UNITED STATES ATOMIC ENERGY COMMISSION

IN THE MATTER OF:

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

(Indian Point Station, Unit No. 2)

Docket No. 50-247

Place - Springvale Inn, Croton-on-Hudson, N. Y.

Date - July 13, 1971 **Pages.** 839 - 1016

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UNITED STATES OF AMERICA

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Springvale Inn
Croton-on-Hudson, N.Y.

Tuesday, July 13, 1971

The above-entitled matter came on for hearing, pursuant to notice, at 9:30 a.m.

BEFORE:

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

DR. JOHN C. GEYER, Member.

MR. R. B. BRIGGS, Member.

APPEARANCES: On behalf of the Applicant:

LEONARD M. TROSTEN, Esq., LEX K. LARSON, Esq., 1821 Jefferson Place, N.W., Washington, D. C. 20036

EDWARD J. SACK, Esq., 4 Irving Place, New York, N.Y., 10003.

On behalf of the Regulatory Staff:
MYRON KARMAN, Esq., and JOSEPH B. KNOTTS, Esq., Office of General Counsel, U.S. Atomic Energy Commission, Bethesda, Maryland.

On behalf of the Atomic Energy Council of the State of New York:

JOSEPH SCINTO, Esq., 112 State Street, Albany, New York, 12207

On behalf of Intervenor, Citizens' Committee for the Protection of the Environment, and on behalf of the Environmental Defense Fund:

ANTHONY B. ROISMAN, Esq., 1910 N Street, N.W., Washington, D. C.

On behalf of Intervenor, Hudson River Fishermen's Association:

ANGUS MACBETH, ESQ., 36 West 44th Street. New York, N.Y. 10036

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C O N T E N T S

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CHAIRMAN JENSCH: Please come to order.

I don't know whether we have anybody on the microphone here or not. If you do not hear, if you will indicate that you cannot hear, we will try to speak a little louder. This is a resumed evidentiary hearing in the matter of Consolidated Edison Company of New York, Inc., in reference to its application for an operating license in reference to Indian Point Nuclear Generating Unit No. 2.

This resumed session is consistent with the notice of hearing issued by the Atomic Energy Commission providing for an evidentiary hearing in this proceeding. The notice of hearing was issued on November 13, 1970, and provided that a prehearing conference would be held in this proceeding, and that prehearing conference was held and then we had a second prehearing conference in combination with an evidentiary session of the proceedings, at which time the evidence proposed by the Applicant was submitted and received in evidence and the evidence proposed by the Regulatory Staff of the Atomic Energy Commission was submitted and received in evidence.

There have been several exchanges of correspondence by and among the several attorneys in these proceedings, all of which are a part of the public record in this proceeding. Before we proceed with the hearing itself, we would request that there be no smoking in the room. This is a low-ceilinged room and we are anxious to maintain the air conditioning intact

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with the number of people who are here.

Rather than have a statement of appearances, I will make a general observation of those who are here and if there are any additions or changes, if you will kindly indicate it, they will be noted in the record.

On behalf of the Applicant, I notice Messrs. Trosten and Larson as well as Mr. Cahill, Vice President of Consolidated Edison Company of New York. On behalf of the Regulatory Staff of the Atomic Energy Commission, I note the presence of Messrs. Karman and Knotts as well as their technical advisors, Mr. Kniel and the other gentleman whose name I do not know.

MR. KARMAN: Mr. McCoy.

CHAIRMAN JENSCH: And we have present for the New York State Atomic Council, Mr. Scinto and, I believe, Mr. Rupert.

MR. SCINTO: And another colleague, Mr. Martin, whose notice of appearance was filed this morning. Mr. Bruce L. Martin.

CHAIRMAN JENSCH: His address is the same as yours?

MR. SCINTO: Yes, sir.

CHAIRMAN JENSCH: On behalf of the CitizensDefense Fund, Mr. Roisman; on behalf of the Natural Resources Defense Council, Mr. Macbeth.

MR. MACBETH: Mr. Chairman, I am representing the Hudson River Fishermen in this proceeding. I am employed by the Natural Resources Defense Council.

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CHAIRMAN JENSCH: Very well, we will note your presence on behalf of the organization you identified.

Are there any other appearances?

MR. SCHWARTZ: Yes, I have requested a limited appearance.

CHAIRMAN JENSCH: Yes. I was just inquiring if there were any further appearances on behalf of attorneys. I hear no further response.

There was a request as reflected by a paper handed to me this morning by the Reporter that a Mr. Walter Schwartz of Crompond, New York, wants to make a limited appearance. We have had several limited appearances in this proceeding.

We had set this time for the receipt of evidence and the various presentations that the several attorneys will be making in this proceeding. I believe, however, that there was a request that came in for a limited appearance from an individual who may have been identified as Mr. Walter Schwartz and we did indicate to him that in view of his inability to attend a previous session, at which the limited appearances were received, that we would endeavor to make some accommodation for his later submittal.

Do you have your statement in writing, Mr. Schwartz?

MR. SCHWARTZ: Yes, sir, I do.

CHAIRMAN JENSCH: Would it be agreeable if it were incorporated into the record as if read? It will be a part of

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the transcript of the proceeding and available for public review.

MR. SCHWARTZ: Well, of course, the people that I have consulted with, and I have lived in this community over 40 years, and I occupy a position of presidency in an association of over 300 families, and I am quite familiar with this area, so I feel the reading of this would be at least more satisfactory to my constituents than just to put it into the record.

It is only a page and a half and will require the use of probably four and a half minutes. And I would appreciate it if I had this opportunity to read it publicly.

CHAIRMAN JENSCH: Is there any objection on the part of the Applicant?

MR. TROSTEN: No, Mr. Chairman.

CHAIRMAN JENSCH: The Staff?

MR. KNOTTS: No objection.

CHAIRMAN JENSCH: The Intervenors?

MR. MACBETH: No objection.

MR. SCINTO: No objection.

CHAIRMAN JENSCH: Mr. Schwartz, will you proceed to the microphone?

LIMITED APPEARANCE OF WALTER SCHWARTZ, CROMPOND, NEW YORK.

MR. SCHWARTZ: Thank you, sir.

I am impressed with the irony of asking those present

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not to smoke because the ceiling is low and this is one of the problems we have been discussing as to the low ceiling of the, the problem of pollutants from the nearby plants, and this is one of the things that we are worried about.

As a resident in the 10-mile, high-risk zone around the nuclear complex Con Edison, which Con Edison is building at Buchanan, I wish to protest the absence of any sign citing policies on the part of the AEC and the Utilities, for these unbelievably dangerous devices. What scant operating experience we have had is all bad. Common sense dictates that experiments should have been made and bugs gotten out of these reactors if they can ever actually be made to operate reliably before they were turned loose on the American public.

What faith can we possibly have in this gigantic bureaucracy's endorsement of Indian Point No. 2, the world's largest reactor to date attempting to be licensed, when this same AEC on June 19th, in an almost surreptitious Saturday afternoon press conference, put on the record that Indian Point No. 1, which has been turning out power fitfully and at frightful expense since 1963, "needs to be refitted"? This, of course, means that it will have to be shut down, but the press release didn't say when. The same applies to other small reactors licensed before 1968.

Why? Because in the meantime the AEC has found that temperatures reached in the reactors are likely to cause metal

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failure in the presence of neutrons. This makes some kind of failure possible and we now know that there is no emergency safety system which could arrest the course of an accident once begun. All along the AEC spoke glowingly of "redundancy back-up systems" making these reactors "perfectly safe." But are they? At least five of the big reactors which the utilities are jumping up and down to get licensed in their hunger for electric power cannot be cleared until September and then they will have to operate at only 80 percent of their original capacity, again for a "safety" reason.

To the layman, this smells like gross mismanagement, and before any reactor is allowed to operate, the whole concept should be investigated by an independent board of engineers, having no connection with the AEC, the utilities or the nuclear industry.

With all the outback places still left in the Northeast, why did this experimental device have to be put in the front yard of Peekskill's 30,000 people and 35 miles from New York City and the 11 million people in the metropolitan area?

If there had been a proposal to store nerve gas here, there would have been a deafening outcry. What is being stored in all these reactors for a year -- or between refuelings -- is deadlier than all nerve gas now in safe cannisters. There is no safety possible for the deadly radioactive wastes stored

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in the reactor core, when the whole apparatus is subject to breakdowns. This plant was built here as a showplace to show how smart and derelict the utility was.

I urge the Atomic Safety and Licensing Board to make an immediate recommendation to the Atomic Energy Commission that all nuclear plants be deactivated, and that investigations be directed to fixing responsibility for the policy that proliferated reactors and sited them so dangerously -- in the absence of knowing anything about short and long term problems. I am sure the public will join the utilities in demanding indemnification for loss suffered because the capability of these reactors was totally misrepresented.

I understand the laboratory has recommended that the only way in which these reactors could be made safe would be to surround them with another giant dome with a 40-foot shield of water in between. The cost would be exorbitant and the idea does not seem as safe as that proposed in legislation by Rep. Jonathan Bingham of the Bronx. Because his constituents could be the victims of the first cataclysmic "peaceful-atom" accident, the Congressman wants all reactors deep underground and completely away from human populations. Since we are already scraping the bottom of the barrel to provide fuel for the 114 reactors now underway, it seems too late to do this.

It would probably cost $20 million to write off the nuclear power craze and develop a sound national energy policy --

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far less than the cost of one nuclear accident, after which we would have to scrub the whole works anyway.

Thank you, gentlemen.

CHAIRMAN JENSCH: Excuse me, sir. Would you give your address?

MR. SCHWARTZ: My name is Walter Schwartz. I live at Crompond, New York, 10517.

CHAIRMAN JENSCH: What is the name of the organization of which you are president?

MR. SCHWARTZ: I am president of this organization, but I am not speaking for it; I am speaking as an individual.

It is Mohegan County Association, Inc., established in 1923.

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CHAIRMAN JENSCH: Thank you, sir.

Are we ready to proceed with matters of evidence in this proceeding? Is Applicant ready?

MR. TROSTEN: Yes, Mr. Chairman.

CHAIRMAN JENSCH: Mr. Macbeth?

MR. MACBETH: Mr. Chairman, I simply wanted to ask whether you intended to have any further argument on the motion which the fishermen have before the Board or intend to make any ruling? I am settled on behalf of the fishermen the radiological health and safety matters with the Applicant and I won't sit through the entire evidentiary proceeding; I would be happy to speak now if the Board wishes to hear anything further. If not, I would leave some time in the course of the day, unless you intend to return to the matter later.

CHAIRMAN JENSCH: You say you have settled on behalf of the Hudson River Fishermen's Association. What do you mean by that?

MR. MACBETH: At the last hearing we entered into the record an agreement between the fishermen and the Applicant on the radiological in which the Applicants agreed to allow the Hudson Fishermen to make certain tests and so on; in return for that the Hudson River Fishermen are not going to press any radiological health and safety case against the Applicants; we will not enter into the evidentiary hearing on those matters. We retain our interest, of course, in the motions on

1 radiological and environmental issues that have been before
2 the Board in which there has been an exchange of correspon-
3 dence in the last week or two. So, if the Board wishes to
4 have any further argument on that question, or intends to
5 make any ruling on that issue, I, of course, would like to be
6 here for that. But I don't intend to stay through all of the
7 evidentiary hearing otherwise.
8 So, if it would be possible to schedule that at
9 some time, I would be here for that and try to get back to
10 the office and do some work the rest of the time.
11 CHAIRMAN JENSCH: Well, the Board has been mindful
12 of the pendency of the motion that has been made by the
13 Hudson River Fishermen's Association and joined by the Citizen's
14 Fund Group. As we have indicated heretofore in the proceeding,
15 this Board will comply with all regulations of the Atomic
16 Energy Commission. These regulations are effective and, as
17 you know, are governing upon any group appointed by the Atomic
18 Energy Commission to conduct a hearing of this kind. As has
19 also been mentioned in the course of this proceeding, there
20 is pending before the United States Court of Appeals for the
21 District of Columbia a case that contests in certain respects
22 the regulations pertaining to environmental matters in which
23 I believe you are interested.
24 We of the Board believe it would be presumptious
25 on our part to make any ruling in view of the pendency of that

1 proceeding. We can understand the dilemma that comes from
2 waiting for that decision by the Court of Appeals. The Board
3 does feel, however, that if that decision does not dispose
4 of the matter fully, as you have set it forth in your motion,
5 we will give further consideration to the matter, either by
6 way of a ruling or possibly certification of the matter to
7 the Atomic Energy Commission, Atomic Safety and Licensing
8 Appeal Board, so that process will not be denied in that
9 respect.
10 It may be that the decision by the Court of Appeals
11 will dispose of all matters and we have other aspects of
12 this proceeding that can use the time, I am sure, until
13 perhaps the U.S. Court of Appeals has rendered its decision.
14 Will that be satisfactory to you?
15 MR. MACBETH: Certainly, Mr. Chairman.
16 Just so I am perfectly clear, the Board will not
17 intend to take up the matter again until there has been a
18 decision from the Court of Appeals?
19 CHAIRMAN JENSCH: Or until we have exhausted all
20 other aspects of this case. But let me say this: We will
21 not take it up until you have been warned of the time when we
22 will take it up, so that you can arrange to be here for the
23 consideration of those matters.
24 MR. MACBETH: Fine.
25 CHAIRMAN JENSCH: While we will regret your absence,

1 you may be excused until you find it convenient to return.

2 MR. MACBETH: I am sure there are plenty of matters

3 for the Board to occupy its time. Thank you very much.

4 CHAIRMAN JENSCH: Very well.

5 The Applicant?

6 MR. TROSTEN: Mr. Chairman, do I understand the

7 Board to say you are going to withhold ruling on this pending

8 a decision from the U.S. Court of Appeals? Because there is

9 no certainty, Mr. Chairman, as to when that decision will be

10 handed down. And I would suggest, sir, that simply withholding

11 ruling on that matter would leave the status of this record in

12 a quite indefinite state.

13 I would urge the Board to rule on the pending motion,

14 such ruling of course being subject to whatever determination

15 the Court of Appeals may ultimately reach, which has an

16 effect on the Board's ruling.

17 CHAIRMAN JENSCH: Well, I think we have done

18 substantially that by indicating that this Board will comply

19 with the regulations of the Atomic Energy Commission, which

20 preclude a consideration of non-radiological matters under

21 Appendix D to the Part 50 regulations of the Commission. We

22 will give further consideration to the motion; however, if a

23 decision comes down from the Court of Appeals, or before this

24 case closes, if we exhaust all other matters, we will give

25 consideration further to the motion. What disposition we will

make of it at that time I do not know. But the status of the record is the regulations of the Atomic Energy Commission are effective and applicable to this proceeding, and we will continue on that basis.

I might note while we have interuppted for a moment that I think I saw Attorney Sacks, who also represents the Applicants, in the room, but I don't seem him now. His appearance may be noted for the record, however.

Are we ready to proceed with cross-examination of the Applicants' witnesses?

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That is the schedule which I believe has been adopted by the attorneys. We have indicated before that the schedule of the call of the witnesses and the manner of proceeding can largely be guided by what the parties develop by and among themselves for the convenience of the witnesses and the Board is amenable to suggestions from the parties as to the schedule that has been developed by or among them.

MR. TROSTEN: Yes, sir.

Mr. Chairman, may I suggest that prior to proceeding with cross-examination, that there are certain other preliminary matters which could probably be taken up, including a previous conference among the Board and the parties at the outset as to the exact order in which the hearing is going to proceed.

CHAIRMAN JENSCH: Very well.

There is another matter that we might perhaps give some consideration to at this time. There was a motion in writing filed by the Applicant seeking authority to load fuel into the reactor to bring it to criticality. The Board has not acted upon that motion. We had a letter from the Citizens' Committee for the Protection of the Environment, through its attorney, Mr. Roisman, who stated as follows:

"We have received a motion from the Applicant regarding fuel loading and subcritical testing. We have no objection to the motion, but do reserve the

1 right to argue that permission for low power testing
2 before licensing should not be granted. Our failure
3 to object to the fuel loading is also not a concession
4 that further testing of the reactor vessel with the
5 fuel removed is unnecessary, nor should the cost of
6 such removal enter into the judgment on whether such
7 testing should be required."
8 Now, the Board did decide to give some consideration
9 to the motion.
10 MR. TROSTEN: Mr. Chairman, I might add we have
11 never seen this letter from the attorney for the Citizens'
12 Committee for the Protection of the Environment. What is the
13 date of it, please?
14 CHAIRMAN JENSCH: June 21, 1971. I have a copy here.
15 MR. TROSTEN: No, sir, we have never seen it.
16 MR. ROISMAN: Mr. Chairman, we did serve one on
17 them or at least we asked the United States mail to assist
18 us in serving one on them.
19 CHAIRMAN JENSCH: The letter did not indicate
20 service, however, that I received.
21 MR. KARMAN: We received a copy, Mr. Chairman.
22 MR. TROSTEN: I can only say, sir, that we have
23 never received a copy, and have not discussed the substance
24 of it insofar as low power testing is concerned with the
25 Applicant.

1 CHAIRMAN JENSCH: Perhaps it would be well to defer
2 consideration of your motion and the response until you folks
3 have had an opportunity -- so that a --
4 MR. TROSTEN: That's fine.
5 CHAIRMAN JENSCH: Is that agreeable to the intervenor?
6 MR. ROISMAN: Yes, that is fine.
7 CHAIRMAN JENSCH: Very well.
8 You may have a copy of the letter that I received
9 to assist you in your confersation and when you have completed
10 that, if you will return it, I would appreciate it.
11 MR. TROSTEN: Certainly, Mr. Chairman.
12 MR. ROISMAN: Mr. Chairman, one preliminary matter,
13 and I can't remember in which one of the letters that have
14 gone back and forth between us and the Board we requested
15 permission to have the use of one of the transcripts which
16 would be made available to the Board and inasmuch as the hearing
17 will probably run on for more than one day, that would be
18 useful to us, so we could prepare our case for the subsequent
19 day with the same type of transcript. I understand that
20 that has been a procedure which has been used in other hearings.
21 I just wondered now if we could make arrangements
22 to be able to do that. Once the hearing is over, we are
23 perfectly amenable to using the copy of the transcript which
24 will be in the public documents room in Washington for pur-
25 poses of preparing our proposed findings of fact. But during
this time that we are physically here, it would be helpful if

we had a copy of the transcript.

CHAIRMAN JENSCH: Well, that matter has come up in other cases and in those other cases it has been the conclusion of the Board that we felt it was consistent with the Commission's endeavor to provide the public will all information concerning this case that could be made available, and for that purpose otherBoards have made this type of arrangement, and I would submit it for consideration here: That the Atomic Energy Commission, in addition to the public document room in Washington, D. C., where are contained all copies of communications exchanged between and among the parties which are also served upon the Commission and this Atomic Safety and Licensing Board, as well as the complete application which was filed by Consolidated Edison Company of New York, as well as all submittals by the Regulatory Staff of the Atomic Energy Commission which have been served upon the Board and made available to the public, the Atomic Energy Commission has provided sort of a public depository for similar documents here in the region of the hearing. It is my understanding that the library at the Henrick Hudson High School, which is down the road a bit from this location here at Spring Valley where the hearing is being held, that depository has all of the documents that I have described and it is the intention of the Commission that the depository will also contain a transcript, and it does now contain a

transcript of the hearings which have so far been held in this proceeding, that is the prehearing conferences and the evidentiary sessions of the hearing which have been held so far; and the public is entitled to read and review all of those documents at its convenience whenever the library is open, and we appreciate the kindness of the principal of the Hendrick Hudson High School to make its library and that depository available for members of the public.

During the hearing, however, members of the public will probably be attending the hearing and be informed concerning the matters presented and the progress of the case. The parties who are represented here through attorneys have indicated and have indicated in other hearings, especially the intervenor parties, have indicated a desire to review the transcript more conveniently than they could by going to the depository, in this instance at the Hendrick Hudson High School, and in order to provide, as the Atomic Energy Commission has wanted to provide, members of the public and likewise that the intervenor parties through their attorneys may be informed, we, the Board, in other cases, have provided that since we know the Applicants will have a copy of the transcript and the Staff, the Regulatory Staff of the Commission will be provided a transcript, the intervenors who may not be purchasing a copy of the transcript, could select among themselves one representative, if I may say, to whom the reporter

1 would be directed to hand the daily transcript for easy
2 reference and review and to keep the transcript during the
3 course of the hearing so they may not need to rely upon
4 recollection or hastily prepared notes as to what has trans-
5 pired.
6 That arrangement, however, is not intended to pre-
7 clude other members of the public who desire to review the
8 transcript and have access to it and any such members of the
9 public who would like to read the transcript, if they will
10 leave their name in written form on a piece of paper at the
11 depository, so that the intervenors may be informed of that,
12 they can make an arrangement with such requesters to have access
13 to the transcript at their mutual convenience. Until such a
14 request is left with the repository, however, this Board will
15 make a similar arrangement.
16 If the intervenors will indicate which lawyer should
17 receive the transcript, the reporter will be directed to hand
18 and deliver the copy of the daily transcript to that represen-
19 tative of the intervenor for use during the hearing.
20 MR. ROISMAN: Mr. Chairman, I have just consulted
21 with Mr. Scinto and with Mr. Macbeth, and they are amenable
22 to the Citizens' Committee for Protection of the Environment
23 having possession of that, and I am staying here at the
24 Spring Vale Inn, and if either of them desire an opportunity
25 to look at it, they are more than welcome to do so.

1 Do I understand that the copy has been put into the
2 Hendrick Hudson High School Library is a daily copy and it is
3 being made available there as quickly as it is being made
4 available to the other parties to the proceeding?
5 Perhaps the reporter knows the answer to that -- but
6 I am assuming that it is.
7 CHAIRMAN JENSCH: I believe that is correct, and until
8 we are informed to the contrary, Mr. Roisman, as the
9 representative of all intervenors, will be authorized to receive
10 a daily copy of the transcript and the reporter is directed
11 to serve the daily copy upon Mr. Roisman as service is also
12 made upon the applicant, the Regulatory Staff and the Atomic
13 Safety and Licensing Board.
14 Is there any other preliminary matter that we may
15 consider before we proceed with cross-examination?
16 MR. TROSTEN: Yes, Mr. Chairman.
17 I would just like to suggest now that we take a
18 brief period to go over the general order for presentation of
19 evidence in this hearing and other matters, if that is satis-
20 factory.
21 CHAIRMAN JENSCH: This is something you have dis-
22 cussed with the intervenors and the Regulatory Staff?
23 MR. TROSTEN: Yes, I have discussed it with the
24 intervenors and the other parties, Mr. Chairman, but it may
25 well be there are new answers here which they would want to

1 add or subtract.

2 CHAIRMAN JENSCH: Very well. Will you proceed?

3 MR. TROSTEN: I would suggest this, Mr. Chairman,

4 that the first order of business in this hearing be the

5 introduction into evidence of documents previously identified

6 by all of the parties as available for evidentiary presentation.

7 I refer in this respect to the, first with respect to the

8 Citizens' Committee for the Protection of the Environment,

9 to all of the documentary evidence which the Citizens'

10 Committee has identified in Appendix A and B of its June 4 and

11 June 21 statements of factual findings.

12 With respect to the Applicant, I would suggest we

13 offer into evidence at the outset the following four documents:

14 A document entitled "Answers of Applicant to

15 Questions of the Atomic Safety and Licensing Board at the

16 March 24 hearing, Part 2, a document entitled "Answers of

17 Applicant to questions raised by the Board on May 13, 1971,"

18 additional testimony of the applicant, Part 1, and additional

19 testimony of the applicant, part 2.

20 We would proposed to offer these into evidence

21 immediately following the receipt into evidence of the Citizens'

22 Committee documents.

23 In addition, Mr. Chairman, we may have available as

24 of that time an additional document which we will be prepared

25 to serve on the Board and the parties today and later offer

1 into evidence. I would like to merely identify this document
2 at this time -- actually, there are two documents.
3 The first is an anaswer to Mr. Brigg's question
4 asked at the March 24 hearings relating to emergency core
5 cooling performance of the system in this plant, and the
6 second is a document which we have prepared which is in
7 response to the AEC's recently published interim acceptance
8 criteria for emergency core cooling systems for nuclear power
9 plants.
10 This document is intended to show compliance of
11 the emergency core cooling system for the Indian Point two
12 plants with the AEC's recently promulgated interim criteria.
13 In addition, Mr. Chairman, this document will res-
14 pond to questions we received from the AEC Regulatory Staff
15 pertaining to the emergency core cooling system in a letter
16 dated July 7, 1971.
17 Following receipt into evidence of the documents
18 I have just identified, Mr. Chairman, I suggest that the
19 Staff could then offer into evidence its written answers to the
20 Board's questions and any other documentary material which it
21 has available for this hearing.
22 Finally, Mr. Chairman, it may be possible to offer
23 into evidence certain documents prepared by the State of New
24 York Atomic Energy Council, but this may prove not to be
25 feasible in light of certain plans that Mr. Roisman has for

1 cross-examination of the State of New York.

2 After receipt of all documentary evidence, Mr.
3 Chairman, I suggest that we turn to the matter of pending
4 motions. You have just indicated with respect to the pending
5 motions of the Hudson River Rishermen's Association and the
6 Environmental Defense Fund, that you are going to defer ruling
7 on that motion.

8 There is, however, the pending motion for authoriza-
9 tion to load fuel, which I would suggest we take up. Thereafter,
10 I would suggest that cross-examination begin. The cross-
11 examination would be as follows:

12 First, the cross-examination of Mr. Wiesemann, as
13 called for in 9A of Mr. Roisman's June 4 memorandum.

14 Following that, the cross-examination of the AEC
15 Staff witness, that cross-examination being identified in the
16 9B of Mr. Roisman's memorandum.

17 Following that, the cross-examination of the Staff
18 identified in 9D pertaining to risk versus benefit considera-
19 tions.

20 Following that, cross-examination of Mr. John McAdoo,
21 concerning design origins and related matters. This subject
22 is identified in 9C of Mr. Roisman's memorandum.

23 Thereafter, the analogous cross-examination of the
24 AEC Staff would take place.

25 Following that, there would be a cross-examination

1 identified by Mr. Roisman in 9F of his June 21 memorandum,
2 dealing with sprays.
3 Thereafter we would propose that cross-examination
4 of Mr. Prestele and Mr. McAdoo take place. The nature of this
5 cross-examination is identified in the documents we received
6 this morning from Mr. Roisman.
7 After that cross-examination has taken place, I
8 would suggest that we address ourselves to Board questions,
9 any questions that the Board may have. I do not know of any
10 questions that the Board may have at this time, but I am merely
11 suggesting that any questions that the Board wishes to address
12 to the witnesses be handled after the cross-examination
13 of the Citizens' Committee has taken place.
14 I think that after the Board questions have been
15 responded to, we can take up additional matters such as
16 further direct testimony and cross-examination.
17 This is the general order, Mr. Chairman, in which
18 I would suggest the hearing proceed. What I would like to do,
19 if the parties are agreeable with this general order, is to
20 attempt at this time, this morning, to identify, if we can,
21 on which days and perhaps in the morning or afternoon, when
22 specific witnesses of the Applicant will be cross-examined
23 by Mr. Roisman. If the Board is agreeable to the procedure
24 I have outlined, perhaps we can identify which days the Board
25 may wish to address, which day the Board may wish to address

its questions to the Applicant's witnesses and witnesses of other parties. There is a matter which I think we should discuss this morning, Mr. Chairman, and that concerns cross-examination of Mr. Sherwood Davies of the State of New York. The State of New York has indicated Mr. Davies will not be available for cross-examination until July 20, and I think we should attempt to reach an agreement that that cross-examination can take place on that date or have whatever discussion appears appropriate about that matter.

Finally, Mr. Chairman, I would like to raise a matter which will come up relative to certain cross-examination that Mr. Roisman has indicated to me he wishes to conduct of Mr. Prestele pertaining to the security procedures for the plant. We may find, Mr. Chairman -- I believe we are going to find -- that the questions, the cross-examination which Mr. Roisman indicates he wishes to conduct, is going to involve matters which in the Applicant's opinion, it would be desirable to consider in an in camera session.

It is our position that these matters pertaining to the security of the plant should not be discussed in a public hearing, because the effect of that could be to frustrate these very security measures, and render them possible to be breached by a person intent on doing that. So, at an appropriate time, Mr. Chairman, we believe that further consideration should be given to scheduling a separate, in camera session, for

that subject.

That is all I have to comment on at this time, Mr. Chairman.

CHAIRMAN JENSCH: Do the other parties desire to speak to this proposed schedule?

MR. ROISMAN: Mr. Chairman, on behalf of the Citizens' Committee, we have spoken with the Applicant about this general outline and we have no objection to it, we think basically it is a good idea.

But there are a couple of points I would like to comment on, if I may: With regard to the cross-examination itself, the cross-examination of Mr. Wiesemann and the Staff witnesses with regard to Items 9A and 9B, I have no objection to that taking place as soon as we have disposed of the other matters. With respect to the cross-examination of the staff on Item 9D, the risk-benefit question, last night I received a copy of a one-paragraph replacement or supplement to the staff's original answers to the Board's question dealing with the question of risk-benefit.

Now, I analyzed it last night and have modified my cross-examination to some extent based on it. But I would like to reserve the right to call back that Staff witness if we cross-examine him today or early tomorrow, to cross-examine further on the question of risk-benefit, inasmuch as the new testimony which I received last night suggests a substantial change in

1 the staff's position from what was stated in its answers to
2 the Board's question.
3 With regard to the cross-examination of the staff
4 regarding the spray systems, again two things:
5 One, both the Staff and the Applicants have objected
6 to the introduction into evidence of a Babcock and Wilcox
7 proprietary document that deals with the question of sprays
8 and the use of a given type of spray additive, sodium thyo-
9 sulphate, rather than sodium hydroxide and water. We will
10 have of course have to resolve that question as to whether
11 that document should be introduced into evidence. And depen-
12 ding on how that is resolved, it might affect the time sche-
13 dule which I would like to have for purposes of doing that
14 cross-examination.
15 In addition, I have been receiving over the last
16 week or so from the Staff answers to questions asked by the
17 Board, many of which also go to the question of the spray,
18 and I would like to have at least -- some of which I got only
19 yesterday -- I would like to have at least this evening to
20 look at that and to frame in clearer terms my cross-examination
21 on the spray question.
22 And I would request that if the other cross-
23 examination ends sufficiently early today, that we would begin
24 the spray system cross-examination, that in fact it be post-
25 poned until first thing tomorrow morning.

1 Finally, with regard to the cross-examination of
2 the witness from New York State, who will not be available
3 until the 20th, presumably, if these hearings are still going
4 on on the 19th, which is next Monday, I have no objection to
5 us continuing Tuesday and taking the New York State witness.
6 If the hearings, however, are completed but for the New York
7 State witness sometime this week, I would strenuously object
8 to us having to come back here for the one day to take the
9 cross-examination of Mr. Davies.
10 We know we will all have to come back at a future
11 time for purposes of cross-examination on the emergency core
12 cooling system, and I would propose that in order to preserve
13 our limited resources that it would be preferable if we could
14 begin that hearing, if necessary, even one day earlier than we
15 would schedule it for the emergency core cooling, and have
16 the cross-examination of Mr. Davies.
17 I have served on the parties and the Board this
18 morning an outline with about 25 items in it indicating the
19 scope of the cross-examination which I would have of
20 Mr. Davies. Perhaps much of that can be disposed of by
21 Mr. Davies submitting additional written testimony. So that
22 I have no objection to us going ahead with this on the 20th,
23 but not if it means having to come back to New York only for
24 that purpose.
25 As to the other matters that were raised, I have

no objection. As to the question of when we should hold an in camera proceeding on the question of security, I would merely say if the plant's security would be endangered by the public discussion of ways in which it can be breached here, perhaps that is sufficient evidence to indicate that the security of the plant is inadequate in the first place. But if the Applicant feels more comfortable with an in camera proceeding, we would not object to that, subject, of course, to a motion that we might make to have that record opened up if we felt there was not a security question that the Applicant should be concerned with involved in the closed sessions.

END#3

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CHAIRMAN JENSCH: Does the Staff care to speak?

MR. KARMAN: As indicated by Mr. Trosten, Mr. Chairman, we too were participants in this general agreement as to the procedures to be followed at the Board's will, of course, and we have no objection. Our witnesses will be here today and tomorrow and the next day if need be.

So we have no problem with respect to when our witnesses will be called this week. Of course, with respect to the question of cross-examination of Mr. Davies, the Staff intends to introduce its testimony dealing with emergency plans and, of course, we would like to have our witness present at the same time Mr. Davies is being cross-examined for any cross-examination that may be had of our witness. Of course, we will leave it in the sound discretion of the Board as to when that will be.

CHAIRMAN JENSCH: First of all, I think it is very difficult to fix hours and minutes and time for witnesses. The parties have to undertake the responsibility of having their witnesses here when the schedule of the case permits their call.

We cannot guarantee or fix a time now for the calling of witnesses. We will endeavor to accommodate the witnesses; we will endeavor to recess, if necessary, to accommodate a witness if advance notice cannot be given.

But as usual in these proceedings, each party has a

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1 responsibility for having its witness here when the call is
2 made for them. We will try to accommodate them, of course,
3 but we can't guarantee that.
4 I am a little concerned about the documentary
5 schedule. I wonder whether it might not be better for the
6 Applicant, in the course of its obligation, having the burden
7 of proof, to put on all of its case and if you have some further
8 documentary evidence, answers to questions from Board Member
9 Briggs, as well as, as I understand it, you are also going to
10 have some answers about the emergency core cooling, I think
11 that is a pretty substantial portion of the Applicant's case,
12 and whether the Applicant should not go forward with that -- I
13 don't know what the parties have discussed here as to a schedule,
14 but I infer from the presentation made here today that you feel
15 that this one week might substantially dispose of many of these
16 matters except for the emergency core cooling, and whether
17 any changes are made in the course of the proceeding.
18 If, however, there are matters still coming in from
19 the parties by way of evidence, it may be advisable to recess
20 earlier than our usual 4:30 or 5:00 in the afternoon session
21 to permit the parties to review these additional submittals.
22 I don't think that the schedule that we contemplated
23 at the outset of this proceeding envisioned the likelihood
24 that a person would receive documentary evidence on one day and
25 expect to cross-examine in reference to it on that day. I just

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suggest that as a possibility, and the request of parties can be considered by the Board for that purpose.

MR. TROSTEN: Mr. Chairman, I would just like to observe this: First, we are cognizant of the fact that it is impossible in a hearing to set forth the exact time at which witnesses will be called. What we are merely seeking to establish this morning is an indication of which days the witnesses will be called.

In other words, if Mr. Roisman is going to conduct his cross-examination today and tomorrow, and the Board will ask any questions of our witnesses on Thursday, this would be satisfactory for our purposes, Mr. Chairman. That is the only point we wish to establish this morning.

CHAIRMAN JENSCH: We wouldn't want the witnesses to be absent, because it might be that something will come up in the cross-examination of Witness Smith that Witness Jones could supplement. That is the purpose of these informal sessions, so that at one place in the record the discussion pertaining to a particular subject can all be included.

A witness can't come and go in order to accommodate that kind of procedure that the Commission intends to follow in this proceeding. So, unless you have an abundance of witnesses, 50 or 60, we think two or three or four that might be here might not be inconvenienced by staying throughout the whole session.

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MR. ROISMAN: Mr. Chairman, there was one other thing I meant to mention and the Staff reminded me of it. We did receive a letter from the Staff regarding our submissions in the form of, if you will, pretrial briefs, that indicated the issues we wanted to raise in the proceeding, not including emergency core colling, and it indicated the nature in which we intended to proceed with respect to the documentary evidence, cross-examination, or both.

Now, the Staff response -- again they have indicated it here today -- seems to suggest that they are not willing to pursue the procedure which we have attempted to pursue, and that is for all the parties before the hearing commences to have in their hands what all of the parties think on specific issues.

I might say that from the standpoint of the Applicant, information that they seek to introduce into evidence today called testimony, supplemental testimony 1 and 2 and their answers to questions of the Board, were received by us last week and we have had a chance to analyze it and have submitted to the Board our analysis of that and the areas of cross-examination.

The Staff, however, has not favored us with that type of prior knowledge and, in fact, now indicates, and they did in this earlier letter, that they want to listen to what everybody has to say and then decide what witnesses they are

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1 going to put on.

2 I don't have any objection to the Staff doing that,
3 so long as it is understood that I want the hearing adjourned
4 for a substantial period of time after I get my hands on the
5 written direct testimony that the Staff intends to offer, so
6 that I will have an opportunity to do it.

7 It is not my intent to do cross-examination of
8 Staff witnesses immediately upon hearing what the Staff witness
9 has to say about one of these other issues.

10 Now, the Staff has had in their hands at least since
11 the 21st of June our total statement with regard to the
12 issues that we consider important in this case, except for
13 emergency core cooling, and we are still waiting for the
14 Applicant's analysis and the Staff's analysis on that point.

