particular items. I didn't have a particular passage I
22 was referring to.
23 BY MR. BLUM: (Resuming)
24 Q Well, just to clarify, because it is your
25 professional opinion now that we are relying on, is it

1 your testimony that other than A-6, you do not know of
2 any instances where there has not been satisfactory
3 compliance or that you do in fact know positively that
4 except for A-6, there was satisfactory compliance with
5 each and every one?
6 A (WITNESS HANNON) The latter characterization
7 is accurate.
8 Q Thank you. That judgment was made entirely by
9 you, or were there others involved in making it?
10 A (WITNESS HANNON) It was my responsibility to
11 come to that judgment as project manager for Indian
12 Point.
13 Q Thank you.
14 Let's now go to C-1, and if we could read
15 that.
16 A (WITNESS ROWSOME) "Review the steady state
17 steam generator operating level to determine the optimum
18 steady state level for purpose of maximizing dryout time
19 with due consideration for overfilling. The results of
20 this study shall be provided to the NRC."
21 Q And this particular requirement is TMI
22 related, is it not?
23 A (WITNESS ROWSOME) Yes, I believe so.
24 Q And this is something that is required of
25 plants generally?

1 A (WITNESS ROWSOME) I am not aware that it is
2 or is not.
3 Q Thank you.
4 Let's go on to C-2.
5 A (WITNESS ROWSOME) "Evaluate possible
6 coimpregnation of the charcoal and the plant's air
7 affluent air filtration system with KI and I2, and in
8 amines such as TEDA (triethylene diamine) to improve the
9 iodine removal capability of these systems. The results
10 of this review shall be submitted to the NRC."
11 Q Now, both C-1 and C-2 are studies that would
12 not by themselves reduce risk. They would only reduce
13 risk if they discovered measures that were in fact
14 implemented. Is that not true?
15 A (WITNESS ROWSOME) That is correct.
16 Q Going on to C-3, could you read C-3, please?
17 A (WITNESS ROWSOME) "C-3: Evaluate effects on
18 plant system stability if power is reduced as much as 50
19 percent, treating power as a parameter (for example, the
20 effects for feedwater flow, automatic control)."
21 Q And this also was a study that does not by
22 itself reduce risk?
23 A (WITNESS ROWSOME) That is correct.
24 Q And when the plants were licensed, it was
25 assumed, was it not, that they could run safely at any

power level, and that they in fact were permitted to do so?

A (WITNESS ROWSOME) They were in fact permitted to do so. Your verb form as assumed, I am not sure I find the verb form and the essence of the sentence reasonable.

Q It was decided that they could operate safely at any power level when they were licensed. Is that correct?

A (WITNESS ROWSOME) Yes. Judged might be a better verb.

Q With respect to C-1, C-2, and C-3, is it known whether there has been complete compliance with these by the licensees?

A (WITNESS HANNON) Yes, I have been able to determine that adequate compliance has been verified.

Q That is, they have done studies that were requested?

A (WITNESS HANNON) They have done the studies, and in some cases actually made changes to the plant.

Q Let us go on to C-4. Could you read that, please?

A (WITNESS ROWSOME) "Submit a schedule to implement the ATWS instrument modification justified in accordance with the Westinghouse analytical results

1 obtained in the letter from T.M. Anderson to S.H.
2 Hanauer in NS-TMA-2182, dated December 30th, 1979."
3 Q Now, ATWS stands for anticipated transient
4 without scram?
5 A (WITNESS ROWSOME) That is correct.
6 Q And is it known whether the schedule was in
7 fact submitted?
8 A (WITNESS HANNON) Yes, the schedule was
9 submitted as required by the order.
10 Q Do you know the dates which the schedule
11 imposed?
12 A (WITNESS HANNON) If you will give me a minute
13 to review my notes.
14 Q Certainly.
15 (Pause.)
16 A (WITNESS HANNON) There is a separate scenario
17 for each utility. Do you want them both, or can I just
18 refer to one?
19 Q Why don't you just read Unit 2 first?
20 A (WITNESS HANNON) Okay. The licensee
21 responded on April the 11th, 1980, with a schedule that
22 was not consistent with the NRC staff recommendations.
23 This prompted us to ask the licensee for a re-evaluation
24 of their original proposal in a letter dated June 30th,
25 1980. In a response dated August the 1st, 1980, the

1 licensee objected to the NRC position, citing results of
2 an earlier submittal of the Westinghouse off-shelf power
3 system's report on evaluation of residual risk as
4 adequate justification for their ATWS timetable.
5 Q Does that complete the schedule for Unit 2?
6 A (WITNESS HANNON) There was another letter
7 dated May the 23rd, 1980, again referencing the OPS
8 report, where the licensee requested that any further
9 NRC staff conclusions with respect to Indian Point Units
10 2 and 3 be based on plant specific residual risk
11 studies, and that study was the IPPSS study which was
12 filed in March of 1982.
13 And the current situation now is, the ATWS
14 timetable is in abeyance pending our final conclusions
15 on the IPPSS study.
16 Q So the licensees have not yet come into
17 compliance with the staff position on ATWS. Is that
18 correct?
19 A (WITNESS ROWSOME) In the formal sense of a
20 rule or regulation, the staff does not have an ATWS rule
21 yet.
22 Q Well, with regard to the position that is
23 implied in C-4, even though it is not a formal rule, I
24 am correct, am I not, that the licensees have not yet
25 come into compliance with that position?

1 MR. LEVIN: Your Honor, I don't know how you
2 come into compliance with something that is not a rule,
3 and besides --
4 JUDGE GLEASON: Have they satisfied the
5 requirement?
6 WITNESS HANNON: Yes, they did file a schedule
7 with us, and that schedule has been the subject of a
8 continuing dialogue. It is still not --
9 JUDGE GLEASON: It is not a finished item?
10 WITNESS HANNON: No.
11 JUDGE GLEASON: But they are proceeding as you
12 are requiring them to proceed? Or that somebody is
13 requiring them to proceed?
14 WITNESS HANNON: My understanding now is that
15 the subject of the ATWS is a potential for rulemaking,
16 and until that is concluded, there wouldn't be a
17 position.
18 JUDGE GLEASON: All right.
19 BY MR. BLUM: (Resuming)
20 Q So a decision has been made to hold this in
21 abeyance now for Indian Point. Is that correct?
22 A (WITNESS HANNON) As I said earlier, until we
23 have completed our review of the IPPSS study and come to
24 some final conclusions, the subject of ATWS is in
25 abeyance.

1 JUDGE PARIS: Mr. Hannon, let me get the
2 scenario. Let me see if I have this essentially
3 straight. The staff told the licensees for Unit 2 to do
4 something to come into compliance, to do something in
5 regard to ATWS, and the licensees objected and said, we
6 don't think we need to do that, and here is why. And
7 then the whole ATWS issue became a generic one, and so
8 the action with regard to Unit 2 is suspended until that
9 generic business is resolved. Is that essentially
10 correct? Am I understanding what you were -- Do you
11 want to summarize the scenario for me?
12 WITNESS BOWSOMB: Let me summarize it as I
13 understand it. There has been a rulemaking under way
14 for a very long time on ATWS. It has not yet produced a
15 final rule. Some time back a number of draft rules or
16 draft fixes had been proposed. A variety of them were
17 in circulation and under consideration. At one time
18 prior to the director's order, there was an informal
19 understanding -- correct me if I am wrong, John --
20 between Consolidated Edison and the staff that they
21 would adopt one variant of the ATWS fixes under
22 consideration.
23 The order required that they submit a schedule
24 of implementation. They did submit something. As it
25 happened, they chose to delay implementation on the

1 grounds that they believed that better evidence of the
2 need for such a fix was forthcoming, and that in the
3 interim there was no compelling evidence that there was
4 any effect, any implementable fix at all, and that has
5 remained the state until the present.
6 My understanding is that the staff has not
7 formally taken a position yet on whether Indian Point
8 ought to be required to make an ATWS fix prior to or
9 apart from the generic rulemaking, which I understand to
10 be proceeding and may at long last result in a rule. So
11 that at this point we have not accepted, but at the same
12 time have not rejected the licensee's position that they
13 wish to await the rule before they do anything.
14 JUDGE PARIS: So is the staff satisfied with
15 Con Edison's request to delay an ATWS fix until the
16 generic ATWS business is completed?
17 Let me put it another way. Is the staff
18 satisfied to delay implementing the fix that the
19 director ordered?
20 WITNESS ROWSOME: I am a little bit hesitant
21 to say yes because it remains possible that as we
22 conclude our harvesting of lessons to be learned from
23 the risk assessment, we might conclude that we would
24 wish to proceed with an ATWS fix ahead of formal
25 rulemaking, but we have not yet arrived at that

1 position, and I don't think it particularly likely.

2 JUDGE PARIS: You don't think it what?

3 WITNESS ROWSOME: I don't think it

4 particularly likely.

5 JUDGE PARIS: Okay.

6 JUDGE GLEASON: So it is a stalemate. Let's

7 go on.

8 BY MR. BLUM: (Resuming)

9 Q Could you tell me when the informal agreement

10 was arrived at to include an ATWS fix for Unit 2?

11 A (WITNESS ROWSOME) I don't have firsthand

12 information on that. Do you, John?

13 A (WITNESS HANNON) No, I don't.

14 Q Do you know who concluded that staff -- the

15 agreement for staff and for Con Edison?

16 A (WITNESS ROWSOME) No, I don't.

17 A (WITNESS HANNON) No.

18 Q Do you know what reasons were given by Con

19 Edison for breaking the agreement?

20 MR. SOHINKI: I object to that

21 characterization.

22 JUDGE GLEASON: I grant the objection.

23 BY MR. BLUM: (Resuming)

24 Q Do you know what reasons were given by Con

25 Edison for departing from the substance of the agreement?

1 MR. SOHINKI: Objection, Mr. Chairman.

2 JUDGE GLEASON: Well, don't just object. Give

3 me some kind of clue as to why you are objecting.

4 MR. SOHINKI: I think he mischaracterized the

5 testimony.

6 JUDGE GLEASON: Rephrase the question.

7 MR. BLUM: I wasn't characterizing the

8 testimony.

9 JUDGE GLEASON: I didn't ask you to agree with

10 him. I just asked you to rephrase the question.

11 MR. BLUM: Oh.

12 BY MR. BLUM: (Resuming)

13 Q Do you know what reason was given by Con

14 Edison for not following through on the informal

15 agreement to include an ATWS fix?

16 A (WITNESS HANNON) I am not aware of this

17 informal agreement, but I do know what they said to us

18 regarding the delay in establishing an ATWS timetable,

19 and that was that they felt that any further staff

20 conclusions with respect to the operation of the Indian

21 Point units should be based on plant specific residual

22 risk studies, which were, as I said earlier, provided in

23 the IPPSS study that came in in March of 1982. And we

24 are still continuing our review of that document.

25 Q Could you now present the schedule for Unit 3,

1 please?

2 A (WITNESS HANNON) Okay. It is similar to that

3 for Unit 2, in that licensee responded on April 11th

4 with a schedule that was not consistent with the staff

5 recommendations, and staff re-evaluated our original

6 proposal in a letter dated June the 30th, 1980. PASNY

7 response dated August the 4th, 1980. They objected to

8 the NRC position, citing the results of the May 23rd,

9 1980, submittal of the Westinghouse off-shore power

10 systems report on the evaluation of residual risk as an

11 adequate justification for their ATWS timetable.

12 Q Is there any other entry here?

13 A (WITNESS HANNON) On March 16th, 1981, PASNY

14 submitted a conceptual design of an ATWS proposal for

15 the staff for approval. On November the 2nd, 1981, the

16 staff completed its review of that submittal, and

17 concluded that the Power Authority's proposal met all

18 the requirements of the original order, but was not

19 fully consistent with the present staff position on

20 ATWS.

21 The licensee then responded in a letter dated

22 January the 15th, 1982, with a schedule for meeting the

23 modifications that the staff recommended. The current

24 schedule indicates that that system would be installed

25 during a refueling outage expected some time in

1 mid-1985.

2 Q You refer to the present staff position on

3 ATWS for Unit 3. Could you tell us what that is,

4 please?

5 A (WITNESS HANNON) No, I do not have the

6 details of that.

7 Q Do you know in what ways the PASNY's proposed

8 conceptual design differs from the staff's position?

9 MS. MOORE: Mr. Chairman, I am going to

10 interpose a relevance objection. We are now to repeat

11 the discussion of ATWS when all the director's order

12 stated was that a schedule had to be proposed, and I

13 believe Mr. Hannon has testified that the schedule was

14 proposed, and that it is still undergoing staff review,

15 because there has been correspondence back and forth.

16 The relevance of not only the ATWS question

17 but this entire line of questioning, of going through

18 the order in detail, escapes me.

19 MR. BLUM: Well, the risk reduction due to the

20 director's order in this respect is not going to come

21 from the schedule but from the fix itself, and whether

22 the fixes are being provided pursuant to the schedule,

23 and this is the kind of information we are getting.

24 JUDGE GLEASON: Answer the question, please.

25 WITNESS HANNON: Could you recite the

1 question?

2 BY MR. BLUM: (Resuming)

3 Q Do you know of the ways in which PASNY's

4 proposed conceptual design for an ATWS fix differs from

5 the staff position on an ATWS fix for Indian Point Unit

6 3?

7 A (WITNESS HANNON) As of March the 17th, 1982,

8 the PASNY proposal as I understand it met the staff's

9 position at that time.

10 Q What was the statement you read earlier that

11 it did not meet a staff position?

12 A (WITNESS HANNON) The March 16, 1981,

13 conceptual design proposal, did not meet all of the

14 requirements. In other words, it wasn't fully

15 consistent with the staff's position on ATWS at that

16 time, and the licensees later responded with a letter

17 dated January the 15th, 1982, and agreed to include the

18 modification the staff had requested in their conceptual

19 design.

20 So, as far as I know now, the current PASNY

21 proposal meets or met the staff requirements for ATWS as

22 of March, 1982.

23 Q Do you know whether or not that conceptual

24 design is being implemented?

25 A (WITNESS HANNON) No, I do not.

1 Q Is there any entry in the log you have been
2 reading from relative to whether or not it is being
3 implemented?
4 A (WITNESS HANNON) Only that the schedule calls
5 for it to be installed during the refueling outage in
6 mid-1985.
7 Q It is true, is it not, that the staff's
8 position on ATWS fix that was referred to in C-4 was
9 first published in 1973. That is correct, is it not?
10 A (WITNESS HANNON) I do not know.
11 A (WITNESS ROWSOME) It may or may not be the
12 staff as under consideration now three quite dissimilar
13 rules with quite dissimilar requirements in them, so
14 that today I don't believe it would be fair to
15 characterize the staff as having a unique position
16 concerning the ATWS rule.
17 We have under consideration three quite
18 divergent positions.
19 Q Well, referring to what we have informally
20 been calling the staff position, which refers to the
21 ATWS instrument modification justified in accordance
22 with the Westinghouse analytic results contained in a
23 letter from T.N. Anderson to S.H. Hanauer, dated
24 December 30th, 1979, using the term "staff position" as
25 short for that, that position was first published in

1973, was it not?

A (WITNESS ROWSOME) I really do not know.

Q Do you know whether it was published any time substantially before 1980?

A (WITNESS ROWSOME) It presumably is one of the variants on one of the four positions, four levels in NUREG-0760 -- 40 -- I am not sure of the number. I have even forgotten now the NUREG number of that ATWS tome, but in the mid-seventies a series of three fat NUREG's were issued to provide the technical basis for a rule on ATWS. The third volume contained four optional levels of rule or levels of enforcement, ranging from modest to no change in the regulations to extensive backfitting.

Variants evolved on those four after review by the Advisory Committee on Reactor Safeguards and public comment, and from time to time the conception of what the ATWS fix was to be was evolving, and to reconstruct that history and to attach one particular interpretation of ATWS requirements on that point in time is quite beyond me at this point.

Q So, to summarize, so we can get beyond C-4, it is the case that PASNY has committed itself to a conceptual design for an ATWS fix that is due to be implemented some time in 1985; however, Con Edison for Unit 2 has in some sense objected or stopped in this

1 process, and that the ATWS fix for Con Edison is
2 currently held in abeyance. Is that correct?
3 A (WITNESS HANNON) The ATWS fix for Con Edison
4 insofar as the schedule for implementation is awaiting
5 the outcome of the IPPSS review.
6 Q So it is currently held in abeyance?
7 JUDGE GLEASON: I think his answer speaks for
8 itself, Mr. Blum.
9 BY MR. BLUM: (Resuming)
10 Q C-5.
11 A (WITNESS ROWSOME) Am I to read it?
12 JUDGE PARIS: Mr. Blum, why don't you just
13 read it, to save time?
14 MR. LEVIN: Your Honor, we object at this
15 point. I think it might at least be useful to establish
16 some showing of relevance. Mr. Blum mentioned risk
17 reduction in his comments a moment ago, but we had the
18 witnesses testif as to the fact that they have done no
19 detailed analysis. I heard them give an estimate that
20 was very low, and an even lower bound of the estimate,
21 and if Mr. Blum is attempting to show that that is in
22 some way inaccurate, then perhaps he could let us know
23 so we know where he is going with this. I count
24 literally dozens of these points that we're going to
25 have to go through here. We will be here until Saturday

1 talking about this. I don't understand the relevance.