15 When the Staff hears the oral testimony of the
16 Applicant's witnesses and the cross-examination, if they
17 decide they want to submit supplemental testimony, we would
18 like an opportunity to study that in depth before we are
19 expected to cross-examine those witnesses.

20 I am not approving of what the Staff is doing, but
21 I am saying if that is the procedure they want to follow, we
22 feel we would need some time and couldn't do it on a day-by-day
23 basis as perhaps the Staff expects us to.

24 CHAIRMAN JENSCH: Well, I think this, I think this
25 is one of the problems that these cases generally encounter.

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1 Each succeeding party can better determine its own position
2 when you have heard the complete presentation, either by
3 direct or cross-examination of the parties.
4 I think the Staff necessarily or rather advisedly
5 has to wait until the evidence has been presented. But, likewise,
6 I think the other side of that is that the parties have got to
7 be able to review it, appraise it, and give consideration to
8 it.
9 If it involves a substantial presentation, it may be
10 necessary to give consideration to some time schedule that will
11 permit adequate review. I do not believe that these cases
12 lend themselves to a complete recital in written form before
13 the cross-examination is undertaken.
14 I think these things are developed and expanded by
15 cross-examination which affect the position of the parties.
16 I think the Staff position probably will lend itself to a more
17 succinct presentation by waiting until it is all presented
18 rather than trying to envision what will be presented in advance.
19 MR. KARMAN: Mr. Chairman, I believe you correctly
20 stated the position of the Regulatory Staff. And we agree
21 in part with Mr. Roisman that should the Staff be put in a
22 position to place something substantial in the way of direct
23 testimony and written testimony, that, of course, the parties
24 should have a reasonable time in which to do it.
25 But a very succinct short statement of ourposition

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I believe will not require an extended period of time to analyze it.

More than that at this moment, I really do not have to expand what the Chairman said, is the role of the Regulatory Staff in a proceeding such as this.

MR. TROSTEN: Mr. Chairman, may I add this: It seems to me from the discussion that has taken place this morning that it may well be that after the hearing sessions this week, it may be necessary to adjourn the hearing until next week in order to allow additional time for the parties to consider the evidence that has been presented.

This will probably render mute any disagreement between Mr. Roisman and myself as to whether or not the State of New York testimony should be considered next Tuesday.

I will say this, however, I think we should all be working on the basis of the principle that all matters in this hearing, with the exception of the emergency core cooling matter, which necessarily must be resolved at a later date, should be resolved in this current continuous session of hearings and if it is necessary to adjourn until next week, and if it is thereafter to adjourn until the following week, that we should be working on that principle.

CHAIRMAN JENSCH: That certainly is the premise upon which the Board is proceeding, that the parties will have to be accommodated as to time in order to study any recently

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prepared and submitted evidence.

If necessary, the Board is agreeable to some recesses in the course of a continuous session. While we are talking a lot about Mr. Davies, we haven't heard as to why Mr. Davies can't be here.

Maybe we ought to give the Atomic Energy Council an opportunity to give us a reason for that, because if any witness is intended to be offered in this proceeding, we ordinarily expect he will be here when the schedule permits his call.

MR. SCINTO: Mr. Chairman, the State of New York atomic energy regulatory organizations are somewhat smaller in staffing than the Commission Staff.

We would like to present for a discussion of the state's emergency plan. The highest of our technical officers within the state government who are fully aware of the technical background for its emergency plan -- that would be Mr. Davies, who is director of the Bureau of Radiological Health.

Mr. Davies' responsibilities extend pretty broadly. He is in charge of the State Medical Licensing Program; he is a key member of the state's Radiological Surveillance Evaluation Program; and Mr. Davies at this time is just extremely busy; he is extremely limited on staff; and we would like to have Mr. Davies spend all of the time necessary to amplify all of the information that the Board and the parties may desire, but as little additional time as possible.

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We would like to utilize his time to the best extent we can. I am afraid in this case we just cannot present Mr. Davies before July 20th. We do feel that in this proceeding, while they are not state regulatory proceedings, we do have a responsibility to the federal government and to the boards in particular, to voluntarily assist the boards, to provide as much information about the state radiological activities as we can, which may assist the Board in their evaluations.

For this reason, we voluntarily come forward with Mr. Davies' testimony in this proceeding, because the Board has asked a few questions, in an area that we feel the state has some special knowledge about.

CHAIRMAN JENSCH: The Board will certainly endeavor to accommodate Mr. Davies and any witness. I think the same arguments you make for Mr. Davies apply to the Westinghouse witnesses, some of whom are here in the room.

They are busy; they have other problems, too. Everybody in the room has other problems as far as that is concerned. So we will just have to find the time. If he can't be here until July 20th, can he be here the 21st, 22nd, or 23rd?

Suppose we don't reconvene until the 24th or something like that, or the next week thereafter?

MR. SCINTO: Mr. Chairman, as I indicated in my letter of July 7th, July 20th would be the earliest he could come. He could then be available at any recessed session of

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the proceeding, or at any other time upon approximately three days' notice. We would know that, for example, on Friday of this week, if the session was continuing vigorously, that would be the equivalent of three days' notice.

CHAIRMAN JENSCH: We will try to do it that way. There has been some talk about the emergency core cooling system. The Applicant, I infer from statement of its counsel, is ready to answer Staff questions about the emergency core cooling.

What can the Staff give us by way of information, when will the Staff be ready to report on emergency core cooling? We will welcome the evidence.

MR. KARMAN: Mr. Chairman --

CHAIRMAN JENSCH: We will endeavor to fix a definite date for a witness for that.

MR. KARMAN: Did you say you would or would not?

CHAIRMAN JENSCH: We will try to fix a definite date to be sure that everything is accommodating the Staff witness in that regard.

MR. KARMAN: As indicated by Mr. Trosten, the Applicant will, within the next day or two, submit to the Staff its answers to certain questions propounded by the Applicant relating to emergency core colling system and the Atomic Energy Commission Interim Guideline Policies.

The best I can do at this moment, Mr. Chairman, is

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to indicate to the Board and to the parties that when the information is received by the Commission it will receive the utmost expeditious processing by the Staff, so that this information can be made available to the parties, to the Board, as quickly as possible.

It may be within the next day or two. I have made some inquiries at our office, and then I may have a better line on the proximate time it will take for us, the Regulatory Staff, to evaluate these responses and submit to the Board and to the parties any supplement to the Safety Evaluation relating to the emergency core cooling system.

CHAIRMAN JENSCH: Do I understand that the Staff has not yet received the answers from the Applicant?

MR. KARMAN: You do understand that, Mr. Chairman.

MR. TROSTEN: That is correct, Mr. Chairman.

CHAIRMAN JENSCH: I thought you had submitted it.

MR. TROSTEN: No, sir, the reproduction was completed this morning and I intend to hand it out this morning.

CHAIRMAN JENSCH: Is that what you have in your hand?

MR. TROSTEN: Yes.

CHAIRMAN JENSCH: Some 50 pages or so? It looks like that might require a recess in and of itself for a few days at least.

MR. TROSTEN: Mr. Chairman, it is our understanding

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and intention that the portion of the hearing at which the information contained in this document and the Staff's supplemental Safety Evaluation will have to be deferred for some period of time.

We regard this as an exception to the principle that I was enunciating of a continuous session of hearings for this entire matter.

CHAIRMAN JENSCH: Yes, I understood that.

I just must have misunderstood your statement this morning, because I understood you wanted to introduce your documents on answers this morning, and if the parties haven't had a chance to review, I don't know how they could formulate objections, if any, to it.

So that was just a problem I had with your statement.

end 4 #5

MR. ROISMAN: Mr. Chairman, on this emergency core cooling, I would like to remind the Board that we have outstanding a motion for the production of documents and answers to some questions regarding the emergency core cooling system to the Staff which had several parts to it, some of which have been responded to and some of which have not.

In particular, we have asked for a copy of the Senior Task Force Report. If this document that is floating around called "Interim Guidelines" is the report of the Senior Task Force, that is not apparent on its face, nor has the Staff attempted to respond to our motion for production of the

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1 documents by submitting it to us in this proceeding.

2 We have it as a result of its publication in the

3 Federal Register on June 29th.

4 In addition, we asked the Staff to provide us with

5 a list of all of the documents which were in the hands of the

6 Senior Task Force, and which it used and relied upon in taking

7 its position on the emergency core cooling system. Thatlist

8 has not been provided. We will continually take the position

9 that before we are ready to reconvene the hearing on the question

10 of emergency core cooling, we will need at least a substantial

11 period of time -- and I won't comment on the time until I see

12 the documents -- to analyze those documents, once we have

13 gotten them from the Staff and from the Applicant -- I gather

14 we will get the Applicant's today -- to formulate and submit

15 to the Board in advance of that hearing another pretrial

16 brief, just on the emergency core cooling system, so we can

17 define what the issues are that we wish to raise.

18 But so far we have not received anything from the

19 Staff specifically related to that with the exception of these

20 monthly newsletters of which they have sent us seven now.

21 CHAIRMAN JENSCH: I wonder if the whole matter of

22 emergency core cooling should not be deferred except for

23 perhaps the exchange that the Applicant has ready to submit to

24 the parties now, so that perhaps the Staff could better formulate

25 its position in response to your motion after its position is a

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little better formulated itself. Would that be agreeable?

MR. ROISMAN: Yes.

CHAIRMAN JENSCH: I don't mean we will defer it inevitably, but I think it is a package that might better be considered in a composite, rather than seriatum.

MR. TROSTEN: Mr. Chairman, may I suggest that at this point in the hearing we distribute to the Board and the parties the letter to the Board transmitting the answer to Mr. Briggs' question on emergency core cooling, which is entitled, "Additional Testimony of Applicant, Part 3," and the document entitled, "Emergency Core Cooling System Performance."

This is the document I identified previously, which we would propose to offer into evidence at an appropriate time in the hearing. I might suggest, Mr. Chairman, that perhaps it is a reasonable approach for us to follow today, since our sponsoring witness, Mr. James Moore is here, to have this document received in evidence, subject to a motion to strike in view of the fact that Mr. Moore is available at this session of the hearings to sponsor it in evidence.

If Mr. Roisman is agreeable to that approach, it would be satisfactory from our point of view.

CHAIRMAN JENSCH: That seems to be, lacking the opportunity by the Intervenors to formulate specific objections, I think it should be understood that any document in this proceeding will be subject to a motion to strike at any time a party feels that objections are valid.

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Do the parties desire to speak to this suggestion of Applicant's counsel? Staff counsel?

MR. KARMAN: May I, before we reach that point, Mr. Chairman, respond to Mr. Roisman for the record, so that we can possibly get rid of one aspect of his motion to produce of May 24th.

The request for the analysis and conclusions of the Senior Task Force, with respect to which reviewed the emergency core cooling system, that report is nonexistent, the Interim Guideline policies is, in effect, the only report of the Senior Task Force on emergency core cooling.

With respect to Item 2, the motion with respect to the production of documents, wherein they request a list of all of the documents and other data considered by the Senior Task Force, I indicated to Mr. Roisman at one of our informal meetings that we are preparing a list of such documents and that list will be given to him as soon as it is completed, consistent with any matters that may arise as a result of Section 2.744 of the Commission's rules with respect to the production of documents.

But we are working on that and hopefully it will be compiled soon.

CHAIRMAN JENSCH: Well, every hour and fifteen or twenty minutes we endeavor to accommodate the Reporter in these proceedings and since we have received quite a sheaf of

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papers, maybe we might take a morning recess for a few minutes and then resume with the suggested order of introduction of documents and other considerations related thereto.

At this time, let's recess to reconvene in this room at 10:55. Before we do this, however, there has been a request by the Springvale Inn that whoever owns a black Mustang convertible with a Virginia license plate No. 995630, please remove it someplace.

(Recess.)

end 5

CHAIRMAN JENSCH: Let's come to order.

I would just like to remind the people that there is no smoking in the room whether during the hearing or the recess, because if we fill it up with smoke during the recess, we are just about as bad off as if we keep sucking away during the hearing. So, just step outside then and enjoy some fresh air and we will have it here, too.

Is the Applicant ready to proceed?

MR. TROSTEN: Yes, Mr. Chairman.

CHAIRMAN JENSCH: We just received, it should be acknowledged on the record, your three documents, one of which is entitled "Answers to Questions Raised by the Atomic Safety and Licensing Board on March 24, 1971;" also a letter dated July 13, 1971, transmitting the answers and other matters; and also a sheaf of papers bearing on the outside the title, "Additional Testimony of the Applicant Concerning Emergency Core Cooling System Performance."

Will you proceed.

MR. TROSTEN: We are prepared to offer in evidence at this time, Mr. Chairman, the other documents which have previously been served upon the Board and the parties. The first of these is the document entitled, "Answers of Applicant to Questions raised by Atomic Safety and Licensing Board on March 24, 1971, Part 2, dated July 6, 1971."

I show this document to the following witnesses, all

1 of whom have previously been sworn in this proceeding:

2 Messrs. Prestele, Grob, Moore, McAdoo, and Wiesemann.

3 Whereupon,

4 JOSEPH A. PRESTELE

5 JOHN J. GROB, JR.

6 JAMES A. MOORE

7 JOHN MC ADOO, and

8 ROBERT A. WEISEMANN

9 resumed the stand on behalf of the Applicant and, having been

10 previously duly sworn, were further examined and testified

11 as follows:

12 FURTHER DIRECT EXAMINATION

13 MR. TROSTEN: I ask you if this document was

14 prepared by you or under your supervision and direction?

15 (Chorus of "yes.")

16 MR. TROSTEN: All right. Are the statements

17 contained in this document true and correct to the best of your

18 knowledge?

19 (Chorus of "yes.")

20 MR. TROSTEN: Do you desire that this document be

21 received in evidence in this proceeding as your testimony?

22 (Chorus of "yes.)

23 MR. TROSTEN: Mr. Chairman, I now offer the documents

24 I have just identified in evidence in this proceeding, and I

25 ask that it be incorporated into the transcript as if read.

CHAIRMAN JENSCH: If you have enough copies, they may be incorporated physically.

MR. TROSTEN: Yes, we do.

CHAIRMAN JENSCH: Is there any objection by the Regulatory Staff?

MR. KARMAN: No objection.

CHAIRMAN JENSCH: Intervenors? Citizens' Fund?

MR. ROISMAN: Citizens' Committee has no objection subject to the reservation of its rights as we have always reserved on the introduction into evidence of this kind of testimony.

CHAIRMAN JENSCH: Very well. Those rights may be reserved.

The offer into evidence by the Applicant is accepted and the prepared answers as described by the Applicant's counsel dated July 6, 1971, may be physically incorporated in the transcript as if read and received in evidence.

THE COMPLETE DOCUMENT, "ANSWERS OF APPLICANT TO QUESTIONS RAISED BY ATOMIC SAFETY AND LICENSING BOARD ON MARCH 24, 1971, PART 2, DATED JULY 6, 1971, FOLLOWS:)

BEFORE THE UNITED STATES
ATOMIC ENERGY COMMISSION

In the Matter of	)	
Consolidated Edison Company of New York, Inc. (Indian Point Station, Unit No. 2)	)))	Docket No. 50-247

Answers of Applicant to Questions Raised

by Atomic Safety and Licensing Board

on March 24, 1971

Part II

July 6, 1971

KEY TO IDENTIFICATION OF QUESTIONS

(B) Question by Mr. Briggs

(G) Question by Dr. Geyer

(J) Question by Mr. Jensch

(Tr. 683) - Transcript Page 683

"Now, with regard to the reactor vessel and related somewhat to inspection, in reading the information that came from the construction permit stage, one, I think, is impressed that at that time, at least, there is some concern about the possibility of a rupture of the reactor vessel.

The Applicant provided special concrete structure, I will call it, shielding around the reactor vessel to prevent missiles. The Staff safety analysis indicated and the ACRS letter indicated that certain provisions were being made in the design of the plant to take care of meltdown fuel and this could be expected in the event of a rupture in the reactor vessel.

In ACRS documents prior to that time a concern was expressed. Yet, as the plant comes up for an operating license, it is indicated that there is now no concern about the rupture of a reactor vessel, that this is not a design basis accident that needs to be considered and, in fact, there is no provision for handling the meltdown of the core should such an accident happen.

I think it is important to justify this change in outlook that has occurred between 1965 and 1966 when a construction permit was issued and the present stand."

Answer:

No provisions were ever made or considered for Indian Point Unit No. 2 or for any other water reactor of which the Applicant is aware that would take care of fuel meltdown following the rupture of the reactor vessel. It is the position of the Applicant that the conservatism in the design and care taken in the manufacturing process, strict quality controls and quality assurance during every facet of the design and manufacturing process combined with careful operation and a responsible in-service inspection program, both conforming to Technical Specification requirements, eliminates the probability of reactor vessel rupture and, hence, its consideration as a design basis event.

The crucible was proposed as a back-up to the Emergency Core Cooling System at a time when that system was not designed to prevent fuel clad melting for large breaks in the reactor coolant piping. The system as then designed permitted higher peak fuel clad temperature than can occur with the present improved design. In addition, the present Emergency Core Cooling System design includes valving and piping modifications which give capability to maintain core cooling and containment cooling in the event of a possible failure in the safety injection system or service water system for the long-term after a loss-of-coolant. The purpose of the crucible was specifically to handle molten fuel should such occur and melt through the reactor vessel after a large loss-of-coolant accident.

After the Indian Point Unit No. 2 construction permit was granted the design of the Emergency Core Cooling System was changed to increase its capability to reduce the maximum fuel clad temperature and restrict the amount of metal-water reaction which can occur in a loss-of-coolant accident and thereby maintain the effectiveness of the Emergency Core Cooling System. The concurrent development of the accumulator system by Westinghouse made this technically feasible.

At the same time, the development of a crucible to handle the potential effects of molten fuel in the containment was found to be impractical and because the improvements in the Emergency Core Cooling System removed concerns about fuel clad melting which led to the adoption of the crucible concept

in the first place, it was therefore proposed and the AEC after its review concurred in not providing the crucible.

Question No. 4 (B) (TR. 684) ASLB 3/24

"In connection with the emergency core cooling system, as I read the Staff safety analysis and the ACRS letter for 1966, the emergency core cooling system as proposed at that time was inadequate. The flow from the system was going to have to be increased and increased to the extent that a meltdown of the core could not occur.

This at least is my reading of the reports at that time.

In addition to that the Applicant was going to provide and the papers seemed to indicate that it would be nice to provide for containment, at least, in the event this emergency core cooling system or one that was supposed to fail actually did fail and this was the reason for putting the crucible below the reactor vessel.

This was no longer considered necessary. In other words, no back-up for the emergency core cooling system seems to be considered necessary. Though there may be very good reasons for this, I think it would be desirable to discuss at the hearing more about what work was done on the design of that core catcher, I will call it, because this is stated in reply to the extensive design work that was done.

Give additional information concerning the reasons for removing this device, even though it was provided only as a back-up to a system that was not supposed to fail."

Answer:

The reasons for elimination of the crucible are discussed in response to ASLB Question 3 (B) (TR. 683). Design work done on the crucible prior to its elimination was in the areas of layout, structure, heat transfer and materials selection. The result of this work is described in Section 7 of Supplement 7 to the PSAR of Indian Point Unit No. 2 (attached).

7. REACTOR PIT CRUCIBLE

7.1 SUMMARY DESCRIPTION

The reactor pit crucible was proposed in Supplement 5 to serve as back-up to the emergency core cooling system in the event that the core might melt and deposit in the reactor vessel cavity. The reactor pit crucible, Figure 7-1, is a refractory lined vessel with a sloped bottom supported and elevated from the cavity floor by structural members which allow free flow of water beneath the vessel and steam separation by way of the space between the vessel sides and the concrete reactor cavity walls. The crucible is located directly below the reactor vessel and in-core instrumentation guide thimbles, and extends into the access tunnel as shown on Figure 7-2. The capacity of the crucible is sufficient to contain all of the fuel (UO_2), fuel assembly grids (Inconel), fuel assembly end fixtures (stainless steel) and portions of the lower core support structure and reactor vessel bottom head.

The addition of the accumulators to the redundant and independently protected emergency core cooling systems relegates the reactor pit crucible back up to a role which will never be needed, even under the worst accident hypothesis. Core thermal transient studies (Section 1, Supplement Six) analytically demonstrate the capability of the emergency core cooling system, with its increased capacity, in preventing any clad melting for a loss of coolant accident even when considering complete rupture of a reactor coolant pipe.

The engineering approach to design of the reactor pit crucible was based on the following generalized assumptions.

1. The reactor pit is submerged with borated water from the break in the reactor coolant system and introduction of containment spray water from the refueling water storage tank (350,000 gals capacity).

2. Molten agglomerate including UO_2 solidifies on contact with the water cooled refractory.

With solid external boundarys of the agglomerate mass, an insulating barrier is obtained which essentially lowers the interface temperatures in the refractory to plate region.

Thermal analysis presented in Supplement 5 indicated refractories with service temperatures in the range of 3000°F are adequate. Of the many materials available today, silicon carbide brick and a high alumina brick are presently being considered for use in Indian Point No. 2. Chemical and Physical characteristics of the above materials are shown in Table 7-1.

Both materials are available in the same fundamental geometeric shapes and are suitable for attachment to steel back up plates. It is presently planned to cover the refractory with a ten or twelve gauge stainless steel liner to preclude material damage and moisture absorption during plant life time.

TABLE 7-1

CHEMICAL AND PHYSICAL CHARACTERISTICS
OF REFRACTIES

CHEMICAL COMPOSITION	Percent Alumina Brick	Silica Carbide
Al_2O_3	89.0	0.78
SiO_2	9.0	11.75
SiO	-	86.10
Fa_2O_3	0.25	1.05
TiO_2	0.10	-
CaO	0.02	0.21
MgO	0.02	0.10
Na_2O	-	Trace
K_2O	-	None
B_2O_3	-	-
PHYSICAL CHARACTERISTICS		
Bulk Density		
gms/cc	3.01-3.06	2.57-2.65
lbs/ft^3	188-191	161-168
Porosity-Percent	14-16	14-17
Modulus of Rupture-psi	2800-3600	3000-4000
Cold Crushing Strength-psi	14-18000	14-18000
Use Temp.-°F	3100	3100
Coef. of Thermal Expansion (per °F - 212 to 1800°F)	4.2×10^{-6}	2.6×10^{-6}
Thermal Conductivity ($BTU/hr/ft^2/in/°F$)	$\cong$ 16	105

7.2 DESIGN BASIS

The crucible is designed to contain the residue from core meltdown and vessel melt through, thereby preventing contact of the meltdown residue with the containment.

The load criteria for the design of the refractory lined crucible are based on a core and reactor vessel meltdown residue of 512,000 lbs. determined as follows:

		lbs.
1.	Reactor fuel (UO_2)	220,217
2.	Zr (as ZrO_2)	
	Fuel assembly girds (Inconel)	
	Fuel assembly end fixtures (Stainless steel)	61,100
3.	Lower core support structure (Stainless steel)	166,000
4.	Reactor vessel bottom head (Carbon steel)	64,500
	Total	511,817

The limiting case for crucible structural design is the assumption of meltdown residue collecting in a cone shaped mound with a 1:1 height to diameter ratio and a density of 750 lbs/ft^3 which results in a core volume of 683 ft^3. The weight of the meltdown cone over its area results in a load of approximately 8300 psf on the crucible under the reactor, a value well within the strength of the structure at its use temperature.

The dynamic loading of the crucible structure associated with vessel melt through and Class I seismic criteria, as defined in Supplement Two to the Preliminary Safety Analysis Report, have been applied to the structural design.

The cooling mechanism of the crucible was analyzed in Section 2 of Supplement No. 5 to the Indian Point Unit No. 2 Preliminary Safety Analysis Report. The principle consideration for crucible thermal integrity is that the steel vessel be maintained at temperatures below which its strength satisfies the load requirements previously listed. The major item affecting temperature in the steel vessel is the heat flux which determines surface temperature and temperature rise through the metal. The heat flux is dependent on the "melt" volumetric heat generation rate, and conductivities of the solid and liquid UO_2 phases which with the UO_2 vaporizing temperature and the refractory melting temperature establish the thickness of the solid and liquid UO_2 layers which conduct heat into the refractory.

In Section 7.4, conservative estimates for the above parameters have been used in a steady state thermal analysis which establishes that the mode of heat transfer at the vessel water interface is nucleate boiling and the temperature in the carbon steel crucible vessel would be maintained below 800°F. In Supplement 5 the transient effect of initially molten UO_2 contacting the crucible was determined to result in a monotonic heat up of the system verifying the applicability of the steady state thermal analysis.

7.3 MECHANICAL AND STRUCTURAL DESIGN

7.3.1 CRUCIBLE (See Figures 7-2 and 7-3)

The bottom of the crucible is composed of 12 inch wide flange sections sitting on concrete pads to form a trough with a minimum angle of 20° from the horizontal up to a maximum of 37° at toe of boot. One inch carbon steel plates are welded to the wide flange sections; this plate supports the refractory.

The side walls of the crucible under the incore instrumentation leads consist of 18 inch wide flange columns resting on concrete and bearing against concrete side walls. Where crucible side walls taper down to 8 inch wide flange sections due to clearance required for incore instrumentation, the columns are 1 inch plate box sections. One inch steel plates are welded to these vertical columns. The side walls extend approximately 11 feet (up to El. 29'-0", top of crucible) above the lowest point of the concrete.

The side walls under the reactor, consist of 2 inch thick plate against the concrete, 18 inch wide flange sections welded to the plate and then a 2 inch layer of plate welded to the 18 inch wide flange columns. These walls extend approximately 12 1/2 ft above the lowest point of concrete. The side walls will have 2 inch T-bars welded vertically at 2 ft. center to center spacing to support the 4-1/2 inch refractory.

The bottom plate is designed for approximately 8300 psf under the reactor and based on approximately 685 cubic feet of molten material. A loading of approximately 4300 psf is assumed at the toe of the boot. The temperature of the plate as a result of meltdown is considered in determining allowable plate stresses.

There are four - 8 inch diameter pipes encased in concrete around the reactor section that will carry water from elevation 46' - 0" to the underside of the crucible by gravity flow.

The side walls of the crucible will have a baffle located around the top extending out from concrete wall to direct falling material inward toward the crucible and away from the cavity annulus.

All structural steel sections and plates will be in accordance with ASTM A36 specification.

All welding will be in accordance with the latest edition of American Welding Society D1.0-66.

7.4 THERMAL ANALYSIS

Section 2 of the Fifth Supplement to the PSAR describes the mechanisms of heat transfer which govern the design of the reactor pit crucible. A hypothetical accident is postulated in which total failure of core cooling systems results in melting and migration of the core material, lower core support and reactor vessel bottom head, to the crucible. In this configuration, the core mass is surrounded by water resulting from reactor coolant loss and containment spray. Self heating of the core mass is only partially dissipated by conduction through the solidified outer crust. The remainder is transferred by expulsion of UO_2 vapor and liquid through breaks in the crust created by UO_2 vapor pressure. Quenching of these eruptions by the surrounding water causes steaming in the reactor cavity which is relieved through the access openings to the reactor loop compartment where it is ultimately condensed by containment spray or the air recirculation coolers.

It is the specific purpose of the crucible in this hypothetical situation to maintain insulation of the foundation mat and liner from the core mass. A water space is provided surrounding the crucible shell for the purpose of cooling the steel plate and refractory insulation of the crucible. Boiling at the plate surface maintains a temperature gradient through the crucible structure which is definable in terms of the volume heat source, melting points and thermal conductivities of the materials. A satisfactory evaluation is obtained when the average temperature of the steel plate is within the range where adequate structural strength is assured and the heat flux at the water/steel interface is within the nucleate boiling range.

Heat Transfer at the Crucible Wall

The transient and steady-state heat transfer models with which the temperature distribution in the crucible wall was determined are described in Supplement Five, pages 2-4 to 2-10. Further consideration of the problem during subsequent engineering studies has confirmed the applicability of these models, subject to confirmation of the thermal properties of the materials used. In the present supplement, the results of a recalculation of temperatures with parameters reflecting design are presented.

The following refinements of input parameters are here incorporated:

1. Internal heat generation rate (q''') of the UO_2 has been selected as 0.4×10^6 Btu/ft^3 hr based on the residual heat rate (1.9% of the full power value) at an elapsed time of 2000 seconds after shut down. Noble gases, halogens, and 5% of the cesium fission products are assumed stripped from the fuel. The remaining decay heat sources are assumed to be present in concentrations representative of the leading 10% of the core, having an average power density which is 1.6 times the core average.

2. A value of 5.2 Btu/ft-hr-F° was assumed for the effective conductivity of the molten UO_2 below the vaporization temperature. This was the "worst case" assumption used in the Fifth Supplement analysis.

3. Solid UO_2 conductivity was taken as 2.5 Btu/ft-hr-F°, again the worst case value, to maximize the heat flux to the crucible wall.

4. A maximum UO_2 liquid temperature of 8000°F was assumed, corresponding to the vaporization temperature of UO_2 at 4000 psia.

5. Refractory conductivity values of 1.33 and 8.75 Btu/ft-hr-F° were assumed, representing alternate material selections of Cerox 700 (alumina) and Kellog 3 AD (silicon carbide), respectively. In both cases the thermal analysis was based on the assumption that above 3000°F the refractory was removed from the slab, reducing the thickness of the refractory layer until only material below 3000°F remained. In this manner a conservative allowance was made for possible eutectic formation which might reduce the protection of the steel afforded by the firebrick.

The maximum heat flux to water estimated in these calculation is 1.28×10^5 Btu/ft^2 hr. No higher value can be expected, because:

a) Higher conductivity of refractory is not obtainable with the materials under consideration.

b) Maximum values of UO_2 solid and liquid conductivities are assumed.

c) Maximum value of UO_2 liquid temperature is assumed.

d) Lower values of the parameters listed in (a-c) give rise to less UO_2 contained in the conducting layer, hence a lower heat flux.

The maximum heat flux of 1.28×10^5 Btu/hr ft^2 is within the range where pool boiling heat transfer will maintain the water-side wall surface temperature below 330 °F with a conservative heat transfer coefficient of 4000 Btu/ft^2-hr-°F. DNB heat flux at this condition would be expected to be approximately 200,000 Btu/ft^2 hr. The calculation has thus established a stable heat transfer mode capable of dissipating the largest heat flux which can be delivered to the crucible/fuel interface. Table 7-2 summarizes the region thicknesses and interface temperatures for both the insulating materials under consideration.

At a heat flux of 1.28×10^5 Btu/hr ft^2, the calculated steam separation rate at the periphery of the crucible is a maximum of 0.122 lb/sec. per foot of perimeter. A minimum of 18-in radial clearance is provided at all points, sufficient to pass this flow of steam with a superficial velocity of about 1 ft/sec, hence there would be no tendency to vapor-bind the region under the crucible.

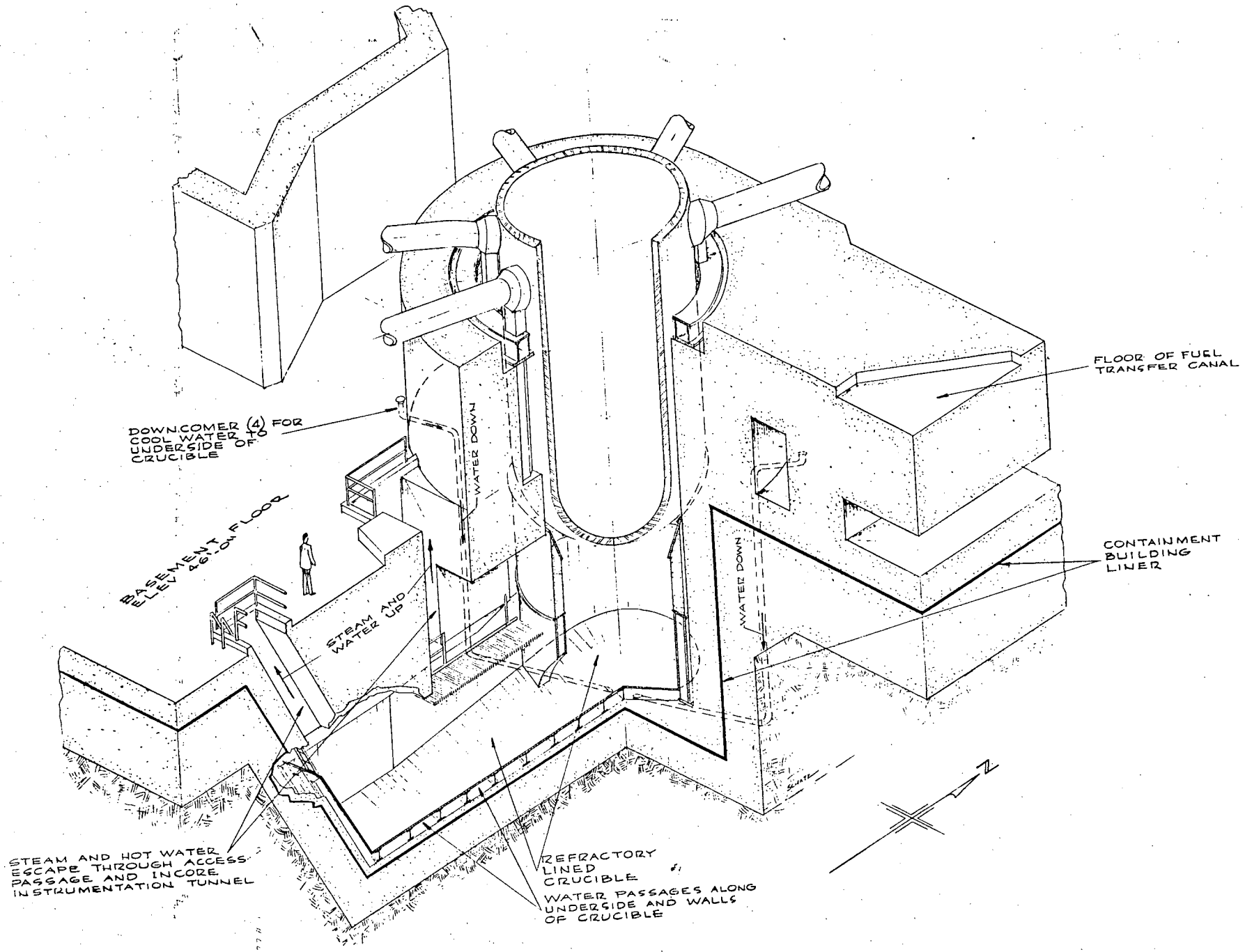
The total rate of steam formation from the entire core mass, if it were contained in the crucible cavity and assuming saturated water were returned from the containment floor to the cavity, would be about 65 lb/sec.

The available area to pass this steam flow is approximately 30 sq. ft., comprising the openings for personnel access and in-core detector conduit into the reactor cavity. The superficial velocity of steam rising through these openings is about 32 ft/sec. The calculated pressure drop for this steam flow is less than one inch of water, hence the back pressure created is of no consequence in limiting the natural convection flow of water through the downcomers in the reactor cavity.