2 MR. BRANDENBURG: It does seem --

3 JUDGE GLEASON: Please. Can I say something?

4 I understand Mr. Blum's questions. He is

5 attempting to find out the degree of compliance the

6 licensees have made with the director's orders, which is

7 related directly to the question the Commission has

8 asked in Question 2, and I don't -- I fail to understand

9 how that is irrelevant, if that is your objection.

10 MR. LEVIN: That is not the way I heard Mr.

11 Blum explain it earlier.

12 JUDGE GLEASON: Well, he has been going

13 through rather minutely, I agree, each one of the orders

14 that was in the director's appendix or the appendix

15 attached to his order, Appendix A, and in essence asking

16 the same question, or he is asking several questions.

17 MR. LEVIN: I guess the final point is, Judge,

18 even if he establishes to some extent some degree of

19 non-compliance with one or more of these orders, he has

20 already got the opinion of the witnesses as to the

21 degree of risk reduction that can be expected, and

22 nothing is going to change that. I don't see how this

23 is of any help to the Board or the Commission.

24 JUDGE GLEASON: Well, it may prove not to be,

25 but I can't say at this point that it is not relevant

1 toward the questions the Commission has asked.

2 Please proceed.

3 JUDGE PARIS: Just try to keep it moving, Mr.

4 Blum.

5 BY MR. BLUM: (Resuming)

6 Q All right. C-5 says that the licensee shall

7 examine methods of establishing the highest reliability

8 for the gas turbines and submit the results to the NRC,

9 and then it provides five different ways of doing this.

10 Now, the reason for this is because the staff hopes to

11 rely on gas turbines to offset diesel generator

12 vulnerability. Is that correct?

13 A (WITNESS ROWSOME) Those wouldn't be the words

14 I would have chosen, but in a broad sense, yes.

15 Q And requiring the licensees to provide the

16 information about gas turbines is useful but does not by

17 itself lower risk. Is that correct?

18 A (WITNESS ROWSOME) Merely examining methods

19 would not in fact lower risk.

20 Q Do you know specifically what has been done

21 with gas turbines pursuant to this part of the

22 director's orders?

23 A (WITNESS HANNON) Yes. I am referring to an

24 inspection report, 50-247/80-15, dated January 26th,

25 1981. Page 9 of that report details eight different

1 items that were done to increase the reliability of gas
2 turbines at Unit 2.
3 Q Has their reliability been judged adequate?
4 A (WITNESS HANNON) There is an outstanding
5 request for Con Ed to conduct a reliability analysis to
6 verify just exactly how much improvement has been
7 obtained from these actions, and we currently expect
8 that reliability analysis to be in and reviewed by
9 November of this year.
10 Q When was the request dated?
11 A (WITNESS HANNON) The request for the
12 reliability analysis? Is that what you are referring
13 to?
14 Q Yes. Yes.
15 A (WITNESS HANNON) It has been made verbally,
16 and I don't have the date that the request was made.
17 Q Do you know approximately when it was made?
18 A (WITNESS HANNON) It was approximately
19 December of 1982.
20 Q And do you know whether it imposed any time
21 limit for when that should be done?
22 A (WITNESS HANNON) I am not aware of a
23 schedule.
24 Q Thank you. Let's go on. I believe we are at
25 C-6 now. "The licensee shall establish an on-site group

1 reporting to off-site management. The function of the
2 group shall be to examine plant operating
3 characteristics, NRC bulletins, licensing information,
4 service advisories, and other appropriate sources which
5 may indicate areas for improving plant safety. Where
6 useful improvements can be achieved, the group shall
7 also develop and present detailed recommendations for
8 revised procedures, equipment modifications, or other
9 improvements."
10 First of all, do you know whether the on-site
11 group reporting to off-site management has been set up?
12 A (WITNESS HANNON) Yes. As documented in
13 Inspection Report 50-247/80-01, dated July 8, 1980, for
14 Con Ed Unit 2, and Inspection Report 50-286/80-05, dated
15 August 13th, 1980, the resident inspectors have
16 documented the compliance with that order item.
17 Q Now, the establishment of such a group grows
18 out of industrywide short companies identified by the
19 Kemeny and Rogovin Commission investigations, does it
20 not?
21 A (WITNESS HANNON) I am not aware of the origin
22 of this requirement.
23 Q Do either of you know whether in fact this is
24 kind of a nationwide problem?
25 JUDGE GLEASON: Is what, Mr. Blum?

1 MR. BLUM: A nationwide problem.

2 WITNESS ROWSOME: I wouldn't characterize it

3 as such. In response to your earlier question, I

4 believe it grows out of lessons learned from Three Mile

5 Island, but whether it was specifically from Kemeny or

6 Rogovin or some of the other staff studies, I don't

7 know.

8 BY MR. BLUM: (Resuming)

9 Q I see, but this was something directed at

10 nuclear plants generally rather than Indian Point

11 specifically?

12 A (WITNESS ROWSOME) I don't know whether any

13 such requirement has been made for Indian Point. It may

14 have been. It may not.

15 Q Well, regardless of whether it was made as a

16 specific requirement, the original suggestion arose as

17 something for all nuclear plants, did it not?

18 A (WITNESS ROWSOME) I can't really say. I

19 don't know.

20 Q And I take it it would be your position you

21 cannot calculate any specific degree of risk reduction

22 from this?

23 A (WITNESS ROWSOME) That is true.

24 Q All right. Let's go on to D-1. "The

25 following measures shall be implemented within 90 days

1 of the date of this order," that referring to May 11th,
2 1980. "1-A. The licensee shall establish the on-site
3 emergency preparedness manning levels on each shift as
4 contained in Table 1 attached to this appendix. B,
5 Power Authority and Con Edison shall jointly arrange to
6 provide additional personnel as contained in Table 1
7 available to the plant on call within 60 minutes."
8 Do you know whether this has in fact been
9 done?
10 A (WITNESS HANNON) Yes, it has been done for
11 both utilities, and I can cite the documentation if you
12 need it.
13 Q No, I don't. And I take it it is your
14 position you are unable to calculate a specific amount
15 of risk reduction attributable to this?
16 A (WITNESS ROWSOME) That is correct.
17 Q "D-2. The Power Authority and Consolidated
18 Edison shall jointly review and identify the significant
19 differences between Indian Point Unit 2 and Unit 3, and
20 shall evaluate these differences in light of present
21 regulatory standards and requirements. Consolidated
22 Edison shall provide a justification for the design
23 differences, or shall recommend design changes."
24 Do you know whether this has in fact been
25 done?

1 A (WITNESS HANNON) Yes. It has been completed,
2 as documented in the staff's safety evaluation report
3 that was issued on December 1, 1982.
4 Q Did Consolidated Edison recommend any design
5 changes as a result of this item?
6 A (WITNESS HANNON) I am afraid I don't have
7 that recall. I would have to research it.
8 Q Do you have anything that would illuminate
9 Conoslidated Edison's response or compliance with this?
10 A (WITNESS HANNON) Only the safety evaluation
11 report which I just referenced, which does have an
12 evaluation of the design differences that were
13 reported.
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1 Q What is that evaluation of those design
2 differences?
3 A (WITNESS HANNON) It is a review of the
4 Licensee's submittal.
5 Q Could you tell us what was said about the
6 particular design differences?
7 A (WITNESS HANNON) There are five different
8 areas that are treated in the safety evaluation report,
9 and without some time to review it and become more
10 acquainted with it, I will not be able to answer you at
11 this time.
12 Q Would you know whether these were considered
13 important?
14 A (WITNESS HANNON) Yes, they were considered
15 important because it required a number of exchanges of
16 information between the staffs to determine that they
17 were acceptable.
18 JUDGE PARIS: Is control room design one of
19 the areas discussed there in the areas compared there?
20 WITNESS HANNON: No.
21 JUDGE PARIS: Okay.
22 BY MR. BLUM: (Resuming)
23 Q Are you able to say what the areas were?
24 A (WITNESS HANNON) Yes. Functional routing of
25 cables, automatic transfer of DC loads between redundant

1 power sources, a single backup AC power source for each
2 of four instrument buses, concurrence on-voltage and
3 safety injection or unit trip signals needed to connect
4 on-site power to Class 1E loads, and each of two
5 sequencing logics providing actuation signals to
6 redundant Class 1E loads.
7 Q And these were all areas where Unit 2 was
8 judged to be inferior to Unit 3, is that correct?
9 MR. BRANDENBURG: I will have to object to
10 that question, Mr. Chairman. First of all, I don't
11 understand what the meaning of the word "inferior" is,
12 but I don't think it reflects anything that is implicit
13 in this Director's order.
14 JUDGE GLEASON: Do you want to restate your
15 question and either eliminate or define the word
16 "inferior"?
17 BY MR. BLUM: (Resuming)
18 Q Such as to require that Consolidated Edison
19 shall require a justification for the design differences
20 or shall recommend design changes.
21 MS. MOORE: Mr. Chairman, I believe Mr. Hannon
22 testified that in order to give a detailed discussion of
23 the safety evaluation he would need time to review the
24 report. If Mr. Blum or the Board wishes that, then
25 perhaps we could have a short recess, but I think it's a

1 little bit unfair to ask him when he's already said he
2 didn't know in detail.
3 MR. BLUM: Perhaps we could do this with the
4 Staff. We would like to serve copies of this report on
5 the parties and then we will just skip all of the
6 questions.
7 WITNESS HANNON: I can answer that question.
8 There was one item that I cited --
9 MR. BLUM: Could Ms. Moore have a chance to
10 respond?
11 MS. MOORE: This is a publicly available
12 document. If the Board wishes, we can make it available
13 to the parties.
14 JUDGE GLEASON: Let's have the witness respond
15 to the question.
16 WITNESS HANNON: There was one issue in the
17 safety evaluation report where the Unit 3 design was not
18 comparable to the Unit 2 design. It was the item
19 involving the single backup AC power source for each of
20 four instrument buses.
21 BY MR. BLUM: (Resuming)
22 Q So that is an area where you are saying Unit 2
23 is better than Unit 3?
24 MR. BRANDENBURG: I'll have to object again,
25 Mr. Chairman. I don't know what "better" means.

1 JUDGE GLEASON: Could you explain to Mr.
2 Brandenburg what "better" means?
3 MR. BLUM: Well, could the witness please
4 explain what is meant by "not comparable"?
5 WITNESS HANNON: This area was being reviewed
6 because of the Staff's concern with the single backup AC
7 power source, and that was the condition that existed at
8 Unit 3, not at Unit 2.
9 BY MR. BLUM: (Resuming)
10 Q Has that condition been resolved at Unit 3?
11 A (WITNESS HANNON) Yes, it has.
12 Q Could you identify the document that you have
13 been reading from?
14 A (WITNESS HANNON) Yes. It is an enclosure to
15 a letter that was dated December 1, 1982. The enclosure
16 was an updated evaluation of differences between Indian
17 Point Units 2 and 3. It was addressed to Mr. John D.
18 O'Toole at Con Ed from Steve A. Varga, Chief/Operating
19 Reactors Branch 1, Division of Licensing.
20 JUDGE SHON: Excuse me a moment, Mr. Hannon.
21 Of the several things that you have mentioned, you said
22 that there was one, that was the single backup power
23 supply item, wherein Unit 3 was not comparable to Unit
24 2. Can I assume from that that in all of the others
25 Unit 2 was not comparable to Unit 3 in the same sense?

1 WITNESS HANNON: Yes, that is correct.

2 JUDGE SHON: Thank you.

3 BY MR. BLUM: (Resuming)

4 Q All right, let's go on to D.3. The Licensee

5 shall establish a temporary on-site interdisciplinary

6 review group consisting of, as a minimum,

7 representatives from the NSS vendor, the

8 architect-engineer and the plant maintenance and

9 operations staff. This group --

10 JUDGE GLEASON: All right, Mr. Blum. You

11 don't have to read the rest of your question. Go ahead

12 and ask your question.

13 BY MR. BLUM: (Resuming)

14 Q Well, first of all, has such a group been

15 established?

16 A (WITNESS HANNON) Yes.

17 Q And this also directs that this group shall

18 review and concur in all existing plant emergency

19 procedures. Has that been done?

20 A (WITNESS HANNON) I don't know.

21 Q You are saying there is no entry in the back

22 of the document that it has been done?

23 A (WITNESS HANNON) Unfortunately, the only

24 documentation that I have indicates that the group was

25 established and that the charter was reviewed by the

1 resident inspectors. I don't have any further
2 information.
3 Q Would the absence of such information tend to
4 suggest that this has not been done?
5 A (WITNESS HANNON) No. I conclude that with
6 the charter being established and the resident inspector
7 having approved it that the group would carry out its
8 intended functions.
9 Q Was the group supposed to report the fact that
10 it was carrying them out to the NRC, or was anyone
11 supposed to report this aspect of the group's activity
12 to the NRC?
13 A (WITNESS HANNON) It is not required by the
14 Order.
15 Q How do you interpret the phrase "this group
16 shall also review and concur in changes to emergency
17 procedures"? The Order does require that the group does
18 that, doesn't it?
19 A (WITNESS HANNON) Yes.
20 Q But the Order does not suggest that the NRC
21 should monitor to see whether this has in fact been
22 done?
23 A (WITNESS HANNON) I'm not aware of any
24 follow-up that has been done by the resident inspectors
25 on this particular item.

1 Q So the answer would be that we simply do not
2 know whether the group has been doing this with regard
3 to emergency procedures? Well, I will withdraw the
4 question. That was our prior testimony.
5 Do we know whether emergency changes have been
6 improved -- I am sorry, have been approved in accordance
7 with licensee requirements and subsequently submitted
8 for approval by the review group? Do we know whether
9 that has occurred?
10 A (WITNESS HANNON) Only to the extent that the
11 charter had that as a requirement.
12 Q So we do not know whether that has occurred.
13 Is that correct? The fact that the charter listed it as
14 something that should be done in the future does not
15 mean we know that it in fact was done?
16 JUDGE GLEASON: I gather, Mr. Blum, he is
17 saying he does not know either way.
18 WITNESS ROWSOME: Neither John nor I know.
19 BY MR. BLUM: (Resuming)
20 Q Okay. Thank you.
21 On to E.1. The following measures shall be
22 completed within 120 days of the date of the Order. The
23 Licensee shall again examine key plant system
24 vulnerability areas and possible operator-dependent
25 areas with the intent of maximizing the reliability of

1 the subject areas. Specifically, the licensees shall,
2 and then we have nine requirements, A through I.
3 A. Verify that the sump for ESF recirculation
4 is free of debris and determine if flow test
5 verification was initially performed. If not, perform
6 or explore means to verify. Review existing procedures
7 and training on recirculation alignment and RWST refill.
8 Do you know whether in fact all of that was
9 done?
10 A (WITNESS HANNON) Yes, it was all done.
11 Q Now this item in essence calls for
12 confirmation that the ESF recirculation system is
13 operable, does it not?
14 A (WITNESS ROWSOME) I would say not. Full
15 operability verification would entail more than is
16 required here.
17 Q So this you would characterize as partial
18 operability verification?
19 A (WITNESS ROWSOME) That is right.
20 Q Now it is true that operability is judged to
21 be in existence at the time of licensing, is it not?
22 A (WITNESS ROWSOME) That is right.
23 Q So this really represents a check into the
24 degree of compliance with existing regulations, is that
25 correct?

1 A (WITNESS ROWSOME) A little more than that.
2 It enhances the reliability of the safety function and
3 enhances the reliability of the operators whose
4 procedures and training is being reviewed or may enhance
5 the reliablity of the operators whose training is being
6 reviewed here.
7 Q Would you agree that if there is any serious
8 question about the operability of the ESF recirculation
9 system that the plant should be shut down immediately
10 until it can be tested?
11 A (WITNESS ROWSOME) That might follow from the
12 regulations.
13 Q Would you agree that it is advisable, based on
14 your professional judgment?
15 A (WITNESS ROWSOME) Based on my understanding
16 of the risk profile of the plant, it would not be of
17 particularly great importance to shut down.
18 Q Okay. Looking at E.1(b), review
19 administrative check and verification procedures for
20 assuring that the two single failure points (manual)
21 valves in the AFWS supply line are in the correct
22 position.
23 Do you know whether in fact that has been done?
24 A (WITNESS HANNON) Yes, it has.
25 Q And this item in effect discloses that there

1 are two places in the auxiliary feedwater system were a
2 single failure could disable the system, does it not?
3 A (WITNESS ROWSOME) The misalignment of those
4 valves, a human error, could disable those systems.
5 Q So the answer is yes?
6 A (WITNESS ROWSOME) So the answer is what I
7 said.
8 Q Was your answer directly responsive to the
9 question?
10 A (WITNESS ROWSOME) If you want yet another
11 answer, try the question again, please.
12 Q This item discloses that there are two places
13 in the auxiliary feedwater system where a single failure
14 could disable the system. That is correct, is it not?
15 A (WITNESS ROWSOME) A single failure in the
16 sense that is meant in licensing, no. A single failure
17 in the sense that it is meant in reliability
18 engineering, yes.
19 Q And this item does not require the licensees
20 to correct this design deficiency, does it?
21 A (WITNESS ROWSOME) It does not require them to
22 alter the design.
23 Q Instead, it gives them 120 days to check that
24 the valves are in the correct position. Is that
25 correct?

1 A (WITNESS ROWSOME) To check the procedures by
2 which the verification is done from time to time. It is
3 not one single verification of the alignment of the
4 valves. It is a review of the procedures by which the
5 valve alignment is periodically verified.
6 Q However, the vulnerability to a single failure
7 will still exist.
8 A (WITNESS ROWSOME) To a single human error,
9 yes.
10 Q Okay. Going on to the next one, which is now
11 E.1(c), just for people to know, we are roughly 80
12 percent of the way through. E.1(c). The licensee is
13 required to impose an administrative order requiring
14 expeditious shutdown whenever an independent train of
15 auxiliary feedwater system and any one of the following
16 are inoperable -- all backup sources of off-site power,
17 diesel generator supplying power to the other
18 independent train, or either of the other trains of the
19 auxiliary feedwater system.
20 Do you know whether this has in fact been
21 done?
22 A (WITNESS HANNON) Yes, it has been.
23 Q Now it is true, is it not, that this is a
24 standard requirement for any safety system and should
25 have been in the technical specifications, if it is not

1 in fact in the technical specifications?

2 A (WITNESS ROWSOME) There is some question of

3 interpretation whether that is implicit in the standard

4 technical specifications or not. To close that

5 ambiguity, we included explicit coverage in this Order.

6 Q But it is a standard requirement of any safety

7 system?

8 A (WITNESS ROWSOME) It is a standard

9 requirement of any safety system that when the design

10 basis complement of trains are unavailable the plant

11 must shut down expeditiously. The extent to which that

12 extends to the network of interdependent auxiliary

13 systems is a question of interpretation.

14 Q Now. With regard to both the latter part of

15 point (c), all backup sources of off-site power, diesel

16 generators supplying power to the other independent

17 train, or either of the other trains of the auxiliary

18 feedwater system, those being inoperable, those plus the

19 things listed in point (d), which include grid

20 dispatcher actions, reactor operator actions, diesel

21 generator repairs, what all of these things are is

22 simply an enumeration of various ways in which the other

23 AFW train can be disabled, are they not?

24 A (WITNESS ROWSOME) I don't understand how you

25 are mixing part (c) and part (d). I don't see the

relevance of the dispatcher actions and the like to other ways of disabling other auxiliary feedwater trains.

Q Well, let me ask you, more generally --

A (WITNESS ROWSOME) Maybe less generally.

Q These don't represent -- well, let's focus specifically on (d), then. E.1(d). Develop station blackout procedures addressing grid dispatcher actions, reactor operator actions, and diesel generator repairs. Do you know whether or not this has in fact been done?

A (WITNESS HANNON) Yes, it has been done.

Q And are you able to calculate a specific amount of risk reduction attributable to this?

A (WITNESS ROWSOME) No, I cannot.

Q Do you know whether these things are somehow unique to Indian Point or somehow required of all plants generally?

A (WITNESS ROWSOME) They are not required of other plants, generally, but whether they have occurred is another matter. But the requirements generally extend to procedures for the reactor operators and it has not been common practice for the Agency to require that these procedures be integrated with those on the part of the grid dispatcher.

Q Do you know whether plants generally have

1 these?

2 A (WITNESS ROWSOME) I don't know.

3 Q With regard to E.1(e), assure that DC power

4 lighting is available at the steam turbine-driven

5 auxiliary feedwater pump, do you know whether that has

6 in fact been done?

7 A (WITNESS HANNON) Yes, it has been completed.

8 Q But you are not able to calculate in a

9 specific amount of risk reduction attributable to this?

10 A (WITNESS ROWSOME) It might be possible to get

11 a rough estimate of it. I have not done so.

12 Q Do you have any idea of what it would be?

13 A (WITNESS ROWSOME) Well, past studies I have

14 done have suggested that repair after an initial failure

15 to start can frequently be successful in components like

16 steam turbine-driven auxiliary feedwater pumps. And, in

17 addition, that system is likely to be called upon under

18 station blackout conditions where AC power lighting

19 would not be available.

20 Therefore, the availability of the steam

21 turbine-driven auxiliary feedwater pump to perform its

22 safety function might in fact be significantly higher if

23 the conditions are conducive to prompt repair than they

24 would be if the conditions were not conducive to prompt

25 repair. And obviously, having lighting there that works

1 would help to be conducive to repair. Beyond that, I
2 would have to go off and do some studies to arrive at a
3 numerical estimate.
4 Q Thank you. (f). Verify that the gas turbine
5 station has black-start capability. Do you know whether
6 this has in fact been done?
7 A (WITNESS HANNON) Yes, it has been.
8 Q Am I correct that what this amounts to is the
9 Staff making sure that gas turbines will function when
10 needed?
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1 A (WITNESS ROWSOME) The black-start capability
2 is valuable for risk reduction and verification of it is
3 not.
4 JUDGE PARIS: Would you repeat the answer to
5 that? I'm sorry. I couldn't hear you.
6 WITNESS ROWSOME: The ability of the gas
7 turbines to start without auxiliary AC power, which is
8 what is meant by black-start capability, is important to
9 the contribution gas turbines can make to reducing the
10 likelihood of station blackout. That is a condition in
11 which no bulk AC power is available.
12 Merely verifying it is just that -- just
13 verifying it. That does not make the plants any safer
14 just to verify that, but that attribute -- the
15 black-start capability -- is important to the safety
16 profile of the plant.
17 BY MR. BLUM: (Resuming)
18 Q Going on to (g), review causes for procedures
19 of operator training required to diminish the overall
20 number of reactor and main feedwater trips. Do you know
21 whether -- well, let me read (h) along with that, which
22 is develop review procedures to restore main feedwater
23 promptly after a trip and to mitigate the consequences
24 of an ATWS event, e.g., emergency boration and CBCS
25 control.

1 Do you know whether these two have in fact
2 been done?
3 A (WITNESS HANNON) Yes, they have been done.
4 Q And they simply call for reviews of apparent
5 feedwater problems. They do not correct the problems in
6 that sense? They do not themselves reduce risk?
7 A (WITNESS ROWSOME) That, I believe, is a
8 correct statement.
9 Q Going on to E.1.1 -- I'm sorry. This is
10 E.1(i), review administrative controls on the manual
11 valves whose misalignment could fail all emergency core
12 cooling systems. First of all, has this been done?
13 A (WITNESS HANNON) Yes.
14 Q Now, am I correct that what this reveals is
15 that a misalignment of manual valves could fail all
16 emergency core cooling systems?
17 A (WITNESS ROWSOME) I believe not. I believe
18 there may have been a valve, one or more valves, whose
19 misalignment could fail one of the several ECCS systems,
20 like low pressure safety injection, but not also fail
21 high pressure safety injection.
22 Q I'm sorry. What would be the meaning of the
23 phrase "manual valves whose misalignment could fail all
24 ECCS"?
25 A (WITNESS ROWSOME) Well, ECCS, emergency core

1 cooling system, it is not clear whether that is all
2 divisions of one ECCS system or all systems. You can
3 draw your inference from all divisions of one ECCS
4 system. One cannot draw that inference for all systems
5 taken together.
6 Q So your testimony is in fact you don't know
7 whether this means the misalignment could fail?
8 A (WITNESS ROWSOME) There is no manual valve
9 whose failure can disable all of the ECCS system. There
10 are, I believe, valves whose misalignment could disable
11 all of the redundant divisions of one of the ECCS
12 systems.
13 Q Would that result in no emergency core
14 cooling?
15 A (WITNESS ROWSOME) There may be some areas in
16 which that is true. I don't know offhand.
17 Q Going on to E.2, a review of control room
18 emergency procedures shall be conducted for the purpose
19 of improving these procedures from a human factors
20 engineering standpoint. Improvements which can be
21 obtained by modifying procedures shall be implemented
22 within 120 days. Controlling displays shall also be
23 reviewed for the purpose of identifying improvements
24 which will increase operators' ability to assess plant
25 conditions. A report will be submitted to describe the

1 improvements recommended and a schedule for their
2 implementation.
3 Do you know whether all of this has been
4 done?
5 A (WITNESS HANNON) Yes, it has been completed
6 and control room modifications were included in the
7 Staff's review of that particular item.
8 Q Do you know, has any specific amount of risk
9 reduction been calculated for these improvements?
10 A (WITNESS ROWSOME) No.
11 Q Is it true that it has been believed for a
12 number of years that the Indian Point control rooms are
13 particularly badly designed from the standpoint of human
14 engineering?
15 MR. BRANDENBURG: I'll object to that
16 question, Mr. Chairman.
17 JUDGE GLEASON: Objection granted.
18 BY MR. BLUM: (Resuming)
19 Q Do you have an opinion about the quality of
20 the Indian Point control rooms from the human
21 engineering standpoint?
22 A (WITNESS ROWSOME) No, I don't.
23 Q Thank you. F.1. Within six months of the
24 date of the Order -- this is August 11 -- the licensees
25 shall conduct a review of past licensee event reports at

1 Indian Point Units 2 and 3. These LERs shall be
2 reviewed to identify design inadequacies (common mode
3 failures, systems interactions, et cetera, procedural
4 and training inadequacies, and man-machine human factor
5 inadequacies). Recommendations shall be submitted for
6 correction of the base cause of the subject LERs,
7 immediate corrections of deficiencies will be made when
8 possible with the required notifications to be made to
9 the NRC.
10 Do you know, first of all, whether the LERs
11 have been reviewed with regard to design inadequacies,
12 including common mode failures, systems interactions,
13 and so forth?
14 A (WITNESS HANNON) Both plants submitted their
15 LER study on August 11, 1980. We were not satisfied
16 that they did treat certain items in sufficient detail
17 and sent them a letter on February 3, 1981, asking that
18 they devote additional attention to LERs dealing with
19 set point drifts, hydraulic snubber failures, and
20 electrical equipment malfunctions, and the licensees
21 responded on May 4, 1981, for Indian Point Unit 3 and
22 May 6, 1981, for Indian Point Unit 2.
23 The subsequent responses were reviewed and
24 found to be acceptable.
25 Q Are the various documents with the licensee

1 submittal and the NRC response, are those publicly
2 available?
3 A (WITNESS HANNON) All of the documents I have
4 just referred to should be in the local PDR.
5 Q Could you identify them, please?
6 A (WITNESS HANNON) Yes. Con Ed and PASNY
7 submittals, both dated August 11, 1980. Our response to
8 the licensees, including a safety evaluation report,
9 response being dated February 3, 1981. The licensees'
10 subsequent submittals for Unit 3, dated May 4, 1981, and
11 for Unit 2, dated May 6, 1981.
12 Q Do you know which immediate corrections or
13 which corrections of deficiencies have in fact been made
14 as a result of this?
15 A (WITNESS HANNON) No, I do not.
16 Q Does either of you know?
17 A (WITNESS ROWSOME) I do not.
18 Q And I take it you don't have any estimate of
19 the amount of risk reduction attributable to any
20 corrections?
21 A (WITNESS ROWSOME) That is correct.
22 Q F.2, meteorological acceptance criteria for
23 emergency preparedness contained in Annex 1 to this
24 Appendix. Do you know whether this has been done?
25 A (WITNESS HANNON) Yes, it has been.

1 Q And what this is, in effect, is a way of
2 establishing a method for determining the dispersion of
3 radioactive material after an accident and a way of
4 relaying that information to the appropriate groups. Is
5 that, in essence, what this consists of?
6 A (WITNESS HANNON) Yes.
7 Q And is there any calculation of risk reduction
8 attributable to this?
9 A (WITNESS ROWSOME) None has been done.
10 Q F.3. Conduct a study to determine a document
11 method by which a plant's compliance with current safety
12 rules and regulations, in particular those contained in
13 10 CFR Parts 20 and 50. Would such a study be -- well,
14 first of all, has that been done?
15 A (WITNESS HANNON) Yes, it has.
16 Q And could you identify the studies that were
17 done?
18 A (WITNESS HANNON) The licensees both responded
19 to this item in submittals dated August 11, 1980. Staff
20 reviews were issued in letters dated January 19, 1982.
21 The audit that was performed by the Staff determined
22 that the licensees' submittal indicated that the design
23 and operation met applicable regulations.
24 JUDGE SHON: Excuse me, Mr. Blum. It seems as
25 if that one little subsection, F.2 -- pardon me, F.3 in

there -- covers rather a gigantic amount of material. The method by which you comply with Parts 2 and 50 is virtually everything in the design and operation of the plant that has to do with safety in any way, wouldn't it be?

I mean, it's got to cover everything, including all the appendices to Part 50, for example. Was this a very large order?

WITNESS HANNON: Yes. I recall the licensees' submittal being quite lengthy.

JUDGE SHON: Go ahead, Mr. Blum. It just sounded like it covered a multitude of sins.

MR. BLUM: Would it be possible for the Staff to make that material available for the hearings?

MS. MOORE: It is a publicly-available document.

MR. BLUM: We have had difficulties identifying what is in the public document room. I will simply make the request. If the Staff feels they can do it, fine. Otherwise, we won't litigate it.

MS. MOORE: Is this a request that all the documents be served on the parties and Board, or is it Mr. Blum wishes the documents? I don't quite understand the request.

JUDGE GLEASON: I believe Mr. Blum would like

1 the documents.

2 MR. BLUM: Yes. Perhaps one for me and one

3 for the Board.

4 JUDGE GLEASON: You can consider it, Miss

5 Moore.

6 MS. MOORE: I will consider it.

7 BY MR. BLUM: (Resuming)

8 Q All right. We are almost there. F.4.

9 Evaluate the reliability of failure modes of selected

10 systems components as follows, and there are three

11 categories -- failure mode effects analysis, implement

12 failure modes analysis for minor departures from

13 operating maintenance and emergency procedures, and (c)

14 explore other ways to improve the reliability of those

15 components with a particularly high failure rate as

16 delineated in NUREG-CR-1205.

17 Do you know whether this has in fact been

18 done?

19 A (WITNESS HANNON) Yes, it has.

20 Q And have you calculated any amount of risk

21 reduction attributed to this?

22 A (WITNESS ROWSOME) I have not.

23 Q When you say "I have not", that would refer to

24 the Staff generally?

25 A (WITNESS ROWSOME) We have not.

1 Q And it's true, isn't it, that this study
2 should actually have been done before the plant was
3 licensed, shouldn't it?
4 A (WITNESS ROWSOME) Not necessarily.
5 Q In other words, these would not be considered
6 a requirement of licensing -- the reliability and
7 failure modes of selected modes be investigated?
8 A (WITNESS ROWSOME) As worded here, they are
9 not now requirements in the regulations.
10 Q Do the regulations have in them requirements
11 that are substantially similar to what is in here?
12 A (WITNESS ROWSOME) I don't believe the
13 regulations require quite so open-ended a survey of
14 possible failure modes and effects as this suggests.
15 Q So the regulations do require some examination
16 of these areas, but perhaps not in the exact manner that
17 is listed here?
18 A (WITNESS ROWSOME) They require compliance
19 with a number of deterministic regulations designed to
20 assure the reliability of safety functions, but do not
21 require the application of the technique of failure mode
22 effects analysis as it has evolved in reliability
23 engineering.
24 Q So is it your testimony that there are some
25 significant failure modes that would be examined by this

1 technique that are not examined in the original
2 licensing process?
3 A (WITNESS ROWSOME) It is plausible that there
4 might be some.
5 Q So the answer would be that you don't know
6 either way?
7 A (WITNESS ROWSOME) That's correct.
8 MS. MOORE: Mr. Chairman, I think he answered
9 the question.
10 JUDGE GLEASON: I do too. I grant your
11 objection.
12 BY MR. BLUM: (Resuming)
13 Q All right. The last one here is F.5,
14 obtaining full compliance with the NRC letters
15 concerning auxiliary feedwater system reliability and
16 improvements. Do you know whether this has in fact been
17 done?
18 A (WITNESS HANNON) Yes, it has.
19 Q Can you tell us what it consists of?
20 A (WITNESS HANNON) First of all, for Unit 2,
21 the documentation on this item resides in a license
22 amendment number 79 to license number DPR-26 for Indian
23 Point Unit 2. It was issued on August 30, 1982. And
24 for Unit 3, in an inspection report, 5286 80-13, dated
25 March 13, 1981.