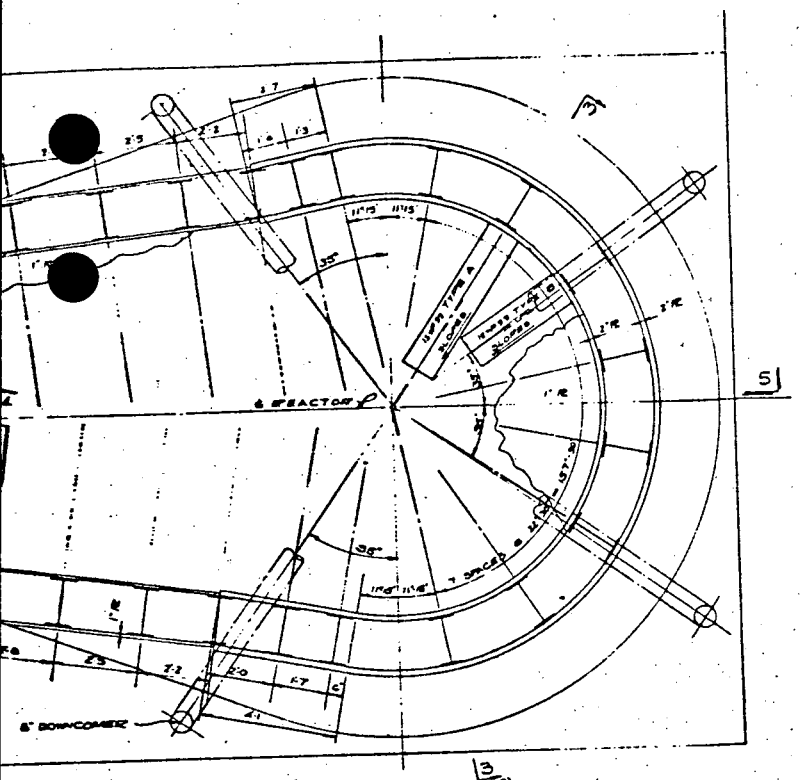
TABLE 7-2

SUMMARY OF THERMAL ANALYSIS

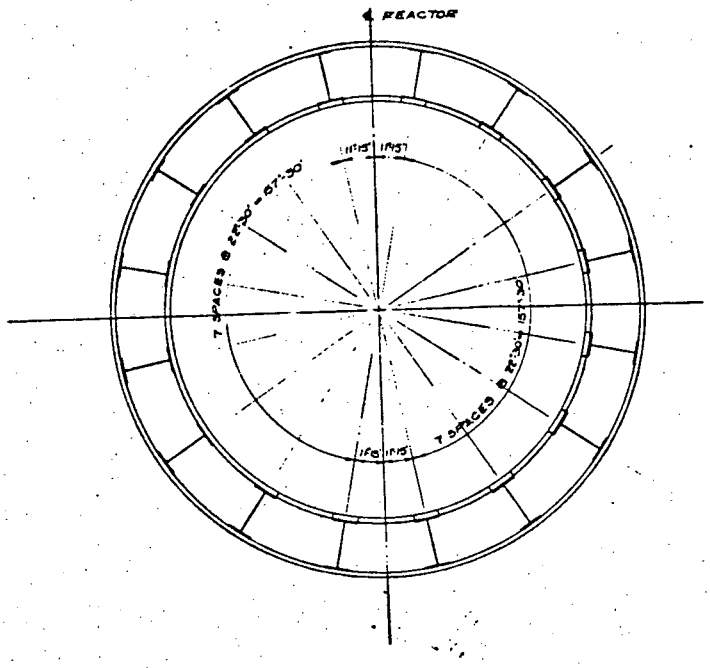
Volumetric Heat Generation Rate (Btu/ft^3-hr)		400,000
UO_2 Vapor Temperature (°F)		8000
Liquid UO_2 Conductivity (Btu/ft-hr-°F)		5.2
Liquid UO_2 Thickness below Vapor Temperature (in.)		3.4
Solid UO_2 Conductivity (Btu/hr-ft-°F)		2.5
Solid UO_2 Thickness (in.)		0.5
Heat Flux Through Crucible (Btu/ft^2-hr-°F)		128,000
Refractory Material	Cerox-700	Kellog 3 AD
Refractory Conductivity (Btu/hr-ft-°F)	1.3	8.8
Refractory Thickness Below 3000°F (In.)	1.88	0.29
Maximum Steel Plate Temperature (°F)	800	800



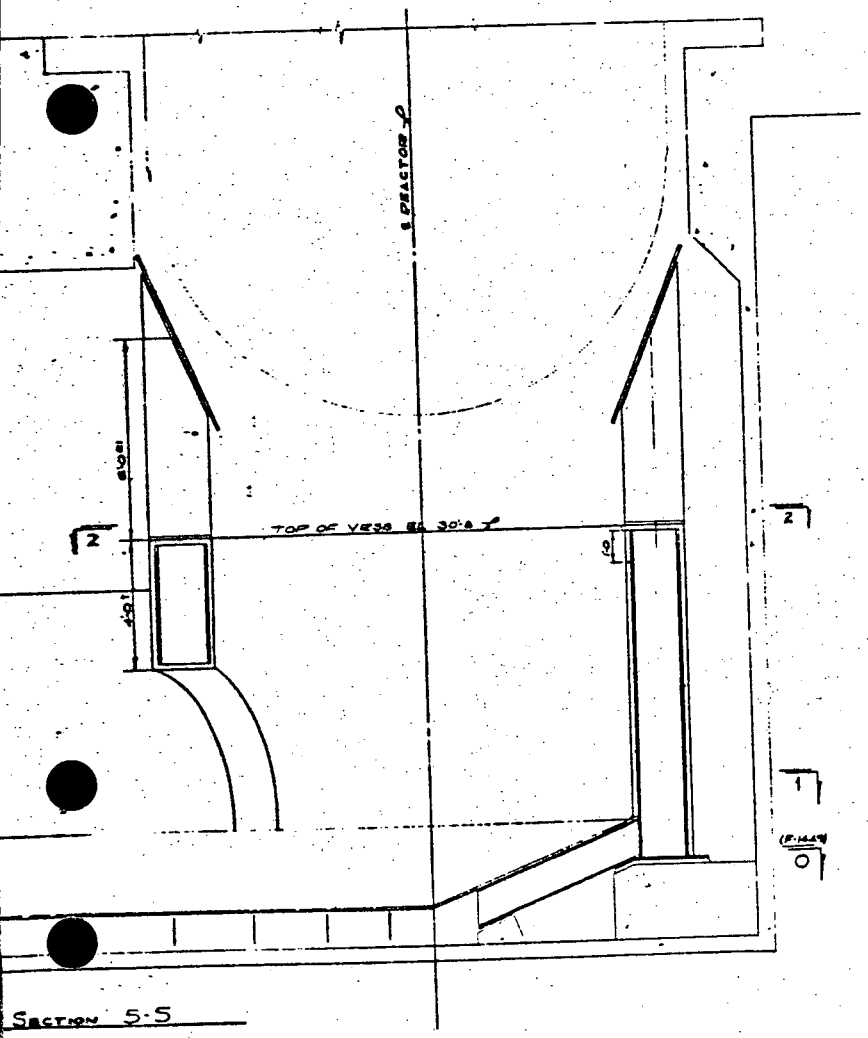
REACTOR PIT CRUCIBLE
FIG. 7-1



SECTION 1-1
SCALE 1/4" = 1'-0

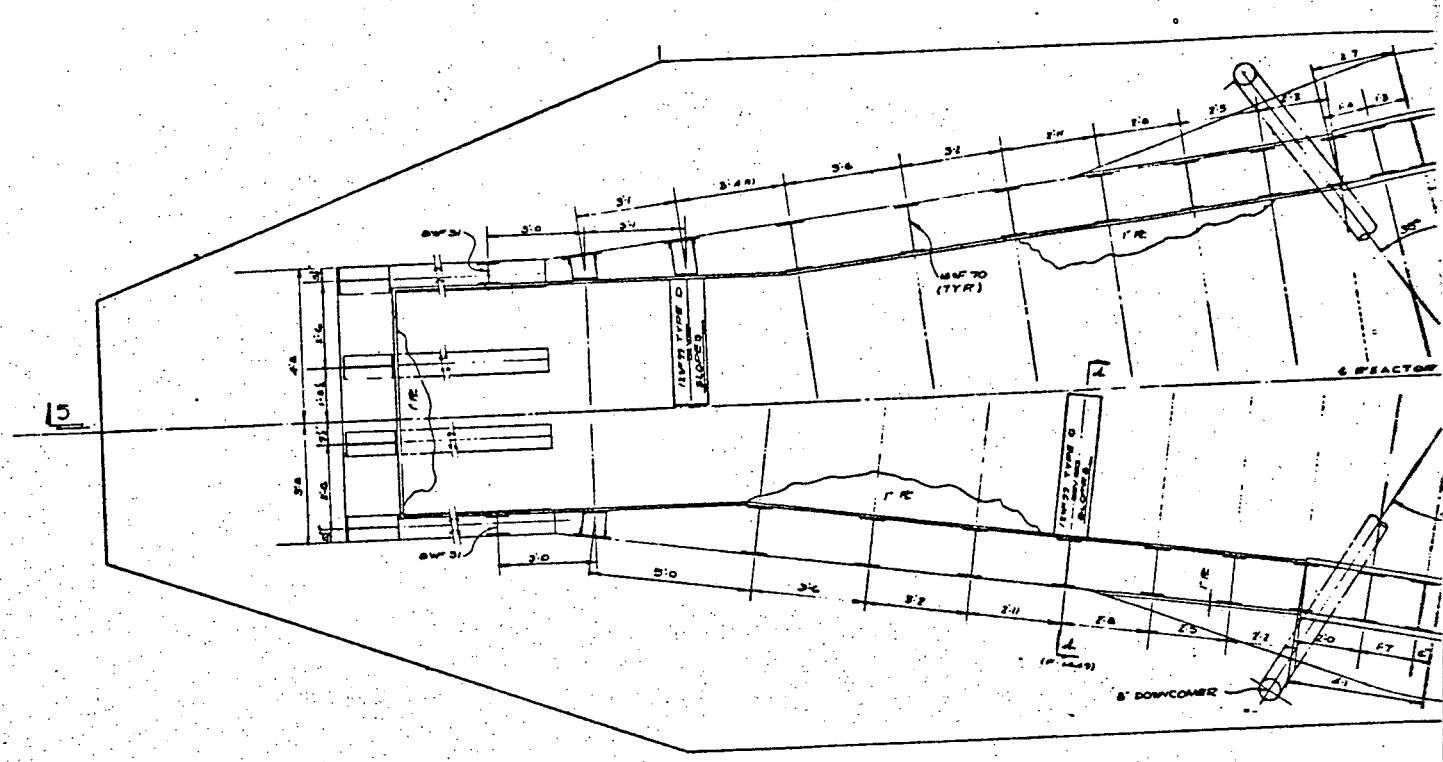


SECTION 2-2

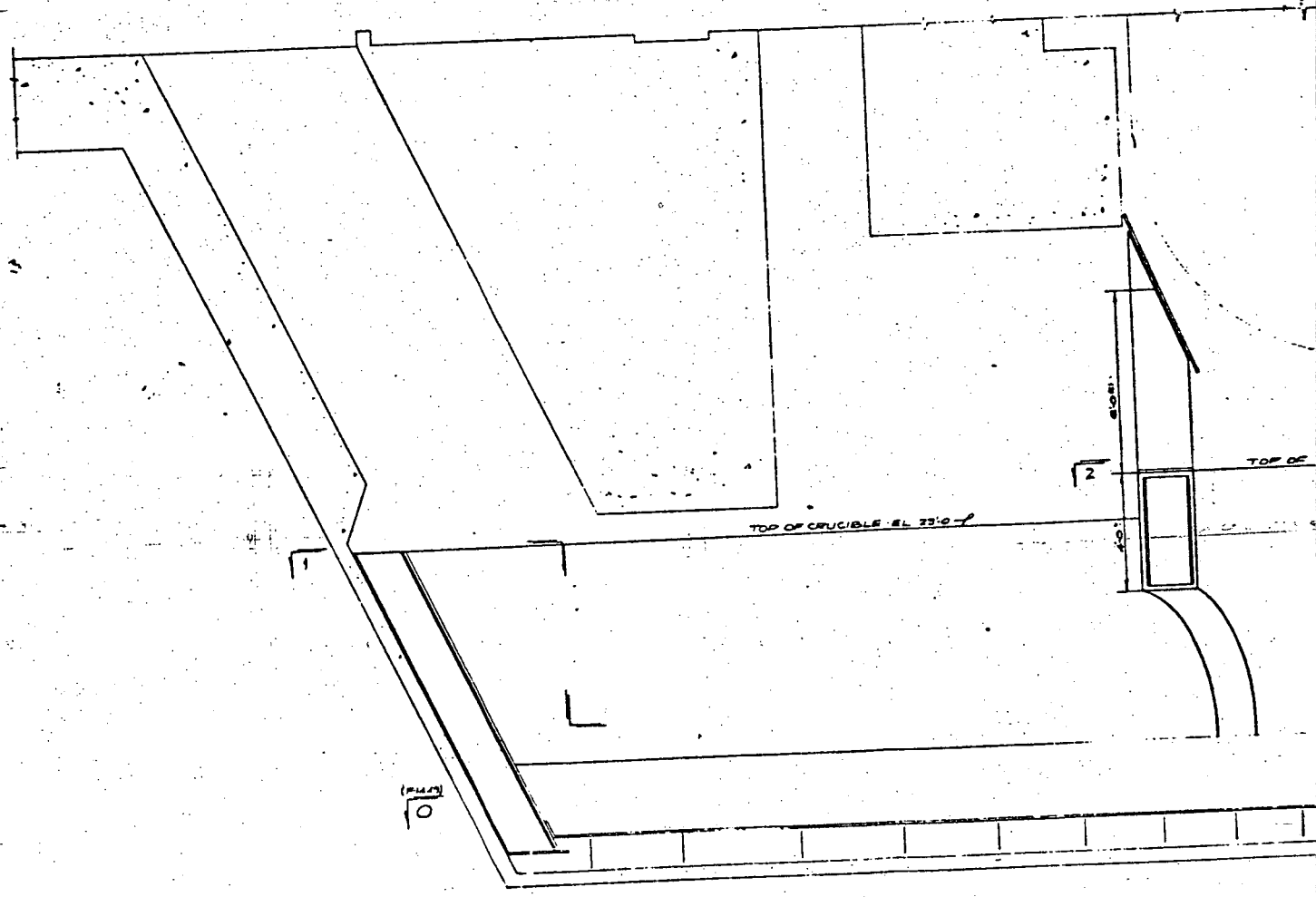


SECTION 5-5

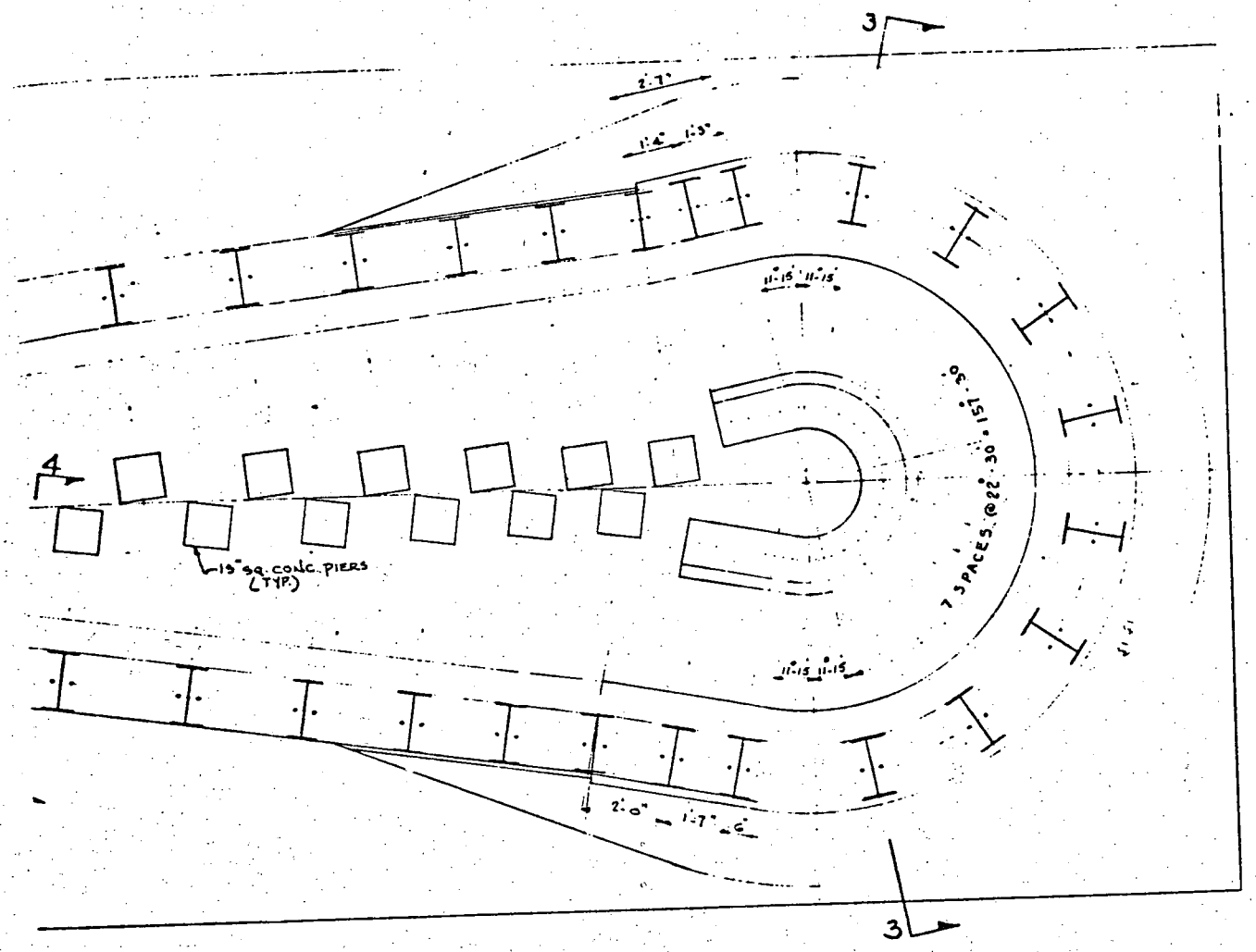
REACTOR PIT CRUCIBLE STEEL DETAILS
FIG. 7-2



SECTION 1-1
SCALE 1/8" = 1'-0

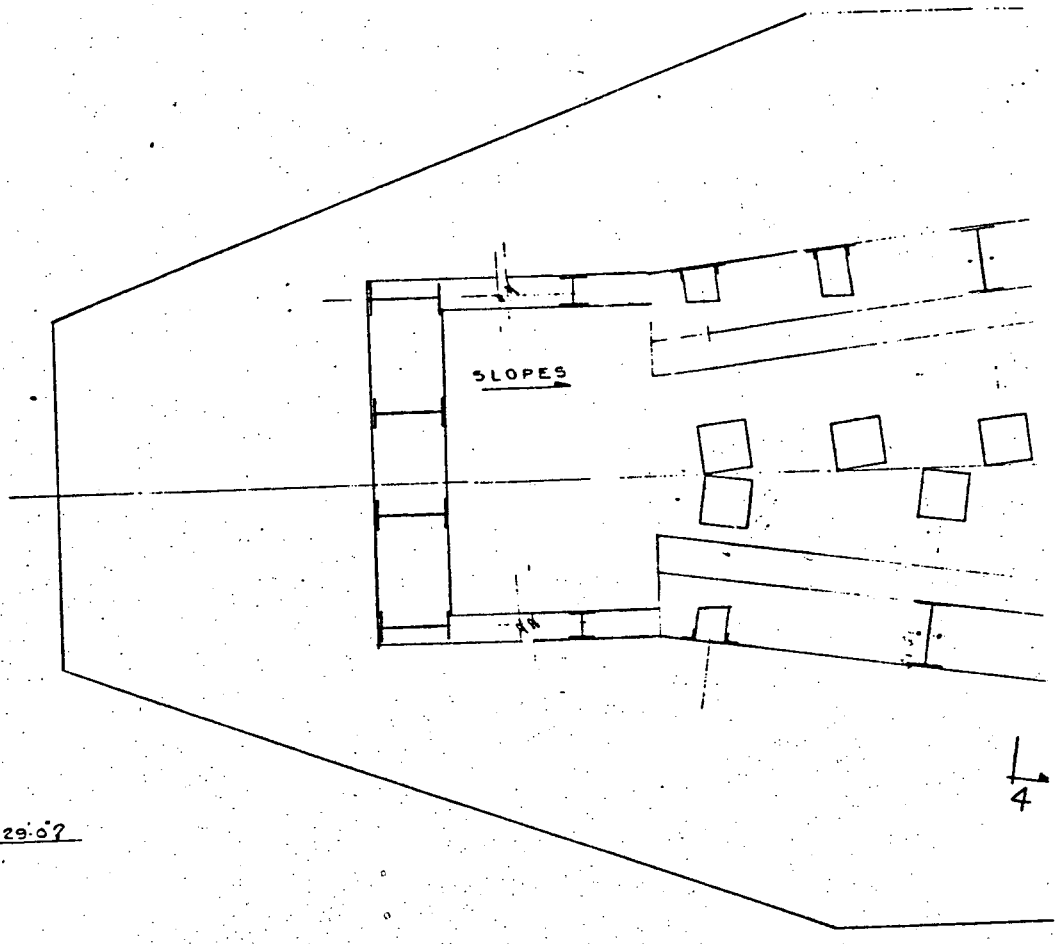


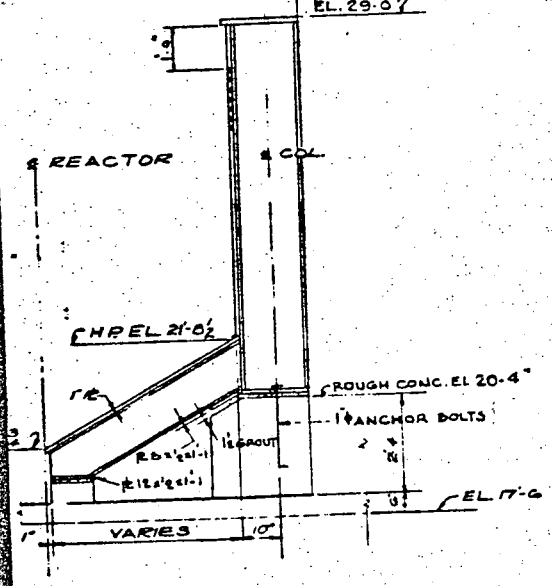
SECTION 5-5



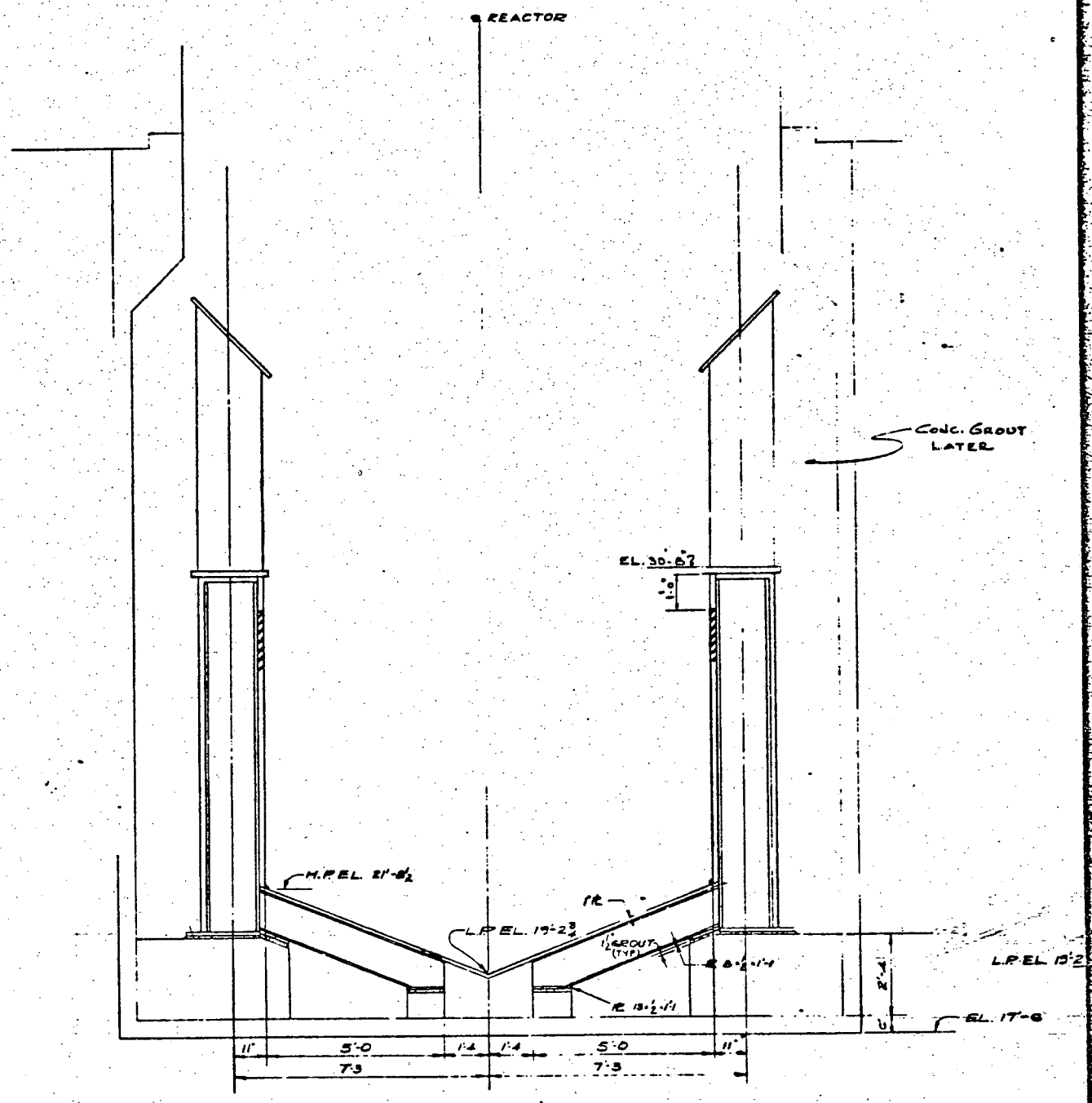
PLAN O-O (F-1447)

REACTOR PIT CRUCIBLE SECTIONS AND CONCRETE OUTLINE
FIG. 7-3


SLOPES
4


EL. 29-0
REACTOR
℄ COL
℄ HP EL 21-0½
ROUGH CONC. EL 20-4"
1" ANCHOR BOLTS
1½ GROUT
EL 17-6
VARIES
10"

SECTION 4-4


REACTOR
CONC. GROUT LATER
EL. 30-6 7/8
H.P. EL. 21'-8 1/2
L.P. EL. 19'-2 3/4
1 1/2 GROUT (TYP)
L.P. EL. 19'-2
EL. 17'-6
11"
5'-0
1'-4
1'-4
5'-0
11"
7'-3
7'-3

SECTION 3-3

Question No. 5 (B) (TR. 685)

"In connection with the emergency plans, there are procedures that are to be followed in the event of an emergency. These are procedures that have been provided by the Applicant and others provided by the State of New York. If the Applicant has anlyzed an accident, one that would involve extensive threat of radioactivity such as the State of New York to be called in, we would like there to be some discussion of the accident and the time that is involved.

Certainly the amounts of time required to notify people and take measurements. I have seen no description of a typical accident; I should call it an accident that is not typical, one that involves a considerable threat of radioactivity, and the time allowed for carrying out these operations according to the Staff's safety analysis; within two hours at the site boundary one could approach the 10CFR100 limits under certain conditions and 12 hours seems to be a fairly short time to carry out all the emergency actions called for in the emergency plan.

We would like to have some discussion about the kind of accidents that have been analyzed and the amount of time considered to be available for carrying out these plans and how they compare with this two-hour business at the site boundary."

Answer:

The Applicant has designed its Radiation Contingency Plan to be responsive to a variety of accident situations, which are generally described in the three categories referred to in FSAR Question 12.5, Section 3.0 beginning on Page 5.

The Applicant has discussed with the State of New York and the AEC Regulatory Staff the spectrum of accidents with which the emergency plan for the Indian Point site is designed to cope. It is the Applicant's judgment that all of these accidents either would not result in releases of radioactivity off-site or would produce off-site doses significantly less than those contemplated by the AEC's reactor site criteria (10CFR100).

Question No. 5 (B) (TR. 685) ASLB 3/24

Taking the case of the hypothetical occurrence of the most serious accident with which the emergency plan is designed to cope, i.e., a double-ended rupture of the largest primary coolant pipe and consequent release of radioactivity into the containment, the Applicant would be required to carry out the following activities related to the emergency plan:

a. Notify the Department of Health through the officer on duty at the 24-hour emergency number (518-457-2200).

b. As indicated in Applicant's answer to Question No. 14 of the Board (offered in evidence on March 24, 1971), the Applicant will also provide the Department of Health with the following information: the type of accident that has occurred; the safeguards which are effective; gross activity levels inside containment as determined by gross gamma instrumentation which observes containment activity through steam line beam holes; a statement as to the nature of the release to the containment; wind speed; wind direction and meteorological category.

Con Edison will further provide the Health Department with calculated thyroid dose levels due to iodine 131 at various distances downwind based upon the activity within containment and an assumed 1/10 of a percent per day leakage from containment. The 1/10 of a percent per day leak rate from containment is assumed even though the pressurized weld channels and penetration along with the seal water injection system is designed to prevent

such containment leak rate, because the field survey monitoring data, which would verify that such containment leakage is not occurring, would not yet be available on this initial notification. If means are available of verifying that containment leakage is not occurring at the time of the initial notification or that is is considerably below the 1/10 of a percent per day assumed, the calculated doses will be adjusted accordingly.

It is estimated that the foregoing information could be provided to the Department of Health within one-half hour after the onset of the accident.

Other emergency notifications and activities of the Applicant in connection with a design basis accident are set forth in FSAR Question 12.5, on Pages 23 - 30.

The Applicant would institute off-site radiation surveys following the above-described accident. Initial radiation surveys off-site would be made by Con Edison's plant health physics survey team who would use a survey truck with two-way radiocommunication to the control room. These personnel would monitor airborne radioactivity and direct radiation downwind of the site. It is anticipated that initial results of these surveys would be available in approximately two hours. Other emergency monitoring assistance (e.g., from the AEC) should be available within four hours. The times involved in carrying out radiation surveys by off-site support groups would vary, of course, with the extent and nature of the radioactivity involved.

"There is a question concerning whether the releases are as low as practicable or whether they are a small percentage of the MPC value. I think at the hearing we will go into some extent to the provisions that have been made for controlling the routine releases from the plant and into the question as to whether they are indeed as low as one should expect, what kinds of modifications might be required to reduce them further and whether there would be any real advantage to such reduction.

In other words, whether the reduction would be so significant as to be concerned. I don't believe I have any other points to consider."

Answer:

The basic waste processing system design in the Indian Point Unit No. 2 plant to collect radioactivity has been discussed in Chapter 11 of the FSAR. In the plant, various radioactive fluids are collected and processed by either demineralization, filtration, evaporation, or some combination of all of these.

Based on the estimates given in the FSAR of the quantity of liquids to be handled in the WDS, and the design objective for equipment performance, Table 1 has been prepared to indicate the design objective of radioactive substances to be released from the Indian Point Unit No. 2 plant. The estimated activity to be released from the plant through the liquid system, exclusive of tritium, over the year has been estimated at .025 curies per year. This represents on an average annual basis a concentration when mixed with minimum circulating water flow of less than 1/50,000 of 10CFR20 regulations for all isotopes, exclusive of tritium. Tritium release as calculated on the basis of knowledge available at the writing of the

FSAR was estimated at 4240 curies per year. This total quantity of tritium on an average annual releases basis is less than 1/1000 of 10CFR20 MPC values. Operating experience with zircaloy cladding has indicated that this tritium figure will be substantially reduced. In any case, some tritiated liquid will be discharged from the plant in the form of HTO or T_2O, as there is no practical means of separating tritium. Concentrations quoted above are in the circulating water discharged from the plant, and further dilution will occur upon mixing with the Hudson River which flows past the plant.

Table 2 has been prepared to indicate the estimated gaseous releases from the Indian Point Plant. It will be noted that approximately 10,000 curies per year of gases will be released from the plant throughout the year. The estimated integrated whole body dose for a person residing continually at the site boundary would result in less than 20 mr/yr. This level of exposure represents less than 1/5 of the estimated annual dose from natural background source. Based on the above, it is clear that with this level of releases the plant will be operating at a level which is a very small percentage of the existing 10CFR20 regulations.

In order to ensure that the design objectives are realized, several modifications to the Indian Point Unit No. 2 plant are being made to the radioactive waste processing systems. Several of these modifications represent mechanical modifications to basic plant equipment where leakage of fluid has been a problem.

Specifically, modifications will be made to reciprocating charging pumps to collect leakage from these pumps and return it to the CVCS and secondly, modified bellows seal assembly is being provided on the pressurizer spray valves to eliminate the leakage being experienced from these components. Both of these items have been problems on existing plants and only as a result of recent testing and development has it been possible to incorporate these features in the Indian Point Unit No. 2 plant. These two specific modifications will reduce the amount of primary coolant leakage, the processing load on the evaporators, and consequently, the amount of activity being released.

In addition, modifications will be made to the waste disposal evaporator and are presently in design. These modifications are being made to improve the capacity and to achieve the decontamination factor as originally indicated in the equipment specification. These modifications are expected also to increase substantially the operability and consistent performance of the unit.

As a back-up measure to reduce the release from the plant in the event the evaporator by itself does not produce a sufficiently high decontamination factor, a polishing demineralizer/filter installation is being designed and will be procured for waste evaporator condensate cleanup. The function of these units will be to provide additional polishing to the distillate from the waste evaporator prior to discharge. The polishing demineralizers will provide an additional reduction in activity

released from the plant and will be installed in the event the modifications to the evaporator do not provide sufficient reduction in activity release.

A charcoal filtration system will be installed in the plant vent to significantly reduce any gaseous releases of iodine, which might occur from containment purge in the event of the existence of radioactive iodine in the primary coolant concurrent with primary leakage to containment atmosphere.

An intertie will be provided between the Indian Point Unit No. 2 steam generator blowdown lines and the new Indian Point Unit No. 1 blowdown purification system. This intertie will serve to significantly reduce liquid releases in the event of steam generator leakage.

It is anticipated that the modifications referred to in the last two paragraphs will be completed by the end of the first refueling outage.

TABLE I

Estimated Liquid Radioactivity Release From
IPP #2 and Resultant Concentration In Plant Effluent

Isotope	Annual Release $\mu C/yr$	Concentration In Circ. Water Disch. Canal $\mu C/cc$	Max. Per. Concentration (10CFR20) $\mu C/cc$	Fraction of MPC
Mn-54	9.08×10^{-1}	6.05×10^{-16}	1×10^{-4}	6×10^{-12}
Mn-56	1.94×10^{1}	1.30×10^{-14}	1×10^{-4}	1.3×10^{-10}
Co-58	2.34×10^{1}	1.56×10^{-14}	9×10^{-5}	1.7×10^{-10}
Co-60	2.99	1.99×10^{-15}	3×10^{-5}	6.6×10^{-9}
Sr-89	9.09	6.06×10^{-15}	3×10^{-6}	2×10^{-9}
Sr-90	4.46×10^{-1}	2.97×10^{-16}	3×10^{-7}	1×10^{-9}
Y-90	8.32×10^{-1}	5.55×10^{-16}	2×10^{-5}	2.8×10^{-11}
Sr-91	2.37	1.58×10^{-15}	5×10^{-5}	3.2×10^{-11}
Y-91	1.82×10^{1}	1.21×10^{-14}	3×10^{-5}	4×10^{-10}
Y-92	3.52×10^{-1}	2.35×10^{-16}	6×10^{-5}	3.9×10^{-12}
Mo-99	9.92×10^{3}	6.61×10^{-12}	4×10^{-5}	1.7×10^{-7}
I-131	5.52×10^{3}	3.68×10^{-12}	3×10^{-7}	1.2×10^{-5}
Te-132	5.60×10^{2}	3.67×10^{-13}	2×10^{-5}	1.8×10^{-8}
I-132	1.76×10^{2}	1.17×10^{-13}	8×10^{-6}	1.5×10^{-8}
I-133	3.35×10^{3}	2.23×10^{-12}	1×10^{-6}	2.2×10^{-6}
I-134	7.62	5.08×10^{-15}	2×10^{-5}	2.5×10^{-10}
I-135	1.88×10^{3}	1.25×10^{-12}	4×10^{-6}	3.1×10^{-7}
Cs-134	7.44×10^{2}	4.96×10^{-13}	9×10^{-6}	5.5×10^{-8}
Cs-136	7.10×10^{1}	4.73×10^{-14}	6×10^{-5}	7.9×10^{-10}
Cs-137	3.19×10^{3}	2.13×10^{-12}	2×10^{-5}	1.1×10^{-7}
Ba-140	1.88	1.25×10^{-15}	2×10^{-5}	6.3×10^{-11}
La-140	1.75	1.17×10^{-15}	2×10^{-5}	5.9×10^{-11}
Ce-144	6.85	4.57×10^{-15}	1×10^{-5}	4.6×10^{-10}
H-3	4.24×10^{9}	2.83×10^{-6}	3×10^{-3}	9.4×10^{-4}

μC = Micro Curies

Flow Rate In Circ. Water Disch. Canal = 15×10^{14} cc/yr

TABLE 2

Estimated Gaseous Radioactivity Release From Indian Point Unit No. 2 and Resultant - Site Boundary Dose

Isotope	Estimated Annual Release Curies/yr	Integrated Whole Body Dose mr/yr	Fraction of MPC
Kr-85	5310	7	0.014
Xe-133	4540	6	0.012
Total	9850	13	0.026

$\frac{X}{Q} = 2.5 \times 10^{-5}$ sec/m^3

"Emergencies don't necessarily happen when the weather is fine and everybody is home listening to the telephone so that the question of back-up and organizational changes that are required because people aren't available or communication isn't just what it is expected to be, might be discussed in some detail.

The plan looks like a good one and it is quite elaborate if everything works out as it is expected to in that plan. But if it doesn't work out, what then happens?"

Answer:

The capability to respond effectively to emergencies at any time is necessary for the success of an emergency plan. This need is recognized in Applicant's Radiation Contingency Plan. Under that plan, persons immediately responsible for dealing with the emergency (i.e., the Contingency team) are part of the regular operating shift for the plant at the time of the emergency (see Page 2 of plan). In particular, the persons responsible for collecting the radiological, meteorological and other information needed to evaluate the emergency are the same persons assigned around-the-clock duties as licensed Reactor Operators, Senior Reactor Operators, and Health Physics Technicians. Accordingly, there is no need for home or outside telephone contact of Con Edison personnel immediately required for evaluation of and response to the emergency condition.

The communications available to reach the Atomic Energy Commission and the responsible agencies of the State of New York are provided through 24-hour manned telephone service. The governmental agencies in turn have available rosters of persons by name and home telephone who are available. In the

event of a telephone system breakdown at Indian Point, the station has available to it radio communications with the Con Edison System Operator who would then make contact with the individuals and State and Federal agencies involved.

In order to provide up-to-date rosters of telephone contacts, periodic reviews are performed to assure current information to those responsible for implementing the plan.

"But there have been two letters particularly from Advisory Committee on Reactor Safeguards, one of which was October 12, 1966, a letter addressed to the Chairman of the Atomic Energy Commission and its consists of some four pages outlining specific areas in which the Advisory Committee on Reactor Safeguards indicated that further research in Government should be undertaken.

Now, maybe it has been undertaken. We would be pleased to have both the Applicant and the Staff discuss that letter with specifics on fulfillment of the R&D that probably has been undertaken since 1966. We talk about a possible functional failure of the emergency core cooling system and other aspects of the entire operations. This does not apply solely to Con Edison. It applies to all reactors.

So I think this proceeding might give the Staff, specially, and the Applicant, if it could get the data, an opportunity to more or less update these areas of concern so that the record will show and the Advisory Committee will have an opportunity to review the transcript as to how the programs have been carried out.".

Answer:

The following are applicant's comments with respect to fulfillment of R&D undertaken since 1966 relative to the ACRS letters mentioned above.

1. On October 27, 1966, the Atomic Energy Commission appointed a task force to review the emergency core cooling systems and core protection. The task force issued a report in 1967 entitled: "Emergency Core Cooling - Report of Advisory Task Force on Power Reactor Emergency Cooling". Conclusion 12 and Appendices 7 and 8 of this report deal with the subject of molten mixtures of fuel, clad and other materials and means of handling them.

Additional studies dealing with molten mixtures of fuel, clad and other materials and means of handling them have been included in a broader program of review and evaluation of the

loss-of-coolant accident and the emergency core cooling experimental program started in 1968. The latest quarterly report from this program which is available to us (Reference 1) lists numerous technical papers and quarterly progress reports.

Design modifications were developed and incorporated in the Indian Point Unit No. 2 Emergency Core Cooling System which limit peak fuel clad temperature and restrict metal-water reaction so that continued effectiveness of the Emergency Core Cooling System is assured thus avoiding the onset of fuel clad melting. These modifications are increased capacity of the Emergency Core Cooling System by the addition of a pressurized accumulator to each coolant loop plus valving and piping changes which provide capability to maintain core cooling and containment cooling in the event of a passive failure in the safety injection system or service water system for the long term after a loss of coolant.

22. The PWR Full-Length Emergency Cooling Heat Transfer (FLECHT) Program was authorized by the AEC and performed by Westinghouse with objectives to obtain experimental flooding heat transfer data under simulated loss-of-coolant accident conditions for evaluating the heat transfer capabilities of pressurized water reactor emergency core cooling systems. The tests investigated the effects of peak power, power decay rate, maximum initial clad temperature, constant and variable flooding rates, inlet coolant subcooling, pressure,

flow blockage, borated coolant, and clad material. Bottom flooding heat transfer tests were conducted on full-length rod bundles. The tests studied transient heat transfer coefficients and clad temperatures, axial and radial pressure drop data, local coolant temperature and measurements of carry-over water.

The test results have verified the basic assumptions used in current reactor loss-of-coolant accident analysis, in particular, the effectiveness of bottom flooding and the importance of liquid entrainment as a heat transfer mechanism. A compilation of work performed under this program up to January 1970 has been published in References 2 through 5.

3. The development of practical systems for periodic inspection of Reactor Vessels was implemented by ANSI N45 Committee sponsored by the ASME as well as the Edison Electric Institute/TVA sponsored program carried out under contract to Southwest Research Institute. The efforts of the N45 Committee resulted in the formal adoption by the ASME in January, 1970 of Section XI as a practical method for inspection. The program sponsored by EEI/TVA relating to Reactor Vessel testing and inspection (RP79) was authorized in 1967 with completion of this program scheduled during 1972. A compilation of work performed under this program up to January 1, 1971 is listed in Reference 6.

4. A program recommended by the Pressure Vessel Research Committee was implemented in two parts. A very large program, known as the Heavy Section Steel Technology Program was funded by the AEC and administered by ORNL. This program undertook the developmental work necessary to improve the knowledge of fracture, leading to more positive assurance of pressure vessel safety. This program included very significant efforts in the development of fracture mechanics technology, test methods, analytical procedures, material property determinations, and crack propagation behavior. The latter also included radiation effects programs. It has been described in detail in References 7 through 9, and results have been published in semi-annual reports, References 10 through 16. The second part of the program, called the Industry Cooperative Program, undertook to evaluate better the properties of pressure vessel steels in heavy sections. Samples of many plates and forgings being used for Reactor Pressure Vessels were tested to determine the variation in properties that could be expected from place to place and through the thickness of actual production material. Another aspect of this program was to evaluate the adequacy of the non-destructive examination procedures used to assure the integrity of vessels. Plate, forgings, castings and welds are included in this study. Results of this work are included in the reports of progress of the Welding Research Council. Reference 17 lists the results of numerous papers.

Extensive work on fracture analysis and irradiation effects has also been accomplished at the Naval Research Laboratory funded by HSST and other AEC programs. Pertinent papers are listed in References 18 through 24. Westinghouse and The Empire State Atomic Development Associates (ESADA) have also participated in this work; results of these efforts have been technically incorporated into the HSST reports.

Additional efforts to understand fracture have been proceeding at Universities, such as Lehigh and the Colorado School of Mines. Private industry has also carried out extensive work with its own funds, publishing its results in various symposia and in conjunction with HSST Program. Further References 25 through 34 are given wherein results of this large body of work are reported. Some of these references contain many technical papers dealing directly with the results of the work discussed above.

Generally, it has been found that the effect of thickness can readily be handled by either transition temperature or fracture mechanics approaches. Variations in properties have been found to be well within the allowances made for them. Crack propagation rate studies have shown that present criteria are very conservative.

The extensive work on assessment of radiation effects has also shown that the changes in properties can be accurately predicted and will not be detrimental. Several different approaches to setting safe operating procedures have been developed. These all result in similar criteria, giving additional confidence that the subject of fracture is well understood, and therefore can be prevented.

5. The hypothetical large reactivity insertion accident which is postulated for Pressurized Water Reactors is the Rod Ejection Accident. This postulated event, in which a rod control cluster is rapidly ejected from the reactor core, would cause a strong reactivity insertion and a dynamic power redistribution.

As is shown in the FSAR, the hypothetical ejection of a control cluster from the "full power" configuration or from the "zero power" configuration does not lead to overpressurization of the primary system or to gross fuel melting. This FSAR analysis relies on methods which agree with the appropriate Spert experiments. Analytical techniques described in Reference 35 show that the methods used in the Rod Ejection analysis are conservative in comparison with more recently developed spatial kinetic transient analyses for cases of interest.

Westinghouse has developed space-dependent kinetic computational capability. Methods are now in use which treat three space dimensions, two neutron energy groups, fuel temperature "local" feedback, and transient water density "local" feedback. Sufficient spatial detail is now practical to allow detailed analyses of such events as Rod Ejection. Other effects which are of special interest, in certain unusual cases, are also modeled directly; e.g., non-unity importance of delayed neutrons, and spatially varying delayed neutron yield from fission. These methods are related to the WIGL codes (Reference 36), although separately developed, and give accuracy/stability performance equal to that of the W-R method, Reference 37. These advanced methods, by allowing direct engineering analysis of transients in which spatial effects are important, reduce the uncertainty in the study of reactivity accidents. In addition, the Westinghouse spatial kinetic models are direct extensions of the Westinghouse spatial static models which have been confirmed by reactor operating experience and are reconfirmed in each reactor by startup physics tests and periodically-repeated physics tests.

Experimental results from the planned PBF test program, as to fuel failure modes and fuel failure propagation modes (if any), while of definite interest, are not essential to the design and safe operation of Westinghouse PWR's. Even when

subjected to hypothetical Rod Ejection reactivity insertions from full power to zero power, the PWR is inherently limited by conservative design to staying below the point of gross fuel melting or significant primary pressure surges.

6. Stronger steels were not required for the Indian Point Unit No. 2 reactor vessel. The materials used (see FSAR Section 4) were those for which a wealth of data and exprience already existed.

7. In 1914, the American Society of Mechanical Engineers first published its boiler code for use by industry. Along with this first code, various ASME sub-committees were established to remain abreast of industrial experience and developments in several areas including design, fabrication, inspection and testing. Members of these sub-committees are selected from both industry and government (i.e., Insurance Companies, Manufacturers, Utilities, Designers, Regulatory Bodies) with careful attention given to a proper balance of representation amongst the participants. Each subcommittee member is, of course, active in his particular field. This results in aggressive action by all committees to maintain the particular segment of the code as current and viable as possible. Recommendations are made by individual members on a continuing basis as advances in technology are made or as other specific requirements arise. As a result, commercial experience on both

nuclear and non-nuclear components is considered on a current basis with applicable codes and regulations being updated frequently. The nuclear codes are an outgrowth of these recommendations and review work, recognizing the additional requirements of public safety introduced by the advent of commercial nuclear power.

8. The Plutonium Recycle Program was initiated in 1964 to ensure the design, fabrication, and operation of plutonium recycle fuel on a commercial basis as well as identifying safety-related problems associated within this type of fuel. The program includes four years of operation and post-irradiation examination of Saxton plutonium fuel, two joint projects with the Edison Electric Institute, criticality studies for Empire State Atomic Development Associates (ESADA) and operation of the Westinghouse Plutonium Fuels Development Laboratory (PFDL) which was completed in 1969. In addition, design and fabrication development work is being conducted by Westinghouse. This includes fabrication of plutonium fuel reload assemblies in the development laboratory during 1971-1974, plus the design and development work leading to construction of a commercial plutonium fabrication plant during this period.

The first part, the Saxton Plutonium Program, was a joint effort with the AEC and the Saxton Nuclear Experimental Corporation from its inception in 1964 until mid-1970 after which it was supported completely by Westinghouse. This part of the program has two basic objectives: to demonstrate performance of mixed oxide fuel at linear power and burnup levels consistent with modern PWR technology; and to obtain design information on depletion and transuranic isotope generation characteristics of plutonium fuel at higher burnup.

An extensive Core II post-irradiation program was completed in early 1970. The peak burnup evaluated was 29,000 megawatt days per tonne (MWd/t). Saxton has continued to operate satisfactorily since starting Core III power operations in December 1969. Since then, a significant number of plutonium rods have operated at 19 kW/ft. Burnup for this fuel has achieved 44,000 MWd/t, demonstrating the peak power and burnup levels required for modern PWR's.

The EEI-Westinghouse Plutonium Utilization Study combined with the ESADA-Westinghouse Critical Experiments (1966-68) was the next part of the program. This EEI Project RP72 Phase I program was primarily an analytical feasibility study of the technical and economic parameters influencing the use of plutonium in a PWR.

The EEI-Westinghouse Plutonium Recycle Demonstration Program was undertaken (EEI Project RP-72) under support of the AEC, Contract (30-1)-4167, to license, operate and evaluate a representative number of plutonium fuel rods in the San Onofre reactor. This demonstration experience under actual utility operating conditions will complement the material and design recycle information being generated in the Saxton test reactor, AEC Contract AT(30-1)-3385. In order to achieve a meaningful demonstration, Westinghouse first determined the characteristics of future commercial recycle fuel, based on technical and economic comparisons of various recycle methods for the Indian Point Unit No. 2 design. The comparisons included core power distribution calculations, plus an in-depth analysis of reactivity coefficients and control requirements.

Four demonstration assemblies were loaded in the San Onofre reactor in October and the reactor returned to full power in November 1970. Currently, these assemblies have achieved a burnup of 3,000 MWd/t. On site tests and inspections at San Onofre, plus post-irradiation examinations by W, are planned starting in 1972. Based on the results of these demonstration programs, no safety problems are anticipated for plutonium recycle in pressurized water reactor plants. Progress of the program through December 1970 is described in Reference 38.

9. Methods for detecting leakage in primary coolant systems of reactors already existed at the time of the October 12, 1966 ACRS letter. However, as a result of work performed by Westinghouse in 1966, an additional method (described in Supplement 7, PSAR) determines total leakage of steam and water systems inside containment by measuring the condensate collected by the containment cooling coils. Several other W Pressurized Water Reactor Plants now utilize this method. With this method, Indian Point Unit No. 2 has four methods available for early detection of small leaks. These methods with sensitivities and basis for design are described in Section 6.7 of the FSAR.

10. Studies of dilution, dispersion and transport of liquid radioactive wastes have been conducted for the Hudson River and are reported in the Indian Point Unit No. 2 FSAR, Section 2.5. Other such studies, necessarily site-dependent, have also been conducted by others for other plants as part of normal efforts to obtain AEC regulatory staff licensing approval.

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MR. TROSTEN: The next document I wish to offer into evidence is entitled, "Answers of Applicant to Questions Raised by Atomic Safety and Licensing Board on May 13, 1971," dated July 6, 1971.

I now show this document to the following witnesses:

1 Messrs. Grob, McAdoo, and Wiesemann, and I ask you
2 if this document was prepared under your supervision and
3 direction, and are the contents of this document true and
4 correct to the best of your knowledge?
5 (Chorus of "yes.")
6 MR. TROSTEN: Do you desire to have this document
7 received in evidence in this proceeding?
8 (Chorus of "yes.")
9 MR. TROSTEN: Mr. Chairman, I now offer into
10 evidence the document I have identified, copies of which have
11 been given to the reporter, and I ask that it be physically
12 incorporated into the transcript as if read.
13 CHAIRMAN JENSCH: Is there any objection by the
14 Staff?
15 MR. KARMAN: No objection, Mr. Chairman.
16 CHAIRMAN JENSCH: State of New York?
17 MR. SCINTO: No objection, Mr. Chairman.
18 CHAIRMAN JENSCH: Citizens' Committee for the
19 Protection of the Environment?
20 MR. ROISMAN: Same reservations, Mr. Chairman.
21 CHAIRMAN JENSCH: Same ruling.
22 The offer of the Applicant is accepted and the
23 prepared testimony can be submitted to the reporter and she
24 is directed to physically incorporate it within the transcript
25 at this place; those prepared answers and such answers are

received in evidence.

(THE COMPLETE DOCUMENT, "ANSWERS OF APPLICANT TO QUESTIONS RAISED BY ATOMIC SAFETY AND LICENSING BOARD ON MAY 13, 1971," DATED JULY 6, 1971, FOLLOWS:)

BEFORE THE UNITED STATES
ATOMIC ENERGY COMMISSION

In the Matter of	)	
Consolidated Edison Company of New York, Inc. (Indian Point Station, Unit No. 2)	)))	Docket No. 50-247

Answers of Applicant to Questions Raised

by Atomic Safety and Licensing Board

on May 13, 1971

July 6, 1971

KEY TO IDENTIFICATION OF QUESTIONS

(B) Question by Mr. Briggs

(G) Question by Dr. Geyer

(J) Question by Mr. Jensch

(Tr. 749) - Transcript Page 749

Question No. 1 (J) (TR. 749) ASLB 5/13

"I would appreciate some further information from this witness as to whether he has assumed a uniform mixing of the containment spray in the containment atmosphere and whether there are any so-called dead spots in the containment area which may affect the assumption of uniform mixing."

Answer:

A description of the effects of mixing in the containment on the iodine removal analysis has been presented in response to Question 6.2-6 reported in Supplement 2 of the Indian Point FSAR. In this response it is shown that a minimum of three out of five containment fan-coolers are in operation giving a minimum ventilation rate in the containment of 210,000 CFM. At this minimum ventilation rate, one containment volume is turned over every seven minutes. The ventilation pattern is such as to assure ventilation of all significant parts of the containment. Under these conditions there would be no deadspots that would affect the assumption of uniform mixing. Therefore, the analysis of spray effectiveness in the Indian Point Unit No. 2 containment during the post loss of coolant accident considered that iodine released during the accident was initially uniformly mixed in the containment atmosphere. Correspondingly, the analysis also considered that the iodine removal coefficient was uniform throughout containment.

"I think as I understand from the several times that this subject has been under consideration in some proceedings that it is with some difficulty that the assumption can be entertained that there will be uniform and perfect mixing. and furthereore there may be a problem of extrapolating from a small experiment to a larger experiment, although as I understand it in a recent instance of a small experiment it has been asserted with some certainty that you cannot extrapolate from a small experiment to a larger area. If it doesn't have to do with containment spray, but it may have to do with another safety mechanism. So I have that problem that if it's difficult in one instance to extrapolate for a certain sort of mixing to a larger size, I wonder how we can assume that we can extrapolate from these experiments to the containment atmosphere, which I think is a separate consideration."

Answer:

A. SPRAY MODEL

A detailed mathematical model has been developed for the analysis of the elemental iodine removal capability of the containment spray system. The modeling of the iodine absorption characteristics of the spray is accomplished in two parts:

a) Description of the spray drop size and the number of drops of each size occurring in the spray.

b) Solution of the time dependent diffusion equation for each drop size encountered in the spray.

This detailed approach in the derivation of the model permits the use of well established mathematical relationships describing such fundamental phenomena as molecular diffusion, which forms the basis of this model. Thus, the derivation of this model is completely independent of any experimental evalu-

ations of the performance of the containment spray system.

Since this model is not based on extrapolation of small and intermediate scale experimental results of the containment spray effectiveness, no scale factors or extrapolation corrections are required in the model.

B. COMPARISON OF CALCULATED AND EXPERIMENTAL RESULTS

The experimental results of the elemental iodine removal by containment sprays obtained at the NSPP and CSE facilities afford an opportunity to compare the calculated and observed results.

The experiments were designed to duplicate the basic parameters affecting the iodine removal effectiveness of the spray.

The significant parameters are:

a) Temperature and Pressure

The temperature and pressure for the experiments were typical of those in a post-accident PWR containment, such as Indian Point Unit No. 2.

b) Spray Solution

The same additive used for the Indian Point Unit No. 2 spray system was used in the experiments (30 weight % sodium hydroxide added to dilute boric acid solution).

c) Spray Nozzles

The nozzles used for the NSPP experiments were of the same design, (and manufactured by the same supplier) as the Indian Point Unit No. 2 nozzles. Similar nozzles of the hollow core pressure type were used at CSE.

d) One of the most important parameters is the spray flux (i. e. spray flow rate per cross-sectional area covered by the spray). This parameter varied between 0.125 and 0.2 gpm/ft^2 for NSPP and 0.025 gpm/ft^2 to 0.3 gpm/ft^2 for CSE. This completely brackets the Indian Point Unit No. 2 design spray flux of 0.175 gpm/ft^2.

e) Similarly the ratio of spray flow rate to containment volume, which is 1.0×10^{-3} gpm/ft^3 for Indian Point Unit No. 2 varied from 0.5×10^{-3} to 1.0×10^{-2} gpm/ft^3 for the experiments.

f) The only significant parameter for which a considerable difference exists between the Indian Point Unit No. 2 application and the experiments is the drop fall height. This parameter varied from less than 10 ft for the NSPP set-up to a maximum of 50.5 ft for the CSE containment, while 118.5 ft was used for the Indian Point Unit No. 2 design calculations. However, the modeling of the containment spray is such as to allow a comparison of experimental and calculated results for various heights, since the model itself is independent of height.

In the model the calculations are performed for incremental height steps. The height dependent parameters are then updated at the end of each step. Thus, the results calculated for each small height step are used as input for the next height step. By this method the spray performance may be calculated for any drop fall height.

This comparison of calculated and measured results for the iodine removal effectiveness of the spray shows that the model gives conservative predictions of observed effectiveness for all cases.*

* See WCAP-7499L

"As I recall some of the previous discussions about containment spray, the staff made a statement I think Indian Point 3 as to this effect, that the research and development program relating to the drop size spectrum, the drop coalescence and the possible effect of the liquid phase mass transfer resistance is not in itself sufficient to resolve the present uncertainties, and I wondered just what has been done to remove those uncertainties.

This may be directed to the staff in inquiry for presentation in that regard when their presentation of evidence is made, but the Applicant, likewise, may desire to address himself to those factors."

Answer:

The analysis of Indian Point Unit No. 3 spray effectiveness which was performed prior to the Unit No. 3 construction permit hearing utilized a relatively simple single drop model. Such factors as drop size spectrum, drop coalescence, and liquid phase mass transfer resistance were only included by approximation, hence the uncertainty of the board regarding possible effects on the conservatism in the analysis. A similar conservative analysis using the single drop model was also provided in the Indian Point Unit No. 2 FSAR. A more rigorous treatment of spray effectiveness taking into account these factors was developed and applied to Indian Point Unit No. 2 subsequent to the Unit No. 3 hearing and is described in detail in Question 6.2 of Supplement 2 to the Indian Point Unit No. 2 FSAR and in topical report WCAP-7499L. The results of this more detailed study show that the net effect of these factors is small compared to the large safety margin that exists between the effectiveness of the spray as designed and that which is required. In the improved

analysis of spray effectiveness the drop size spectrum was considered in its entirety instead of a single surface average drop. The resultant effect on spray effectiveness was to improve the performance which is due to the higher surface area per unit of spray volume of the drop groups having sizes less than the mean diameter used in the single drop model.

The improved model also considers condensation of steam from the high temperature containment atmosphere where no discernable effect was found due to the increased drop size.

Drop coalescence, actual drop trajectory, and liquid film resistance have been examined in detail with the result that iodine removal efficiency is reduced somewhat. However, those factors, as shown by analyses using the detailed mathematical model have only a minor effect on iodine removal compensated for by conservatism in the overall analysis.

Question No. 4 (J) (TR. 750) ASLB 5/13

"And then as I recall, and I notice Mr. McAdoo is here, I think these questions came up in connection with some testimony that he gave on Indian Point Unit No. 2 or 3, something about a design margin, and as I recall the situation, he felt that there should be a certain design margin in these considerations of safety, but at that particular time he was not able to indicate what the design margin should be, and perhaps when the evidence comes on he would indicate if he has selected it and how he forms that design margin and how effective is it and on what experimentation report that design margin was made."

Answer:

The Spray System is sized for heat removal and provides an iodine removal rate constant, λ_s, of 48 per hour, per WCAP-7499 L. The conservative single drop analysis in the FSAR gives 32 per hour. This amounts to a factor of about 1½ and accounts for the net effect of simplifying assumptions listed in Question No. 3 (J) (TR. 750) ASLB 5/13, which were evaluated in detail since the issuance of the Indian Point Unit No. 3 construction permit.

As has been discussed in Chapter 14 of the Indian Point Unit No. 2 FSAR to meet the guidelines of 10CFR100 of 300 rem, a removal effectiveness rate of only eight per hour is required, thus, providing additional margin. Thus, heat removal is the limiting consideration in the design of the spray system.

Question No. 5 (J) (TR. 752) ASLB 5/13

"I wonder, and this will involve the staff as well, as to how the compliance inspector will determine if the spray system meets the performance specifications, and of course that raises the assumption or raises the question what are the performance specifications for the containment spray and how can it be determined to be performable. I just happened to be going over some phases of the construction permit decision in Indian Point Unit No. 3 that I think has some relevance to Indian Point Unit No. 2, since the same types of containment spray systems are used. Is that correct?

Answer:

The results of the following tests and inspections are available for the compliance inspector to determine if the spray system meets the performance specifications:

1. Pre-operational and in-service testing of spray system to prove system meets design specifications (See Indian Point Unit No. 2 FSAR, Question 6.5).

2. Testing of safety instrumentation (See Technical Specification 3.5).

3. Operational safety review (See Technical Specification 4.1).

4. Testing of containment spray system (See Technical Specification 4.5).

Question No. 6 (J) (TR. 752) ASLB 5/13

"In connection with that I think we got into some considerations of plateout factors and all those matters and if they could be discussed, composition on the containment wall, and what is the temperature of the containment wall, and I think there was some question about whether there will be TID 14844 assumption plateout factor or whether the containment wall is going to be higher so that that portion is no longer realistic. I am sure Mr. McAdoo will be called for these inquiries and my questions and will deal fully with these various aspects which were considered in Indian Point 3 on the containment spray."

Answer:

The plateout assumption used in the Indian Point Unit No. 2 FSAR is the same one implicit in the AEC Safety Guide No. 4 for Water-Cooled Nuclear Power Plants (November 2, 1970). Release of radioactive iodine from the fuel and containment can be conservatively assessed, according to the Guide, based on 25% of the equilibrium inventory from full power operation becoming immediately available for leakage from the primary reactor containment. The same Guide provides that reduction in the amount of radioactive material available for leakage to the environment by containment sprays, etc., may be taken into account, the degree of reduction to be evaluated on an individual case basis. This approach was utilized in the Indian Point Unit No. 2 FSAR.

In the Indian Point Unit No. 3 ASLB Hearing, discussion of the matter of plateout centered around the conservatism of assuming that plateout of one-half of the iodine released from the fuel would occur, as the Regulatory Staff assumed, independently of removal by the spray. At that time the Applicant showed that, with spray removal as efficient as the Applicant

concluded it to be (based on theory and test data then presented), it was possible to neglect plateout altogether and still demonstrate doses less than 10CFR100 guidelines. The hearing board pointed out, however, that with the Staff's "suitably conservative" estimates of spray removal rates, some expectation of plateout was necessary to meet these guidelines. The board noted that acceptance of the design required "technical justification that sufficient plateout occurs simultaneous with spray and filter operation, (or) until some other means are taken to reduce the uncertainties in the spray absorption capability..." (Page 73).

The FSAR and other reference material derived from the spray R&D program have demonstrated that the uncertainties in spray capability are well within the margins provided. Hence, it would seem appropriate that the Staff's "suitably conservative" value of spray removal coefficient λ_s of 4.5 per hour might be increased toward the value presented by the Applicant, 32 per hour. However, this is not essential to the case for resolving the Indian Point Unit No. 3 hearing board's concern, since even using the Staff assumption, analyses show that the system is adequate.

As noted further in the Indian Point Unit No. 3 board's findings (Page 70 et seq.) the Staff model did not account for the possibility that the dominance of the containment spray as a heat absorbing medium would prevent condensation on surfaces from acting as a plateout sink of the required effectiveness.

This reasoning does not consider the fact that the containment fan-coolers act to condense steam concurrently with the sprays, and their iodine removal effect (analogous to that of the heat absorbing surfaces) is considerable.

The safety analysis (FSAR Section 14.3.4) shows that condensation occurs via the fan-coolers and heat absorbing surfaces at an average rate of about 0.072 lb/hr per cu. ft. of containment volume over the first two hours. By comparison, removal of elemental iodine was demonstrated to occur in the CSE test A-11 (without spray) at a rate corresponding to a half-life of 16 minutes when the surface condensation rate was .0144 lb/hr per cu. ft. (BNWL-1457, Page 5.22, 5.34). Applying the CSE observed plateout rate to the Indian Point containment volume and correcting for condensation rate, one would calculate a plateout removal coefficient of 13 hr^{-1}. This rate applies to a process independent of spray absorption <u>and</u> spray condensation. Thus, a combined removal coefficient, using the Staff's Indian Point Unit No. 3 spray removal coefficient, of 13 + 4.5 or 17.5 hr^{-1} could be justified. The dose reduction factor, integrated over two hours, would be 35 for inorganic iodine. Using the figures for the Staff's two-hour dose estimates for Indian Point Unit No. 3 (Table 1 of the Indian Point Unit No. 3 findings, Page 67 and 72) which are conservative for Indian Point Unit No. 2:

Inorganic iodine dose without plateout,
sprays or filters = 2 x 1287 = 2574 rem

Reduced by combined spray and revised plateout factor = 2574/35 = 73.5 rem

Organic iodine dose, with filter =

$$396 - \frac{2 \times 1287}{9} = 110 \text{ rem}$$

Total dose with filter, spray and revised plateout = 73.5 + 110 = 183.5 rem

Thus, justification exists for combining reliance on plateout in combination with spray removal to a sufficient degree to permit meeting the 10CFR100 dose limits with a conservative margin.

For simplicity, and because the result is also conservative, the Applicant has presented its analysis using the assumption that 25% of the iodine is initially available for leakage as described earlier.

Question No. 7 (J) (TR. 754) ASLB 5/13

"...and if you could take this document, (WASH) 1146, which I think would be a good guide, and then fill in just what the results are, we will assume that these plans are still in effect; if they are not fully performed they are still being undertaken, but if you could give us documents that would show the results, or any other presentation of the factual data of what has been done, I am sure it would be more responsive to the question.

And if the Staff does not have these dates or the Staff does not have a witness who is intimately familiar with these programs and then a reasonable request might be to bring somebody from the departments that do have to do with the execution of this water reactor safety program as reflected in WASH 1146. That might involve the Director of Reactor Development Technology and if he would be available to present the matter directly under his supervision I am sure it would be a responsive presentation. He probably can give us a better overall picture than several witnesses from each of the several experimental programs.

...When you put everything together in the containment will it work, or when you put everything in the core vessel, will it work? And I think that rather than saying that the plastic cover for something has proven satisfactory, the Division of Reactor Safety, in fact I think it's set forth in the Indian Point 3 construction permit decision, reference was made to a Division of Reactor Safety announcement by the Atomic Energy Commission that the best test is in the assembled form, and that's the kind of data response I think would be helpful. And if the Commission Staff doesn't have a summary report as elaborate as this plan before us, maybe something like that could be developed for this proceeding and could be utilized in many, many cases.

But, in any event, if we could have a data response."

Answer:

AEC Staff Response.

Question No. 8 (J) (TR. 758) ASLB 5/13

"The concern that I have also is reflected in the appropriations hearings. I believe these were last year but in many places the indication was given that certain experimental work could not go forward for lack of funds. And I wondered how that has affected or will affect the research and development work that may be pertinent for this proceeding. If some analysis could be made of that it would be appreciated."

Answer:

AEC Staff Response.

"I have not had time to go through the Applicant's responses to the last questions by the Board except to look briefly at some statements that are made. As you know, I've asked several questions about the inspection program. Not yet have I seen the statement concerning the program that the Applicant is undertaking to assure that the inspection can be made. I have not had any indication of how much money, for instance, is involved or what the program is that the Applicant has undertaken. However, it says here: We are confident that the needed inspection equipment will be developed within the next ten years.

It is indicated that there are four firms actively developing this type of equipment. I wonder whether some of the uncertainty might be removed if the technical specifications were altered to say that these inspections will take place if the equipment is developed. In the testimony that we get from the Applicant it says: We are confident that the inspections will take place and that we have committed ourselves to making the inspections. Maybe a large part of the problem could just be solved by modifying the Tech-Specs to take out any statements that this will be done if the equipment is developed. Possibly the staff and the Applicant could consider this and might have some change to suggest or some additional information to provide at the next session of the hearings that we have."

Answer:

As stated previously, there are several firms actively pursuing the development of volumetric in-service inspection techniques of reactor vessels. Inspections have been performed and are being evaluated, using ultrasonic techniques on reactor vessels at two plants, partial in-service at San Onofre (U. S.) and pre-service at Oskarshamnsverket (Sweden). Baseline UT data has already been collected on the Indian Point Unit No. 2 reactor vessel, from the inside through the cladding, so that a meaningful examination could be performed in-service using equipment and techniques similar to those used on the two vessel examinations mentioned above.

However, to perform these inspections without benefit of remote equipment now under development could result in increased occupational exposures and a multi-month extension of the plant shutdown.

Three major in-service inspection programs currently under study are especially noteworthy:

1. The Heavy Section Steel Technology Program, a USAEC sponsored effort for investigating the effects of flaws, variations of properties, stress raisers and residual stress on the strength and structural reliability of present and contemplated water-cooled pressure vessels.

2. The Industry Cooperative Program on Heavy-Section Steels sponsored by the major industrial companies represented on the Pressure Vessel Research Committee of the Welding Research Council to answer the question as to what are the properties and how effective are inspection techniques for heavy-section steels?

3. The Edison Electric Institute and TVA sponsored program which is being carried out under contract with Southwest Research Institute to answer the question as to what inspection techniques may be effectively applied to vessel in service? The program is identified as Research Project No. 79 (RP 79).

Con Edison is an active participant in RP 79, both in funding and direction. Work started in 1968 and will be essentially completed in 1972. Major portions of this program are:

Project 1 - Review of recent utility experience with power reactor coolant pressure boundary inspection regarding service condition, defect detection capability, defect size and defect orientation.

This review, including a survey of automated inspection equipment has been completed and reported upon. Current work is confined to the NDT examination of fossil fueled steam boilers of representative material, size and thickness.

Project 2 - Development of a Non-Destructive Test Method Evaluation Facility

With the cooperation of the AEC, the Experimental Beryllium Oxide Reactor (EBOR), located at the National Reactor Test Site, was made available. Necessary modification design has been completed and construction is now underway. This test facility will permit testing of NDT equipment on natural and machined flaws on an actual reactor vessel, under conditions of variable pressure and temperature and generated background noise. Companies with acoustic emission systems are invited to test their hardware, subject to the testing schedule. Both hydrostatic test systems and on-line systems will be evaluated.

Project 3 - Investigation of the Acoustic Spectrometer

This project has been discontinued.

Project 4 - Investigation of Acoustic Emission Techniques for Continuous Monitoring

Under this project, an acoustic emission system was developed, built, and tested by Battelle Northwest Laboratories.

A method to extend the temperature range of material for use as an AE was developed.

Of special interest is the development of wave guides to enable the sensor and preamplifier of the AE system to be located remotely from the operating nuclear reactor environment. This is a significant accomplishment in the development of the on-line system.

A number of field tests have been conducted to study the acoustic emission behavior of heavy-section steel components under control-led flaw growth.

Project 5 - Improvement in Reliability and Reproducibility of Conventional Ultrasonic Systems for Reactor Inspection

Results of this project indicate that inspection must be concerned with change of flaw with periodic inspections.

The effect of reactor environment on ultrasonic signal characteristics of reactor steel test samples is under study. A BWR Crud Effect Study has been completed.

Present studies indicate that ultrasonic testing can be successfully done through cladding. Studies are still underway and the final report is due shortly.

Project 6 - Investigation of Acoustic Holography for Visualization of Flaws in Thick-Walled Pressure Vessels

BNWL is conducting the program under Jersey Nuclear direction. The initial laboratory phase of this project has been completed and the current work is directed to the testing of samples of representative thickness containing

natural flaws.

Present thinking is that acoustic holography would be utilized to detail a fault located by acoustic emission methods.

Results of the RP 79 program to date are quite encouraging. Static testing of heavy-walled pressure vessels is a reality. On-line testing appears feasible, pending completion of development work now underway.

Con Edison is proceeding on the basis that the proposed Technical Specifications require a volumetric in-service inspection of the reactor vessel within ten years, predicated on the development of appropriate equipment.

Evidence of Con Edison's intent is its $150,000 support of the $1,557,000 EEI Project RP 79. Although two of these inspections have been performed to date, they represent part of the industry development program, and should be considered as a demonstration of the feasibility of such inspections, not as a demonstration of appropriate equipment.

Con Edison considers appropriate equipment that which will permit the inspections to be performed as much as possible in parallel with another planned outage, such as for refueling, and with little or no additional occupational exposure to personnel.

Con Edison therefore, feels that it should not initiate a change in the Indian Point Unit No. 2 Technical Specifications since they now allow some flexibility in case of delay in the development of appropriate equipment while providing incentive

for its development within the required period to suppliers of equipment and services for this inspection.

Question No. 10 (B) (TR. 816) ASLB 5/13

"Once you start loading the fuel it becomes inconvenient to unload the fuel again and to take out the innards from the reactor. In connection with your motion, I would like to see a reply to a question, if you wish, by someone who is doing development work on ultrasonic testing of reactor vessels. I would like to see information concerning the effect of the surface roughness of the reactor vessel on the results that one can get from the inspection.

At one hearing I remember the manufacturer had chosen to change from inspecting the vessel from the inside to inspecting the vessel from the outside. The impression I have, or the understanding I have, was that the inspection could be done more satisfactorily because this way it was done when the vessel was fabricated. The vessel outside was smoother than the vessel inside, and that this would have some effect on the results of the inspection.

I'd like to be assured, before the reactor vessel becomes radioactive, that meaningful inspections by ultrasonic methods can be conducted from the inside without having to polish the surface, smooth the surface where the inspection is going to take place, or that the surface has been smoothed where the inspection is going to take place.

In other words, I wouldn't like someone to come back and say, "Well now, we have made the plant radioactive; it's not convenient to get in to smooth the surface. The inspection isn't going to be as good as it would have been had we done this initially."

Answer:

During the shop fabrication of the Indian Point Unit No. 2 vessel, the inside weld deposited clad surface area local to each shell weld was prepared by hand grinding. The area prepared was the cladding over each weld for sufficient distance either side to allow ultrasonic examination of the weld heat affected zone. This smoothing of the clad surface is specified for all Westinghouse reactor vessels and assures satisfactory performance of the ultrasonic inspection program in accordance with the Technical Specifications and requirements

of the ASME Code Section XI.