1 In both of those documents there is a long
2 list of correspondence between the Staff and the
3 licensees that was reviewed by the inspectors and the
4 Staff in coming to the conclusion that the reliability
5 improvement for the auxiliary feedwater system had been
6 complied with. There were a number of recommendations,
7 both short and long-term, and I am not prepared at the
8 present time to summarize all of this material.
9 Q One of the major issues here is the existence
10 or non-existence of a third pump. Is that correct?
11 A (WITNESS ROWSOME) It would surprise me if the
12 answer is yes. I think we have known for some time that
13 Indian Point came with three pumps.
14 Q Okay. This concludes the review of the
15 various provisions of Appendix A containing the
16 specifics of the Director's Order. I just have a couple
17 of general questions to ask. I guess these are mainly
18 addressed to Mr. Rowsome.
19 In the testimony in answer 11 -- this is your
20 prefiled testimony -- the middle of the page, right
21 under 1, you stated that some of the measures contained
22 in the Orders, particularly those dealing with staffing
23 and staff training, cannot be evaluated by risk
24 assessment techniques -- by existing risk assessment
25 techniques.

1 Could you elaborate on that statement and
2 explain what you mean by it and why you feel it is
3 true?
4 A (WITNESS ROWSOME) I think I already did. I
5 don't think I can add much to my comments earlier about
6 the limitations of modeling human performance.
7 Q What, then, about the statement: The state of
8 the art in PRA is inadequate to relate the likelihood of
9 operator error under accident conditions to the details
10 of staffing or staff training?
11 A (WITNESS ROWSOME) There are models in use
12 that relate the estimates of human failure probability
13 to staffing, the number of people there, and to general
14 classifications of their training and responsibility.
15 The models are not, I believe, capable of resolving
16 differences in training as well as differences in
17 manning.
18 Q All right. And on page five of the testimony,
19 the second line down, you refer to the likelihood that
20 operators might fail to diagnose a severe reactor
21 accident promptly and correctly, but say we cannot
22 devise a reliable quantitative measure for the change in
23 risk.
24 Is this because you cannot devise reliable
25 quantitative measures of the risk itself of severe

1 reactor accidents being diagnosed promptly and
2 correctly?
3 A (WITNESS ROWSOME) That is correct.
4 MR. BLUM: I have no further questions of the
5 witnesses.
6 JUDGE GLEASON: All right. Is there any
7 redirect?
8 MS. MOORE: Mr. Chairman, I think I have a few
9 questions on redirect, but could we take a break at this
10 point since we have been going quite a while?
11 JUDGE GLEASON: Certainly. We will now break
12 for ten minutes, please.
13 (A brief recess was taken.)
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1 MS. MOORE: Your Honor, I have just a few
2 questions on redirect.
3 JUDGE GLEASON: All right.
4 REDIRECT EXAMINATION
5 BY MS. MOORE:
6 Q I refer the panel to Item A-6 on the
7 Director's Order. Does that item require the review by
8 licensees of any specific permanent plant modifications?
9 A (WITNESS ROWSOME) It does not.
10 A (WITNESS HANNON) No.
11 Q I next turn your attention to Item D-3. Does
12 this item require that the review group established by
13 the item report to the NRC?
14 A (WITNESS HANNON) No, it does not.
15 Q Mr. Rowsome, would you please summarize
16 briefly --
17 JUDGE GLEASON: Excuse me just moment, Ms.
18 Moore. Ms. Moore, Item B-3 --
19 MS. MOORE: D.
20 JUDGE GLEASON: Oh, D. I'm sorry. All
21 right. Go ahead.
22 BY MS. MOORE: (Resuming)
23 Q Mr. Rowsome, would you please summarize
24 briefly for us the basis for your risk reduction
25 conclusions as set forth in your testimony regarding the

1 Director's Order?

2 A (WITNESS ROWSOME) Well, I segregated the

3 conclusions into conclusions on the elements of the

4 Director's Order that deal with conduct of operations,

5 staffing, staff training, pool of technical experts

6 available and the like, and for that I identified that

7 the changes were in the interest of improved plant

8 safety, but we could not measure the difference in risk

9 associated. That improvement is, however, applicable, I

10 think, to most, if not all, of the accident sequences to

11 which the plants may be subject.

12 The other subset I identified were the changes

13 in surveillance, maintenance and technical

14 specifications involving the reliability of particular

15 systems in the plant. These have lowered the projected

16 frequency of some accident sequences. The estimate of a

17 factor of three I drew from NUREG-0715 and conducted a

18 brief review to identify that that assessment was still

19 applicable today in light of what we know today about

20 the risk profile of the plant.

21 However, there are a number of other accident

22 sequences which we now believe to be more important to

23 risk for which these changes in hardware reliability, if

24 you will, have little or no influence. So the factor of

25 three is, at most, an upper bound on accident sequences.

1 Q Mr. Rowsome and Mr. Hannon, has anything that
2 has arisen on cross examination today thus far caused
3 you to change the conclusions reached in your testimony?
4 A (WITNESS ROWSOME) Not at all.
5 A (WITNESS HANNON) No, it has not.
6 MS. MOORE: Thank you. I have no further
7 questions, Your Honor.
8 JUDGE GLEASON: Licensees have any cross
9 examination?
10 MR. BRANDENBURG: Yes.
11 CROSS EXAMINATION
12 BY MR. BRANDENBURG:
13 Q Gentlemen, my name is Brent Brandenburg. I
14 would like to direct your attention to page five of your
15 testimony. Ms. Moore was just, I believe, referring
16 your attention to in the middle of that page the
17 reference to NUREG-0715 and its conclusion of a risk
18 reduction factor due to the Director's Order, measures
19 of an order of three.
20 On page five of your testimony you go on to
21 say that this estimate is consistent with our update
22 analyses, et cetera, and I would like you to describe
23 for me exactly what these update analyses that you refer
24 to here consist of.
25 A (WITNESS ROWSOME) That is our submittal on

1 Commission Question 1.

2 Q Well, I guess I'll be getting that in the mail

3 in a day or two, but I admit to some impatience with

4 it. Can you describe for us in a little more detail

5 exactly what that update analyses consists of, in your

6 own words?

7 MS. MOORE: Mr. Chairman, I'm going to object

8 to that at this point. The analysis is rather complex,

9 as any risk analysis might be, and it might be unfair to

10 Mr. Rowsome at this point to have to characterize it in

11 a few succinct sentences.

12 MR. BRANDENBURG: I withdraw the question.

13 JUDGE GLEASON: Thank you.

14 MR. BRANDENBURG: I don't have any further

15 questions.

16 JUDGE GLEASON: Mr. Levin?

17 MR. LEVIN: The Power Authority has no

18 questions, Your Honor.

19 JUDGE GLEASON: All right. The witnesses --

20 MR. BLUM: One redirect question.

21 JUDGE GLEASON: You have redirect?

22 MR. BLUM: No, recross.

23 JUDGE GLEASON: All right. Make it brief,

24 please.

25 MR. LEVIN: I assume, Your Honor, this has

1 something to do with something raised on redirect.

2 MR. BLUM: Yes.

3 RECROSS EXAMINATION

4 BY MR. BLUM:

5 Q Mr. Rowsome, you stated on redirect

6 examination that the factor of three was at most an

7 upper bound. What would it be as opposed to being at

8 most an upper bound? What is it, at least?

9 A (WITNESS ROWSOME) I don't have an at least.

10 MR. BLUM: Thank you.

11 JUDGE GLEASON: All right. Just a minute,

12 please.

13 JUDGE SHON: Either of you gentlemen, we have

14 discussed this with other witnesses before, and just in

15 order to keep things as comparable from one set of

16 testimony to another as we can, when you talk of

17 reduction of risk by a factor of three, it implies that

18 the risk is a scale of quantity of sorts -- that you

19 could have a third of it or have twice as much of it.

20 On two occasions before this, others have

21 pointed out that risk, probability and consequences, is

22 in some sense inherently a vector or a two-dimensional

23 manifold. When you say "a third as much", do you mean

24 you have simply reduced the product of probability and

25 consequences by a factor of three, or have you moved a

1 curve in some way that has moved it by a factor of three?

2 WITNESS ROWSOME: The calculations to which I

3 was referring in NUREG-0715 were calculations of an

4 accident likelihood. It was a change in frequency only.

5 JUDGE SHON: I see. So it is only the change

6 in frequency around probability.

7 WITNESS ROWSOME: That's correct.

8 JUDGE SHON: Thank you.

9 JUDGE PARIS: I have a couple of questions

10 that refer to Mr. Hannon. Are there or is there a

11 resident inspector at each of the two plants, or is

12 there one resident inspector assigned to both plants?

13 WITNESS HANNON: At the present time, there

14 are resident inspectors at each facility.

15 JUDGE PARIS: Okay. Thank you.

16 The second question is addressed to Mr.

17 Rowsome. You have referred several times to your

18 knowledge of the risk profile of Indian Point Units 2

19 and 3. Now it may be that this is something that is

20 going to be developed in subsequent Staff testimony and,

21 if so, you can answer by telling me that. But we would

22 be interested in knowing what, to your knowledge, is the

23 highest dominant risk scenarios or are the dominant risk

24 scenarios betwee 2 and 3.

25 WITNESS ROWSOME: You are right. The risk

1 profile will be developed in Staff testimony on
2 Commission Questions 1 and 5. My understanding of the
3 dominant contributors to, let's be specific, the early
4 fatality risk are, first, seismically-induced
5 accidents. Second, among the other contributors I
6 wouldn't want to rank them as to second or third, would
7 be hurricanes, fires, interfacing system LOCA.
8 JUDGE PARIS: Okay. And does the Staff intend
9 to address those in more detail under Number 1?
10 WITNESS ROWSOME: We do indeed.
11 JUDGE PARIS: Thank you.
12 JUDGE GLEASON: Mr. McGurren, before I dismiss
13 the witnesses the other day we had some colloquy
14 regarding the admissibility of the Exhibit propounded by
15 UCS, Number 6, I believe, concerning a so-called rather
16 quick study done by the Westinghouse people and
17 licensees. And I thought I heard Mr. Hannon refer to
18 that.
19 Would he be able to comment on this, or should
20 I wait until Mr. Meyer comes on?
21 MR. MC GURREN: I will let Janice Moore
22 address that.
23 MS. MOORE: Mr. Chairman, Dr. Meyer will be
24 able to address that subject.
25 JUDGE GLEASON: All right, fine. The

1 witnesses are excused. Thank you, gentlemen.

2 (The witnesses were excused.)

3 JUDGE GLEASON: Would you call your next

4 witness?

5 MR. BLUM: Your Honor, there are several

6 important procedural matters hanging, at least one of

7 which I think the licensees would benefit from having

8 cleared up early, and I notice the amount of time

9 available is not such that it is likely we would be able

10 to complete cross examination of this witness on what is

11 a fairly major topic.

12 I was wondering if we could dispense with

13 these various other matters and in that connection I

14 have one announcement to make.

15 JUDGE GLEASON: Why don't you make your

16 announcement? Is it in connection with that, or is the

17 announcement outside of that? Why don't you make your

18 announcement? What is your announcement? You've even

19 got me going.

20 MR. BLUM: Okay. The announcement is that

21 there will not be testimony from witnesses Frank Von

22 Hippel and Gordon Thompson. Dr. Von Hippel just

23 couldn't deal with the time demands that were going to

24 be imposed between depositions and various other things

25 and, therefore, conveys his regrets that he is unable to

1 come through with that. And I know the licensees had
2 wanted to know as soon as we could give them this
3 information.
4 There is -- the matter that is most urgent
5 that I was alluding to was the motion for extension of
6 time for Mr. Weatherwax, who is waiting for me to get
7 back to him, and also we have to finalize a deposition
8 time for the licensees.
9 I also wanted to ask the Board -- well, notify
10 the Board of a particular question we had with regard to
11 some testimony that could be placed under Question 1 or
12 Question 5 and to see if the Board had guidance as to
13 how that should be done.
14 JUDGE GLEASON: Let's take up the first
15 matter. Could we hear from the licensees with respect
16 to the UCS motion to delay the submittal of testimony of
17 Mr. Weatherwax until February 7?
18 MR. COLARULLI: Your Honor, on behalf of the
19 Power Authority, at least, we oppose this motion by Mr.
20 Blum. Mr. Blum repeatedly says that no prejudice is
21 caused by his repeated delays in this proceeding but, in
22 fact, Your Honor, we believe there would be prejudice
23 from this delay.
24 The Question 1 testimony will be heard on
25 February 8. Mr. Blum is suggesting that Mr. Weatherwax

1 not file his Question 1 testimony until February 7, the
2 day before, and we believe that our witnesses in the
3 Power Authority are entitled to review that testimony of
4 Mr. Weatherwax before the February 8 commencement of
5 testimony on Question 1.
6 Therefore, we believe that our witnesses would
7 be prejudiced by not having that testimony in hand on
8 the schedule that this Board set, which is January 31.
9 Your Honor, I could add several other points.
10 JUDGE GLEASON: Please don't.
11 MR. COLARULLI: Concerning statements made by
12 Mr. Blum in this document.
13 JUDGE GLEASON: Please don't. I anticipate
14 what you will say, so please don't.
15 MR. BRANDENBURG: Con Ed similarly opposes the
16 pending motion, Mr. Chairman. We believe that the
17 situation regarding the Weatherwax deposition is one of
18 the Union of Concerned Scientists making it is not a
19 legitimate ground for extending the date of filing
20 testimony on Question 1.
21 MR. BLUM: Your Honor, if I may be heard, just
22 to put the matter of prejudice in perspective, what
23 parties have been doing -- and I thought this was a
24 correct interpretation -- is mailing out testimony on
25 the due date so that it then arrives by regular mail a

1 number of days later.

2 For example, we have not yet received the

3 Staff testimony on Question 1 and what we are proposing

4 with this extension is to hand deliver it on Monday,

5 February 7, so we are really talking about a delay in

6 real terms of between Friday and Monday.

7 Secondly, there is no way that Mr. Weatherwax

8 would be coming on in the first week. He is filing

9 after all the other parties have filed and after the way

10 we have been going on schedules in the past is

11 reasonably certain to come only in the second week, so

12 there would be the eight days in which to review it.

13 The final point with regard to the delay in

14 the deposition, I would simply add again that the

15 original deposition ended with the licensees walking

16 out, refusing to continue --

17 JUDGE GLEASON: I have already said I would

18 rather not hear that kind of thing, Mr. Blum, from

19 either side.

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1 MR. BLUM: The final point is that Mr.
2 Weatherwax really does need the time, and it is just
3 going to be a big task reviewing IPPSS, and he does have
4 other clients that impose demands.
5 JUDGE GLEASON: All right. Just a moment.
6 (Whereupon, the Board conferred.)
7 JUDGE GLEASON: Let's go off the record a
8 minute.
9 (Whereupon, a discussion was held off the
10 record.)
11 JUDGE GLEASON: Back on the record.
12 It is important in the Board's view to have as
13 much testimony on Question 1 as we can obtain, and
14 therefore we are inclined to grant the UCS request for
15 the extension. The only thing that I could possibly
16 consider in addition to that, there is the possibility
17 if one needs more time after seeing that testimony,
18 then, you know, we will be amenable to some kind of a
19 suggestion to delay for whatever time is necessary to
20 review it. But I don't see where we have any
21 alternatives unless we just are going to perhaps put the
22 intervenor in a position of not being deprived of that
23 testimony.
24 MR. BRANDENBURG: If I understand Your Honor's
25 last remarks correctly, that would envisage a slippage

1 of our entire timetable of whatever time period that
2 might be.
3 JUDGE GLEASON: Well, I wouldn't countenance
4 that.
5 MR. BRANDENBURG: Nor would we, sir.
6 JUDGE GLEASON: What I am talking about is, we
7 would start with your testimony, but if you require some
8 additional time period to respond specifically to things
9 in the party intervenor's testimony which are new and
10 different, we will just have to somehow find time to
11 grant it.
12 MR. BRANDENBURG: What I might suggest, Mr.
13 Chairman, is since the entire premise of Mr. Blum's
14 motion seems to be that it would be inappropriate for us
15 to see his witnesses' testimony before we complete our
16 deposition, that Your Honor simply direct that the
17 deposition be held at an early time than Friday, the
18 4th, or Saturday, the 5th.
19 Those dates were discussed by us with Mr. Blum
20 yesterday wholly independent of any mention by him to us
21 of a need to slip the date for filing. I don't think if
22 we merely look at the time period in which the
23 intervenors and UCS in particular should be required to
24 file their testimony, that we have any good cause for
25 delaying and not filing that relates at all to the

1 unfortunately circumstances about Mr. Weatherwax's
2 deposition.
3 I for one would be prepared to take the
4 deposition prior to January 31 to meet Mr. Blum's
5 principal consideration or concern that we not be privy
6 to Mr. Weatherwax's testimony before the deposition, and
7 have the Board hold to its filing deadline that is
8 applicable to all other parties of having that deadline
9 filed on January 31st.
10 That would give us the seven or eight days
11 contemplated by the Board's original order to go over
12 Mr. Blum's testimony and the testimony of his witness
13 with our witnesses so that our witnesses could be
14 prepared to respond to that testimony when they appear
15 here on the 8th.
16 JUDGE GLEASON: Mr. Brandenburg, I think it is
17 very clear in the motion that has been filed by UCS that
18 his witness will not be able to complete his testimony
19 until the time that he requests an extension to. So why
20 do you go over that fact?
21 MR. BRANDENBURG: I didn't quite read it that
22 way.
23 JUDGE GLEASON: Well, am I reading it
24 incorrectly?
25 MR. BLUM: That is completely correct, Judge

1 Gleason.

2 JUDGE GLEASON: It is simply not tied up with

3 the deposition of the matter. Is there a possibility,

4 leaving that question aside, that they could conclude,

5 that they could have this deposition period at an

6 earlier date?