All the pressure containing welds in the vessel shell were ultrasonically examined after shop hydrostatic test by both longitudinal and shear wave from the inside surface through the cladding. This shop mapping, performed utilizing direct contact and immersion (wheel transducer) methods, was intended for use as a pre-service base line record. This also demonstrated that the cladding has been suitably prepared to permit successful in-service ultrasonic examination.

1 MR. TROSTEN: The third document is entitled,
2 "Additional Testimony of Applicant, Part 1, dated July 6,
3 1971."
4 I show this document to Messrs. McAdoo, Prestele,
5 and Grob , and I ask you if those documents were prepared under
6 your supervision or direction and are the contents of this
7 document true and correct to the best of your knowledge?
8 (Chorus of "yes.")
9 MR. TROSTEN: Do you desire that this document
10 be received in evidence in this proceeding as your testimony?
11 (Chorus of "yes.")
12 MR. TROSTEN: Mr. Chairman, I offer into evidence
13 the documents which I have just identified and ask that it be
14 physically incorporated into the transcript as if read.
15 CHAIRMAN JENSCH: Is there any objection by the
16 Staff?
17 MR. KARMAN: No, objection.
18 CHAIRMAN JENSCH: State of New Y ork?
19 MR. SCINTO: No objection.
20 CHAIRMAN JENSCH: Citizens' Committee for the
21 Protection of the Environment?
22 MR. ROISMAN: Same reservations.
23 CHAIRMAN JENSCH: Same ruling.
24 The offer of the Applicant is accepted and the
25 prepared testimony as described by the Applicant's counsel

will be physically incorporated within the transcript at this place, and such answers are received in evidence.

(THE COMPLETE DOCUMENT, "ADDITIONAL TESTIMONY OF APPLICANT, PART 1, DATED JULY 6, 1961," FOLLOWS:)

BEFORE THE UNITED STATES

ATOMIC ENERGY COMMISSION

In the Matter of	)	
Consolidated Edison Company of New York, Inc. (Indian Point Station, Unit No. 2)	)))	Docket No. 50-247

ADDITIONAL TESTIMONY OF APPLICANT

PART I

Date: July 6, 1971

The testimony in this document is being supplied in response to the evidence proposed to be introduced by the Citizens Committee for the Protection of the Environment by its letter to the Atomic Safety and Licensing Board dated June 4, 1971. For each item of testimony the particular proposed finding by the Citizens Committee to which the testimony responds and the witness who will sponsor the testimony at the hearing on July 13 are identified.

Response to Item 3.a.3.g (p. 6) (Mr. John D. McAdoo)

The possibility of explosions in the reactor vessel resulting from the accumulation of small releases of hydrogen was considered. There are two potential sources of hydrogen in the reactor, namely metal-water reaction and radiolysis. They occur at different times.

Metal water reactions occur during the period of high fuel cladding temperature before the ECCS has reflooded the core. Hydrogen produced is rapidly swept to the containment with the steam produced by reflooding the hot fuel. Until it reaches the containment, there is no oxygen present, hence no possibility of combustion.

Radiolysis occurs during the long term cooling period following reflooding, and is accompanied with stoichiometric amounts of oxygen. The concentration of these gases does not reach the explosive range, even before dilution in the containment atmosphere, although a flammable mixture may be present inside the reactor pipe or reactor vessel dome. The energy release associated with combustion of this mixture is insufficient to damage the pressure retaining components of the system; hence it is not conceivable that safety related functions of the reactor coolant system would be affected by ignition of the mixture.

Release and mixing of hydrogen in the containment from the point of efflux was studied to show that mixing occurs within a very small space. Ignition here is a remote

1 possibility -- but in case it would occur, the heat
2 energy of combustion can be accommodated within the
3 capacity of the emergency containment cooling systems.

Response to Item 3.a.3(i) (p. 7) (Mr. John D. McAdoo)

A stainless steel water reaction does not occur below a temperature of about 2500°F. Since temperatures do not reach this value in the design basis accident, such reactions will not occur.

Response to Item 3.b.3 (p. 8) (Mr. John D. McAdoo)

Spray nozzles randomly selected from those to be installed in Unit 2 were tested by the manufacturer and found to exhibit drop size characteristics much more favorable than that assumed in the FSAR. The analysis was made assuming a number mean drop size larger than that representing two standard deviations from the norm of the measured data. The analysis is therefore quite conservative in this regard.

Response to Item 6.b. (p. 15) (Mr. Joseph A. Prestele)

The plant will be adequately protected against unauthorized entry by the measures outlined in the answer to Citizens Committee's question No. H-30. In addition to the roving guard patrol of the site, the normal point of entry to the fenced plant proper is through a continuously guarded gateway. Unauthorized attempts at entry by breaching or climbing the fence will be deterred by intensive perimeter lighting. Such lighting will also facilitate detection of any attempts to gain unauthorized access to the plant. In addition, Con Edison has under study a method of direct surveillance of the lighted fence perimeter by a modern electronic detection system to further enhance security precautions.

If, in spite of these precautions, an unauthorized person were to attain access to the fenced area, entry to the plant controlled area buildings would be prevented by locked doors. Further, entry points to the controlled area from the conventional area will be equipped with alarms and indicators to alert the Staff to any unauthorized entry.

Response to Item 6.C. (p. 16) (Mr. John J. Grob)

An analysis of the probability of an aircraft hitting Indian Point Unit No. 2 has been completed. It is based upon (1) a survey of the current number of overflights by aircraft in the general vicinity of the Indian Point site; (2) a probabilistic approximation of the distance from the airway centerline to the point where an aircraft hits the terrain being overflown if there is an inflight accident; (3) the incidence rate of in-flight aircraft accidents resulting in a serious crash; and (4) the area of the Indian Point Unit No. 2 that is considered to represent a target for such an aircraft crash.

The in-flight accident data upon which the study was based was obtained from the accident investigation files of the National Transportation Safety Board. Airway and overflight data was obtained from the New York Air Route Traffic Control Center. The result of the study yields an estimated probability of a hit by an aircraft into the reactor containment, the spent fuel or the control room buildings, of $p = 9 \times 10^{-8}$/year.

Stated in other ways:

1. One hit would be expected in 11 million years.
2. The probability of having a hit in a year is 0.00000009 or a chance of 1 in 11 million per year.

The Applicant concludes from this study that the likelihood of an aircraft hitting Unit No. 2 is so remote that this contingency need not be considered in the design.

With respect to the specific assertions in section 6.C. 1), 2), and 3) of intervenor's proposed findings, the nearest holding pattern is the Brewster holding pattern serving the Westchester County Airport. Only a small number of aircraft use this holding pattern, and the closest point of the pattern is 8 miles northeast of the Indian Point site. The nearest approach route to Kennedy Airport does not go directly over the plant site but rather passes two miles east of the site. There are many aircraft movements within ten horizontal miles of the site, but the Indian Point site is not unique in this respect. These movements are taken into account in the analysis described above.

1 MR. TROSTEN: Mr. Chairman, with respect to the
2 document entitled "Answers of Applicant to Questions Raised
3 by Atomic Safety and Licensing Board on May 13, 1971," in our
4 letter to the Board and the parties dated July 6, we indicated
5 that an additional sponsor of this testimony would be Mr.
6 Fletcher. At the present time this document is not being
7 sponsored by Mr. Fletcher.
8 CHAIRMAN JENSCH: It will be so understood.
9 Proceed.
10 MR. TROSTEN: I now refer to a document entitled,
11 "Additional Testimony of Applicant, Part 2, dated July 8,
12 1971." I call this document to Mr. Joseph Prestele's atten-
13 tion and ask if this document was prepared by you and are
14 the contents of this document true and correct to the best of
15 your knowledge?
16 MR. PRESTELE: Yes.
17 MR. TROSTEN: Do you desire that this document be
18 received in evidence as your testimony?
19 MR. PRESTELE: Yes.
20 MR. TROSTEN: I now offer this document which I
21 have identified in evidence in this proceeding, as the
22 testimony of Mr. Joseph Prestele, and ask it be physically
23 incorporated into the transcript.
24 CHAIRMAN JENSCH: Is there any objection by the
25 Staff?

MR. KARMAN: No objection.

CHAIRMAN JENSCH: State of New York?

MR. SCINTO: No objection.

CHAIRMAN JENSCH: Citizens' Committee for the Protection of the Environment?

MR. ROISMAN: Same reservations.

CHAIRMAN JENSCH: Same ruling.

The offer of the applicant is accepted and it may be received in evidence, and the reporter is directed to physically incorporate it in the transcript at this place.

(THE COMPLETE DOCUMENT, "ADDITIONAL TESTIMONY OF APPLICANT, PART 2, DATED JULY 8, 1971," FOLLOWS:)

BEFORE THE UNITED STATES

ATOMIC ENERGY COMMISSION

In the Matter of	)	
	)	
Consolidated Edison Company	)	Docket No. 50-247
of New York, Inc.	)	
(Indian Point Station, Unit No. 2)	)	

ADDITIONAL TESTIMONY OF APPLICANT

PART II

July 8, 1971

The following testimony is being supplied in response to the evidence proposed to be introduced by the Citizens Committee for the Protection of the Environment in its "Supplemental Statement of Proposed Factual Findings" dated June 21, 1971.

Response to Item 11 (pages 2-6) (Mr. Joseph A. Prestele)

1. Operator Action

Con Edison is required to operate Unit No. 2 in compliance with the technical specifications, which set safety limits for operation of the reactor and require periodic tests and inspections. If in order to comply with the technical specifications or otherwise prevent an unsafe condition it is necessary to shut the unit down at a time when power from the unit is needed, this will be done. Operating procedures are geared to the safe operation of the unit regardless of other considerations such as the need for power from the unit. Operator training is directed toward operation of the unit in a safe condition irrespective of other such considerations. The plant operator has the authority and responsibility for shutting down the plant for safety reasons, and his decision cannot be overruled by the system operator.

2. Plant Design

A backup to the operators' judgment about safety is provided by the design of the unit. That is, reactor protective safety functions are designed

to minimize operator action and automatically shut down the plant if unsafe operating conditions are approached.

3. Safety Review

Surveillance of safe operation of the unit and compliance with technical specifications is maintained by in-plant management personnel, the Nuclear Facilities Safety Committee and the AEC Division of Compliance, all of which have as an overriding concern the safe operation of the unit. The composition and high-level membership of the Nuclear Facilities Safety Committee insure that important decisions affecting safety will be made responsibly and that power demands will not be allowed to jeopardize safety.

1 MR. TROSTEN: Now I come to the two documents handed
2 out this morning, one entitled "Answers of Applicant to
3 Questions Raised by Atomic Safety and Licensing Board on March
4 24, 1971, Part 3, dated July 13, 1971," and the other
5 entitled, "Additional Testimony of Applicant Concerning
6 Emergency Core Cooling System Performance, dated July 13,
7 1971."
8 I might suggest, as one procedure we could follow,
9 Mr. Chairman, that I offer this material into evidence in
10 this proceeding under the sponsorship of Mr. James Moore. If
11 the Board wishes the receipt into evidence of this document
12 could be deferred until a later period of time.
13 CHAIRMAN JENSCH: Yes, that might be done. If
14 there is no objection, let's proceed upon that basis.
15 MR. TROSTEN: Mr. Moore, I show you the two docu-
16 ments which I have just identified. Were those documents
17 prepared by you or under your supervision?
18 CHAIRMAN JENSCH: Will you identify them for the
19 record?
20 MR. TROSTEN: Yes.
21 The first document is entitled, "Answers of Appli-
22 cant to Questions Raised by Atomic Safety and Licensing
23 Board on March 24, 1971, Part 3, dated July 13, 1971;" the
24 second document is entitled "Additional Testimony of Applicant
25 Concerning Emergency Core Cooling System."

CHAIRMAN JENSCH: Excuse me.

Take the first one up first, please.

MR. TROSTEN: Yes, sir.

Mr. Moore, was this answer to Mr. Briggs' question prepared by you or under your supervision and direction, and are the contents of this answer true and correct to the best of your knowledge?

MR. MOORE: Yes.

MR. TROSTEN: Do you desire to have this document received in evidence in this proceeding as your testimony?

MR. MOORE: Yes.

MR. TROSTEN: Mr. Chairman, I offer the document I have identified in evidence in this proceeding.

CHAIRMAN JENSCH: Is there any objection to this one document at least as identified by Applicant's counsel? Regulatory Staff?

MR. KARMAN: No objection.

CHAIRMAN JENSCH: State of New York?

MR. SCINTO: No objection.

I would like to ask one brief question to make sure I have the full document. This document that was just referred to is some five pages long with a table and a list of references?

MR. TROSTEN: That is correct, Mr. Scinto.

MR. SCINTO: Thank you.

1 No objection.

2 CHAIRMAN JENSCH: Citizens' Committee for the

3 Protection of the Environment?

4 MR. ROISMAN: Same reservations.

5 CHAIRMAN JENSCH: Same ruling.

6 The offer of the Applicant is accepted and the

7 reporter is directed to physically incorporate it within

8 the transcript, the answers to the board's questions which

9 were submitted on March 24, 1971, and such answers may be

10 received in evidence.

11 (THE COMPLETE DOCUMENT, "ANSWERS OF APPLICANT TO

12 QUESTIONS RAISED BY ATOMIC SAFETY AND LICENSING BOARD ON

13 MARCH 24, 1971, PART 3, DATED JULY 13, 1971," FOLLOWS:)

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BEFORE THE UNITED STATES
ATOMIC ENERGY COMMISSION

In the Matter of	)	
Consolidated Edison Company of New York, Inc. (Indian Point Station, Unit No. 2)	)))	Docket No. 50-247

Answers of Applicant to Questions Raised

by Atomic Safety and Licensing Board

on March 24, 1971

Part III

July 13, 1971

KEY TO IDENTIFICATION OF QUESTIONS

(B) Question by Mr. Briggs

(Tr. 687) - Transcript Page 687

"In discussions of the emergency core cooling system, the Board will be much concerned about the experimental evidence that was developed for the effectiveness of the system; in other words, its reliability and the assurance that one gives that it is essentially failproof.

We also will be concerned about whether there has been experimental evidence and whether there have been calculations that would indicate whether there is a substantial question as to whether the emergency core cooling system will function as it was designed.

In other words, whether these reservoirs that provide the initial flooding of the core will function as they have been designed to function."

Answer:

Review of ECCS Design

Prior to 1966, the emphasis in core cooling system design was directed toward maintaining core heat removal in the event of a failure of the largest pipe connecting to the reactor coolant system. In addition, the double-ended severance of a reactor coolant pipe was analyzed to demonstrate that core integrity was maintained well within the assumptions made for radioactivity release to the containment. These transients were analyzed with a simple single volume representation of the reactor coolant system. In late 1966, to provide further conservatism, the design basis was increased to include core protection (no clad melting) even in the unlikely event of a complete double-ended severance of a reactor coolant pipe. Initial analyses were performed with a more sophisticated two volume digital code (FLASH).

The limits associated with this new design basis accident required a more detailed knowledge of coolant flow through the core, pressure forces on internals and transient heat transfer phenomena. It was apparent that better analytical models with supporting experimental evidence were necessary to increase the understanding of the accident. A development program described in Answer to Board Question No. 16 (J), 1/19/71, was initiated, both analytical and experimental. Additional programs have been added as required to answer specific questions as knowledge accumulated.

Additional core reflooding capability was required for this new design basis, and the accumulator or bottom flooding concept was selected by Westinghouse to provide rapid core recovery. This concept had the advantage of a direct fast-acting passive system with no large power requirements and fewer uncertainties in heat transfer performance. Both analytical and experimental effort was therefore directed toward this concept. The results of this development effort leading to assurance that reliable emergency core cooling can be obtained are summarized below.

Table I references the transient phenomena of interest, method of analysis and the experimental basis for the analysis. A detailed description of the current analysis and results for Indian Point 2 are presented in the document entitled "Indian Point Unit No. 2 Emergency Core Cooling Performance," which is being submitted to the Board separately. The evaluation model described in that document has been accepted by the AEC in its Interim Policy Statement on Criteria for Emergency Core Cooling Systems for Light Water Power Reactors, published in the Federal Register on June 29, 1971 (36 FR 12247). This model along with the AEC interim criteria is clearly conservative and further experimental information or improved calculational techniques as they become available are expected to demonstrate that the model and criteria are far more conservative than is necessary. The conservatisms will be re-evaluated and a more realistic approach will be taken.

Experimental programs, to date, have focused on the fundamental aspects of the hydraulics of blowdown, blowdown heat transfer, cladding failure mechanisms, embrittlement limits, and the mechanism of reflooding heat transfer. Each of these experiments has contributed to the development of improved analytical techniques forming a foundation for the assurance of the performance of emergency core cooling systems.

LOFT Single Loop Semiscale Test

Single loop blowdown tests have been performed by the Idaho Nuclear Corporation (INC) in their Semiscale Blowdown Project. These tests, while not entirely representative of a reactor system, have included the system effects during blowdown of a steam generator, pump and heated core. The results have been used to confirm analytical models (SATAN) used to describe the blowdown phase, e.g. mass discharge and pressure transients.

More recent tests were performed with the intent of investigating the effect of Emergency Core Cooling System (ECCS) injection. Six tests (Test 845 through 850) were performed to analyze the effect of the break in the reactor vessel inlet pipe. For each of these tests there was essentially no water remaining in the vessel at the end of the test, the water being preferentially expelled via the break nozzle and it did not flood the electrically heated fuel rods. An examination of the test, however, indicates significant characteristics non-representative of the large PWR from the standpoint of behavior during injection and refill. For example the combination of parallel flow paths present in a PWR is not simulated in this test layout. That is, the existence in the PWR of more than one loop allows, even with one loop broken, communication to exist between the upper and lower plena independently from the core flow behavior. The presence of the unbroken loops in a PWR reduces the pressure differential between the two plena and, therefore, reduces the creation of a high pressure point within the vessel that could prevent the ECC water from penetrating the core.

In the same way, the vessel in the semiscale test lacks the multi-dimensionality offered by the downcomer region in a PWR. The inlet nozzle is practically connected directly to the lower plenum and the downcomer annulus is simply simulated by a pipe. Furthermore the vessel lower plenum in the semiscale vessel is reduced to a very shallow volume. The distance from the bottom of the barrel is reduced to the point where even small coolant velocities are able to push out water deposited in the lower plenum. In a PWR the length of the lower plenum allows water to remain at the bottom of the vessel without blocking the communication between the core and the break. It follows that while in a PWR the accumulator water delivered when the system pressure is much higher than containment pressure can be accumulated in the lower plenum, the ECC water injected in these semiscale tests was pushed out the break by the high system to break pressure differential.

Later on in the blowdown transient in the semiscale test, the reduction in system pressure allowed some water to remain in the lower plenum. At this point in time, since the water level is above the bottom of the flow skirt, the steam generated in the system has either to be discharged to the break through the hot leg, steam generator, and pump or as in the test force the water in the vessel out the break.

The amount of water that can penetrate the core is a function of the downcomer height (driving head) and of the loop resistance. A comparison between these parameters in a Westinghouse PWR and in the single loop semiscale tests indicates that the test system had a downcomer height 4 times

smaller and a loop resistance more than 30 times higher than a large reactor. It follows that the possibility for the accumulator water to penetrate into the core was reduced by at least two orders of magnitude in the tests compared to the large PWR.

In addition it should be noted that the small inertia and the type of the pump used in the test loop will further increase the loop resistance, thus increasing the dissimilarity between the tests and the PWR.

In conclusion, it appears that the important test parameters that did not allow water to accumulate in the lower plenum and subsequently to penetrate into the core are not typical of a large scale PWR. It is because of these limitations that the results are not applicable to a large PWR.

In order to eliminate any doubt as to the validity of the semiscale tests, the policy was adopted on an interim basis that all water injected during reactor blowdown must be assumed to be lost. Moreover, it is to be assumed that during accumulator injection, the loops receiving the injected water are blocked to the flow of steam, further penalizing the calculated effectiveness of the accumulator function. These assumptions are acknowledged to be overly pessimistic, and with further work it is believed that a relaxation will be justified; however, even with these pessimistic assumptions the performance of the Indian Point Unit No. 2 ECCS is adequate.

TABLE I

ECCS PERFORMANCE EVALUATION

Phenomena of Interest	Method of Analysis	Experimental Basis*
Blowdown		
a) Core flow, system pressures, effects of reactor coolant pumps, etc.	Multi-node system analysis (SATAN)	Blowdown experiments[2] CSE Blowdown tests LOFT quarter and semiscale tests
b) Heat transfer during blowdown, transition boiling	Multi-node fuel element heat transfer analysis (LOCTA)	W Blowdown heat transfer tests[3] W Radiation heat transfer tests[10]
c) Accumulator performance	Multi-node system analysis (SATAN)	In plant tests (R. E. Ginna plant)[2]
d) Fuel rod failure mechanism geometry, effects on heat transfer	Multi-dimensional fuel rod heat conduction analysis	W Single rod burst tests[4][5] W Multi-rod burst tests[6][7] ORNL Multi-rod burst tests[11] FLECHT Flow blockage tests[7]
Reflood		
a) Core reflood-flooding rate, steam binding, entrainment, system pressure drop	Multi-node system analysis	FLECHT flooding heat transfer tests-entrainment data[8][9]
b) Core reflood-entrainment, heat transfer	Multi-node fuel element heat transfer analysis (LOCTA)	FLECHT flooding heat transfer tests-heat transfer data[8][9]
c) Clad temperature/Zr water reaction limits-embrittlement	Parabolic rate equation	W Rod quench tests[4][5] ORNL,[1] ANL,[12] and INC[13] embrittlement tests

*Specifically derived for LOCA analysis; for generally applicable experimental data used for heat transfer correlations, pressure drop, etc. -- see references in WCAP-7422-L.

REFERENCES

1. P. Rittenhouse, Presentation at AEC Clad Temperature Criteria Meeting (unpublished data), February 1971.

2. J. Dorrycott, "Topical Report - W PWR Core Behavior Following a Loss-of-Coolant Accident," WCAP-7422-L, January 1970.

3. R. F. Farman, J. O. Cermak, "Post DNB Heat Transfer During Blowdown," WCAP-9005, February 1969.

4. J. B. Roll, "Topical Report - Performance of Zircaloy Clad Fuel Rods During a Simulated Loss-of-Coolant Accident--Single Rod Tests - Volume I," WCAP-7379-L, October 1969.

5. J. B. Roll, "Topical Report - Performance of Zircaloy Clad Fuel Rods During a Simulated Loss-of-Coolant Accident--Single Rod Tests - Volume II," WCAP-7379-L, October 1969.

6. C. L. Caso, et. al., "Topical Report - Performance of Zircaloy Clad Fuel Rods During A Simulated Loss of Coolant Accident--Multi Rod Burst Tests, Volume I - Test Setup & Results," WCAP-7495-L, July 1970.

7. C. L. Caso, et. al., "Topical Report - Performance of Zircaloy Clad Fuel Rods During A Simulated Loss of Coolant Accident--Multi Rod Burst Tests-Volume 2 - Analysis of Results," WCAP-7495-L, July 1970.

8. J. O. Cermak, et. al., "Full Length Emergency Cooling Heat Transfer (FLECHT) Group I Tests," WCAP-7435, January 1970.

9. F. F. Cadek, et. al., "Full Length Emergency Cooling Heat Transfer (FLECHT) Group II Test Report," WCAP-7544, September 1970.

10. R. M. Hunt, "Topical Report - Safety Related Research and Development for W PWR's--A Program Outline--Fall 1969," WCAP-7396-L, December 1969.

11. R. A. Lorenz, et. al., "Final Report on the First Fuel Rod Failure Transient Test of a Zircaloy-Clad Fuel Rod Cluster in Treat," ORNL-4635, March 1971.

12. James C. Hesson, et. al., "Laboratory Simulations of Cladding-Steam Reactions Following Loss-Of-Coolant Accidents in Water-Cooled Power Reactors," ANL-7609, January 1970.

13. R. H. Meservey and R. Herzel, "Brittle Behavior of Zircaloy in an Emergency Core Cooling Environment," IN-1389, September 1970.

1 MR. TROSTEN: The second document I will identify
2 again, Mr. Chairman. It is entitled "Additional testimony of
3 Applicant Concerning Emergency Core Cooling System Performance
4 dated July 13, 1971."
5 Mr. Moore, was this document prepared by you or under
6 your supervision and direction?
7 MR. MOORE: Yes --
8 MR. TROSTEN: And are the contents of this document
9 true and correct to the best of your knowledge?
10 MR. MOORE: Yes.
11 MR. TROSTEN: Do you desire that this document
12 be received in evidence in this proceeding, as your
13 testimony?
14 MR. MOORE: Yes.
15 MR. TROSTEN: Mr. Chairman, I now offer the document
16 which I have identified in evidence in this proceeding as
17 the testimony of Mr. James Moore.
18 CHAIRMAN JENSCH: Now, as to this document, is it
19 your suggestion that we defer the ruling until the parties
20 have had an opportunity to review it and get the answers
21 from the Staff?
22 MR. TROSTEN: This is satisfactory.
23 CHAIRMAN JENSCH: Very well, the ruling will be
24 deferred and the matter held in abeyance until we have had
25 comments from the Regulatory Staff, the State of New York, and

the Citizens' Committee for the Protection of the Environment.

Does that compete your offer of documentary evidence?

MR. TROSTEN: Yes, Mr. Chairman.

CHAIRMAN JENSCH: Very well.

There was a suggestion this morning that you folks had considered that at this time the other parties would proceed. Does the Staff have additional documentary evidence at this time?

MR. KARMAN: We do, Mr. Chairman. Before we do that, and before we introduce some additional evidence, I would like at this time to get into the record the professional qualifications of some additional witnesses from the Regulatory Staff of the Atomic Energy Commission.

CHAIRMAN JENSCH: Proceed.

MR. KARMAN: I would like at this time to call Mr. Richard Grill Mr. Albert Kenneke, and Mr. Gordon Burley. I would like to ask several questions which would allow us to incorporate into the record their qualifications.

CHAIRMAN JENSCH: None of those have been sworn?

MR. KARMAN: They have not.

Whereupon,

RICHARD GRILL,

ALBERT KENNEKE, and

GORDON BURLEY,

were called as witnesses on behalf of the Regulatory Staff and, having been first duly sworn, were examined and testified as follows:

DIRECT EXAMINATION

MR. KARMAN: Messrs. Grill, Kenneke, and Burley, I ask each of you to state your name, your employer, and the position you hold with such employer?

MR. GRILL: My name is Richard P. Grill, I am Chief of the Site Safety Branch, Division of Reactor Licensing, United States Atomic Energy Commission.

MR. BURLEY: Gordon Burley, I am a physical chemist with the Radiation Safety Branch of the Atomic Energy Commission Regulatory Staff.

MR. KENNEKE: My name is Albert Kenneke, I am site analyst in the Radiological Safety Branch, Division of Reactor Licensing, U.S. Atomic Energy Commission.

MR. KARMAN: You may answer these collectively:

Did each of you prepare a statement of your professional qualifications?

(Chorus of "yes.")

MR. KARMAN: Do each or any of you have any corrections or notations to such statements?

(Chorus of "No.")

MR. KARMAN: Are the statement of your professional qualifications true to the best of your knowledge?

(Chorus of "Yes.")

MR. KARMAN: Do you adopt these as part of your testimony in this proceeding?

(Chorus of "yes.")

MR. KARMAN: At this time I offer into evidence the statements of professional qualifications of Messrs. Albert Kenneke, Gordon Burley and Richard Grill, and request they be incorporated into the transcript as if read.

They have previously been distributed.

CHAIRMAN JENSCH: Is there any objection on behalf of the Applicant?

MR. TROSTEN: No objection.

CHAIRMAN JENSCH: State of New York?

MR. SCINTO: No objection.

CHAIRMAN JENSCH: Citizens' Committee for the Protection of the Environment?

MR. ROISMAN: No objection.

CHAIRMAN JENSCH: Very well.

The offer of the Regulatory Staff counsel is accepted and the statements of professional qualifications of Witnesses Kenneke, Burley and Grill may be received into the transcript and the reporter is directed to physically incorporate the

statements as the statements and evidence from these three witnesses.

(THE COMPLETE DOCUMENTS, PROFESSIONAL QUALIFICATIONS OF WITNESSES RICHARD GRILL, ALBERT KENNEKE, AND GORDON BURLEY: FOLLOW:)

RICHARD P. GRILL

PROFESSIONAL QUALIFICATIONS

SITE SAFETY BRANCH

DIVISION OF REACTOR LICENSING

As Chief of the Site Safety Branch of the Site and Radiological Safety Group of the Division of Reactor Licensing, I am responsible for the supervision of the Branch's participation in evaluating site related safety aspects of nuclear facilities.

I hold a Bachelor of Science Degree in the biological sciences from San Francisco State College with post graduate work both of that institution and the University of California at Los Angeles. I have attended numerous courses at the University of California at Berkeley, the Lawrence Radiation Laboratory, and the Atomic Energy Commission in Radiation Safety, Health Physics, Fire Protection and other disciplines of safety. I also have attended the summer course at Colorado State University in Environmental management conducted by the Westinghouse Environmental Systems Department. I hold a California General Secondary Teaching credential.

From 1962 until 1969, I was employed by the Lawrence Radiation Laboratory Berkeley, California, evaluating experimental programs for all aspects of safety. For three of these years I headed the Safety Services Department which has prime responsibility for all aspects of environmental and experimental safety at that laboratory. I have served as a visiting expert with the

International Atomic Energy Agency in Vienna Austria and Cairo, UAR, in the areas of air cleaning and radiological safety.

I resigned from the Lawrence Radiation Laboratory and joined the Division of Reactor Licensing in August 1969. Prior to my appointment as Branch Chief I was atcive in the safety review of various power reactors including Vermont Yankee, Dresden 3, Quad Cities, J. M. Farley, etc.

PROFESSIONAL QUALIFICATIONS

ALBERT P. KENNEKE

Division of Reactor Licensing
U. S. Atomic Energy Commission

I am a site analyst in the Division of Reactor Licensing. My responsibilities include evaluation of site-related radiological aspects of nuclear facilities.

I earned a B.S. Degree in Physics from St. Joseph's College (Pa.) in 1956, a M.S. in Radiation Biology from the University of Rochester in 1957, a M.P.H. in Environmental Health from the University of Michigan in 1959, and completed in 1960 all requirements, except for a dissertation, for a doctoral degree in Environmental Health.

I have worked as an electronic engineer for RCA, as a health physicist for the University of Michigan, as a research physicist in medical physics for the Sloan-Kettering Institute, and as Deputy Radiation Safety Officer at Memorial Hospital, New York.

In 1962, I joined the Atomic Energy Commission as a health physicist, working in the area of radiation protection standards, principally those related to effluent and environmental radioactivity. In 1969, I entered my present position, and have been involved in the site evaluation of a number of nuclear power reactors, including Pilgrim, Limerick, Surry, Midland, Kewaunee and Indian Point.

GORDON BURLEY

PROFESSIONAL QUALIFICATIONS

ENVIRONMENTAL AND RADIATION SAFETY TECHNOLOGY BRANCH

DIVISION OF REACTOR LICENSING

I am a member of the Environmental and Radiation Safety Technology Branch and perform technical analyses and evaluations in the areas of fission product release, propagation and removal, as well as in other areas related to nuclear power reactor safety for which competence in the chemistry and physics disciplines is necessary for proper review.

Before joining the Atomic Energy Commission in April 1967, I was associated for 14 years with the National Bureau of Standards and worked on problems in the field of solid state chemistry. Prior to that, I was a research associate with the Geophysical Laboratory of the Carnegie Institution of Washington and worked in the area of chemical thermodynamics. I have been instructor at the N.B.S. Graduate School, University of Maryland, and Howard University. I a principal author of more than thirty scientific research papers or reports.

My formal education is as follows:

Temple University	Chemistry	A.B.	1948
University of Maryland	Physical Chemistry	M.S.	1950
Georgetown University	Physical Chemistry	Ph.D.	1962

I am a member of the following professional societies:

American Chemical Society

American Physical Society

American Crystallographic Society

Mineralogical Society of America

I have been elected to membership in Sigma Xi, professional honorary society and to fellowship by the American Institute of Chemists.

1 CHAIRMAN JENSCH: Will you proceed?

2 MR. KARMAN: Mr. Chairman, at this time I would like
3 to offer into evidence the responses of the Atomic Energy
4 Regulatory Staff to the questions of the Atomic Safety and
5 Licensing Board questions asked at the sessions of January 19,
6 March 24, and May 13, which were responded to by the Staff
7 on April 15, July 8, and July 12, respectively. I would like
8 at this time to ask of Mr. Karl Kniel, who has already been
9 sworn in as a witnesses in this case, whether there are any
10 errors or corrections or notations to the responses of the
11 Regulatory Staff to the Board questions which I have just
12 offered into evidence.

13 CHAIRMAN JENSCH: Excuse me, before you proceed,
14 I wonder if you could give us a compilation of those three
15 separate dates so we may have them at hand.

16 MR. KARMAN: The answers were submitted on April 15
17 -- that is for the January 19 session.

18 CHAIRMAN JENSCH: May we have the physical document?
19 Do you have extra copies here? Proceed.

20 MR. KARMAN: All right, Mr. Chairman.

21 On July 8 and July 12.

22 Whereupon,

23 KARL KNIEL

24 was called as a witness on behalf of the Regulatory Staff and,
25 having been previously duly sworn, was further examined and

1 testified as follows:

2 DIRECT EXAMINATION

3 MR. KARMAN: Mr. Kniel?

4 MR. KNIEL: Mr. Chairman, I have a substitution for

5 a question that was asked at the January 19th session by

6 Dr. Briggs of the Board.

7 The question appears in the transcript on page 487.

8 We are substituting for the answer that we previously presented

9 a new answer which has been I believe circulated to the parties

10 this morning.

11 CHAIRMAN JENSCH: Well, before you discuss that

12 matter, I think the question presently outstanding to you

13 is, I think were there any changes or modifications. Is this

14 your answers, thatyou are changing one portion? Is that

15 correct?

16 MR. KNIEL: That is correct, Mr. Chairman.

17 CHAIRMAN JENSCH: Very well.

18 Mr. Roisman is handing to me his copy of that which

19 was dated April 15. Any objection to my reviewing this while

20 we are here? Applicant?

21 MR. TROSTEN: No.

22 MR. KARMAN: It is on page 3, Mr. Chairman, maybe

23 that would help.

24 CHAIRMAN JENSCH: Is this the new answer to which

25 Mr. Roisman referred this morning?

1 MR. KARMAN: That is correct.

2 I think Mr. Kniel should read this so the record

3 will indicate what our answer is to that question.

4 CHAIRMAN JENSCH: Will you proceed.

5 MR. KNIEL: The answer to the question is as

6 follows --

7 MR. ROISMAN: I object. I don't mind if Mr. Kniel

8 reads what he wants to call the answers, but I do object to

9 him saying it is the answer. What you have before you is the

10 answer to Mr. Briggs' question. What is to be read now by

11 Mr. Kniel is something additional, but is not the answer to

12 Mr. Briggs' question.

13 CHAIRMAN JENSCH: It will be so understood, that

14 difference. The objection will be noted, but overruled.

15 Proceed.

16 MR. KNIEL: The risk-benefit determination regarding

17 reactors is not made and should not be made in individual

18 licensing proceedings. Such a determination is in the first

19 instance made by Congress and after public hearings and debate

20 in which all points of view may be presented, reflected in

21 the Atomic Energy Act of 1954, as amended. This determination

22 is made in the second instance by refinement of the

23 generalized legislative determinations through rule-making

24 proceedings where substantial public input is again

25 obtained. The essential elements of risk-benefit determination

1 are found in 10 CFR Part 20, 50, and 100 of the Commission's
2 Regulations.
3 CHAIRMAN JENSCH: And this is in lieu of the
4 entire answer on page 3 and 4. Is that correct?
5 MR. KNIEL: I believe it is just page 3, Mr.
6 Chairman.
7 MR. SCINTO: Mr. Chairman, I would like my objection
8 to that answer noted, please. I believe that answer amounts
9 to a conclusion of law as applicable to the proceeding and I
10 don't think the witness is qualified to draw legal conclusions.
11 CHAIRMAN JENSCH: The question was, "It might be
12 interesting to hear the Staff in particular addressing itself
13 to how it considers this problem," and I think that since the
14 question asks for the view of the staff, it necessarily
15 involves a composit determination, and whether it is legal
16 or factual in whole or in part, nevertheless as I understand
17 this recital this morning, this does reflect the view of the
18 Staff.
19 Now, maybe Mr. Karman will also supplement it, in
20 case he desires to supplement it legally. But this objection
21 is overruled.
22 I will return now to Mr. Roisman this document.
23 Thank you.
24 MR. KNOTTS: If I may call the attention of the
25 Board and the parties to the answers which were submitted on

1 July 8, 1971 -- the pages are unfortunately not numbered.
2 It refers to the question which appears at Transcript 687
3 and 689.
4 In our answers the sentence appears, "The degree
5 of conservatism of the calculated doses has been discussed
6 in response to Question 5."
7 That cross-reference was inadvertent; Question 5
8 does not appear in this set of answers. For clarification
9 that sentence should read, "The degree of conservatism of
10 the calculated doeses will be discussed in the Staff's
11 testimony concerning emergency plans."
12 To clarify it for the record, I might ask Mr.
13 McCoy, who has been previously sworn, if that accurately
14 represents his understanding?
15 Whereupon,
16 MICHAEL MC COY
17 resumed the stand on behalf of the Regulatory Staff and,
18 having been previously duly sworn, was further examined and
19 testified as follows:
20 DIRECT EXAMINATION
21 MR. MC COY: Yes, that is true.
22 CHAIRMAN JENSCH: Very well. Will you proceed.
23 MR. KARMAN: Yes, Mr. Chairman.
24 At this time I would like to offer into evidence a
25 Supplement 2 to the AEC --

1 MR. ROISMAN: Mr. Chairman, excuse me, but as I
2 understand it, the Board has not yet ruled on the offer into
3 evidence of these other three documents, nor have we had a
4 chance to state fully our objections, if there is an attempt
5 to introduce into evidence, not the changes suggested just
6 now by Mr. Knotts, but the substitution, if you will, of
7 Mr. Kniel's short statement of how the staff views the
8 question of risk-benefit.
9 I will wait until Mr. Karman suggests all of the
10 things he wants to offer and argue it then, or I would like
11 to argue it now.
12 CHAIRMAN JENSCH: Well, I understood your objection
13 to the recital to his reading of it to have been overruled.
14 And he hasn't yet offered the other two documents. Mr. McCoy
15 explained something about it, but there hasn't been an offer
16 of either the supplemental No. 2 nor the July 12 statement.
17 There has been a discussion about it, but not an offer.
18 MR. ROISMAN: I am unclear at this point: Has the
19 Board ruled that with respect to the answers to the questions,
20 or the cover letter is dated April 15, that what Mr. Kniel
21 has read this morning is to replace or is to supplement the
22 answer that was given? If it is to supplement, I have no
23 objection. If it is to replace, I object very strenuously.
24 If Mr. Kniel wrote the first answer, then I would like Mr.
25 Kniel to explain to us what has happened since he wrote that

1 answer in response to a question from the Board, and stated
2 something substantially different than what he stated here.
3 As the Chairman pointed out, the question was, What
4 does the Staff think about the question of risk-benefit ?
5 Somebody in the Staff thinks differently than Mr. Kniel --
6 I don't know whether it was Mr. Kniel, or whether it was
7 somebody else who did so. And I think the answer that was
8 in the original April 15th submission should continue to be
9 included in the record as the opinion of the staff.
10 Chairman Jensch; I think these matters to which you
11 refer are appropriate matters for cross-examination and
12 Mr. Kniel has been sworn and will be available for cross-
13 examination, at which time you can make a motion to strike if
14 you desire after you have learned the foundation of the
15 document, the foundational material for the two different
16 answers, or two answers. Let me say, whether they are different
17 or not, I haven't analyzed them.
18 MR. ROISMAN: Are both answers being accepted into
19 evidence?
20 CHAIRMAN JENSCH: Yes. As I understand it, the
21 April 15th one has been received.
22 Is that correct?
23 MR. KARMAN: Not yet.
24 CHAIRMAN JENSCH: There are answers in the April
25 15th submittal and I understood at one of our sessions we

1 brought ourselves up to date on everything that was exchanged
2 except the discovery procedure.
3 MR. KARMAN: We havenot up to this point, Mr.
4 Chairman, offered into evidence any of our responses to the
5 Board's questions. That is why I am asking now for introduc-
6 tion into evidence of all our responses to the Board questions
7 with the substitution of the answer just read by Mr. Kniel
8 and the correction made by Mr. Knotts and Mr. McCoy with
9 respect to a cross reference on emergency plans.
10 MR. ROISMAN: Mr. Chairman, it is the substitution
11 which I object to, not the introduction into evidence of both
12 answers, but the introduction into evidence of only one. I
13 might indicate we have offered to introduce the original
14 document into evidence and will continue to do so. But we
15 object now to the substitution that what was said somehow or
16 other is now going to be unsaid by Mr. Kniel saying we have
17 thought it over and decided we don't think that any more.
18 It was said; it was submitted in response to a question; it
19 is signed by the Staff, and it says that that is their answer
20 to Mr. Briggs' question. I would like it to be in evidence.
21 CHAIRMAN JENSCH: All right. When you get to the
22 point of offering evidence, I think this might be taken as
23 an admission against interest or some basis foradmission.
24 But this purports to be what is now recited the only answer
25 as far as this record is concerned in reference to that

subject matter reflected in the April 15th submittal, if nothing has been offered heretofore.

MR. KARMAN: That is correct, Mr. Chairman.

At this time I would like to offer into evidence supplemental No. 2 to AEC Regulatory Staff Safety Evaluation in this proceeding, dated July, 1971, which was prepared by the Division of Compliance, United States Atomoc Energy Commission. This is in effect an updating of the Supplement No. 1, which was offered in evidence at the first session of our hearing in December, Mr. Chairman.

CHAIRMAN JENSCH: We have heretofore in the record received physically into the transcript those submittals by the Staff as to the Safety Evaluation and Supplement 1? This purpots to be Supplement No. 2 to the Staff's Savety Evaluation. Is that correct?

MR. KARMAN: That is correct, Mr. Chairman.

CHAIRMAN JENSCH: The document I have is dated July, 1971. You were using a date of July 12 for this?

MR.KARMAN: No, I just said July, 1971.

CHAIRMAN JENSCH: Very well. What was the date of this updating?

MR. KARMAN: It is effective as of today's date, July 13, 1971.

CHAIRMAN JENSCH: Very well.

MR. KARMAN: I would like at this time, Mr.

Chairman, to call upon Messrs Maseley and Madsen, who have previously been sworn in this proceeding, and ask each of you, did you participate in the preparation of this document entitled "Supplement No. 2 to AEC Regulatory Staff's Safety Evaluation?"

Whereupon,

NORMAN MASELEY, and

GLEN MADSEN,

resumed the stand on behalf of the Regulatory Staff and, having been previously duly sworn, were further examined and testified as follows:

DIRECT EXAMINATION

(Chorus of "yes.")

MR. KARMAN: Is this a copy of the document just identified?

(Chorus of "yes.")

MR. KARMAN: Are there any corrections or additions in the document you wish to make?

(Chorus of "no.")

MR. KARMAN: Is the content of this document true and correct to the best of your knowledge?

(Chorus of "yes.")

MR. KARMAN: Do you adopt this Supplement No. 2 to the Safety Evaluation dated July 13, 1971, as your testimony and that of the AEC Regulatory Staff in this proceeding?

(Chorus of "yes.")

MR. KARMAN: I now offer this Supplement No. 2.

CHAIRMAN JENSCH: Is there any objection by the Applicant?

MR. TROSTEN: Mr. Chairman, we just received a copy of this document this morning. We have no objection to it being received in evidence, subject to our right to move to strike in the event that we discover such a motion should be made.

CHAIRMAN JENSCH: The State of New York?

MR. SCINTO: No objection, Mr. Chairman.

CHAIRMAN JENSCH: Citizens' Committee for the Protection of the Environment?

MR. ROISMAN: Same reservation.

CHAIRMAN JENSCH: And that is subject to a motion to strike?

MR. ROISMAN: Yes. The one we raised to all similar introductions into evidence.

MR. KARMAN: Mr. Chairman, so we will have no problem with respect to the answers to the Board's questions that we have just offered --

CHAIRMAN JENSCH: Let's first get this one taken care of first.

Supplement No. 2 to the Staff's Safety Evaluation is received in evidence, and the reporter is directed to

physically incorporate it within the transcript, the previously prepared supplement number 2 which will constitute a part of the evidence from the Staff.

(COPY OF DOCUMENT TO BE FURNISHED BY THE REGULATORY STAFF:)

SUPPLEMENT NO. 2

TO

AEC REGULATORY STAFF SAFETY EVALUATION

IN THE MATTER OF

CONSOLIDATED EDISON COMPANY

INDIAN POINT NUCLEAR GENERATING PLANT UNIT 2

DOCKET NO. 50-247

July, 1971

Prepared by

Division of Compliance
U. S. Atomic Energy Commission

I. INTRODUCTION

This supplement updates the Division of Compliance Supplement No. 1, dated November 20, 1970, to the Safety Evaluation dated November 16, 1970, prepared by the Division of Reactor Licensing of the Atomic Energy Commission in connection with its review of the application of the Consolidated Edison Company for an operating license for Unit 2 of the Indian Point Nuclear Generating Station located in Buchanan, New York.

The paragraph titles and numbers used in this supplement correspond to those in Supplement No. 1. The page references in parenthesis identify the page in Supplement No. 1 where the updated information supersedes that stated in Supplement No. 1.

II. RESULTS OF CONSTRUCTION INSPECTIONS

A. Reactor Coolant System

1. Reactor Coolant Pressure Piping (page 8)

Certain cast valve discs (7) had not been radiographed. The necessity for radiographing these valve discs was evaluated by Compliance Headquarters and the Division of Reactor Licensing. This review resulted in an agreement that none of the subject valves is contained within the reactor coolant pressure boundary and therefore the discs do not require radiographic examination.

3. Steam Generators

Ultrasonic examination of the steam generator cladding revealed evidence of tube sheet cladding separation in the vicinity of the divider plate.

Completion Status: The steam generator cladding problem is presently being evaluated by the applicant. Satisfactory resolution, including any required repairs, is necessary before an operating license is issued.

5. Pressurizer (Page 11 and 12)

Pre-service ultrasonic examination of the pressurizer welds revealed the presence of non-metallic inclusions in the base plate material. The applicant submitted a report to the Division of Reactor Licensing on this subject. The condition was evaluated and considered to be acceptable. The in-service ultrasonic examination requirements were expanded for the area in question, and the item is considered satisfactorily resolved.

Completion Status: Construction of the pressurizer has been completed.

Conclusions: (page 12) Based on the results of previous inspection and corrective actions taken by the applicant and contractor to date, we conclude that there is reasonable

assurance that the reactor coolant system will have been completed in accordance with AEC regulatory requirements.

B. Containment and Class I Structure

1. Primary Containment (Pages 13 and 14)

Problems identified by the applicant during construction included lack of full traceability of documentation on pipe penetration materials. The applicant reviewed the available documentation and performed additional field testing to verify that the penetrations did meet the intent of the requirements described in the application. The penetrations are continuously pressurized by the penetration and weld channel pressurization system and if leaks should develop the leakage could be detected. Based on the results of the applicant's evaluations and testing, Compliance considers the subject to be resolved.

The containment leak rate test has been performed and preliminary calculations indicate that the leak rate is within the proposed Technical Specifications limit.

Completion Status: The concrete placement has been completed, the penetration bellows question has been resolved, and the containment leak rate test has been performed. This system will be considered complete following the installation of the reactor coolant system

leak detection equipment and upon a determination from the final calculations that the integrated leak rate is within Technical Specifications limits.

C. Engineered Safety Features

1. Emergency Core Cooling System (ECCS) (Pages 15-18)

Results of our inspection included the following:

a. Welding quality control records were incomplete.

b. Visual inspection indicated a weakness in first line quality control; i.e., weld splatter, arc strikes, and excessive grinding.

c. Accumulator check valves were not manufactured to specifications.

The applicant initiated a program for verification of proper record keeping. Our review of independent record checks which were performed by the licensee satisfied our concerns in this area and item a. above is considered satisfactorily resolved.

The applicant similarly initiated a final mechanical surface cleanup program. The inspection and cleaning were performed just prior to application of insulation. Our review in the field did not identify additional deficiencies. This program is considered to resolve weakness in first line quality control as indicated in item b. above.

The applicant initiated a program for evaluation of the acceptability of the accumulator check valves and concluded that the valves were adequate for the intended use. Our subsequent evaluations of this subject provided a satisfactory resolution for the item c. above.

Completion Status: (Page 16) Construction of the ECCS system is essentially complete. Remaining work to be accomplished includes: (1) finish surface cleanup, (2) completion of hanger and support installation.

2. Containment Spray and Fan Cooling Systems (Page 17)

Containment spray pump #21 was returned to the vendor shop due to excessive vibrations noted during the performance of preoperational testing.

Completion Status: Construction of the containment spray and fan cooling systems is nearing completion. Work remaining includes filter testing, satisfactory repair of containment spray pump No. 21 and functional testing.

3. Post Accident Hydrogen Control System (Page 17)

The post accident hydrogen control system has been installed.

Completion Status: Installation of the required hydrogen control system has been completed.

D. Instrumentation, Control and Power Systems (Pages 18-20)

2. Our initial observation was that independent quality control of cable installation was lacking. Subsequently, the applicant performed an audit program relating to cable installation conformance to pulling schedules. This audit included about 80 percent of the protection and safeguards cabling. This audit provided confidence that the cable installation conformed to the pulling schedule. Our review of this audit resolved our previous concerns.

4. Our inspection program revealed items which required additional design consideration. Each of these items has been reviewed, corrective actions identified, and the necessary revisions are nearing completion.

   Completion Status: Redundant cables for the tunnel fans have been installed and the cable surveillance program is considered to be complete. Items remaining to be completed include:

   1. Installation of remainder of separation barriers and fire stops.

   3. Installation of transite barriers at the single penetration area.

E. Radioactive Waste Control (Page 20)

A further review of the radioactive waste control system revealed that the radiation monitoring installation was essentially complete; however, the following items require resolution:

1. Adequacy of the stack monitoring sample probe location.
2. Lack of continuous monitoring for stack halogens and particulates.
3. Adequacy of the liquid waste disposal system capacity.
4. Adequacy of liquid sampling probes.
5. Need for charcoal filters in the containment building purge line.

Completion Status: The radioactive waste control system is essentially complete with the exception of the satisfactory resolution of items 1 through 5 above.

Conclusion: Based on inspections to date and the applicant's planned actions, we conclude that there is reasonable assurance that the radioactive waste disposal system will be completed in accordance with AEC regulatory requirements.

G. Conduct of Operation (Pages 21-22)

Conduct of operation as used here includes organization and staffing, preparation and review of procedures, and the administrative directives which the applicant has developed

to conduct the functional testing program and subsequent operation of the Unit 2 facility. We have verified that the applicant has established operational review and audit committees which are actively engaged in activities relating to plant startup. We have verified that the applicant has developed a program for functional testing of equipment and systems.

1. Procedure Preparation

The proposed functional test procedures have been approved for use by the applicant. We have examined these procedures on a selective basis. We have completed an examination of the program and procedures associated with fuel loading and have initiated our review of power ascension testing outlines and available procedures.

We have reviewed the index for proposed plant operating procedures and a selected number of key procedures.

Completion Status: The proposed functional testing procedures have been approved for use by the applicant. Items have been identified to the applicant for additional test coverage consideration.

The fuel loading procedures have been completed.

Eighty percent of the proposed power ascension test procedures have been approved by the applicant. The remaining procedures are receiving a final review by the applicant.

The review of the plant operating procedures index indicated that it was not broad enough in scope and the selected procedures examined did not contain an acceptable degree of detail. Specifically, the index did not contain surveillance, response to alarms, or maintenance procedures, and operating procedures were not provided for all systems involved in nuclear safety. The individual procedures contained nonspecific terms such as "normal," "appropriate," "as necessary," and "as required." The applicant subsequently initiated a program for expanding and upgrading the operating procedure scope and detail coverage. Compliance will reexamine these areas.

Preparation of functional testing, power ascension and operating procedures is scheduled to be completed prior to licensing.

2. Functional Testing

We have witnessed the performance of portions of the reactor coolant system hydrostatic, hot functional,

containment leak rate, containment overpressure and high pressure safety injection tests. We have also selectively examined the results of tests which have been completed.

Completion Status: Functional testing has progressed through the hot functional testing program and about 80 percent of the testing requirements for operating licensing have been completed.

Evaluation of functional test results by the applicant and our confirmation of the testing program completion is scheduled prior to licensing.

3. Plant Security

A review of plant security construction revealed that the following has not been completed.

a. Erection of the restricted area fence.

b. Construction of the controlled access passageways to the containment, fuel storage, primary auxiliary and emergency diesel buildings.

c. Doors and associated alarm systems.

Completion Status: Plant security construction is scheduled to be completed prior to plant licensing.

Conclusions: Based on the results of our inspection to date and responsive action taken by the applicant previously, we conclude that the administrative organization is in conformance with the application and that testing will be completed in accordance with AEC regulatory requirements.

APPENDIX A

CHRONOLOGY OF COMPLIANCE DIVISION INSPECTIONS
CONSOLIDATED EDISON COMPANY
INDIAN POINT NUCLEAR GENERATING STATION UNIT 2

Date	Type of Inspection	Scope of Inspection
11/4, 5, 24, 25/70	Site	Continued inspections of preoperational test program, mechanical system cleanup, containment closure and pipe support installation. Resolved six previously identified items of concern.
12/2/70	Management meeting	Discussed views relating to a sample review of IP-2 preoperational procedures and reviewed the proposed guidance for preoperational testing programs.
12/16/70 & 1/6, 7/71	Site inspection	Continued inspections on preoperational testing and mechanical system cleanup. Reviewed core loading and the available portions of power ascension program. Obtained resolution for nine previously identified items of concern.
12/7 - 10/70	Site	Reviewed construction log books maintained by applicant and contractors. Eighty-five questions were presented to the applicant for resolution.
1/12 & 15/71	Corporate Management	Discussed apparent deficiencies in the preoperational testing, power ascension program, and operating procedures.
1/20 - 21/71	Site	Reviewed pipe design analysis and pipe support installation.

Date	Type of Inspection	Scope of Inspection
1/20, 21, 22, 28, 29 & 2/3/71	Site	Continued inspection activity relating to preoperational testing, and power ascension programs and operating procedures. Reviewed programs relating to operator involvement and check-out of operating procedures during hot functional testing. Inspected final results of field weld documentation verification program.
2/5/71	Corporate Management	Discussed resolution status relating to previously identified deficiencies in the preoperational test program.
2/10-11/71	Site and Engineering offices	Continued inspection efforts in the areas of preoperational testing, power ascension programs and operating procedures.
2/17/71	Engineering offices	Reviewed the results of evaluations relating to pressurizer base plate and discussed the need for an expanded inservice inspection.
2/23, 24/71	Site	Continued review of preoperational test, pipe support installation and resolution of outstanding items. Discussed reactor coolant pump repairs, circulating water pump testing, and loss of off-site power.
3/5, 6, 8/71		Witnessed portions of the containment overpressure and leak rate tests.
3/10-12/71		Continued inspection efforts relating to preoperational testing, operating procedures and pipe supports. Reviewed electrical jumper and termination control program.

Date	Type of Inspection	Scope of Inspection
3/15/71	Site	Review damage to polar crane pedestal and witness a portion of the high pressure safety injection testing.
3/16/71	Engineering Office	Review status and progress of operating procedure revisions.
3/19, 23, 25/71	Site	Review resolution of construction log book review questions.
4/6, 7, 8, 21, 22/71	Site	Review preoperational testing, power ascension program, pipe support installation, polar crane repairs, organizational coverage and resolution of previously identified items.
5/4, 5, 14, 26, 27/71	Site	Review preoperational testing, power ascension programs, operating procedure preparation, implementation of security and emergency plan and resolution of previously identified items.

1 MR. KARMAN: Mr. Chairman, I would like at this
2 time, after offering all of the Staff's responses to the
3 Board's questions, as indicated within the past few minutes,
4 I would like to call upon each of the witnesses who have
5 previously been sowrn in this hearing and are prepared today
6 at the hearing, whether each of them participated in this
7 preparation of the documents entitled, Responses of the
8 Regulatory Staff, Division of Reactor Licensing, to the
9 Questions of the Atomic Safety and Licensing Board for the
10 Hearings dated January 19, March 24, and May 13.
11 I am calling particularly upon Messrs. Kniel, as
12 indicatedbefore, Mr. McCoy, Mr. Burley, and Mr. Kenneke and
13 Mr. Grill, did each of you participate in the preparation of
14 these documents?
15 MR. GRILL: No.
16 CHAIRMAN JENSCH: Will you two gentlemen come
17 forward so you will be in one group.
18 MR. KARMAN: Messrs. Burley, McCoy and Kniel,
19 I ask if each of you participated in the preparation of the
20 documentsjust identified?
21 (Chorus of "yes.")
22 MR. KARMAN: Are there any corrections or additions
23 in the documents other than those already indicated with
24 you wish to make?
25 (Chorus of "No.")

MR. KARMAN: Are the contents of these documents as corrected true and correct to the best of your knowledge?

(Chorus of "Yes.")

MR. KARMAN: Do you accept these responses as your testimony and that of the AEC Regulatory Staff in this proceeding?

(Chorus of "yes.")

MR. KARMAN: I now offer these responses as Staff's evidence, Mr. Chairman.

CHAIRMAN JENSCH: Now, I think we are going to have to have copies made so the reporter can physically incorporate them in the transcript.

MR. KARMAN: We will do so, Mr. Chairman.

CHAIRMAN JENSCH: So we will know specifically what they are.

MR. KARMAN: We will do the same on Supplemental No. 2.

CHAIRMAN JENSCH: Very well.

Any objection by the Applicant?

MR. TROSTEN: No objection, subject to a motion to strike.

CHAIRMAN JENSCH: State of New York.

MR. SCINTO: No objection, Mr. Chairman. I assume from the regulations the motion to strike is always permissible.

CHAIRMAN JENSCH: Correct.

1 Citizens' Committee for the Protection of the
2 Environment?
3 MR. ROISMAN: Same reservation.
4 CHAIRMAN JENSCH: Very well, the reservation will
5 be preserved.
6 The offer of the Staff is accepted and the responses
7 by the Regulatory Staff to the inquiries made by the Atomic
8 Safety and Licensing Board on January 19, 24 and May 13, are
9 received in evidence. It is understood that the Regulatory
10 Staff will prepare copies of responses to each of those
11 inquiries as identified, so the reporter may physically
12 incorporate it in the transcript, those responses to questions
13 posed by the Board.
14 (COPIES OF THE DOCUMENT TO BE FURNISHED BY THE
15 REGULATORY STAFF:)
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MR. KARMAN: At the first session of the hearing, Mr. Chairman, we introduced what we considered and called Joint Exhibit A, which was the index to correspondence between the Applicant and the Atomic Energy Regulatory Staff, relating to the Indian Point No. 2 plant. I would like at this time to update such testimony by filing the exhibit which would be -- this was an exhibit. I am not sure at the moment what number or letter it was given.

But I would like to supplement that with this updated index and correspondence which has already been distributed to the parties.

CHAIRMAN JENSCH: If it is related to Joint Exhibit A, maybe we can call it Supplement No. 1 to Joint Exhibit A, and -- have copies been served upon all of the parties?

MR. KARMAN: Yes, they have, Mr. Chairman.

CHAIRMAN JENSCH: It refers to Items 47 through 56, as set forth in the covering portion of that which we are now identifying as Supplement No. 1 to Joint Exhibit A.

Is that correct?

MR. KARMAN: That is correct, Mr. Chairman.

CHAIRMAN JENSCH: Is there any objection by the Applicant?

MR. TROSTEN: We have no objection to the receipt of this document, Mr. Chairman.

CHAIRMAN JENSCH: State of New York?

MR. SCINTO: Mr. Chairman, the document as with original Joint Exhibit A, was introduced for the purpose of identifying in the public record in the proceeding of the exchange of correspondence of various documents.

MR. KARMAN: These are all documents in the public record.

MR. SCINTO: And the function is to show the documents relied on by the Staff?

MR. KARMAN: That is correct.

MR. SCINTO: No objection, Mr. Chairman.

CHAIRMAN JENSCH: Citizens' Committee for the Protection of the Environment?

MR. ROISMAN: No, but there is another intervenor here and I will now speak on his behalf, and that is the Environmental Defense Fund. These items 47 to 56, at least a number of them, are the letters relating to environmental matters.

As I understand the pendency of the ruling of this Board, no non-radiological environmental matters are relevant in this case. If this is being offered in evidence, nothing related to environmental matters is relevant in the case either. For instance, just noting item 49, an AEC letter to Consolidated Edison transmitting something which purports to be an environmental statement, and the Federal Register notice

1 So do not feel that these documents which were
2 attached to those letters or even references to them properly
3 belong in this record so long as appendix D in its present form
4 remains in effect. Now the attachment is the letter and not
5 the so-called environmental statement with it. But at an
6 early hearing the Staff attempted to introduce into evidence
7 the detailed environmental statement, not for the purpose of
8 its substance, but to prove that they had complied with the
9 National Environmental Policy Act. It would be our position
10 that compliance with the National Environmental Policy Act
11 is not an issue which they are permitted to raise in this
12 proceeding unless we are permitted to challenge it.
13 As I understand it, we are not permitted to
14 challenge, it, at least not until some ruling from the court
15 comes down on the validity of Appendix D. Therefore the
16 question on the water quality certification -- that is Item
17 50, Item 49, on the environmental statement, Item 48 on the
18 Applicant's Environmental Report, 47 concerning the Environ-
19 mental Report, 51, the guide on preparation of environmental
20 reports -- all of those would appear to us to be irrelevant,
21 and we would object strenuously to having anything introduced
22 in the record regarding them.
23 Now, if there are other matters in those letters
24 that don't relate to that, and the Staff wants to submit to
25 us a letter with those portions cut out, we wouldn't object

to the introduction.

MR. KARMAN: Mr. Chairman, Mr. Roisman has a valid point. I notice there is one other typographical problem involved. At this time I will withdraw my request for the introduction of this, and at some subsequent time submit what we consider to be an appropriate amendment or supplement to Joint Exhibit A.

CHAIRMAN JENSCH: Very well. What has heretofore been described as Supplement No. 1 to Joint Exhibit A is withdrawn and we will at the present time consider that we do not have any offer of anything that purports to be a Supplement No. 1 to Joint Exhibit A.

Very well. Does that complete the offer of all documentary evidence from the Regulatory Staff?

MR. KARMAN: As far as I know at this time, that is so, Mr. Chairman.

CHAIRMAN JENSCH: Very well.

The State of New York, do you desire to introduce any documentary matters at this time?

MR. SCINTO: Mr. Chairman, the only evidence we would like to introduce would be the testimony of Mr. Sherwood Davies and he is not physically present here to substantiate it. So we will offer it when he is physically present to support it.

CHAIRMAN JENSCH: Very well.

1 MR. SCINTO: I would like to note that we have
2 served on the parties a copy of a document entitled "Supple-
3 mentary Testimony of Mr. Sherwood Davies."
4 CHAIRMAN JENSCH: Very well. It was served as of
5 today?
6 MR. SCINTO: It was served as of July 7, 1971.
7 CHAIRMAN JENSCH: Very will. It will be noted.
8 Does the Citizens' Committee desire to identify
9 or offer any documentary material?
10 MR. ROISMAN: Yes, Mr. Chairman, in conjunction with
11 two submissions which we have made, one dated June 4 and one
12 dated June 21, we have attached to those two submissions an
13 Appendix A and Appendix B, and these have been served on
14 all of the parties, identifying some 30 documents, some of
15 which are documents already in evidence in the proceeding, and
16 wehave used numbering and lettering systems for our purposes
17 so it would be clear and consistent in preparing our brief.
18 Others of them are documents that are related to this proceed-
19 ing, but which have not previously been offered into evidence
20 in the proceeding.
21 With respect to all of these -- I am sure Staff and
22 Applicant will rise to object if I misstate this -- with
23 respect to all of these, they do not have any objection to the
24 introduction into evidence, but they don't in any way concede
25 that they believe that any of the documents, except the ones

1 prepared by themselves, are relevant to this proceeding. But
2 they do object to the document identified as Exhibit AA, which
3 is a Babcock and Wilcox Report relating to spray, containment
4 spray systems.
5 If I might, I would like to offer into evidence all
6 the other exhibits, dispose of that matter, and then come
7 back and hear their objections on the Babcock-Wilcox document,
8 and argue that with the Board.
9 CHAIRMAN JENSCH: Let us see if we have before us
10 exactly the documents about which you will be speaking. Will
11 you identify again those matters? You are purporting to
12 identify and offer those documents set forth in your
13 Appendix A --
14 MR. ROISMAN: To the Submission on June 4, 1971.
15 CHAIRMAN JENSCH: Which was entitled "Statement of
16 the Factual Findings with Reference to Supporting Data?"
17 MR. ROISMAN: Yes, Mr. Chairman.
18 CHAIRMAN JENSCH: I wonder if we should give numerical
19 designations to your different exhibits so we will keep
20 them in sequence?
21 MR. ROISMAN: You mean rather than using -- they are
22 marked Exhibits A, B, C, and D, and that does tie into those --
23 in identifying the various factual issues that we contend
24 in the case, we have identified it as Exhibit A, and then
25 indicated the page we direct the Board's attention to.

CHAIRMAN JENSCH: All right. That might, rather than redesignating the entire matter, we will use the alphabetical identification for the Citizens' Committee exhibits, and if you will maintain that schedule throughout, so when you reach the end of the alphabetical, you may double up.

MR. ROISMAN: Yes, I have done that.

CHAIRMAN JENSCH: The offer has been made, then, of Exhibits A through Y as contained in a submittal by the Citizen's Committee for the Protection of the Environment on June 4, 1971.

END#6

Is there any objection by the Applicant?

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MR. TROSTEN: Mr. Chairman, the Applicant regards many of these documents of highly questionable relevancy and materiality. Nevertheless, in its interest of moving forward expeditiously with this proceeding and in light of the fundamental principle that there should be a relaxation of the evidentiary rules in administrative proceedings, we do not object to the introduction into evidence of any of these documents.

CHAIRMAN JENSCH: The Staff?

MR. KARMAN: Mr. Chairman, we too feel that many of the matters listed in Appendix A to the Citizens' Committee's offer of evidence are of highly questionable relevance to this proceeding.

We too are anxious not to cause any delay by legal arguments on some of these questions, but there are some in here that the Board certainly could take official notice of rather than having them admitted into evidence.

But in the interest of expediting the hearing, in the interest of seeing to it that this hearing is concluded in a proper manner, we will not at this time object to the introduction into evidence of these exhibits, but would like the record clearly to indicate that we do have serious questions as to the relevance of certain of the items.

CHAIRMAN JENSCH: The Board is inclined to say to the Applicant's statement in that regard we just don't want to

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be good fellows in this thing, either you fish or cut bait, and if you have some objections, tell us what they are, and we will either clear the record up or let it all in. If these things are relevant at all, it might be enough to put it in.

So maybe you both have admitted some relevancy to these documents. But we hear the complaints that the Board is letting so much evidence in. Well, it is this kind of a statement that we are hearing, well, we think it is something, but you go ahead and take it --

MR.KARMAN: I am prepared to finish or cut bait.

CHAIRMAN JENSCH: Speak, will you please.

MR. KARMAN: Exhibit B, Mr. Chairman, the Regulatory Staff sees no reason why the initial decision in the Columbia University case should be in evidence in this proceeding.

CHAIRMAN JENSCH: Proceed.

MR. KARMAN: Under any circumstances the Board can take official notice of that decision.

CHAIRMAN JENSCH: If that be the case, it can take official notice, it might be enough relevancy to let it in. I think that is kind of a procedural mechanism.

It might be easier, if it is subject to official notice, to have it in the record.

MR. KARMAN: That is it, Mr. Chairman.

CHAIRMAN JENSCH: Very well. The State of New York?

MR. SCINTO: Mr. Chairman, I am just confused a little

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bit about the nature of this offer. If there were a request for official notice, the regulations specifically provide that all of the parties have an opportunity to controvert any fact in the documents.

CHAIRMAN JENSCH: You can still do it with exhibit material.

MR. SCINTO: I just wondered, since many of the exhibits that the Citizens Committee is offering, are Atomic Energy Commission documents, I am wondering, for example, who we would controvert the information contained in those documents with, the Citizens Committee or the Staff?

CHAIRMAN JENSCH: That is something you would probably want to work out in your own office.

MR. SCINTO: The Staff has already introduced the same documents, I believe, in a couple of cases. I am just wondering what is the nature of this offer?

CHAIRMAN JENSCH: As I understand the gentleman, the Citizens Committee is offering these as relevant to his position in the case. Now, do you have objection to that offer?

MR. SCINTO: I would like to know in what manner we will have an opportunity to controvert a fact in the documents.

CHAIRMAN JENSCH: That is something you boys in the back office will work out, I am sure.

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Is there any other objection?

(No response.)

CHAIRMAN JENSCH: If not, Exhibits A through Y are received in evidence in this proceeding and will bear the identification as shown on Appendix A to the statement of proposed factual findings with reference to supporting data submitted by the Citizens Committee for the Protection of the Environment.

(The documents referred to were marked Citizens Committee Exhibits A through Y for identification, and were received in evidence.)

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CHAIRMAN JENSCH: Will you proceed?

MR. ROISMAN: Now, with respect to a document dated the 21st of June, entitled, "Supplemental Statement of Proposed Factual Findings with Reference to Supporting Data Submitted by the Citizens Committee for the Protection of the Environment," there is an Appendix B attached to that, and that Appendix B lists five additional exhibits, Exhibit Z and Exhibit AA, BB, CC and DD.

With the exception of Exhibit AA, which I would like to offer separately, so that we can have our discussion on that document, I would like to offer the other four documents into evidence.

CHAIRMAN JENSCH: Any objection by the Applicant?

MR. TROSTEN: We have no objection subject to the

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1 observation that I made previously, Mr. Chairman.

2 CHAIRMAN JENSCH: Subject to the same observation

3 by the Board, let us call upon the Staff.

4 MR. KARMAN: Mr. Chairman, the only request we have

5 of the Board is that on Exhibit Z, which is entitled, "A Report

6 to the President by the Federal Power Commission, December 6,

7 1965, Northeast Power Failure, November 9 and 10, 1965," the

8 Intervenor has indicated that pages 1 through 21 and 63 through

9 65. We ask the Board to take official notice of the entire

10 report, as we also request that the Board take official notice

11 of the entire supplemental report under Exhibit R, wherein

12 Mr. Roisman has indicated certain pages, and Exhibit W, the

13 extract from Nuclear Technology, the Journal of the American

14 Nuclear Society.

15 We ask the Board take official notice of the entire

16 report, parts of which Mr. Roisman has requested be introduced

17 into evidence.

18 CHAIRMAN JENSCH: Let's first dispose of the offer

19 by the Citizens Committee of Exhibits Z, BB, CC and DD, as

20 identified in their submittal of June 21st.

21 State of New York?

22 MR. SCINTO: We have noobjection subject to my

23 understanding that we will have an opportunity to controvert

24 factual information contained in those documents in some

25 manner.

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CHAIRMAN JENSCH: Very well. Exhibits Z, BB, CC, and DD as identified in the submittal by Citizens Committee for the Protection of the Environment on June 21, 1971, are received in evidence.

(The documents referred to were marked Citizens Committee Exhibits Z, BB, CC and DD for identification and were received in evidence.)

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CHAIRMAN JENSCH: No, in the course of passing you have a request for official notice of certain documents?

MR. KARMAN: Yes, Mr. Chairman.

CHAIRMAN JENSCH: Is there any objection to that request?

MR. TROSTEN: Yes, Mr. Chairman, I see no reason why the Board should take official notice of the expanded contents of these exhibits that Mr. Roisman has offered into evidence. He has selected from these documents the portions that appear to him to bear upon this case.

The Applicant has not had an opportunity to examine the -- did not examine the remaining portions of these documents with a view to responding to this request. And at this time we are not prepared to acquiesce in the Board's taking official notice of the contents of these documents.

CHAIRMAN JENSCH: Well, let's leave it this way: The ruling will be deferred and when you have completed your

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examination in that regard, would you volunteer when you are ready, your response in this regard and we will give consideration to the question at that time?

MR. TROSTEN: That would be fine, Mr. Chairman.

CHAIRMAN JENSCH: Very well.

Does that complete the offer by the Citizens Committee?

MR. ROISMAN: No, Mr. Chairman, there is the one document to which the Applicant and Staff are not agreeing to its submission in evidence. That is in Appendix D, identified as Exhibit AA. It is a Babcock and Wilcox report.

CHAIRMAN JENSCH: Do you have a copy of that or do we have copies?

MR. ROISMAN: I have a copy here that was supplied to me by the Staff at my request. My understanding is that a copy has not been supplied to the Board of this document, and its size encouraged me not to do it until I was absolutely certain that there weren't perhaps available to the Board other copies.

The Staff and the Applicant have advised me that they do have copies available and have seen this document. In other words, they are also familiar with it. The other parties who have not physically received a copy I have spoken to on the telephone and they have indicated that they had no objection, as long as the document was here physically for

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them to look at, and, if, after looking at it they decided they wanted a copy, I would try to make arrangements to get them a copy of the document.

CHAIRMAN JENSCH: The Board has not had a review of that document.