7 MR. BLUM: Well, the date we now have was to

8 accommodate them. It was a date they specifically

9 requested. If they have now changed their mind about

10 what they would like, I would be willing to go over

11 other possible dates with them.

12 JUDGE GLEASON: Is there a possibility you

13 might accelerate your deposition date a little bit,

14 which would then give you presumably more time for

15 preparation?

16 MR. BRANDENBURG: If the deposition date is to

17 be arrived at wholly independent of the date of filing,

18 I presume or feel that it should be left the way it is.

19 It just seems that there is some bootstrapping of the

20 deposition date and an attempt to link that up with the

21 date when the testimony is going to be filed.

22 My principal concern is that there would be an

23 adequate amount of time between the time we do receive

24 the testimony from this witness and the time that our

25 witnesses are required to go forth on that subject

1 matter. I get back to the point that I don't see how --
2 that accommodating Mr. Blum's request be linked with the
3 deposition situation or independent of it, that we are
4 facing a slippage in the timetable for these hearings
for each day that we give Mr. Blum additional time to
6 prepare his testimony.
7 JUDGE GLEASON: Your testimony has been filed
8 on Question 1?
9 MR. BRANDENBURG: Yes, sir. And the Board
10 order contemplated a period of time between the filing
11 of that testimony and the intervenor's responsive
12 testimony. The January 31 date will be met by other
13 intervenors, Friends of the Earth, Audubon Society, and
14 so on. And then another period of time between the
15 filing of that responsive testimony and the commencement
16 of cross examination on that.
17 JUDGE GLEASON: Mr. Brandenburg, please. We
18 understand what the schedule requirements are. What
19 about the possibility of allowing you to file, assuming
20 there is no objection -- I don't see how there would be
21 -- after the deposition, supplemental testimony?
22 MR. COLARULLI: Your Honor, I think at this
23 point it would be best to simply proceed, and based upon
24 the deposition, and based upon the filing of Mr.
25 Weatherwax's testimony late, and we can then assess

1 where we are.

2 JUDGE GLEASON: All right. The motion of UCS

3 for an extension of time to file Mr. Weatherwax's

4 testimony is granted until February 7th.

5 MR. BLUM: Thank you, Your Honor.

6 MR. BRANDENBURG: Mr. Chairman, just one point

7 of information. I heard Mr. Blum say that that date

8 would be in hand receipt, but I don't see it referred to

9 in the motion here. Do I understand --

10 JUDGE GLEASON: That is with the understanding

11 that it is in hand receipt.

12 MR. BLUM: Yes, that is our understanding.

13 The additional matter I have concerns

14 testimony on consequences that Mr. Sholly is preparing.

15 As I become more familiar with the substance of it, it

16 becomes clear that this is sort of an amalgam of

17 Question 5 testimony and Question 1 testimony, and that

18 some of it is talking about comparative consequences at

19 Indian Point and other plants, and then some of it is a

20 critique of consequence modeling used in IPPSS and other

21 Indian Point specific studies.

22 The testimony really should be presented as a

23 whole, because that is the way it was designed. My

24 assumption, based on the fact that Mr. Sholly had not

25 been identified specifically as a Question 1 witness and

1 had thought originally in terms of the comparative
2 study, was that this should come in under Question 5,
3 but I wanted to check to make sure the Board would not
4 have a particular problem with the fact that parts of
5 the testimony conceivably relate to Question 1 as
6 opposed to Question 5.
7 MR. COLARULLI: Your Honor, if I may, just two
8 brief comments.
9 This is the very first time that we have heard
10 that Mr. Sholly was going to be a witness on Question 1,
11 and as you know, we are under an obligation to notify
12 the other side of witnesses and take depositions, et
13 cetera, so, today, Tuesday, the 25th, is the first time
14 that we had heard -- Under the schedule December 17 was
15 the date by when each side -- or by when UCS had to file
16 its list of witnesses on Question 1. Mr. Sholly has
17 never appeared on any list, nor has Mr. Blum prior to
18 today, the 25th of January, suggested that Mr. Sholly
19 would testify on Question 1.
20 Second, it appears that Mr. Blum is asking for
21 an advisory opinion from the Board as to where best to
22 file his testimony. I suggest that he file his
23 testimony where he thinks best.
24 MR. BLUM: Part of the reason I brought this
25 up now is that if the Board did feel strongly that

1 anything having both Question 1 and 5 elements should
2 come under Question 1, that we know this now so that Mr.
3 Sholly could be available at the deposition time that we
4 had originally scoped out for Dr. Von Hipple. I don't
5 know what to do with -- It is not really an advisory
6 opinion, because it is a whole separate question.
7 Having whole separate questions is confusing, and we
8 don't know how the Board wishes to interpret it.
9 (Whereupon, the Board conferred.)
10 JUDGE GLEASON: Let me ask a question for an
11 advisory response from the licensees. I think you
12 understand what the purport of Mr. Blum's quandary is.
13 I think we all recognize and have recognized from the
14 beginning that there is a certain interrelationship
15 between certain of these questions, and that it is a
16 little bit difficult at times to put each question
17 within the confines of a particular box, if you will.
18 Be that as it may, we have attempted to do
19 that, and certainly we don't want the presentation if
20 witnesses at this date to prejudice the licensees. As
21 Mr. Blum has stated, and as I will restate, he has
22 indicated that he intends to present Mr. Sholly as a
23 witness on Commission Question 5. Part of his testimony
24 is really going to be dealing with aspects of evidence
25 that would ordinarily be considered under Question 1.

1 Which would you prefer? How would you prefer
2 to handle it yourselves?
3 MR. BRANDENBURG: Mr. Chairman, if the
4 testimony is truly testimony under Commission Question
5 5, then it belongs under Question 5. However, as I
6 understood Mr. Blum's presentation, he was going to be
7 presenting original testimony that would evaluate the
8 consequences of reactor risks at Indian Point. Now,
9 that is clearly Commission Question 1 material, and if
10 we were to grant -- if my reading of what Mr. Blum has
11 asked is correct, and were that request to be granted,
12 UCS would be presenting its Question 1 case about two
13 months after everyone else in the case, which I think is
14 entirely inappropriate.
15 The line I would propose to the Board to be
16 drawn is that any witness who is proposing new analysis,
17 original analysis of the risk that would be posed by
18 accidents at the Indian Point site from the Indian Point
19 reactors, that that be considered Question 1, and that
20 any witnesses proposing to give testimony on that topic
21 be required to do so according to the timetables that
22 the Board has set for Question 1, and that Question 5 be
23 reserved for analyses which attempt to compare extant
24 Question 1 analyses of Indian Point risk, if you will,
25 versus the risk of other plants determined from some

1 other source, so that new material purporting to
2 evaluate the risk of the Indian Point units not be
3 raised for the first time when we get to Question 5.
4 That has not been the premise upon which I
5 think all of the other parties have been proceeding, and
6 it is certainly not the premise upon which we were
7 proceeding in preparing our Question 1 testimony, nor do
8 I think it is the staff's understanding, and that is the
9 line of demarcation, if you will, between Question 1 and
10 5 that I would recommend to the Board at this time.
11 If, as I say, if I understand what Mr. Blum
12 has characterized as Mr. Sholly's testimony, in my mind
13 that is truly Question 1 testimony. For Mr. Blum to
14 propose it at this time, some two months late, after
15 having failed to identify it to us on December 17th, I
16 believe it would be inappropriate for the Board to
17 receive it at this late date.
18 MR. BLUM: If I could clarify the
19 characterization, the testimony, I believe, will be such
20 that there are certain lines or paragraphs of it that
21 are clearly Question 5 testimony, and that it will be
22 explicitly comparative. There are other paragraphs or
23 lines which are indirectly comparative in that they go
24 to supporting a comparison, but they bear more directly
25 -- they are more comparative of Indian Point

1 specifically, since they discuss flaws and methodology
2 by which figures were drawn for Indian Point.
3 So, the testimony is genuinely an amalgam of
4 both that to my mind could plausibly be presented under
5 either question, just as I believe the staff had certain
6 things that could plausibly come under Question 2 or
7 Question 5, and they chose Question 5. But I want to be
8 very up front about this, and if the Board feels it
9 should be Question 1, that the witnesses be made
10 available for a deposition.
11 MR. BRANDENBURG: If I could respond briefly,
12 Mr. Chairman, if the consequence analysis that Mr. Blum
13 has told us is being prepared by Mr. Sholly for Indian
14 Point, that portion of his testimony as described to us
15 is something that flows from the testimony that he is
16 going to be presenting on Commission Question 1, then if
17 consequence is part of the risk -- the Commission has
18 told us that on several occasions -- that properly
19 belongs with Commission Question 1.
20 I think Mr. Blum in his own second
21 characterization of what he is proposing has himself
22 indicated how to parse these out between 1 and 5. That
23 which compares Indian Point with other plants is
24 properly Question 5. That which is new analysis of the
25 risks specifically at the Indian Point plants belongs

1 properly in Commission Question 1. And to that extent
2 any offerings by the intervenors should be held to the
3 Board's timetables for that issue.
4 MR. COLARULLI: Your Honor, if I could just
5 very briefly state that it obviously is impossible to
6 evaluate a piece of testimony we have not seen.
7 JUDGE GLEASON: It does make it difficult.
8 MR. COLARULLI: So we do not know if it is
9 Question 1 or Question 5. If the Board or if Mr. Blum
10 believes that this piece of testimony analyzes the risk
11 posed by Indian Point, then it sounds like it is
12 Question 1 testimony. I would suggest that he proceed
13 in that manner. If when the testimony is filed there
14 are pieces of it that are obviously Question 5, we will
15 certainly bring that to the Board's attention.
16 JUDGE PARIS: Mr. Blum, the parenthetical
17 statement at the end of Commission Question 5 says the
18 Board should limit its inquiry to generic examination of
19 the range of risks and not go into any site specific
20 examination other than for Indian Point itself, except
21 to the extent raised by the task force, so a certain
22 amount of specific Indian Point testimony, I think,
23 would be appropriate on Commission Question 5.
24
25

1 JUDGE GLEASON: Let me ask this. What is the
2 status of Mr. Sholly's testimony, regardless of whether
3 it is on 1 or 5 or both?
4 MR. BLUM: Mr. Sholly is confident that he can
5 have it ready by January 31st. I myself feel that he
6 could probably benefit from some additional time beyond
7 that, and would prefer to present it on the Question 5
8 deadline rather than have it appear late. I gather from
9 the point that Judge Paris is making that maybe I just
10 made too much of this problem, and maybe by the clear
11 terms of Question 5 it really shouldn't matter whether
12 there is some stuff which could also come under Question
13 1.
14 JUDGE GLEASON: Well, it matters if in fact it
15 is testimony that should have been under 1, because then
16 the licensees have not been prepared to receive that
17 testimony, so then we are way behind. The only thing to
18 do at that point then is to allow, to be fair to the
19 licensees and the staff as well, to have additional --
20 to present additional testimony to meet that argument.
21 It just gets another phase.
22 MR. BLUM: We would be willing to consent to
23 that.
24 MR. LEVIN: That is both expensive and very
25 difficult to arrange.

1 MR. BRANDENBURG: Mr. Chairman, I think Mr.
2 Blum has pointed the way out of this situation. If he
3 has assurances from the gentleman who is actually
4 preparing the testimony that it could be prepared by
5 January 31st, I think we can all err on the safe side
6 and receive it at that time.
7 JUDGE GLEASON: What I would like to do is
8 suggest that you gentlemen make an effort, and I know
9 these efforts have been -- I won't say singularly
10 unsuccessful, because you have come up with some
11 solutions at times, as hard as it is to believe, to make
12 some effort to see whether that part of Mr. Sholly's
13 testimony can be segregated, and that you can perhaps
14 depose him in the time suggested for the other
15 witnesses, and then we would also extend him the delay
16 in putting that testimony to February 7th for the other
17 witnesses.
18 If that is feasible, that can be worked out,
19 and then of course we would have Mr. Sholly testifying
20 on 1 and he would also be testifying on 5, but I will
21 leave it to you people to try to work that out, to find
22 out what the testimony of Sholly is about, and see if
23 you can't work it out, and maybe you can report back to
24 us some time tomorrow, maybe.
25 Anyway, let's not rule on it right now.

1 Please proceed with your witness.

2 MR. BLUM: There is one last thing, as long as

3 we are getting all of this out of the way. We have an

4 outstanding motion to compel discovery of Harold

5 Denton.

6 JUDGE GLEASON: I realize that. But I think

7 we have to see what the next witness -- Does that relate

8 to 5? Ms. Moore?

9 MS. MOORE: That is an arguable point. I

10 think that was part of the argument.

11 JUDGE GLEASON: Let us not raise that issue

12 before we have to. I don't think we have to at this

13 moment, Mr. Blum, do we? I know we would like to get

14 everything resolved as quickly as we can.

15 Let's proceed with this witness.

16 Whereupon,

17 JAMES FREDERICK MEYER

18 was called as a witness, took the stand, and was

19 examined and testified as follows:

20 DIRECT EXAMINATION

21 BY MS. MOORE: Dr. Meyer, would you please

22 state your full name and business address?

23 A (WITNESS MEYER) My name is James Frederick

24 Meyer. My address is the U.S. Nuclear Regulatory

25 Commission, Washington, D.C.

1 Q What is your position with the NRC?

2 A (WITNESS MEYER) I am the senior engineer

3 responsible for the reactor system and containment

4 system portions of severe -- that is, core melt accident

5 analysis for risk assessment.

6 JUDGE GLEASON: Mrs. Moore, would you mind if

7 I swear the witness in?

8 Would you please stand up?

9 (Whereupon, the witness was sworn.)

10 MS. MOORE: Shall I begin again?

11 JUDGE GLEASON: No, I don't think he lied

12 about his name.

13 BY MS. MOORE: (Resuming)

14 Q Do you have before you a document entitled

15 Direct Testimony of James F. Meyer concerning Contention

16 2.1A and D?

17 A (WITNESS MEYER) Yes, I do.

18 Q Was that document prepared by you?

19 A (WITNESS MEYER) Yes, it was.

20 Q Do you have any additions or corrections to

21 your testimony?

22 A (WITNESS MEYER) Yes, I do. On Page 1, Answer

23 2, the first line, my position title has been changed to

24 now read senior nuclear engineer.

25 On Page 3, Answer 6, Line 2, after the words

1 "risk contribution," add the phrase "to latent
2 fatalities." So it would read, "greatest single risk
3 contribution to latent fatalities comes from."
4 JUDGE GLEASON: Hold it just a minute,
5 please.
6 (Pause.)
7 JUDGE GLEASON: Please proceed.
8 WITNESS MEYER: On Page 5, Line 2, the comma
9 after the word "installation" should be removed.
10 Page 16, Answer 28, Lines 4 and 5 should read
11 as follows: "Estimate was determined by considering the
12 costs." That is, strike the word "actual" and add the
13 word "the." "The costs of those components of
14 containment structures." Strike the word "existing."
15 Page 19, this is Answer 31 on Page 19, Item
16 3. The first line, remove the parenthetical expression,
17 which reads "all requiring AC power."
18 JUDGE PARIS: Delete the whole --
19 WITNESS MEYER: Delete the whole parenthetical
20 expression.
21 That concludes my corrections.
22 BY MS. MOORE: (Resuming)
23 Q With these changes to your testimony, is it
24 true and correct to the best of your knowledge,
25 information, and belief?

1 A (WITNESS MEYER) Yes, it is.

2 Q Do you adopt this as your testimony in this

3 proceeding?

4 A (WITNESS MEYER) Yes, I do.

5 MS. MOORE: Copies of this testimony have been

6 delivered to the Board, the parties, and the Court

7 Reporter. I ask that the testimony and the attached

8 professional qualifications be received into evidence

9 and bound into the record as though read.

10 JUDGE GLEASON: Is there objection?

11 (No response.)

12 JUDGE GLEASON: Hearing none, the testimony of

13 Mr. Meyer will be received and bound into the record as

14 if read.