MR. ROISMAN: (Handing to Board.)

CHAIRMAN JENSCH: I hesitate to receive it.

MR. ROISMAN: It is not my suggestions that you read it now, Mr. Chairman, but merely that you see what document I am talking about. I am not sure that our case or the position taken by the Applicant or the Staff, that the review of the document per se is critical.

The point of contention is whether or not it is relevant in this proceeding, to introduce into evidence a document relating to spray systems, where the spray systems are not the ones proposed for this plant, but rather are spray systems being proposed for other types of plants, but a spray system which we would contend in effect has been considered in this proceeding already in the form of direct testimony of Mr. Fletcher, and which would be relevant in evaluating the spray system that the Applicant is proposing in this plant.

But if the Board prefers, and would like an opportunity --

CHAIRMAN JENSCH: Is this a containment or core spray?

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MR. ROISMAN: Containment spray. The issue basically goes to the question of whether the addition to the spray should be a sodium thiosulphate as Babcock and Wilcox proposes in this document, or should only be sodium hydroxide, as the Applicant uses in this plant.

And our purpose for introducing it is in order to demonstrate that there is evidence available to suggest that the sodium thiosulphate is a better system for controlling the release of radioactivity in the event of a major loss of coolant accident inside of the containment.

We point out that Mr. Fletcher has testified by comparing the sodium thiosulphate spray to the sodium hydroxide spray, suggesting that sodium hydroxide is superior. We believe this document sheds a contrary light on that question and we want the Board to look at it.

If the Board prefers to see the document before it receives it, I would postpone offering it at this time and arrange, after I get back to Washington, to have copies duplicated and provided to the Board of this document and we can bring it up at a subsequent time.

But I should add that that will affect a major area of cross-examination with which we are concerned.

CHAIRMAN JENSCH: I just wondered, isn't that maybe your first inquiry, to see -- is Mr. Fletcher here?

MR. TROSTEN: Mr. Fletcher is not here today, but he

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can be here tomorrow.

CHAIRMAN JENSCH: Wouldn't that develop in the course of cross-examination? He may agree with you after all, that Babcock and Wilcox report, he may agree with it.

During the cross-examination, wouldn't you be able to develop that phase of it?

MR. ROISMAN: I had not intended to call Mr. Fletcher. My concern was calling -- this was the other point of contention which we haven't come to yet. In identifying the cross-examination which we intended to do, which is included in Item 9 of our June 4th submittal, and then in our June 21st submittal we made a supplement to Item 9 and added an Item 9-F, we asked for cross-examination of the Staff personnel responsible for approving the use of sodium thiosulphate spray for the Midland nuclear plant and the Staff personnel responsible for approving sodium hydroxide spray for the Indian Point plant. It was our intention to have the Staff help us under how it was possible that two different systems, according to already introduced testimony, which are mutually exclusive and one is considered better than the other, how it was possible for the Staff to conclude that for this plant the sodium hydroxide was adequate.

So that the documents would be relevant for purposes of cross-examination of Staff witnesses, rather than Mr. Fletcher. But the Staff also objects to having those people come and

1n11 1 testify from the Staff on the grounds that it is not relevant
2 what the Staff has done in the Midland case. I think that is
3 the position of the Staff.
4 CHAIRMAN JENSCH: I think that is something we will
5 probably want to consider when the Staff witness is available.
6 But the problem is, I wonder -- we haven't heard from the
7 Applicant yet -- but I wonder whether this does not reflect
8 a document prepared by a person not here.
9 I realize you have had a lot of informal discussions
10 between you and the Applicant. For instance, I just wonder
11 about foundation evidence for any document. Maybe we should
12 hear from the Applicant.
13 Have you completed your statement of the reason for
14 your wanting to offer Exhibit AA?
15 MR. ROISMAN: Yes.
16 Let me just say this, Mr. Chairman, that with regard
17 to the question of foundation, it would be our intention to
18 put on the witness stand a person from the Staff who would
19 identify this document and state that the Staff had used it and
20 relied upon it in making its conclusions in Midland and that
21 would be the foundation for the document.
22 Our point is to demonstrate that the Staff, in its
23 analysis of the plants, has considered this report and the data
24 contained in it adequate to prove the safety of the plant would
25 be met using the sodium thiosulphate spray.

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CHAIRMAN JENSCH: In other words, your thought is that the document would be relevant as pertaining to the evidence from that Staff, but it wouldn't necessarily be binding upon the Applicant. Is that correct?

MR. ROISMAN: It is not a question of binding here. What we have in this proceeding is a case in which the Applicant and the Staff, after many months of analysis, have jointly concluded that the plant should be permitted to operate and have come here seeking an operating license.

The Applicant's analysis is based upon whatever documents it submits into evidence, but the Staff as a party has a special position in the proceeding. What we are attacking, if you will, or what we wish to explore further, is the Staff's responsibility.

I assume that where we end up is with the position that the Staff has incorrectly approved sodium hydroxide for this plant and that the Staff position is in error.

Now, of course, the Applicant could still take the position, as it would if the Staff took that position initially in the prehearing discussions, that it believes sodium hydroxide is adequate, if we could have a hearing in which the Staff and the Applicant were on the opposite sides of the issue and ultimately the Board would have to resolve that.

We seek that here too, we do not want the Applicant to confess error. We understand it will stick to its sodium

ln13 1 hydroxide system to the end. We hope when the Staff witnesses
2 get on the stand, he will support our position and that the
3 Board will agree with the Staff and Intervenors that the sodium
4 thiosulphate spray should be used here and order that the change
5 be made and that the operating license be denied.
6 So in that sense I am not certain as to how that
7 responds to your suggestion that it is not relevant to the
8 Applicant. I assume they will stick to their guns.
9 CHAIRMAN JENSCH: Well, the problem I have is
10 foundation evidence for any document prepared by other than
11 a party to this proceeding. Does the Applicant care to speak
12 to that?
13 MR. TROSTEN: Mr. Chairman, our position on this
14 matter is set forth in a letter of July 8th to the Board. In
15 our letter, we stated that our fundamental objection to the
16 Citizens Committee's offering into evidence this Babcock and
17 Wilcox report is that they are attempting by offering this
18 into evidence to demonstrate that the spray additive proposed
19 by a competing vendor is superior to the additive which is in
20 use in, or is proposed to be used in the Indian Point 2 plant.
21 Our position on this matter is that the Citizens
22 Committee misconceives the issue that is before the Board in
23 this proceeding. The issue is whether or not the sodium
24 hydroxide spray which the Applicant has proposed is adequate
25 and meets the standards and requirements of the Atomic Energy

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Commission. We are prepared to be cross-examined.

Mr. Fletcher is available to be cross-examined by Mr. Roisman concerning the adequacy of the sodium hydroxide spray and he is entirely free to cross-examine with respect to evidence introduced by Mr. Fletcher, testimony of Mr. Fletcher, and the B&W Report which he refers is available to him and he can cross-examine Mr. Fletcher with regard to the sodium hydroxide spray, based upon the information contained in the B&W Report.

We object, however, to the introduction of the B&W Report for the purpose that Mr. Roisman intends to use it, to show that the Applicant is required somehow to include a system in this plant which is better than the system we now propose to use, regardless of the adequacy of the system that we are now using.

In essence, Mr. Chairman, this is the reason why we are objecting to what Mr. Roisman is proposing to do.

CHAIRMAN JENSCH: The Staff?

MR. KARMAN: Our position is, Mr. Chairman, that the Applicant has submitted in its request for licensing on the Indian Point 2 plant a sodium hydroxide spray system which was evaluated by the Staff and we have a witness who will certainly be prepared to testify as to his part in the evaluation of the sodium hydroxide as a spray additive in this plant.

ln15 1 I really feel that bringing in the Midland plant
2 or mixing apples and oranges with other plants is not relevant
3 to this particular hearing and the introduction of the Babcock
4 and Wilcox Report would lead this Board astray in its determina-
5 tion to evaluate and to judge the evaluation of the spray
6 additive which we are dealing with in Indian Point 2.
7 MR. ROISMAN: Mr. Chairman, may I just say briefly
8 a couple of things. I didn't want to anticipate all of the
9 arguments, although I had some idea what they would be from the
10 Applicant and the Staff. Let me respond first to Mr. Trosten's
11 suggestion about whether it is relevant in this hearing that
12 we come up with the best rather than merely a good system
13 for control of radioactivity in the event of a major accident
14 inside the reactor.
15 First of all, there is substantial doubt about the
16 effectiveness of the spray systems generally, the proceeding
17 in Indian Point No. 3 is an example, and if we have a comparable
18 spray system here.
19 Those doubts can in part be resolved in a better
20 additive is used for the spray, because then we can give a
21 higher credit to the spray that is being used if it is more
22 effective.
23 In addition, one of the issues which was in the
24 Indian Point No. 3 hearing and which will be in issue here is
25 whether or not, when you use a spray, the fact that you are

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in effect, washing the inside of the containment prevents any credit to be given for plate out, the iodine being released from the reactor vessel itself, adhering to the walls of the containment.

Now, if there is better additive that can be used that will reduce iodine more quickly, it may be possible to use less washing and it, therefore, may be possible to have more or some plate out. So we think even the question as to whether we are looking for the best is a question that is relevant in this proceeding, because we are not dealing with an absolute.

The safety of the plant as it relates to the spray system is an improbable and has a lot of questions in it, that still remain unanswered. We think when the Board ultimately has to conclude in this proceeding whether or not to issue a license for the plant, it is going to be telling us, certainly in part, with the question of the effectiveness of the spray system.

And we think it would be relevant for the Board to know that there might be a system which would give a better removal of iodine from the system.

Secondly, I was surprised to hear the Staff take the position that making the considerations at this plant with considerations at other plants is the mixing of apples and oranges. The Staff Safety Evaluation which is in evidence

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here is replete with references to other plants and the Staff's analysis of other plants being used with reference to this plant.

This very answer submitted on July 12th relating to the spray system used as the basis for comparing this spray system and its effectiveness test run at the Zion nuclear power plant. Now, if the Staff considers it relevant to talk about the Zion plant, we think it is relevant to talk about other pressurized water plants.

It is true that Zion was a Westinghouse plant and Babcock and Wilcox's Midland plant is another one. But that seems to me sort of a question for the marketplace and not for this proceeding. We are trying to come up with a safe plant, or determine that this one can't be safe. And the Staff has already in effect conceded that what goes on at other plants is relevant here.

We would like to have an opportunity to discuss what is going on with the Babcock and Wilcox spray system. If not -- I might add that at present the very same position is being taken in the Midland hearing on the opposite side, namely, that it is relevant in evaluating Midland to have the Westinghouse documents present, and the same oppositions are being given by the Staff and Applicant in that proceeding.

The position in which Intervenors are left is the position that there is no place where we can have a Board made

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1 up of technical people as this Board is, sit down and make
2 a judgment about what nuclear plants ought to be. Yet this is
3 occurring at the very time when the AEC is beginning a new
4 program to develop national safety standards, standards that
5 will be applicable to all plants.
6 And we find it anomalous that the Staff here should
7 take the position that we should fragment the plants, and
8 close our eyes to developments that are going on at other
9 plants, while at the same time in their other capacity as a
10 regulator of nuclear power, they are telling us that we ought
11 to start having national standards on radiological releases,
12 on welding standards and so forth and eventually some day they
13 will come up with a national standard for spray.
14 We want this plant to have the benefit of that
15 analysis.
16 CHAIRMAN JENSCH: I think this compartmentalizing
17 technology is exceedingly difficult.
18 MR. KARMAN: Mr. Chairman, what I wanted to say
19 was when I discussed apples and oranges and mixing plants,
20 I specifically meant that we would certainly refer to other
21 plants with similar systems. I don't think Mr. Roisman would
22 indicate that the two spray systems are similar.
23 CHAIRMAN JENSCH: Well, the systems are the same,
24 but the solutions are different. Is that about it?
25 MR. KARMAN: It doesn't bother me.

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CHAIRMAN JENSCH: Well, that is what I understood.

As I understand Mr. Roisman, he is saying that we are talking about how to have an effective spray in the containment.

MR. KARMAN: Exactly. That is the position we are taking, that we are ready to prove that in our evaluation of this plant, that there is and will be an effective spray.

CHAIRMAN JENSCH: Yes. And I suppose in what is effective, you consider what is available for sprays. I mean I think we get into the gimlet eye like the eagle, he sees everything except which is around him.

(Board conference.)

CHAIRMAN JENSCH: The Board has been giving some consideration to this matter. The Board has great difficulty in understanding that we are going to focus only on sodium hydroxide when we are talking about what is a good containment spray.

My recollection of some of the records in these proceedings is that even plain water has been considered as a spray and maybe rejected because as it goes through the sump, it reaccumulates the material again.

So there are several solutions, mixtures of some kind that seem relevant to the Board. We do not believe that the Intervenor, Citizens Fund, is limited to only talking about sodium hydroxide and must not mention any other solution.

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Maybe you can drop something else in the water solution, whether it be sodium thiosulphate or hydroxide or just plain water, I don't know, but we think the subject matter is open for comparison in order to determine what is a good spray.

We are bothered at the moment by lack of foundation for the document. It may be it will develop in the course of cross-examination or some foundation evidence could be submitted at some time. But we do not believe the document in and of itself is admissible at least at this stage, but we do believe the entire containment spray subject is open to many variations.

The objection is sustained for the moment to Exhibit AA, but we emphasize that the subject matter is open for thorough investigation, whether it is sodium hydroxide, sodium thiosulphate, plain water or if you drop some mud in it.

Is there any other matter we can consider before we take a noon recess and come back for cross-examination?

Has everybody offered everything they intended to offer at this time? Subject to what changes they may make in the course of the presentations?

MR. TROSTEN: We have, Mr. Chairman.

MR. KARMAN: Is there a question, Dr. Briggs?

CHAIRMAN JENSCH: I am asking has everybody offered all that they intend to offer? Once we hear from the parties, we will give you a question.

To be specific, we received -- I don't know whether

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this is a computerized --

MR. KARMAN: We will get you a substitute, Mr. Chairman. This is an attachment to the responses filed this morning. This is an attachment to one of our responses to a Board question.

CHAIRMAN JENSCH: It was not attached, and that is why we wondered. Maybe we will have to go through this again to see what it is. Which one is it attached to? Have the parties directed their attention to that in their consideration of objections?

MR. ROISMAN: I think it is the Staff submittal dated July 12th.

MR. KARMAN: This is the one with respect to the questions of Board dated May 13th, which our response is dated July 12th.

CHAIRMAN JENSCH: What answer specifically? What was the question?

MR. KARMAN: This was the Question No. 4 on page 756 of the transcript.

CHAIRMAN JENSCH: Which said what?

MR. KARMAN: Quoting, I believe, the Chairman of the Board on the Water Reactor Safety Program, Mr. Chairman, wherein you request certain information on the Research Program.

CHAIRMAN JENSCH: What does the question specifically

ln22 1 read?

2 MR. KARMAN: It is a very long one, Mr. Chairman. If
3 you would like me to read it, I will.

4 CHAIRMAN JENSCH: I recall there was a question
5 asking for an updating of your water safety --

6 MR. KARMAN: Yes, the Chairman asks, "By the way,
7 isn't there a document at all in the Atomic Energy Commission
8 that summarizes, say, on an annual basis what is being done
9 on the research and development work other than what is reflected
10 in the actual report to the Congress which is as I read it
11 quite general in nature?"

12 I think this exhibit might be somewhat more
13 specific, Mr. Chairman.

14 MR. BRIGGS: Mr. Karman, is this a status report on
15 all the research and development that is being done in the
16 Safety Program?

17 MR. KARMAN: On the Water Reactor Safety Program,
18 yes, Mr. Briggs.

19 MR. BRIGGS: Thank you.

20 CHAIRMAN JENSCH: There is nothing more than what
21 you have reflected in this document, is that correct?

22 MR. KARMAN: I am sorry, Mr. Chairman. I didn't
23 hear you.

24 CHAIRMAN JENSCH: There is nothing more to report
25 in reference to the Safety Program of water reactors other than

ln23 1 reflected in this -- I take it this is a copy of abstracts --

2 MR. KARMAN: These are all contracts which are,

3 contracts relating to water reactor safety.

4 CHAIRMAN JENSCH: This is a description of what the

5 contract undertakes to perform?

6 MR. KARMAN: These are progress reports, Mr. Chairman.

7 CHAIRMAN JENSCH: Now, I just turned to one here.

8 The full length Emergency Cooling Heat Transfer Reflector

9 Program, the computer number is 1020900, page 01, 06-22-71.

10 Progress. The progress is dated September, 1969, "Tests on

11 stainless steel clad heater bundles were performed to obtain

12 data to prescribe a performance surface for ECC operations" --

13 I presume that is emergency core cooling operations --

14 "for both BWRs and PWRs." I take it those are boiling water

15 reactors, and pressurized water reactors, -- "one BW core

16 unit and a section of a PW core unit were represented by

17 bundles consisting of a square seven by seven pin arrays.

18 "Two bundles consisting of the zircaloy type were

19 tested in the PWR configurations to demonstrate emergency

20 core cooling effectiveness."

21 Now, is there something more on the effectiveness

22 core cooling that we don't have? I mean this describes what

23 they undertook to do, what the results were, how the figures

24 worked out, 0654, or something. This is a conclusionary

25 type of description of what they did without any data.

ln24 1 I just wonder if this brings up to date, as of
2 Project Code 1020900, as of 06-22-71, all there is on emergency
3 core cooling effectiveness? Maybe this is the Senior Task
4 Force data.
5 MR. KNOTTS: Mr. Chairman, I think you are talking
6 about a roomful of material.
7 CHAIRMAN JENSCH: Yes, that is what I was wondering
8 if there was something that could be specific to tell us -- for
9 instance, take this paragraph I just happened to turn to.
10 "Tests on stainless steel clad heater bundles were
11 performed to obtain data." Isn't there some summary of the
12 data? I mean this looks like a road guide without being on the
13 road.
14 MR. MC COY: Mr. Chairman, we could furnish you
15 the report associated with each of these projects. Not today.
16 CHAIRMAN JENSCH: It isn't going to help me a bit.
17 It is the public record I am thinking of, and the public
18 record is looking for some data. As I say, it would take a --
19 I hate to use this name, because I might be emphasizing it --
20 Mobil gas and Gulf oil roadmap, you have to drive out on the
21 road to see what is on the road, and it won't help this
22 record if we likewise get references to other reports.
23 I thought there would be something as complete as
24 this document which the Staff mailed out this spring, as I
25 recall it, this Water Safety Program was sent in, as I took

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it, to tell us about the safety work at the Commission. They have some statistics here. And this seems to be of same general character as the so-called WASH-1146, Water Reactor Safety Program Plan, that is the plan, and where is the performance?

This says yes, we have made a test.

MR. KNIEL: I believe this submittal does include summaries of performance of tests. Where you are reading, if you look at the next page, there is a summary of what the results of the tests indicated. This is a compilation of all of the work that is being done and there is an attempt made here to summarize what results were obtained also, in addition to what the work was.

CHAIRMAN JENSCH: For instance, just let me take as an example, I understand that the Idaho Nuclear Corporation has come up with recent reports on emergency core cooling effectiveness. Is that reflected in the computer summary?

MR. KNIEL: Yes, sir, the computer summary should be up to date as of the date on the top of the page.

CHAIRMAN JENSCH: That is, it will show that in, what was it, February or March that they found that according to these tests, which I understand have been described as small scale and not likely to be subject to extrapolation, and are unreal in reference to the real size of the core, and cannot be used in fact very generally, but does this computer summary

ln26 1 show those data, that the water does not reach the core under
2 temperature conditions?
3 MR. KNIEL: That is correct, Mr. Chairman.
4 There is an entry entitled, "Semiscale Blowdown in
5 LCC," which describes some of that work.
6 CHAIRMAN JENSCH: Can you tell us what page?
7 MR. KNIEL: The project code number is 102 --
8 CHAIRMAN JENSCH: Give the page number, if you will.
9 MR. KNIEL: Unfortunately all of these are separate
10 summaries, they aren't sequentially page numbered.
11 CHAIRMAN JENSCH: Just give us the number in the
12 upper left.
13 MR. KNIEL: It is about two-thirds of the way through
14 the output there, and the top number is 1021724.
15 CHAIRMAN JENSCH: I don't mean that.
16 There is a red numeral designation on the very
17 upper left of a double sheet and if you can find what number
18 that is, we can turn to it, even though it is not in sequence.
19 MR. ROISMAN: Mr. Chairman, the project numbers do
20 run in consecutive order. Looking through from 102, then 17,
21 then 24.
22 CHAIRMAN JENSCH: What is the number, 102?
23 MR. ROISMAN: 102 and then the whole first group of
24 these are 102, first 101, then 102s, and in the 102s it moves
25 from 01 through -- it is 102-1724.

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CHAIRMAN JENSCH: On the outside I have 4673 on the double sheet for 102-1724, semiscale blowdown in ECC.

MR. KNIEL: That is correct.

CHAIRMAN JENSCH: Are there several semiscale blowdown reports in this collection, do you know? I am having a little difficulty matching that section to which I referred with the numerical designation on Mr. Kniel's copy.

I have 4673 on the double sheet on the outside of 102-1724. This report that I have, 10-1724, semiscale blowdown in ECC, progress," is May, 1970, September, 1970, and January, 1971. I understood that the Idaho nuclear semiscale blowdown tests were March and April, 1971.

Are those reports in here someplace?

MR. KNIEL: If you look at the last sentence of that entry, I think that is the result you were looking for that was reported in these other reports you refer to.

CHAIRMAN JENSCH: The last sentence, "No significant amount reached the core during the blowdown and less than 10 percent remained in the vessel after blowdown."

Is that the sentence?

MR. KNIEL: That is the sentence I am referring to, I don't know if that is the result you are referring to.

CHAIRMAN JENSCH: I am not looking for any result, I am just looking for the complete report. I understand this is supposed to reflect as of June 22, 1971, it does not reflect

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whatever was reflected by the Idaho reports for February, March and April, 1971. So I wonder how up to date it, in fact is.

MR. KNIEL: This is the most up-to-date compilation of a summary of the results of all of the water reactor safety programs that is available. Naturally there are individual reports for individual work that could be used in specific areas to supplement this information.

CHAIRMAN JENSCH: Then it isn't up to date as to June 22, 1971, which it purports to be as shown by the upper right-hand dating on that report for Project Code 102-1724?

MR. KNIEL: It is probably up to date with respect to the reporting that is made to this particular --

CHAIRMAN JENSCH: Machine.

MR. KNIEL: That is correct. The compilation can't follow on a day-to-day basis the work that is going on in all areas everywhere.

CHAIRMAN JENSCH: These are the problems I am just asking about computers. I understood this was supposed to be up to date as to June 22nd and you say we just can't do it up to date.

Is that what you are saying?

MR. KNIEL: This is the best compilation that we have in response to your question about a compilation of the Water Reactor Safety Program.

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CHAIRMAN JENSCH: Thank you.

MR. BRIGGS: This Water Reactor Safety Program, this follows the Water REactor Safety Program Plan, is that right?

MR. KNIEL: Yes, sir, that is correct.

MR. BRIGGS: And that involves participation by industry as well as AEC funding the programs? Well, the question goes on like this: This Project Code No. 101-1145 has to do with incipient failure detection system development. And the reports progress here for January and May, 1970, on acoustic analysis crack detection and location system.

And then it says September, 1970 program not funded for FY '71.

On the other hand, in the Applicant's evidence there are answers to Board's questions. He has provided here a paper from the Heavy Section Steel Technology Program for March 25-26, 1971, in which there is considerable discussion of acoustic detection techniques and the program that is involved in perfecting this technique, yet that does not seem to be included in your compilation here.

Is this compilation only AEC-sponsored work that you have provided us with?

MR. MC COY: This program is sponsored by Reactor Development and Technology. The actual conduct of the tests may be conducted by industry or other AEC laboratories.

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But there is contact with the Division of REactor Development and Technology.

CHAIRMAN JENSCH: I think it is the same problem we have about foundation evidence. How was this prepared? What is fed into the computer? Where did you get the data? Is it all AEC? I think what Mr. Briggs is asking are these AEC contracts?

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MR. MC COY: Yes, they are all AEC contracts.

CHAIRMAN JENSCH: In other words, the AEC executes contracts on safety and some of the work is done in the AEC laboratories and some of it is done by Westinghouse, for instance, on Westinghouse reactors, is that right?

MR. MC COY: That is correct.

CHAIRMAN JENSCH: Then the results say from Westinghouse as to the safety of their reactor is reflected in this compilation here, is that correct?

MR. MC COY: In those particular instaces, yes.

MR. KNOTTS: Mr. Chairman, I don't believe that that situation could arise under the Commission's requirements on organizational conflict of interest.

CHAIRMAN JENSCH: What work would Westinghouse then do on safety?

MR. KNOTTS: Mr. Chairman, I am not in a position to say what work Westinghouse would do on safety but I am sure Westinghouse could not be put in a position of evaluating the safety for AEC as an AEC contractor.

CHAIRMAN JENSCH: I think that is something we should--if you don't know what work is being done, I am having difficulty accepting your conclusion.

MR. KNOTTS: Mr. Chairman, there are detailed requirements in the Commission's Manual to avoid organizational conflicts of interest. You are suggesting a

DB-2

1 possible conflict of interest. I am saying there are require-
2 ments to prevent such a conflict of interest.
3 CHAIRMAN JENSCH: I am glad to be informed of
4 that. I just would like to know then what is the safety work
5 that Westinghouse does. Does Westinghouse work up the safety
6 of the General Electric reactors and vice versa? What work
7 do they do? You see what I mean. If this is a safety
8 program and we know some of it was done by various organiz-
9 ations, I know we don't want a conflict of interest, but what
10 is it Westinghouse does, if it doesn't test their own
11 reactors? If they are not -- maybe we have got a foundation
12 for the document here, Mr. Roisman's Babcock and Wilcox stuff,
13 and maybe what really Babcock and Wilcox is reporting in
14 their document is something Westinghouse did.
15 MR. KNOTTS: Perhaps I got us off on the wrong
16 foot in talking about evaluating somebody else's system.
17 What we are talking about here is research and development,
18 which should be generally applicable research and development.
19 It is conceivable that one manufacturer or one company
20 somewhere in business could be doing research and development
21 work generally applicable to all systems, including its own.
22 Thatis conceivable.
23 CHAIRMAN JENSCH: Well, would Westinghouse, which
24 is a pressurized water manufacturer, be doing boiling water
25 reactor safety?

jrbl

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MR. KNOTTS: It is conceivable that Westinghouse could do something that was applicable to boiling water reactors. I don't know what the facts are. It is perfectly conceivable that something to do with metallurgy, let's say, would be done by a company such as Westinghouse, that would be applicable to components of the facility manufactured by another company, such as GE.

CHAIRMAN JENSCH: In other words, you are supporting Mr. Roisman, as far as Babcock and Wilcox and containment spray, they might be doing research and development that would be applicable to a pressurized water reactor made by Westinghouse. Is that what you are saying substantially?

MR. KNIEL: I think the water reactor safety program is run by the reactor development division of the AEC, not by the regulatory staff.

CHAIRMAN JENSCH: We understand.

MR. KNIEL: All right. Their criteria for selecting who is going to do what work is based on who is best qualified to do that work. And I think it is pretty much independent of any question of what kind of reactor they are building. Certainly the technology of boiling water reactors and pressurized water reactors is not mutually exclusive.

There are many broad areas that are common to both types of reactors. So I don't see what the problem here is.

CHAIRMAN JENSCH: The problem is does this compendium

include for instance Westinghouse, safety research on Westinghouse reactors?

MR. KNIEL: It includes any work that the Reactor Development Division sponsors at Westinghouse, that is correct.

CHAIRMAN JENSCH: We understand your general statement. Let's be specific:

Does Westinghouse do research and development on the safety of Westinghouse reactors, do you know?

MR. KNIEL: Yes, in specific cases. You mentioned a case, the Flecht Test. Westinghouse is working on part of that program, the Flecht Test.

CHAIRMAN JENSCH: Is Westinghouse working on the emergency core cooling research and development?

MR. KNIEL: That is part of the emergency core cooling system research and development, the Flecht test.

CHAIRMAN JENSCH: Are they doing the semiscale blowdown tests on the emergencu core cooling for instance?

MR. KNIEL: No, the project you refer to there is being done by Idaho Nuclear.

CHAIRMAN JENSCH: Only?

MR. KNIEL: That is correct. They may do certain work in that general area on blowdown. They have always been interested in it. It is hard to design a reactor without doing some background work. But that particular project you refer to is being done by Idaho Nuclear.

1 CHAIRMAN JENSCH: Is there another project that
2 Westinghouse is doing on emergency core cooling, aside from
3 that; do you know?
4 MR. KNIEL: On blowdown?
5 CHAIRMAN JENSCH: Yes, emergency core cooling; I
6 don't know whether it is a blowdown or not. They talk about
7 the water leaving the core.
8 MR. KNIEL: They have participated in the Flecht
9 test, and that is part of the emergency core cooling. They
10 may have participated in others, I am not sure.
11 CHAIRMAN JENSCH: Well, it is beyond the reporter's
12 time for a rest, beyond our usual noontime rest. I don't
13 know whether the parties want to consider foundation considera-
14 tions over the recess and we can take it up after lunch.
15 MR. ROISMAN: Just to answer your question, Mr.
16 Chairman, since we have two documents in evidence, both of
17 which fit the category of questions you asked, the Citizens'
18 Committee for Protection of the Environment Exhibits U and
19 Q are both Westinghouse documents performed with regard to the
20 safety of nuclear power plants under contract with the AEC
21 directly, or with a contractor of the AEC in subcontract to
22 Westinghouse.
23 One is the heavy section steel technology program
24 report dated August, 1970; and the other is the topical
25 report, Performance of Zircaloy Clad Fuel Rods During a

Simulated Loss of Coolant Accident, Single Rod Tests; and they both indicate on their covers that they are performed under contract with the AEC, or under subcontracts to contractors with the AEC.

CHAIRMAN JENSCH: Let us give further consideration to this Appendix to the Staff answer after our noon recess. At this time let us recess to reconvene in this room at 2:15.

(Whereupon, at 12:40 p.m., the hearing was recessed, to reconvene at 2:15, p.m., this same day.)

END#8

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AFTERNOON SESSION

(2:15 p.m.)

CHAIRMAN JENSCH: Please come to order.

MR. KARMAN: Mr. Chairman, a bit of a housekeeping problem, sir. On the matters which we offered for introduction into evidence this morning and which the Board ruled should be incorporated in the record, the answers to the Board questions, Supplemental No. 2 to the Safety Evaluation, we do not have sufficient copies to incorporate them in the record.

Of course, we are at a disadvantage being far from our home base to have additional copies made for the Reporter to have those incorporated in the record of today's proceedings

Might it possibly be a good idea to have them as exhibits rather than directly incorporated into the transcript?

CHAIRMAN JENSCH: I appreciate the difficulty, but I think most users of the transcript would like to see the complete Staff presentation just as they have it from the Staff Safety Evaluation.

I think this, the daily copies that are furnished today could be supplemented when you have copies. The other copies that the Reporter will make up probably won't be until a time when you will have the copies and can give them to them.

When we receive the daily copies, we will keep a note that you will supplement it and we will put it into the transcript.

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(Supplemental No. 2 to the Safety Evaluation will be furnished at a later date.)

MR. TROSTEN: Mr. Chairman, mindful of the Board's request that the witnesses remain present this morning, nevertheless, I would like to ask if it would be acceptable to the Board if Mr. James Moore were excused for the rest of today and for tomorrow.

Mr. Moore was present in order to sponsor evidence on the emergency core cooling system and to answer questions on that matter. Since it appears extremely unlikely that there will be questions addressed to him this afternoon and tomorrow, I would like to ask the Board's permission to have Mr. Moore excused.

CHAIRMAN JENSCH: Any objection from the Staff?

MR. KARMAN: No objection, Mr. Chairman.

CHAIRMAN JENSCH: The State of New York.

MR. SCINTO: No objection.

CHAIRMAN JENSCH: Citizens Fund?

MR. ROISMAN: No objection, Mr. Chairman.

CHAIRMAN JENSCH: Very well. We will, in fact, for any witness try to set definite times if we can for appearance and we can make minor adjustments if he does not have to be here at that time.

Mr. Moore may be excused for this afternoon and tomorrow.

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(Witness Moore excused.)

CHAIRMAN JENSCH: Before we recessed at lunch, we were considering this summary of the results or the reports which have been submitted for the Water Reactor Safety Program Plan. I take it from the discussion that this summary which the Staff has submitted reflects all that the Information Center, if I may use the term, at Oak Ridge has accumulated for presentation in this form.

MR. KARMAN: That is correct, Mr. Chairman.

CHAIRMAN JENSCH: There may be some additional reports, but at least they have not been reflected in this Information Center arrangement.

MR. KARMAN: Yes, sir.

CHAIRMAN JENSCH: Is there any objection to these summaries, as shown in this tabulated form, being considered a part of the response by the Staff to the questions from the Board dated May 24th?

MR. KARMAN: I believe this was May 13th, Mr. Chairman.

CHAIRMAN JENSCH: May 13th.

Is there any objection on behalf of the Applicant?

MR. TROSTEN: We have no objection, Mr. Chairman.

We have not had an opportunity to review these documents as yet, of course.

CHAIRMAN JENSCH: Would you prefer your review before you state your position?

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MR. TROSTEN: No, our position is that these may be considered part of the response, and considered in evidence, subject to our usual right to move to strike, if necessary.

CHAIRMAN JENSCH: Very well.

State of New York?

MR. SCINTO: No objection, Mr. Chairman.

CHAIRMAN JENSCH: Citizens Committee?

MR. ROISMAN: Mr. Chairman, I think our response somewhat depends upon what it is the Staff is doing with the document. In answer to the question asked on the 13th of May and responded to in a submission dated July 12, 1971, the answer defines what this enclosed tabulation is.

It says, "The progress associated with various water reactor safety contracts outlined in WASH-1146 is discussed in the enclosed tabulation." I got the impression from the questions asked by the Chairman in the morning session that there may be some items that are in WASH-1146 which are not discussed in the enclosed tabulation and it is conceivable, I guess, that the enclosed tabulation includes some items not in WASH-1146.

We would prefer if the Staff would identify this document more accurately. As I understand it, it is a printout from a computer that is at the Oak Ridge National Laboratory and we would rather have it identified as what it is purported to be vis-a-vis that computer.

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Our only interest in making that point is merely not to be foreclosed from arguing at some subsequent date that the Staff had not fully investigated current water safety reactor programs and there were other reactor safety projects under contract with AEC that were relevant.

I would note, for instance, that the Board's point about the emergency core cooling system reports seem to indicate that there was only a single test in which there was a failure or apparent failure of the emergency core cooling system when as all of the parties are aware and the Board is aware, there apparently were several tests in which that occurred.

I wouldn't want to have this computer printout cited back to us at some subsequent time as being evidence of the fact that this is all that there was to say on the programs regarding emergency core cooling testing.

In addition, the date that appears on here, 6-22-71, seems to me should be qualified to indicate that all that is is the date that the computer program was run, and the printout came.

And it does not purport to say that everything that is in here was what had occurred before June 22, 1971. Clearly many of these programs stopped much before that date and I assume that the computer could have been more updated.

We also haven't had a chance to look at it in detail,

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and we would want to reserve our rights as to other matters.

But perhaps the Staff could be a bit more explicit in defining what this enclosed tabulation is in introducing it into evidence.

CHAIRMAN JENSCH: Well, I understood from Mr. Kniel's statement just a moment ago that this reflected all that the computer has had put into it, and it is the best that the Staff has for assembly in response to WASH-740 outline. There may be additional documents, as I understood Mr. Kniel to say, which had not yet been fed into the computer and, of course, this would have to be understood as being deficient in that regard, but that is the best the Staff has.

MR. KARMAN: From the information given to me, Mr. Chairman, this printout from Oak Ridge includes all projects on file at the Oak Ridge computer laboratory at the time of the printout.

CHAIRMAN JENSCH: That does not mean there aren't further reports?

MR. KARMAN: That is correct, sir.

MR. ROISMAN: I just want to make clear then, is Mr. Kniel's testimony earlier in effect a supplement to or clarification of the written answer that is in the document that we received yesterday from the Staff and is to be treated that way?

CHAIRMAN JENSCH: I would assume so. Is that correct?

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Whereupon,

KARL KNIEL

resumed the stand as a witness and, having been previously duly sworn, was examined and testified as follows:

MR. KNIEL: Yes, Mr. Chairman.

I think, addressing one of the points made by Mr. Roisman, the summaries do address the date of the work that was done, in other words, all of the work that is summarized is started with a date, each paragraph. So I think the date of the work is carefully distinguished in this compilation as opposed to the date on the top of the page which is the date it was printed out on the computer.

MR. ROISMAN: Subject to that, we would reserve our rights as we have all along and not object to the introduction at this time.