15 (The testimony of Mr. Meyer follows.)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CONSOLIDATED EDISON COMPANY OF NEW YORK (Indian Point, Unit 2)	)	Docket Nos. 50-247-SP 50-286-SP
	)	
POWER AUTHORITY OF THE STATE OF NEW YORK (Indian Point, Unit 3)	)	

DIRECT TESTIMONY OF JAMES F. MEYER
CONCERNING CONTENTION 2.1 (a and d)

Q.1 Please state your name and business address for the record Dr. Meyer.

A.1 My name is James F. Meyer. U.S. Nuclear Regulatory Commission, Washington D.C.

Q.2 Please describe your position with the NRC and describe your responsibilities in that position.

A.2 I am a Senior Task Manager responsible for the reactor system and containment system portions of severe (coremelt) accident analysis for risk assessment.

Q.3 Have you prepared a statement of your professional qualifications?

A.3 Yes, I have prepared a Statement of my professional qualifications attached to this testimony.

Q.4 What is the purpose of your testimony?

A.4 The purpose of my testimony is to address the contention on mitigation features, namely,contention 2.1 (a and d), which states:

> Contention 2.1(a)
>
> A filtered vented containment system for each unit must be installed.
>
> Contention 2.1(d)
>
> A separate containment structure must be provided into which excess pressure from accidents and transients can be relieved without necessitating releases to the environment, thereby reducing the risk of containment failure by overpressurization.

Q.5 Please define the term "mitigation feature".

A.5 A "mitigation feature" is defined here as an engineered system designed to mitigate the consequences of severe accidents, that is accidents that are beyond the design basis of nuclear reactor containment buildings. This is accomplished by reducing or eliminating one or several of the containment building failure modes. It is, however, important to note here that the existing containment buildings adequately mitigate the consequences of a wide range of postulated accidents that are more severe than those considered in the original design of the building. A new mitigation feature, combined with an existing containment building design, will mitigate the consequences of an even wider range of severe accidents.

Q.6 Of the various containment building failure modes that you have studied, which is the most important from the standpoint of risk to the public?

A.6 According to both the utilities study and the NRC Study, the greatest single risk contribution comes from slow overpressurization of the containment building by steam and non-condensibles to the point where the containment building structurally fails.*

Q.7 Is there a need then to consider overpressurization protection beyond that provided by the existing containment systems?

A.7 If the goal is to reduce risk at Indian Point, overpressurization protection should be considered.

Q.8 How can the risk resulting from overpressurization failure at Indian Point be reduced? That is, how can we protect against this failure mode occurring.?

A.8 There are two general approaches: either the probability of the accident sequences that lead to overpressurization failures can be reduced (prevention) or the consequences to the public can be reduced by extending further the overpressurization capabilities of the containment buildings (mitigation). The contention under consideration here takes the latter approach, namely to reduce risk by mitigating the consequences of accidents that would otherwise fail the containment building by overpressurization.

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*The NRC analysis determined that extensive yielding of structural members (reinforcing bars) for the containment building would take place at 126 psig. We have defined this as the failure pressure.

Q.9 Please describe mitigation features that will prevent or considerably delay containment building failure by overpressurization.

A.9 Any design fix which can: (a) accommodate the overpressurization energies (resulting from decay heat, primary system stored energy, hydrogen production and burning and other sources) by providing an ultimate heat sink of sufficient capacity; and (b) prevent or significantly reduce the release of hazardous radionuclides to the environment should be a candidate for consideration. These candidates include:

(1) Filtered Vented Containment Systems (FVCSs) (Contention 2.1.a),

(2) Venting to separate Containment Structure (Contention 2.1.d)

(3) Passive Containment heat removal systems, and

(4) Independent Auxillary Containment Spray Systems.

Q.10 Please describe in general terms, the information needed in order to make a decision regarding mitigation features. Then continue by providing the available information on the FVCS and the venting to a separate containment structure.

A.10 There are basically five elements in the decision making process--whether or not to require a particular mitigation feature. They are:

(1) <u>engineering feasibility</u>, that is, can a practical system be engineered and built which meets the functional requirements imposed.

(2) risk reduction, resulting from this mitigation feature.

(3) cost, of feature including installation, and recovery costs and down time costs of units 2 and 3 and how these costs are factored into a value-impact analysis.

(4) the risk to the public from Units 2 and 3, without this mitigation feature. That is, relative to some risk yard stick are Indian Point Units 2 and 3 safe enough or should some measures be taken to reduce risk?

(5) trade-offs between prevention, (of core-melt) measures and mitigation measures, when they both result in similar risk reduction values, taking into account questions of completeness and uncertainties in both prevention and mitigation options.

Of these five elements, I will discuss elements (1) and (2) in some detail at this time with respect to filtered vented containment systems, and venting to a separate containment structure. I will also present some order-of-magnitude cost estimates for these two mitigation features (element 3). Although some very rough estimates of cost of these systems have been made, the Staff has not performed detailed design studies, studies which would be a prerequisite for an accurate determination of costs. NRC does perform some conceptual design studies, but only for the purpose of developing realistic design requirments and criteria such as those found in Section IV of NUREG 0850. The fourth and fifth elements will be considered in the broader context of risk at Indian Point--the subject of Commission Question 1 and 5,

to be considered at a later time in this hearing. Thus, the bases for elements 4 and 5 cannot be presented until later in this hearing. I will at this time, however, discuss elements (1) and (2).

Q.11 Please describe a filtered vented containment system.

A.11 A filtered vented containment system (FVCS) is a device incorporated into the design of the containment building which allows for controlled venting of the containment atmosphere. Controlled filtered venting is a process in which a portion of the containment atmosphere is deliberately released to the environment in a controlled manner through a system of filters and energy absorbers. Such a pressure relief system would be actuated to reduce containment pressure, a pressure which could otherwise lead to containment failure and thereby allow the uncontrolled and unfiltered release of radionuclides into the atmosphere. This system would only be used to mitigate the effects of a severe accident, i.e., an accident which is beyond the design basis accident. Depending on the characteristics of specific designs, different radioactive isotope attenuation factors could be realized for these filtering systems. For all designs considered by NRC the attenuation factors for particulates and molecular iodine are better than 98%.

The pressure level at which point the FVCS would be actuated would depend on the specific set of dominant-risk-contributor damage states for a given nuclear power plant. (The "dominant-risk-contributor damage

states" are those several damage states which, when using quantitative risk analysis, are considered the major contributors to the risk from a given nuclear power plant. These matters will be discussed in some detail under Commission Question #1). Basically, the pressure levels cannot be too high so as to vent too late for the venting system to accomodate the pressure surge, nor too low so as to vent unecessarily. One pressure presently being considered for FVCS vent activation is that approximately halfway between the design basis pressure of the containment building and the structural failure pressure (e.g., for Indian Point, 100 psia).

Q.12 For what overpressurization events will the FVCS be effective?

A.12 Overpressurization events can be divided into three classes--rapid overpressurization, resulting for example from a hydrogen burn; moderate-rate overpressurization, resulting for example from primary system blowdown and molten core quenching; and the gradual overpressurizations, resulting for example, from core-concrete interactions and/or long-term decay-heat (less than 1%) conversion of water to steam. FVCS cannot accommodate the rapid overpressurization events and therefore would be ineffective in preventing containment failure by such rapid pressure events. FVCS can be designed to accommodate the moderate and gradual overpressurizations, and can therefore prevent containment building failures from such overpressurizations.

Q.13 What are examples of the negative characteristics (attendant risks) of FVCSs?

A.13 The FVCS can fail or, even if it works correctly, it can cause the failure of other safety features by adverse system interaction, thereby introducing other accident paths. Furthermore, inadvertant operation can release radionuclides when they may not have been otherwise released thereby exacerbating normally contained low-consequence accidents. The evaluation of the attendent risks requires the identification of the main FVCS-systems interactions and the main FVCS failures. Three FVCS-systems interactions have been identified as important: 1/

(1) Premature venting could negate the containment spray injection system (CSIS) function, which is actuated by containment overpressurization. If CSIS actuates after FVCS has removed most of the noncondensible gases, a strong vacuum could result.

(2) A rapid depressurization of the containment building by FVCS could cause the sump water to flash and the containment spray recirculation system and low pressure recirculation system may fail because of pump cavitation due to insufficient net positive suction head.

(3) The FVCS could affect the ability of the Emergency Core Injection (ECI) systems to keep water in the core even with the systems working. If a LOCA has occurred with ECI activated, a venting of the containment building will lower the pressure acting on the ECI water at the point of the LOCA. The escape of ECI water into the containment will increase and will lead to a greater boiloff of water in the core.

1/ "Report of the Zion/Indian Point Study," SAND 80-0167/1, NUREG/CR-1410, Vol. 1, 1980.

Two types of system failures should also be considered:

(1) Vent Failure to open on demand;

(2) Filter failure (filter bypass or loss of filter efficiency).

Q.14 Have these attendant risks been considered in your assessment?

A.14 Yes, a number of FVCS design options have been eliminated due to high attendant risks. Also, attendant risks and uncertainties associated with attendant risks are included in assessments of realistic risk reduction.

Q.15 Have costs of these systems been estimated?

A.15 Yes, Costs in one study 1/ ranged between 12 and 32 million dollars, depending on the seismic design requirements and filtering capability.

Q.16 What is the status of the filtered vented containment system (FVCS) studies to date?

A.16 Various types of FVCSs have been installed or are being installed in fast breeder reactor facilities both here and abroad. For example, the Zero-Power Plutonium Reactor (ZPPR) test facility, 2/ the Fast Flux Test Facility (FFTF), and the German SNR-300

2/ Lawroski, et al., Final Safety Analysis Report on the Zero Plutonium Reactor (ZPPR) Facility, ANL-7471 (Argonne, IL: Argonne National Laboratory, June 1972).

prototype LMFBR [3/] all have FVCSs, or will be installing them. Also, the present design of the Clinch River Breeder Reactor (CRBR) includes a FVCS.

Vent-filter systems for light water reactors (LWRs) have received attention since 1975, when Norwegian and Swedish studies on underground siting considered the use of the surrounding soil and rock as a filtering medium. [4/] Subsequently, a study group at the University of California at Los Angeles (UCLA) presented a conceptual design of a vent-filter system [5/] comprised of a graded sand and gravel bed with downstream HEPA and charcoal filters. Their design included the use of hydrogen burners to minimize the likelihood of hydrogen explosions and air cooling fans to prevent overheating of the charcoal filter. More recently, the use of a controlled vent-filtered system for core-melt accidents was considered in a conceptual study of underground nuclear plants for the California Energy Commission (CEC).[6/],[7/] The CEC design was

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3/ Bohn, S. Jordan, and W. Schikarski, "The Off Gas Filter System of the SNR-300," Proc. 13th USAEC Air Cleaning Conference, San Francisco, CA, August 1974, pp. 620-631.

4/ Rock Siting of Nuclear Power Plants from a Reactor Safety Standpoint, Final Report (Sweden: Centrala Draftledningen, November 1975).

5/ Gossett, et al., Post-Accident Filtration as a Means of Improving Containment Effectiveness, UCLA-ENG-7775, December 1975.

6/ C. Finlayson, et al., Evaluation of the Feasibility ,Economic Impact and Effectiveness of Underground Nuclear Power Plants, Final Technical Report, AIR-78 (7052-14)-1 (Aerospace Corporation, May 1978).

7/ E. Ward, et al., Conceptual Design and Estimated Cost of Buried 'Berm Contained' Nuclear Power Plants, Contract No. 154-064 (S & L Engineers, January 1978).

completely passive, with the principal filtering structure being an underground pressure relief volume filled with crushed rock and gravel. Presently, Sweden is initiating installation of a FVCS on two of their BWR systems and France is considering the installation of FVCS, on their 900 Mwe PWRs.

Q.17 Does the NRC have a program to address the safety, licensing and value impact of FVCS?

A.17 The U.S. Congress, in the Fiscal Year 1978 Budget Authorization Act, directed the Nuclear Regulatory Commission to prepare a plan for the development of new or improved safety systems for nuclear power plants. In April 1978 the NRC submitted such a plan to Congress, outlining seven key areas of research to be conducted over three years at a total estimated cost of $14.9 million. Of the various research projects being conducted by the NRC, a program for the development and analysis of FVCS conceptual designs was accorded particularly high priority by the NRC and the Advisory Committee on Reactor Safeguards (ACRS).

This program combines risk reduction analysis for specific plants with actual conceptual design analyses being performed at Sandia Laboratories. Results of this NRC/RES sponsored activity specifically for Indian Point are reported in NUREG/CR-1410. This activity is presently considering mitigation features for other types of reactor systems. As a followup to this RES-sponsored generic program, NRR initiated a study of FVCSs for specific application to licensing actions including Indian Point.

Q.18 Based on these studies, what are the conclusions reached by the Staff regarding engineering feasibility of the FVCS (element 1)?

A.18 Of the three types of overpressurization events that could potentially lead to containment failure as defined above it is the Staff's judgement that a practical FVCS cannot be designed to accomodate the first type, namely rapid overpressurization. This judgement is based on RES-sponsored assessments reported in NUREG-CR-1410 and presented at technology exchange meeting #4. 8/

A practical FVCS can be designed to accomodate the second type, namely the moderate-rate overpressurization; 1/, 8/ however, Staff studies (NUREG-0850) indicated that the magnitude of these pressure rises are not likely to fail the Indian Point Containment and thus there is no need to provide mitigation for these pressurizations.

A practical FVCS can be designed to accomodate the third type, namely, the more gradual overpressurization, which is the most dominant overpressurization event of both Indian Point units. 1/, 8/

If the FVCS is to mitigate the consequences of accidents initiated by external events (i.e. seismic events, hurricanes, tornados, floods) the design requirements will be considerably more stringent and the costs will increase accordingly. However, FVCSs still remain feasible systems for further consideration.

8/ Technology-Exchange Meeting No.4, "Filtered Vented Containment Systems and Core Retention Devices," summary of meeting, J.F. Meyer and A. Marchese, NRC, July 21, 1980.

Q.19 Based on these studies and your risk analysis for Indian Point, what are the conclusions reached by the Staff regarding the risk reduction ratio (element 2)?

A.19 The risk reduction ratio can be large (approximately a factor of five*) for both units when considering "latent fatalities" as the "risk measure". It is not as large when considering "early deaths" as a risk measure (approximately a factor of 2 for Unit 2 and a factor of 4 for Unit 3). The risk reduction ratios quoted here are derived from the specific risk analyses performed by the Staff for Units 2 and 3 which will be discussed in response to Commission Question 1. These risk-reduction ratios can only be realized if the mitigation features are qualified to withstand the external events that have been shown to be the major risk contributors.

Q.20 Based on the mitigation studies, what are the conclusions regarding the cost of these systems (element 3).

A.20 Costs can only be judged approximately. As discussed earlier estimates have ranged from 12 to 32 million dollars. These estimates did not include reactor down time (which can run $500,000 to $1,000,000 per day) or costs to qualify the FVCS to withstand the large external events. (which, as I already stated, can be considerable).

Q.21 Are you familiar with contention 2.1, part d?

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* A risk reduction ratio of 5 can be stated equivalently as a risk reduction percentage of 80%.

A.21 Yes, contention 2.1, part d states:

"the following additional specific measure should be required as conditions of operation:

d. A separate containment structure must be provided into which excess pressure from accidents and transients can be relieved without necessitating releases to the environment, thereby reducing the risk of containment failure by overpressurization."

Q.22 Please describe a "separate containment structure" in general terms.

A.22 This concept simply provides for more containment volume and attendant heat sink and source-term attenuation capability by means of a piping hookup from the existing containment building to another (large) building. This concept has the potential to prevent or delay containment building failure and thereby greatly reduce consequences to the public from severe overpressurization accidents that would have otherwise resulted in containment failure. One such concept, referred to as a Containment Venting Building, is shown in Figure 2.1d-1.

Q.23 Has this concept been studied by the NRC?

A.23 Yes, Sandia National Laboratory under contract to NRC's Office of Research conducted "A Value-Impact Assessment of Alternate Containment Concepts" (NUREG/CR-0165, 6/78) which considered "compartment venting" together with other mitigation features. A more recent study, specific to Indian Point, also conducted by

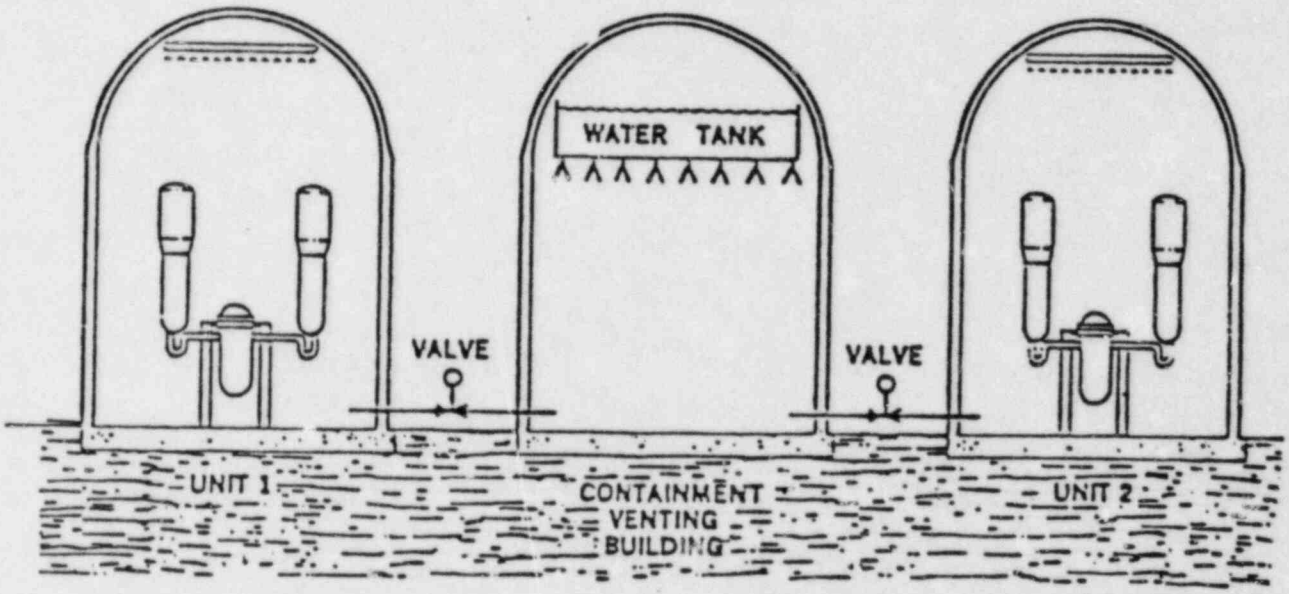

Figure 2.1d-1 - Compartment Venting

Sandia National Laboratory, considered venting to a second building as an option to a conventional filtered, vented containment system ("Report of the Zion/Indian Point Study", Vol.1, NUREG/CR-1410, 8/80).

Q.24 What were the results of these studies?

A.24 Basically, they concluded that, if overpressurization failure of the containment building was a major contributor to risk, this concept has significant potential safety benefit. The original study (NUREG/CR-0165) also concluded that costs would be high since an aditional containment-like structure would have to be constructed.

Q.25 Is such a separate containment structure part of any existing nuclear power plants?

A.25 Yes, the Canadians have incorporated this type of mitigation feature into some of their heavy water nuclear power plants. (E.W. Fee and G.E. Shaw, "Vacuum Containment Systems for Multi-Unit Nuclear Power Stations," 7th Int. Congress on the Confinement of Radioactivity in the Utilization of Nuclear Energy, Societe Franciase de la Radioprotection, Versailles, France, May 1974.).

Q.26 Are you familiar with the testimony filed in the proceeding by the Union of Concerned Scientists and the New York Public Interest Research Group (UCS/NYPIRG) concerning Contention 2.1?

A.26 Yes, I am.

Q.27 Please describe the system proposed by UCS/NYPIRG in response to this contention.

Sandia National Laboratory, considered venting to a second building as an option to a conventional filtered, vented containment system ("Report of the Zion/Indian Point Study", Vol.1, NUREG/CR-1410, 8/80).

Q.24 What were the results of these studies?

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Q.26 Are you familiar with the testimony filed in the proceeding by the Union of Concerned Scientists and the New York Public Interest Research Group (UCS/NYPIRG) concerning Contention 2.1?

A.26 Yes, I am.

Q.27 Please describe the system proposed by UCS/NYPIRG in response to this contention.

A.27 As I understand the testimony this mitigation feature would consist of a separate and dedicated containment structure for each unit which has the capability of providing protection against overpressurization accidents.

Q.28 Is such a separate containment vent volume feasible for each unit at Indian Point, and if so at what cost?

A.28 Assuming that sufficient space is available at the site, it is feasible to build and maintain such systems, however, the cost will be very high, approximately $100 million dollars apiece. This cost estimate was determined by considering actual costs of those components of existing containment structures which would constitute the vent volume system.

Q.29 Have you considered a vent volume system which achieves the same end at less cost?

A.29 Yes, Unit 1 is shut down, and its containment would be a candidate for further consideration. The NRC is studying the feasibility of using the Unit 1 containment building as a "separate containment structure" or "vent volume."

Q.30 What are the results of the feasibility study to date (element 1)?

A.30 Before presenting the results of the NRC study, it is important to note that NRC does not go beyond a determination of feasibility

in its consideration of the engineering aspects of this or any mitigation design. That is, NRC does not do detailed engineering design studies. This, quite properly, is the primary responsibility of the utilities. NRC does perform conceptual design studies for the purpose of developing realistic design requirements, and criteria. A statement of feasibility at this time must have two important qualifiers. First, some information required to make the final feasibility determination is lacking, and, second, the feasibility is a strong function of the effect of external events (hurricanes, earthquakes, floods, tornados) on the Unit 1 containment. With these qualifiers in mind, the present position on feasibility is:

- unless the information still outstanding demonstrates new major problems, the use of the Unit 1 containment as a vent volume appears feasible to significantly reduce or delay the effects of severe overpressurization accidents caused by internal event initiators (including fires)
- The use of the Unit 1 containment as a vent volume does not appear feasible for accomodating severe overpressurization accidents caused by seismic external event initiators. This is because the nominal seismic resistance of IP-1 is substantially less than that of IP-2 or IP-3. Sufficient information to assess other external initiators is lacking.

Q.31 Please list the pros and cons in drawing the above interim conclusions.

A.31 The features of the Unit 1 containment building that make it an attractive candidate are:

1) The Unit 1 containment building is a steel sphere surrounded by a thick-walled concrete building. It is of the the large-dry type and was originally designed to withstand overpressure (approx 25 psig) resulting from large LOCA reactor accidents. The Unit 1 containment building free-volume is considerable--1.75 x $10^6 ft^3$ (compared to 2.6 x $10^6 ft^3$ each for units 2 and 3). The passive energy absorption (heat sink) capability of the containment building (exclusive of any active heat removal capability) was calculated to be greater than 650 x 10^6 Btu (equivalent to 6 hrs. of core decay heat at 1% in IP-2 or 3).

2) The Unit 1 containment building also has additional potential active cooling capability (that is, a potential ultimate heat sink capability) via containment sprays (both internal and external to the steel sphere containment boundary). At least the external sprays can be supplied with emergency cooling water sources (such as fire trucks).

3) There appear to be sufficient containment penetrations available (for Units 2 and 3 as well as Unit 1) to accomodate the necessary vent piping from Units 2 and 3 to Unit 1).

4) The additional volume and surface area provided by IP-1 could increase plateout and condensation effects and thereby reduce ambient radioactivity available for release to the environment. The negative-pressure annulus between the steel and concrete containment structures may also enhance such reductions.

The features of the Unit 1 containment building that make it unattractive as a vent volume are:

1) Indian Point Unit 1 was originally designed to withstand only a 0.1 (horizontal) seismic event. Its normal seismic capability appears to be considerably below that of Units 2 and 3. In addition, currently available information does not indicate that Indian Point Unit 1 was specifically designed to meet other external event design criteria--criteria that were imposed on Units 2 & 3. Thus, Unit 1, as is, may not be a worthy candidate for mitigation against core-melt accidents initiated by external events.

2) Indian Point Unit 1 was shutdown in 1974; the effect of eight years of disuse on containment integrity and system functions is not known. Also some safety systems have been dismantled. Costs of rehabilitating these systems is not known.

3) Unless active containment cooling systems are functional (all requiring a.c. power), the Unit 1 containment does not provide an unlimited (i.e. ultimate) heat sink capability. Unless these cooling systems operate or unless adequate ability is provided to re-isolate Indian Point Unit 1 at appropriate times during venting, it too may ultimately fail and thereby release fission products to the atmosphere (via the annulus between the steel sphere and the concrete building).

4) The design of any vent lines would require substantial hardening against external events that could involve significant costs.

5) The potential combustion of any hydrogen transported to Indian Point Unit 1 under continued venting could require the addition of other mitigation devices and further consideration of pressure-reducing capabilities of the Indian Point Unit 1 containment.

Q.32 What are the Staff conclusions regarding cost of venting to the Unit 1 containment building (element 3)?

A.32 Because of a lack of some very basic information (as discussed above) the cost estimate cannot be made. However, it can be stated that if no further seismic upgrading is needed, then the costs should be considerably below the costs of a FVCS. On the other hand, if extensive upgrading is needed to accomodate external events, then the costs would be equal to or possibly greater than those of a FVCS.

Q.33 What are the Staff conclusions regarding the risk reduction potential resulting from venting to the Unit 1 containment or venting to the two separate structures as posed by Intervenors. (element 2)?

A.33 The conclusions are essentially the same for either of the two options, and furthermore are approximately the same as the FVCS, namely:

- large potential reductions when considering latent effects;
- moderate potential reduction when considering early deaths;
- risk reduction is negligible unless the vent volume is qualified for the key external events.

Q.34 Do you believe that the addition of a FVCS or a separate vent volume as described by the Intervenors should be required as a condition of continued operation of Indian Point Units 2 and 3?

A.34 No, I do not believe that a filtered vented containment system or a separate vent volume described by the Intervenors should be made a condition of continued operation of Indian Point Units 2 and 3. These systems are costly ways to achieve the level of risk reduction that they may provide. There are better and less expensive ways to achieve the same end in terms of risk reduction. Our testimony in reponse to Questions 1 and 5 will discuss the level of risk at Indian Point as well as mitigation and prevention options which may be warranted from the standpoint of risk reduction and the level of risk.

Q.35 What is your recommendation regarding the use of Unit 1 containment as a vent volume?

A.35 I am unable to conclude that the cost benefit ratio for venting to the Unit 1 containment is so high as to obviously preclude at this time further consideration of this matter. Therefore, this particular concept will be considered in our subsequent testimony. (discussed further).

Q.36 Does this conclude your testimommy on Contention 2.1 (a) and (d)?

A.36 Yes.

PROFESSIONAL QUALIFICATIONS
JAMES F. MEYER
REACTOR SYSTEMS BRANCH
DIVISION OF SYSTEMS INTEGRATION

My name is James F. Meyer. I am employed by the U.S. Nuclear Regulatory Commission, Washington, D. C. 20555. I am a Senior Task Manager and, as such, am responsible for analyzing and evaluating technical input for licensing actions in the general areas of severe (core degradation, melt or disruption) accidents in nuclear power plants.

I attended Valparaiso Univeristy, Valparaiso, Indiana from 1958 to 1963, where I received Bachelor degrees in Electrical Engineering and Physics. Upon completion of my undergraduate studies in 1963, I enrolled in the Nuclear Engineering Department at the Pennsylvania State University. In 1965, I received my M.S. degree and in 1968 my PhD, both in the subject area of nuclear engineering. Following graduate studies, I worked for Argonne National Laboratory for about six years. During the first five years, I worked in the Applied Physics Division at ANL on development, planning, execution, analysis, and reporting of experiments on Zero Power (Plutonium) Reactors. My experience was in reactor analysis, fast reactor experiments, and general engineering (design and development). In addition to completing the above tasks, my responsibilities included being a reactor supervisor on two plutonium test reactors.

From October 1973 to November 1974 I was on loan from ANL to the Atomic Energy Commission (now NRC) working in the Liquid Metal Fast Breeder Reactor Branch.

For about 4 years (including the one year I was on loan from ANL), my duties included analysis, assessment, and evaluation of safety/licensing issues associated with the Clinch River Breeder Reactor with specific responsibility in the areas of fuels, reactor physics, accident analysis, and core disruption analysis. Accomplishments during this period included publishing reports, establishing licensing criteria and preparation for licensing hearings. From about August 1977 to August 1978, I had similar responsibilities for the Fast Flux Test Facility (FFTF) culminating in contributions to the Safety Analysis Report for FFTF.

The NRC, especially during the period from August 1978 to August 1979, participated in the Carter Administration's Non-Proliferation Alternative Systems Assessment Program and the International Nuclear Fuel Cycle Evaluation Program. I had lead responsibility, representing the Office of Nuclear Reactor Regulation, in conducting an independent comparative evaluation of the safety, environmental, safeguards, and licensing issues for the advanced reactors under consideration. Our preliminary assessment has been sent to the Department of Energy and a Report to Congress was prepared.

Because of my experience in the area of severe (core melt) accidents for advanced reactors, I was given similar parallel responsibilities, during

the summer of 1979, in the area of PWR and BWR severe accidents and severe accident mitigation features. These responsibilities included analysis and evaluation of Filtered Vented Containment Systems, Hydrogen Control Systems, and Core Retention Devices. Particular licensing applications included the Zion/Indian Point Task Force consideration of mitigating features for these power plants and the consideration of degraded or melted cores in safety reviews for other nuclear facilities.

Expanding on the above activities, I am presently a Senior Task Manager responsible for guidance and coordination of specific NRR licensing activities related to degraded core/molten core accidents.

While working in all of the above areas, I have been responsible for managing a large ($1 million) technical assistance program at various laboratories and universities. Also, I have made numerous presentations before the Advisory Committee on Reactor Safeguards.

During this time period in the evenings I have taught reactor physics courses at the University of Maryland. As a "Visiting Lecturer" I taught three 3-credit graduate level courses in the Fall of 1976 and 1977 and the Spring of 1978.

My honors include Sigma Xi, a number of Scholarships and Fellowship awards, and a "High Quality Certificate" presented in July 1978. I am the author or co-author of several papers involving reactor physics and reactor safety.

JAMES FREDERICK MEYER (Up to 1973)

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2. R. A. Lewis, K. D. Dance, E. F. Groh, F. H. Martin J. F. Meyer and T. W. Johnson, "The Argonne Variable-Temperature Rodded-Zone Facility", Trans. Am. Nucl. Soc., 12(2), 696 (November 1969)
3. J. F. Meyer, T. W. Johnson and J. E. Sustman, "A Sodium-Vapor Monitor", Trans. Am. Nucl. Soc. 13(2), 794 (November 1970)
4. J. F. Meyer, E. M. Bohn and W. R. Robinson, " B_4C Control Rod Worths and Reaction Rates, Sodium-Void Worths and 238-U Doppler Effects Near B_4C Control Rods in a Typical LMFBR Core", Trans. Am. Nucl. So 15(1), 501 (June 1972)
5. E. M. Bohn, J. F. Meyer and R. B. Pond, "Measurements of the 238-U Doppler Effect in Boron-Poisone Zones in a LMFBR-Type Critical Assembly", Trans. Am. Nucl. Soc. 15(1) 502 (June 1972)

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2. R. A. Lewis, K. D. Dance, J. F. Meyer and E. M. Bol "Variable Temperature Rodded Zone Project Design Summary Report" ANL-7639
3. R. A. Lewis, K. D. Dance, J. F. Meyer and T. W. Johnson, "The Variable Temperature Rodded Zone (VTRZ) Program", Reactor Physics Division Annual Report, July 1, 1968 to June 30, 1969, ANL-7610, p. 1
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5. J. F. Meyer, T. W. Johnson and J. E. Sustman, "A Sodium-Vapor Monitor", Applied Physics Division An Report, July 1 1969 to June 30, 1970, ANL-7710, p

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Reports (continued)

6. K. D. Dance, J. F. Meyer, E. F. Groh and D. M. Smith, "The Variable Temperature Rodded Zone Project", Applied Physics Division Annual Report, July 1, 1970 to June 30, 1971, ANL-7910, p. 185
7. J. F. Meyer and E. M. Bohn, "Description of Simulate B_4C Control Rods and Measurements of Control Rod Worths in ZPR-6 Assembly 7", Applied Physics Division Annual Report, July 1 1971 to June 30, 19 ANL-8010
8. J. F. Meyer, E. M. Bohn and R. B. Pond," 238-U Doppler Effect Near the Simulated Control Rod Assemblies in ZPR-6 Assembly 7", Applied Physics Division Annual Report, July 1 1971 to June 30, 19 ANL-8010
9. E. M. Bohn and J. F. Meyer, "Sodium-Void Worth Near the Simulated Control Rod Assemblies in ZPR-6 Assembly 7", Applied Physics Division Annual Report July 1 1971 to June 30, 1972, ANL 8010
10. R. B. Pond, E. M. Bohn and J. F. Meyer, "Small Sample Reactivity Worths Near the Simulated Control Rod Assemblies in ZPR-6 Assembly 7", Applied Physics Division Annual Report, July 1, 1971 to June 30, 1972, ANL-8010 (to be published)
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16. C. E. Cohn and J. F. Meyer, "Doppler Reactivity Worth Traverses by the Inverse Kinetics Method", Applied Physics Division Annual Report, July 1, 1971 to June 30, 1972
17. C. D. Swanson, A. B. Long and J. F. Meyer, "On-Line Acquisition and Analysis of Data from Reactivity Measurements Using an Autorod", Applied Physics Division Annual Report, July 1, 1971 to June 30, 1972

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6. J. F. Meyer, R. A. Moore, J. W. Daughtry, P. H. Kier, "Structural Material Doppler Effects in the FFTF Engineering Mockup," Trans. Am. Nucl. Soc. 16(1)
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✓ T. P. Speis, J. F. Meyer, R. P. Denise and T. G. Theofanous, "Core Destructive Accidents and Associated Energetics - An Assessment of the State of Our Understanding," presented at a special meeting on LMFBR Energetics held at Argonne National Laboratory, May 1976.

✓ T. P. Speis, R. P. Denise, R. W. Starostecki, L. Lois, J. F. Meyer, and T. G. Theofanous, "LMFBR Accident Energetics and Their Role in Licensing," Proceedings International Meeting on Fast Reactor Safety and Related Physics (CONF-761001), Oct. 6-8, 1976, Chicago, Illinois.

✓ T. P. Speis, J. F. Meyer, and T. E. Fenstermacher, "Risk Reduction Associated with Severe Accident Mitigation Features - A Regulatory Perspective," Proceedings of the International ANS/ENS Topical Meeting on Probabilistic Risk Assessment, Sept. 20-24, 1981, pages 447-460

✓ J. F. Meyer and M. Silberberg, "Severe Accidents and Their Impact On Licensing In the United States: From Specific Applications To Long Term Rulemaking," paper presented to the European Atomic Energy Society Symposium, Stockholm, Sweden, May 11-13, 1981

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✓J. L. Carter and J. F. Meyer, "The Vapor Pressure Equation of State In Core Disassembly Calculation," Transactions of the American Nuclear Society, Vol. 26, p. 368, 1977

1 BY MS. MOORE: (Resuming)

2 Q Dr. Meyer, would you please summarize your

3 testimony?

4 A (WITNESS MEYER) Yes. This testimony sets

5 forth the position that neither a filtered vented

6 containment system nor a separate containment structure

7 as defined by the intervenors should be a requirement

8 for continued operation of either Indian Point Units 2

9 or 3.

10 There are five basic elements in the

11 decision-making process whether or not to require

12 mitigation features, specifically the filtered vent or

13 the separate containment structure. These are risk

14 reduction from the feature, the engineering feasibility

15 of the feature, the cost, the question of prevention

16 versus mitigation --

17 JUDGE GLEASON: Just summarize your

18 testimony. Don't repeat it all.

19 WITNESS MEYER: And the fifth point, whether

20 Indian Point represents undue risk.

21 In order to draw the conclusions that I have

22 in this testimony, I have relied on the first three

23 elements that I have just listed.

24 MS. MOORE: Your Honor, the witness is now

25 available for cross examination.

1 JUDGE GLEASON: Mr. Blum.

2 CROSS EXAMINATION ON BEHALF OF UCS

3 BY MR. BLUM:

4 Q Dr. Meyer, I would like to clear up one

5 confusion I have that was highlighted by the summary you

6 just gave. I take it your position is that the decision

7 of whether to require filtered venting and compartment

8 venting at Indian Point should be based on five separate

9 factors. Is that correct?

10 A (WITNESS MEYER) There are five factors that

11 would go into the decision-making process. Any number

12 of these could be a sufficient condition for not

13 recommending either of these two mitigation features.

14 Q I see. And you -- the two you do not address

15 are the question of whether Indian Point represents

16 undue risk and the tradeoffs of prevention and

17 mitigation. You don't address those at all.

18 A (WITNESS MEYER) That is correct.

19 Q On the other three, I take it from your

20 testimony that on the issue of feasibility, your

21 position is that both of these mitigant measures are

22 feasible from an engineering standpoint.

23 A (WITNESS MEYER) That is correct.

24 Q And with regard to costs, you have given some

25 general, rough, ballpark estimates of costs, but have

1 not looked into this in any substantial detail. Is that
2 correct?
3 A (WITNESS MEYER) That would depend on your
4 definition of detail.
5 Q Well, I think what you said is that the
6 compartment venting will probably cost something like
7 $100 million unless Unit 1 is used as the compartment.
8 Is that correct?
9 A (WITNESS MEYER) Yes, that is correct.
10 Q And for filtered venting, you threw out
11 general figures of $12 million to $32 million, just as a
12 very rough estimate. Is that --
13 A (WITNESS MEYER) No, that is only part of the
14 cost story of filtered venting.
15 Q No, I was going to say in addition to possible
16 cost of down time for the reactor while it is being
17 installed.
18 A (WITNESS MEYER) And other very important cost
19 considerations, such as upper grading the capability of
20 filtered vents to withstand the external events that
21 these mitigation features would have to protect
22 against. This is a considerable potential cost
23 addition.
24 Q Right, but you don't include any figures for
25 those, do you?

1 A (WITNESS MEYER) Not in my testimony.

2 Q So, is it fair to say that neither engineering

3 feasibility nor cost is a sufficient factor in and of

4 itself for concluding that there should not be filtered

5 venting and compartment venting at Indian Point?

6 A (WITNESS MEYER) Only if there are no

7 alternatives to the two mitigation features that have

8 been recommended by the intervenors.

9 Q I am sorry. Could you address the question

10 more directly? Is it your position that either of these

11 two is a sufficient ground in and of itself for saying

12 there should not be filtered venting or compartment

13 venting?

14 A (WITNESS MEYER) If there are two mitigation

15 features that do essentially -- that perform essentially

16 the same function in terms of risk reduction, and one

17 costs considerably more than the other, then cost is a

18 sufficient reason for dismissing the more expensive of

19 the two.

20 Q Now, which of the two are you talking about

21 here? You are implicitly drawing a comparison.

22 A (WITNESS MEYER) Here I am referring to either

23 the filtered vented containment system or the separate

24 containment structure defined by the intervenors as

25 being examples of mitigation features that are expensive

1 relative to other features. Other features that hold
2 promise for being less expensive I have indicated in my
3 testimony.
4 Three are included, one being, as you
5 mentioned before, the possibility of venting to the Unit
6 1 existing containment building. The second is a
7 passive containment heat removal system, and the third
8 is an independent auxiliary spray system, all of these
9 mentioned in my testimony.
10 Q But your testimony does not specifically
11 establish comparative costs for -- well, I gather in a
12 sense it does for the use of Indian Point Unit 1. You
13 have some costs for that, do you not? I am sorry.
14 A (WITNESS MEYER) I don't have specific costs
15 for what it would take to properly modify the Unit 1
16 containment to be consistent with the requirements and
17 criteria that we would establish for a mitigation
18 feature. I do say that the expectation is that the cost
19 would be less than the separate containment volumes
20 recommended by intervenors.
21 Q So you are saying that if Unit 1 as a separate
22 containment functions as well as another newly built
23 containment, then that would be grounds for eliminating
24 the compartment venting in the newly built containment.
25 Is that correct?

1 A (WITNESS MEYER) That would be grounds for
2 eliminating that particular candidate.
3 Q Now, your testimony seems to be ambiguous on
4 whether Unit 1 would work as well as a newly built
5 containment structure, in that you do list a number of
6 what seem to be significant disadvantages of Unit 1.
7 A (WITNESS MEYER) That is correct.
8 Q So you would not say that in your testimony
9 here you have a sufficient basis for eliminating the
10 idea of separate compartment venting to a new
11 containment structure based on unfavorable cost
12 comparisons using Unit 1, would you?
13 A (WITNESS MEYER) Based only on comparing a new
14 separate vent volume to the existing Unit 1 volume.
15 That is correct. The major reason is, as mentioned in
16 the testimony, the Unit 1 containment is not properly
17 seismically qualified for what we feel to be the
18 external event dominant risk figure.
19 Q Well, does your testimony contain any cost
20 comparisons that form a sufficient basis for eliminating
21 any mitigative measures?
22 A (WITNESS MEYER) The costs that we have
23 presented -- that I have presented in my testimony are
24 very substantial, and in our view, that the other
25 candidates that I have indicated show much more

1 favorable promise for being much less expensive, and
2 also in various ways much better ways of solving the
3 problem of overpressurization failure than the two
4 mitigation schemes in question here.
5 Q Well, first let me clarify what are these
6 other measures that you are referring to? This is
7 passive heat containment removal?
8 A (WITNESS MEYER) Passive heat removal from
9 containment.
10 Q Yes, right.
11 A (WITNESS MEYER) And an auxiliary independent
12 spray system.
13 Q Now, your testimony does not contain the
14 substance of the staff's information or case that these
15 are better mitigative measures than filter venting or
16 compartment venting from the standpoint of risk
17 reduction.
18 A (WITNESS MEYER) That is correct. As I
19 mentioned earlier, the questions of comparing prevention
20 to mitigation and the questions of whether appropriate
21 mitigation measures are deemed important or not, those
22 types of questions will have to wait until later in the
23 hearing, when we address the Commission Question Number
24 5.
25 Q Well, maybe if I could short-circuit some of

1 this, would it be fair to say that your testimony
2 standing alone here does not contain sufficient grounds
3 for rejecting filtered venting or compartment venting?
4 Now, I am not referring to everything the staff might
5 present in the hearing. I am just referring to your
6 testimony as it exists as an isolated piece.
7 A (WITNESS MEYER) Because of the way that the
8 hearing has been set up, certain important elements in
9 the decision-making process will not be presented in
10 detail until later in the hearing. In that sense, the
11 complete bases for the position that we have taken is
12 not part of my 2.1A and D testimony.
13 Q Right. So it would be fair to say that you
14 presented some aspects of the staff's case which will
15 eventually lead to a conclusion which you informed us
16 of, but that you did not present the whole conclusion as
17 testimony.
18 A (WITNESS MEYER) We will in the course of the
19 hearing present to the Board all the bases that we feel
20 are appropriate and important in this decision-making
21 process. What my testimony does say is the conclusion
22 that we have drawn regarding these two very specific
23 contention items only until Question 1 and 5 are
24 addressed, and the relationship of one mitigation
25 feature to another, prevention to mitigation, an ALARA

1 approach, for example, as to whether or not it is an
2 appropriate step to go to prevention, mitigation. All
3 of these aspects will be presented under Question 1 and
4 5 in later testimony.
5 Q Now, this will be based -- I take it from what
6 you are saying this will be based primarily on a
7 comparison of different preventive and mitigative
8 measures, but that your testimony does not take the
9 position now that the Indian Point plants are safe
10 enough as they are, therefore, nothing is needed. That
11 is not in your testimony, is it?
12 A (WITNESS MEYER) That is correct. That is not
13 in my testimony.
14 Q Would you be able to identify the witness who
15 is going to tie it all together for the staff later on?
16 Is that someone you know about?
17 MS. MOORE: Mr. Chairman, that is clearly not
18 in the scope of Dr. Meyer's testimony.
19 JUDGE GLEASON: Is it in the scope of what you
20 would care to volunteer, Ms. Moore?
21 MS. MOORE: If I knew, I would be glad to do
22 that. As I believe we have explained both to Mr. Blum
23 and in letters that were served on all the parties, one
24 of our principal witnesses in this case, Dr. Hanauer,
25 has left the agency, and we are in the process of

1 determining who in fact will be the principal witness.

2 There will be one, and we will designate that

3 witness before his testimony is due on Question 5, as

4 soon as we possibly can.

5 MR. BLUM: There is a certain metaphysical

6 problem here that there is a conclusion that exists but

7 there is no head that it is within.

8 MS. MOORE: I think that is an incorrect

9 statement. I think the conclusion here is quite clear.

10 Dr. Meyer has said that filtered vented containment

11 systems and compartment venting systems are expensive,

12 and that there are cheaper, better ways to do the same

13 thing from his technical judgment.

14 What he is saying, I believe, and I am not

15 intending to testify, but since this is obviously of

16 great importance to Mr. Blum, the bases for the general

17 conclusion will be presented in our entire testimony in

18 Question 1 and Question 5, and you have to look to that

19 entire testimony to find all of the numerous bases for

20 those conclusions. But the conclusion is here, and Dr.

21 Meyer is prepared to defend those conclusions to the

22 extent that they depend on the technical aspects of the

23 mitigation features discussed.

24 JUDGE GLEASON: He doesn't want to, I gather,

25 lift the tent a little bit, Ms. Moore, since he knows

1 what the answer is going to be? He has already told us
2 what the answer is.
3 MS. MOORE: That is right, and I think he is
4 prepared to defend that answer as far as his technical
5 judgment is concerned. Whether the plant is safe
6 enough, and whether mitigation versus prevention is
7 appropriate is not in the context of these two
8 contentions. That goes to the much broader question of
9 if any mitigation feature should be imposed. I believe
10 Dr. Meyer has clearly said that if a mitigation feature
11 should be imposed, it is not these two.
12 JUDGE GLEASON: Don't get mad, Ms. Moore. I
13 just asked you a question. There is a certain
14 incongruity here, Mr. Blum, and I don't know how to
15 field it myself.
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BY MR. BLUM: (Resuming)

Q But I take it, Dr. Meyer, that you do stand for cross examination only on the first three items, those being feasibility, risk reduction and cost, and not on the fourth and fifth item. Is that correct?

A (WITNESS MEYER) That is correct.

Q And to the extent that the Staff's conclusion rests on those two, it is not established by your testimony?

A (WITNESS HANNON) To the extent that it is established by those two items, that is correct.

MR. BLUM: I have two exhibits. One is UCS-7 and the other is what I am now going to pass out as UCS-8. Maybe since there is just a little bit of time available now, maybe we could go through the decision of whether we are going to admit these.

UCS --

MR. LEVIN: Was the transcript from the NRC meeting.

JUDGE GLEASON: And UCS-8 is what?

MR. BLUM: A memorandum from Dr. Meyer, again some pages of a memorandum.

JUDGE GLEASON: Does Staff have a copy of this?

(Pause.)

1 JUDGE GLEASON: Let's identify the second
2 document as USC Exhibit Number 8 and that is some pages,
3 not consecutive, if I can read and write, from a
4 memorandum dated September 29, 1980 from Mr. J. Meyer to
5 T. Speis -- S-p-e-i-s.
6 (The document referred to
7 was marked USC Exhibit
8 Number 8 for
9 identification.)
10 JUDGE GLEASON: So do you want to make your
11 argument on that, Mr. Blum?
12 MR. BLUM: Well, first of all, is there any
13 objection to this one? I can mention what I am going to
14 be using it for, which is primarily Figure 1 -- no, no.
15 I am sorry. Figure 2, basis for developing Zion-Indian
16 Point mitigating features: requirements and criteria.
17 And I simply wanted to use this as an illustrative
18 device for understanding how the Staff's consideration
19 of the mitigating features has developed and what parts
20 of this plan of action have been done and not done.
21 Implicitly this is for purposes of
22 impeachment, I would guess, in that it would be directed
23 to showing incomplete consideration in the Staff's own
24 terms.
25 JUDGE GLEASON: And you are offering this into

1 evidence?

2 MR. BLUM: No, I frankly would just as soon

3 has this an exhibit and not offer it in evidence -- just

4 append it to the record.

5 JUDGE GLEASON: What about Exhibit 7? The

6 same thing?

7 MR. BLUM: Likewise with UCS-7. This is here

8 not for the truth of the matter asserted but for

9 purposes of impeachment, showing prior inconsistent

10 positions taken by the Staff.

11 MS. MOORE: Your Honor, we would object to any

12 use of UCS-7 in this proceeding.

13 JUDGE GLEASON: All right. I understand your

14 objection on that. What about Exhibit Number 8? Have

15 you finished your review of that?

16 MS. MOORE: Yes.

17 JUDGE GLEASON: What do you say about that?

18 MS. MOORE: We have no objection to the use of

19 that in this proceeding.

20 JUDGE GLEASON: Any objection by the other

21 parties?

22 MR. LEVIN: No objection to 8, Your Honor. It

23 doesn't seem to matter whether 7 is here for -- reading

24 it, it can't be used for any purpose.

25 JUDGE GLEASON: Well, we have not ruled on

1 that.

2 MR. LEVIN: I am saying we maintain our

3 objection to it.

4 JUDGE GLEASON: I see. All right. UCS

5 Exhibit Number 8 is admitted into evidence, and Number 7

6 we will consider tonight and we will see you all at 9:00

7 tomorrow morning.

8 (The document previously

9 marked UCS Exhibit Number

10 8 for identification was

11 received in evidence.)

12 (Whereupon, at 5:03 o'clock p.m., the hearing

13 recessed, to reconvene at 9:00 o'clock a.m., Wednesday,

14 January 26, 1983.)

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NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

ATOMIC SAFETY AND LICENSING BOARD

in the matter of: CONSOLIDATED EDISON COMPANY OF NEW YORK (Indian Point Unit 2 - POWER AUTHORITY OF THE STATE OF NEW YORK (Indian Point Unit 3)

Date of Proceeding: January 25, 1983

Docket Number: 50-247 SP and 50-286 SP

Place of Proceeding: White Plains, New York

were held as herein appears, and that this is the Original transcript thereto for the file of the Commission.

Aldred H. Ward

Official Reporter (Typed)

Official Reporter (Signature)