CHAIRMAN JENSCH: Very well. This tabulation perhaps can be physically attached to the typed response that the Commission has heretofore submitted and for which we have provided that it will be physically incorporated within the transcript, so that the transcript will not only have the written page, but also this will be considered as an attachment.

MR. KARMAN: Yes, sir.

(The document will be furnished at a later date.)

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CHAIRMAN JENSCH: Does that complete the offer of all documentary evidence and are we ready to proceed with cross-examination?

Very well. The Staff I think and the Applicant have indicated that their years of work on this thing have exhausted at least the Staff inquiries. We will turn the cross-examination over to the Citizens Committee for the Protection of the Environment.

What witness is first?

MR. ROISMAN: Mr. Chairman, the first witness would be Mr. Wiesemann.

CHAIRMAN JENSCH: Mr. Wiesemann, will you come forward please?

Whereupon,

ROBERT A. WIESEMANN

resumed the stand as a witness and, having been previously duly sworn, was examined and testified as follows:

CHAIRMAN JENSCH: Mr. Wiesemann is seated at the table. I might suggest that if you have any books or notes you want to get, feel free to stop in the course of the interrogation to get them.

THE WITNESS: Yes, sir.

CHAIRMAN JENSCH: Will you proceed, please?

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MR. ROISMAN: Mr. Chairman, I can't remember from earlier, I think Mr. Wiesemann has been sworn in before.

CHAIRMAN JENSCH: That is my recollection.

CROSS-EXAMINATION

BY MR. ROISMAN:

Q Mr. Wiesemann, just to keep the record straight, would you state again who you are, for whom you work, and what your connection with the Indian Point No. 2 plant has been?

A My name is Robert A. Wiesemann. I work for Westinghouse Electric Corporation. There is a minor change in my qualifications since they were submitted earlier. I am presently Manager of Special Licensing Projects.

In that capacity I am responsible for the Westinghouse participation in this public hearing.

Q What precisely was the work you did with regard to the Indian Point No. 2 plant? I don't mean day by day, but your responsibilities?

A I have been involved in the reactor safety aspects of engineering for the past approximately ten years and for a considerable period of that time I was Manager of Licensing Engineering in which safety evaluations were performed and it was during that time that the Indian Point Unit 2 plant was granted the construction permit and subsequently Indian Point Unit No. 3 and I held that position until November of 1970.

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So I think that puts it in a time span context.

Q Were you in effect the chief Westinghouse person working on reactor safety related to the Indian Point No. 2 plant?

A No, I was not the chief.

Q Who was your chief -- I don't mean some vice president, that was not directly involved with the work on the plant?

A At what time?

Q At the time you were evaluating safety for the Indian Point 2 plant or did that change during the course of your work?

A It changed during the course of my work.

Q Was that person or were those persons people who were directly connected with the plant in terms of sort of the day-to-day review of it, or were they more in a supervisory capacity?

A They were involved in the day-to-day aspects of the safety.

Q Mr. Wiesemann, let me indicate to you where it is I am going in this cross-examination, so you will understand what it is about.

What I would like to do is explore with you an answer that was given to a question which we asked of the Applicant and which the Applicant identified you as the person who had given or was responsible for giving the answer.

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The question related to the concept of what does the word "probably" mean. What I am attempting to discover today from you is how does the use of the term "probable" enter into your evaluation of the safety of this particular plant and what do you mean when you use the term "probable"?

In particular, the question with which I am concerned is in the Citizens Committee Exhibit H, Part 1, Question 1. I will read the question to you and the answer and ask you if this is your question and answer. The question: "In Answer C-1," that was to an earlier interrogatory, "you used the term probability. Define this term as it is used in the answer.

"Is there any possibility of an explosive rupture of an element of the primary loops?"

Answer: "In the answer referred to it was stated that 'the conservatism in the design and in the manufacturing process combined with careful operation, strict quality control, and quality assurance during every facet of the design and manufacturing process and a responsible in-service inspection program eliminates the problem of an explosive rupture of the reactor vessel for large elements of the primarily loop.

'Applicant is aware of no catastrophic failure of nuclear grade vessels.'"

Then the answer goes on, "The definition of the term 'probability' as used in the answer is 'likelihood.' In light of the factors listed in this answer, Applicant does not

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foresee any possibility of an explosive rupture."

First of all, is that your answer?

A Yes, it is.

Q Can you describe to me something further on a definition of what the word "probability" means other than likelihood? For instance, if you would, can you compare it to the other term used in your answer, when you say "We don't foresee any possibility of an explosive rupture."

Do you use those words interchangeably, or do they mean different things to you?

A The meaning of a word depends on the context in which it is used.

Q All right. The context here is an explosive rupture of the reactor vessel. At one point you said there is no probability of it occurring --

A I believe I said the probability had been eliminated.

Q Right. Well, I am reading from what you have here.

CHAIRMAN JENSCH: I wonder if you would tender a copy so he may have precisely before him his answer.

MR. TROSTEN: We will do that, Mr. Chairman. (Handing.)

CHAIRMAN JENSCH: Very well.

BY MR. ROISMAN:

Q You have the same page I am looking at?

A I presume so.

Q All right.

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MR. SCINTO: For the sake of the record, may I identify what the cover is on that document?

MR. ROISMAN: The cover is "Applicant's Response to Questions Submitted by Citizens Committee for the Protection of the Environment, Section H, Part 1," dated March 29, 1971.

MR. SCINTO: Thank you.

BY MR. ROISMAN:

Q At the end of the first paragraph of the answer it says that these variety of things eliminate the probability of an explosive rupture in the reactor vessel.

Now, would you please describe for me what you mean when you say eliminates the probability of an explosive rupture and your subsequent statement that you do not foresee any possibility of an explosive rupture?

Do you mean to say that an explosive rupture is impossible?

A In my professional judgment it is incredible that such an event should occur. That is the answer to both of those. You asked what does it mean --

Q Now, we have another word. You used the word possible; I am now asking you do you mean to say it is impossible? You tell me it is incredible. We will get to incredible in a minute.

Can you tell me, please, whether or not you are claiming, or it is your position that it is impossible to have

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a rupture, explosive rupture of the reactor vessel or large element of the primary loop.

A I think if you want to consider this matter in an abstract sense, I think you would have to admit that anything was possible, providing it was not physically impossible.

But in consideration of this facility and the safeguards that have been provided, the factors that were listed in my answer which dealt with both the conservatism of the design and the control of the fabrication, as well as the controls and surveillance put on operation of the plant, that I don't see any possibility of this happening in that facility.

Q Let me see if I got it straight now.

You are not saying that it is a physical impossibility for it to occur? You are saying that it is highly improbable that it could occur because of certain features of the way it has been designed.

Is that correct?

A No, I didn't say that.

Q All right. Is it impossible for it to occur? Abstract or otherwise? Is it impossible?

A In an abstract sense, it would be possible. If you did not provide any means of keeping the operation of the reactor within the conditions for which the reactor vessel was designed, obviously you could reach a condition where it was no longer sufficiently strong to contain its contents.

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Q Assuming that the reactor operates in a manner in which you have predicted it will operate, you are saying it is impossible for the reactor vessel to have an explosive rupture. Is that right?

A In my professional judgment, this event will not occur in this reactor.

Q Is it impossible for the reactor to operate differently than the way that you design it?

A When you consider the controls that are placed upon the operation of the reactor, both procedural and automatic, together with the surveillance requirements which I believe you are familiar with, the technical specifications for the reactor which impose very stringent requirements on surveillance of not only the components that make up the reactor coolant system boundary, but also all of those systems which are relied upon to keep the reactor operating parameters within the ranges for which the reactor vessel is known to be absolutely safe, I have to say it is not possible.

Q It is not possible that the plant could operate differently than the manner in which you designed it?

A Obviously it is possible to operate the reactor in some different manner.

CHAIRMAN JENSCH: Excuse me.

I think we are having a little difficulty, I am trying to make some notes on this. I wonder if you could answer

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the question, if you can, yes or no, and then you may explain it any way you want to.

I don't think your last answer was what the question called for. He said something about can't it operate differently than you predict and you predict --

THE WITNESS: I will attempt to use yes or no, Mr. Jensch, wherever I feel that that answer is not going to be misleading.

CHAIRMAN JENSCH: That is good.

If you will just answer the question precisely, then you may explain it. I think it will help us in dealing with the question.

MR. TROSTEN: Mr. Chairman, you are not suggesting that the witness answer the question yes or no if he does not feel that a yes or no answer is appropriate, are you, sir?

CHAIRMAN JENSCH: Let's take up each one question by question and see what it is. We have had several questions here. Is it impossible for this to rupture? Yes or no? Then you may explain it.

I think that is what the question is calling for. There have been these additions, with these redundancies you have, you don't feel it will.

But can you deal with the question as propounded? Is it impossible for this -- is it the core or containment or the plant, to rupture. What is the question?

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MR. ROISMAN: This is the reactor vessel or large element of the primary loop.

CHAIRMAN JENSCH: Is it impossible for that to rupture?

THE WITNESS: Is that your question?

MR. ROISMAN: Well, that is where we started. I would still -- I have been taken away from that by your answers with regard to what makes it in your opinion impossible. But let me bring you back to it from a different route, if I may.

BY MR. ROISMAN:

Q If the emergency core cooling system for this plant failed to operate, if the following two things happened: One, the water that is in the accumulators in the event of a major loss of coolant accident, double-ended pipe break, cold leg, did not get to the reactor core, did not cause any flooding of the core, and if the valves in various systems that must open in order to bring water from the major storage tanks that is also part of the emergency core cooling system failed to open, and you had a loss of coolant accident when the plant was operating at full power, would it be possible in that event for the reactor vessel to rupture?

A No.

Q Would you please explain the basis for your statement that it is not possible for the reactor vessel to rupture in that situation?

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A Because the situation you postulated is accompanied by a reduction in system pressure.

Q But I am talking about a rupture from molten fuel? Metal-water reaction. Any other bases on which a rupture could occur.

A No rupture.

Q Can you tell me is there a situation in which the failure of safety elements in the reactor would cause the reactor vessel to rupture?

Not whether, I am asking you now whether those failures are probable or possible, but are there failures which, if they occur, the reactor vessel would rupture?

A I believe that -- I would like to have the opportunity, Mr. Jensch, to check my answer at a later time and come back if I feel there is a need to correct it -- but I believe that there would be an increase in pressure in the worst situation, but no failure of the reactor vessel.

Q Now, earlier you stated when I asked you the question of whether it is impossible for the reactor vessel to rupture, that in the abstract it was not physically impossible for it to rupture.

Would you please explain to me again in the abstract what situation would occur in which it could rupture?

A I have a reactor vessel in this particular plant which is designed for 2,500 pounds per square inch. I would

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just roughly estimate that somewhere in the vicinity of 8,000 to 10,000 pounds per square inch, it would rupture. So if somehow you were to increase the pressure to 8,000 to 10,000 pounds per square inch, you might be able to induce a rupture.

However, there is a high probability that the vessel would leak before it would rupture.

Q You mean in other words, the pressure would not reach the 8,000 to 10,000 pounds per square inch level?

A That is correct.

Q I hate to take you off on a tangent, but I am curious, how do you define the difference between a leak and a rupture?

A Well, did you ever have a water pipe in your house break as opposed to a drinking faucet or a leak in a joint? One involves a gross failure of the component; a leak is where it still retains its ability to contain the bulk of the water, and to contain the pressure, but a certain percentage of the water would escape.

Q If you had a vessel with 8,000 or, let's say, 7,999 pounds per square inch of pressure inside it, and a leak developed, would it be like that leak of water in my water faucet at home, or would it be, if you will, much more rapid a leak?

In other words, what would be the physical characteristics of what would occur if a hole of some kind developed?

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A No, physically probable it would involve something similar to the steam escaping from a tea kettle, not in that sizeframe, but where the lid rises slightly and allows a small amount of liquid to escape in the form of steam, whereupon the pressure decreases and then the lid comes back down.

And this process is repeated periodically.

Q Going back if we can to the question of improbability and impossibility, can you indicate to me the ways in which these terms have entered into your analysis and your judgment about the safety of this plant?

In other words, are there points at which you have concluded that certain events are improbable or impossible or unlikely or something in that general nature? And on the basis of having reached that judgment, taken different actions than you would have if you had concluded that something was possible or probably or whatever it may be?

A I don't really use those terms in my evaluation of the safety of the plant.

Q You mean in other words when you evaluate the safety of the plant, you give no account to whether a particular activity is probable or impossible?

A That is correct.

Q Have you evaluated the effect of a major meltdown of the core of this plant in terms of the effectiveness of the safety systems of the plant?

ln14 1 A No, I haven't.

2 Q Why not? I mean is it within your area that you would

3 do it as part of your job?

4 A No, it is a situation which we have decided is

5 necessary to provide a design to prevent the occurrence of,

6 rather than to allow a situation to get into that, to go that

7 far.

8 Q But having designed the plant a certain way, what was

9 the basis upon which you decided not to investigate the effects

10 of a major meltdown of the core?

11 A Our knowledge of the performance of the -- our

12 knowledge of the design features that have been provided to

13 prevent both the occurrence of the accident and the control of

14 the accident.

15 Q You mean that the event was not possible? A major

16 meltdown of the core was not possible?

17 A We don't believe it credible.

18 Q Was it possible? A major meltdown of the core

19 possible?

20 A Not with the provisions that were provided in the

21 plant.

22 Q Then do I understand that your failure to evaluate

23 the effects of the major meltdown of the core was based upon

24 your assumption that a major meltdown of the core was not

25 possible?

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A The decision not to do that is not my decision.

Q Whose decision is it?

A This has been the subject of reactor licensing reviews for as many years as I have been involved, and during that time there have been many people involved in this review, and all have contributed and it is, I believe, a judgment of not only industry, but also the Atomic Energy Commission in their review that the design basis accident which has been defined as a double-ended rupture of the largest reactor coolant pipe, is the maximum credible accident, if you want to use that terminology.

Q All right.

We are back to terminology again. I see this word credible has come back into it. Is credible -- I assume the counterpart also -- does incredible mean impossible or improbable?

A I believe it means that it is sufficiently that if you reach points where you say something is incredible, it is sufficiently remote that it does not have to be considered.

Q Can you answer that question in the way I asked it? Does it mean impossible or improbable?

A Well --

Q You told me that a lot of people upon whom you rely, and your own judgment as well, indicated that it is not credible that there could be a major meltdown of the core.

I want to know, does that mean it is not probable or

1n16 1 it is not possible?

2 A I guess I am not sure that it means either of those.

3 Q You described the term possible and probable as

4 indicating to some extent likelihood. Are you telling me now

5 that the word credible has nothing to do with the concept of

6 likelihood?

7 I don't understand, Mr. Wiesemann, why you are afraid

8 of these words. You have used them in answers --

9 A I am not afraid of the words. The problem is we

10 design these plants on the basis of engineering knowledge, not

11 on semantics.

12 Q But you have to translate that?

13 A But the problem is that I cannot translate that,

14 because my determination, when I make my own personal

15 determination that a plant is safe in my professional judgment,

16 I rely on my knowledge, my technical knowledge that I have

17 acquired over 20 years of experience in the engineering field

18 and over ten years in the nuclear field, together with consulta-

19 tion with other people in all areas of the industry, and I

20 don't arrive at this by deciding whether it is improbable or

21 possible or anything of that sort.

22 I look at the kinds of things that are done to keep

23 an incident from occurring, I look at the kinds of things that

24 can happen, consider the failures of each individual component,

25 one at a time, to see what the consequences would be, and

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determine whether or not there has been adequate defensibility into the plant to take care of the situation.

People use numbers, but generally these are used to convey a level of something to people who don't understand all of the technical details. Unfortunately, I can't give you that.

Q I understand that the technical aspects of it are expressed sometimes in numbers, in formula, and what-have-you. But I assume that at some point you and other technical people sit down and communicate in what we normally call English, for the purpose of expressing your judgments to one another.

Now, throughout the answers that have been given to various questions in this proceedings throughout the FSAR, the Staff Safety Evaluation, and other technical information associated with these plants, the words "probable, improbable, possible, impossible, credible, incredible" occur. What I am trying to find out is what do technical people like you who use or authorize the use of these terms mean by them when you use them.

You now tell me that you can't mean anything by them, because they are terms you don't have any understanding of. Or that they don't relate specifically to what you are doing.

Am I to conclude from that that you think that what is in the FSAR and other documents that attempt to translate into English the results of engineering knowledge is inherently inadequate, and that if we can't understand E equals

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MC squared as written, then we cannot understand whether this plant is safe or not?

A I can't answer the last question, but the term probability came into this discussion, I believe, in your questions C-1.

And our attempt was to answer your question as best we could and unfortunately, maybe, we used your word that you used in your question. But --

Q Let me see if I understand.

Is it your position that but for the introduction of the word "probable" or "improbable" in our question C-1, that that word does not appear anywhere in the documents or analyses that were submitted by the Applicant or Staff in this proceeding on their own, not in response to something we asked?

A I didn't say that.

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Q Then if the word appears some place, it does seem meaningful we should find out what it means, so we will understand how it is being used?

A But there again we are in context. You started out asking me what the meaning of the word was in my answer to your question. Now you are asking me what was meant by what someone else may have written.

Q No, no. In answering my question, you told me that you get your concept of what is credible from the fact that a whole bunch of engineering has gone on over the last ten years and the judgments of other people. I am trying to find out if you know what they meant, when they used the word "credible," and that you are now able to use it yourself, because you used it only a few moments ago in your testimony.

You said that it is incredible, it is not credible, that there could be a major meltdown of the core.

A I think it means that we agree that this particular event isn't going to occur in this plant in the fact of the provisions that have been made in the design to prevent it.

Q Couldn't occur? Isn't likely to occur? Isn't very likely to occur?

A Will not occur.

Q Will not occur.

A Yes.

Q When you evaluate the effectiveness of the containment

1 spray system, do your assumptions in evaluating that contain-
2 ment spray assume a major meltdown of the core will occure
3 in order to determine how much of the various elements of
4 radioactivity that are in the core are released to the contain-
5 ment?
6 A No, we make some various assumptions as to the
7 amount of elements that would be released from the core, but
8 this is again numbers which have been arrived at again
9 through the process I described earlier, where there is
10 agreement between those who are technically knowledgeable,
11 that this describes an upper limit for this situation which is
12 suitable for this purpose. And --
13 Q Do the figures that are used in evaluating the
14 containment spray system, do they include a figure of 100
15 percent of the noble gases, 50 percent of the halogens,
16 as two of the figures that are to be taken into account in
17 figuring this out?
18 A I am sure in at least one of the calculations done,
19 that assumption was used.
20 Q Under what conditions would it be possible in a
21 loss of coolant accident for there to be a release of 100
22 percent of the noble gases and 50 percent of the halogens, or,
23 if there are several, give me a couple of examples; if you
24 would?
25 A Under what conditions would it be possible?

1 Q Yes.

2 A Realistic conditions or just hypothetical conditions?

3 Q It is assumed in determining the containment spray

4 system effectiveness, and you told me the figures are reached

5 by appropriately conservative assumptions being made about

6 what would happen, and then you evaluate the spray system with

7 it. So I would like to know how was it determined that

8 this --

9 A Well, it is a non-mechanistic assumption. The

10 estimates of the amount of iodine, for example, or the fission

11 products, let's say, that would be released, is probably in

12 the neighborhood of 25 or 30 times lower than those assump-

13 tions under the actual operating conditions.

14 Q Well --

15 A Under the actual conditions that would prevail in

16 a loss of coolant accident.

17 Q Are you suggesting that you believe that an assump-

18 tion of 50 percent halogen and 100 percent noble gase releases

19 are incredible, impossible?

20 A I think that falls in the same category as the

21 rupture of the major system, that, with the provisions that

22 are made in the design of this plant, it is incredible to me

23 that we would get that size release.

24 I would expect in the neighborhood of 25 or 30

25 times less, lower releases. That is one of the reasons why

1 we include that type of analysis which involves the use of gap
2 activity.
3 Q I am really having some difficulty here, then, who
4 do you assume these conditions which you now tell me -- all
5 right. I will use your term -- are not credible? Those were
6 your words, I think. Why do you assume them in evaluating
7 the plant?
8 For instance, you do not assume that the wicked
9 witch of the west is going to sweep into the containment some
10 day and rip all of the bolts off the reactor head; why do you
11 assume that there is going to be a 100 percent release of the
12 noble gases and a 50 percent release of the halogens, if you
13 tell me it is not credible?
14 A I didn't assume that.
15 Q You said that it was part --
16 A We used the assumption, but I didn't make the
17 assumption.
18 Q Why do you use the assumption at all then? Are
19 you telling me it is a meaningless assumption, but you use
20 it anyway?
21 A No, it is an assumption which has been used as
22 a conservative upper boundary for anything that might happen,
23 and it is very conservative.
24 Q How do you determine how conservative is "very
25 conservative?"

A Because the worst consequences of the loss of coolant accident is the rupture of fuel rods and probably not all of them. However, we assume that all of the activity has contained in the fuel rods in the gap which is free to be released upon rupture of the fuel rods, that that activity is released and it gets into the containment. And when we evaluate that, that is 25 or 30 times less. And therefore, it is very conservative to assume 25 or 30 times more than what you expect to occur in a situation that is even there beyond what you really expect.

Q If the fuel rod -- in other words, the way in which you reach the assumption of a release of 100 percent of the noble gases and 50 percent of the halogens --

A I didn't reach that. That was issued in TID 14844 many years ago, and we have continued to use that. Maybe some time in the future somebody will decide that it is too high. But at the present time those are the figures that are used, they are issued in a guide which supplements, I believe, No. 4, that the AEC recently submitted -- that guide is not really new -- it is something that the AEC has been using; it may have developed in some respects over a period of time.

But the AEC only recently made it public. But that guide which supplements TID 14844 and really shows how to apply Part 100 adopted those as part of the design basis accident for considering the adequacy of engineered safeguards, and

1 they were selected to make sure that the design that was
2 ultimately provided would be conservative.
3 Q When the assumption was made, I think you were
4 saying a moment ago that that assumption included an
5 assumption that there would be a fracture of the fuel rods;
6 so that the fuel would be released from inside of the rods?
7 A No, I didn't say. I said there would be rupture of
8 the fuel rods, which is -- well, I believe you have had some
9 reports available to you where you have seen pictures of
10 what some of those ruptures might look like?
11 Q Yes.
12 A However, fuel is not released. However, the
13 activity, some of the activity is released that is contained
14 in the gap. The mechanism for release of radioactivity is
15 the activity is released from the fuel at a certain rate,
16 and it escapes from the fuel itself, the matrix of the fuel,
17 relatively slowly, and is collected in the space which
18 surrounds the fuel in the fuel rod. There is a space at the end
19 to allow for expansion and also a small gap around the pellets
20 themselves.
21 And that gas collects in the rods and when they
22 rupture, that -- those fission gases escape. And that is
23 a very small fraction of the total amount of activity that
24 is in the core -- 25 or 30 times lower in my opinion, than
25 what the assumptions of TID 14844 and the Staff guide use

1 for purposes of evaluating safeguards; therefore making
2 the assumption very conservative.
3 Q I understand.
4 Now, this rupture of the fuel rods, as you put it,
5 the manner in which 100 percent of the noble gases could be
6 released to the containment would have to first begin by 100
7 percent of the fuel rods rupturing? Is that right?
8 I am not asking you to tell me whether you think
9 that is incredible or not.
10 A No, first you would have to have 100 percent of
11 the noble gases in the gap first.
12 Q Right.
13 Then those rods to rupture? Is that a necessary
14 condition?
15 A Then all of the rods would have to rupture, in order
16 to do that.
17 Q If all of the rods ruptured, what effect would that
18 have on the effectiveness of the emergency core cooling
19 system?
20 A If all of the rods ruptured, the effectiveness of
21 the emergency core cooling system would not be impaired. That
22 has been taken into consideration in the design and evaluation
23 of the emergency core cooling system.
24 Q As I understand it, you are referring now to the
25 analysis of the blockage of the flow of the water through

1 the vessel in the event of fracture of the rods?

2 A That is correct.

3 Q Is it your statement now that those tests that

4 were run by Westinghouse, I understand, demonstrate that if

5 all of the rods fractured, ruptured, -- excuse me -- that it

6 would not materially effect the emergency core cooling system

7 operations, or that only if some of them ruptured?

8 A No, I think --

9 MR. TROSTEN: Mr. Roisman, it seems to me that perhaps

10 you are addressing a question which more properly should be

11 addressed to another witness. I will let the witness decide

12 for himself whether this is within the scope of his testimony.

13 But it seems to me that you perhaps should be addressing the

14 question pertaining to the emergency core cooling system to

15 another witness.

16 MR. ROISMAN: Well, I would agree with you normally,

17 Mr. Trosten, except for the fact that this witness has been

18 attempting to discuss with me the meaning of these words

19 "probable" and "improbable," credible" and "incredible,"

20 and one of the examples that we moved to is his statement that

21 it is not credible that there would be a major meltdown of

22 the core.

23 As you know, if the emergency core cooling system

24 doesn't cool the reactor in the case of a loss of coolant

25 accident, that is when you start getting the possibility or

1 probability, as the case may be, of a major meltdown of the
2 core. The witness testified it wasn't credible that a major
3 meltdown could occur. I assume that he has a basis for that
4 testimony. I am trying to find out, not so much whether it
5 is true that it is credible or not credible, but if I can try
6 to understand what he meant when he used the word "credible"
7 or "incredible."
8 MR. TROSTEN: I have no objection to general cross-
9 examination in this vein. My point is if we begin to delve
10 into the details of the emergency core cooling syste, I may
11 object on the grounds that a difference would be more
12 appropriate.
13 MR. ROISMAN: At this point, the purpose of the
14 cross-examination is not per se to prove the effectiveness of
15 the emergency core cooling system, but to see if I can under-
16 stand what factors enter into Mr. Wiesemann's statement that it
17 is not credible that there would be a major meltdown of the
18 core.
19 CHAIRMAN JENSCH: Proceed. I think that --
20 THE WITNESS: In that last go-around, I sort of
21 lost track of what the question was. Could we get the question
22 read back?
23 CHAIRMAN JENSCH: Could you restate it, please?
24 BY MR. ROISMAN:
25 Q We are talking about the question of rupture of the

1 reactor fuel rods. You said the tests had been run and
2 they indicated that in the event of rupture of the fuel rods,
3 it will not destroy the effectiveness of the emergency core
4 cooling system. I asked you if those tests were based upon an
5 assumption that all of the rods ruptured or that only
6 some of them did.
7 I think that is when Mr. Trosten spoke up.
8 A I don't believe whether it is all or some, makes
9 any difference.
10 Q What about the tests, Mr. Wiesemann?
11 A What do you mean, what about the tests?
12 Q Do the tests go on the assumption that all or only
13 some of them rupture?
14 A Well, I think there is a problem here in that
15 I don't believe you understood the manner in which the analysis
16 for core cooling is performed. It is obvious to me from your
17 question.
18 And on this basis I think that in order to explain
19 this sufficiently for you to understand it, we are going
20 to get into a lot of details about the emergency core cooling
21 analysis, and maybe I am not the one that should be saying
22 this, but I believe that Mr. Moore, when you get around to
23 talking to him, would be a much better person to answer that.
24 My answer is that the number of rods involved in
25 the loss of coolant, bursting, the loss of coolant accident

1 doesn't make any difference.

2 In order for me to help you understand that, we have

3 to go into a lot of detail.

4 Q All my question asked was whether or not that was

5 based upon tests that had been run by Westinghouse. That

6 statement that you just made -- you said in your opinion my

7 question had been with regard to Westinghouse tests?

8 A It is a combination of testing and -- the testing

9 was what gave us the physical characteristics of the clusters

10 of ruptured rods. And then, of course, analysis had to be

11 performed to determine the effect on the heat transfer under

12 those conditions.

13 Q And by analysis, you mean the running of computer

14 codes and by testing you mean physically taking the rods,

15 subjecting the rods to certain conditions and observing the

16 physical consequences of that?

17 A The reduction in area, yes, and utilizing that in

18 the classical heat transfer compilations to determine the

19 effect.

20 Q I am just trying to get clear in my mind that when you

21 use the word "analysis" you don't mean a physical test, you

22 mean a computer code data for which -- which may come from

23 physical tests?

24 A That is correct.

25 Q Let me not wend you further down the emergency core

1 cooling system route, but if we can, let's try to get this
2 tied back into the question that we started off with, which is
3 this concept of "probable," improbably," "possible,"
4 "impossible," "credible" and"incredible."
5 I think that we had, when we got into this particular
6 deviation, we had been talking about your conclusion that
7 the major meltdown of the core was not in your opinion
8 credible, and I am trying to find out whether, when you used
9 that term "credible," you have a meaning, a clearly defined
10 meaning for what it is you are saying.
11 Let me give you some words and some definitions
12 tht I would like you to respond to in the context of this, if you
13 can do so. When I ask if something is possible, I mean are
14 there any conceiveable set of circumstances which could happen
15 in which it would occur.
16 Now, when I ask you if something is probable, I
17 mean whether or not a conceiveable set of circumstances
18 is likely -- in your terms -- likely to occur, or probable to
19 occur.
20 And I would like you to tell me this now: you equate
21 the term "credible" with the word "probable" or very closely
22 thereto. In other words, when you tell me that something is
23 not "credible" you are saying that it is extremely unlikely,
24 or there just isn't any realistic possibility of it occurring;
25 but you are not telling me that it is impossible.

1 Am I right in that assumption?

2 A That isn't what I said. I said that, in answering

3 my question, that the probability had been eliminated, and in

4 the discussions of this I believe I said that meant that in

5 my professional judgment it was incredible. Then you asked

6 me what that meant, and I believe I said that I felt that in

7 my professional judgment this event would not happen in the

8 plant.

9 And then you clarified it by saying will not happen.

10 Q I understand that. All right.

11 So that your testimony si when you use the words

12 probably, credible, or possible, they in effect are close to

13 being interchangeable, and they all mean "won't happen?"

14 A Well, I don't like to have you characterize the

15 use of that term. I will go back to the fact that we tried to

16 answer your question -- I personally do not like to use the

17 terms "probable," and "likely" and "possible." I prefer to

18 look at the features that are provided, and evaluate them

19 from an engineering standpoint, to determine what the

20 consequences will be, taking each component of that particular

21 system, and determine what would happen if that particular

22 component did not perform its function.

23 If that function -- if that created some kind of a

24 safety problem, then you have to look to see what provisions

25 are made to keep that failure from occurring. Whether it is

redundancy in components, or having a component running all

1 of the time, or something or that sort.

2 CHAIRMAN JENSCH: Excuse me. Can you pick out

3 something that this gentleman has written using the

4 word "probable" or "improbable" and ask him to explain his own

5 language. If it is contained within the FSAR or some other

6 document that he has prepared, so we can get the definition

7 of what you mean by your language?

8 MR. ROISMAN: Mr. Chairman, he did respond to a ques-

9 question that we asked and said the definition of the term

10 "probable" as used in the answer is "likelihood." Now he says,

11 we sort of forced him into answering that way --

12 THE WITNESS: I didn't say you forced me. Would you

13 go back and read question YC-1

14 BY MR. ROISMAN:

15 Q Yes. You will have to wait a second for me to

16 dig it out. YC-1, which is included in the document entitled

17 "Further Responses to Questions Asked by the Citizens'

18 Committee for the Protection of the Environment," submitted

19 by the Applicant on February 12, 1961 -- incidentally,

20 perhaps we should find out whether this is also your answer,

21 because we had been talking about question H-1, in which you

22 said that was your answer, but you never said whether the

23 answer to question YC-1 was also your answer.

24 The question was, "What is the probability of an

25 explosive rupture of the reactor vessel or of large elements of

1 the primary loop resulting in flying parts at high velocity
2 and momentum? Can it be shown that such a failure has never
3 happened in the history of high pressure vessels or is extre-
4 mely unlikely today?"
5 I will read the answer which appears also in your
6 answer to question H-1. "The conservatism in design and
7 in manufacturing processes combined with careful operations,
8 strict quality control, and quality assurance during every
9 facet of design and manufacturing process, and a responsible
10 in-service inspection program, eliminates the probability of
11 an explosive rupture of the reactor vessel or large elements
12 of the primary loop. Applicant is aware of no catastrophic
13 failure of nuclear grade vessel."
14 That answer comprises the bulk of the answer to
15 question H-1.
16 A Right. That is also my answer, incidentally.
17 Q The C-1 is also your answer?
18 A Yes.
19 Q Then it continues with, "The definition of the
20 term 'probability' as used in the answer is likelihood."
21 And finally,"in light of the factors listed in this
22 answer, applicant does not foresee any possibility of an
23 explosive rupture."
24 MR. ROISMAN: Mr. Chairman, I mean I don't have Mr.
25 Wiesemann's testimony pinned down to specific portions of

1 the FSAR, so I am not able to say where there are other
2 places where he may have used the term.
3 CHAIRMAN JENSCH: Well, at least this C-1 answer
4 is yours?
5 THE WITNESS: That is correct.
6 CHAIRMAN JENSCH: And that says the program eliminates
7 the probability of an explosive rupture?
8 THE WITNESS: Yes, sir.
9 CHAIRMAN JENSCH: Are you saying it means it
10 cannot happen?
11 THE WITNESS: In this facility -- for the further
12 reasons stated.
13 BY MR. ROISMAN:
14 Q Mr. Wiesemann, when you were answering that, you
15 mentioned that rather than use words like probable or
16 possible, you loke to look at the functions, examine the
17 various components, and see whether they will function or
18 not, and then evaluate the safety factors in the plant based
19 upon your analysis of that function. Is that a correct
20 paragraphse of what you had said, thatyou prefer to do that
21 rather than use words like "probable" or "possible" or
22 "credible?"
23 A I said rather than a matter of preference, it is
24 the only thing I can use.
25 Q All right.

1 When you evaluate these various functions in the
2 plant, how do you decide whether or not a particular component
3 will or will not function in order to determine whether or
4 not you need an additional safety feature on the plant to
5 back it up, or be redundant, or have two of them -- like
6 sometimes you have two pumps?
7 A Some components, if you take the plant as a whole,
8 some components in the plant can be determined as being
9 unnecessary as far as safety is concerned by inspection.
10 For example, take the water cooler, the clock on the wall;
11 there are certain things that are not necessary. All of
12 those things which, however, which are related to the operation
13 of the plant have to be considered in light of the single
14 failure criteria.
15 You don't decide whether a piece of equipment will
16 fail or won't. You assume that it failed, and then you see
17 what happens to the rest of the system and whether or not
18 the system is still able to perform its function.
19 Q Did you ever assume that everything would fail? I mean
20 in other words, in your analysis of this plant, did you
21 ever assume that all of the safety components would fail?
22 A No.
23 Q Why not?
24 A It is incredible.
25 Q We are where we were before, aren't we?

A No.

Q I am still trying to find out, when you tell me it is "incredible", first you said you don't like to use that term. Okay. I am not going to ask you to use any term but the ones you like to use -- okay? So you use your terms.

But if you can, answer my question. How do you determine what is your definition of this word "incredible" to know when you, in your own mind, stop analyzing the safety of the plant, because you reach a point at which you say, "going further than this would be exploring events which are incredible, and that, therefore, is not worthwhile?"

A I think that the basic method of performing the safety evaluation is to take each individual component and assume that ti doesn't function for some reason, a non-mechanistic assumption that it fails to operate. And then we have to demonstrate that that particular failure of the component does not produce a safety problem which cannot be tolerated.

Q Do you sometime assume that two components simultaneously don't function, and then from the basis of that, analyze the safety consequences of that?

A Under special circumstances. In the performance of a single failure analysis, it is necessary to ignore the initiating event, obviously, which in itself may be a failure. And also to ignore the -- maybe I am using the wrong word,

1 "ignore," let me go back a second.

2 The initiating event is not considered as one of
3 the single failures. In other words, if you have a failure of
4 a component which could lead to the need for a safety
5 system to perform a safety function, then we also assume
6 a single failure of a component in the safety system. So in
7 that sense, we are assuming failures simultaneously, simulta-
8 neous failure of two components.

9 Now, if the failure in the initiating event is
10 such that it could, through a causal relationship, result in
11 the failure of another component, as a consequence of the
12 initial event, that also has to be included. That is not --
13 in other words, you can't take a credit for that in the
14 analysis and say, "Well, I have assumed my single failure."
15 You have to take a single failure in the protective system in
16 addition.

17 Also there is the matter of undetected failures, that
18 if you don't have means of knowing that something has or
19 has not failed, then that has to be considered. So --

20 Q Are those the only cases in which you -- in other
21 words, the only cases in which you look at failure of components
22 other than, if you will, other than the prime component failures,
23 you look at those failures that you could say would be
24 causally connected? In other words, if you are assuming
25 a certaim pump failes to operate, you would also assume that

1 all of the things which would be causally connected to the
2 reasons that might exist for that pump failing to operate, and
3 you assume they don't operate also? And you also assume
4 that things which you can't know about for sure, when -- whether
5 they would operate or not in the event of the failure of this
6 pump, you also assume that those don't operate; is that
7 correct?
8 A Yes.
9 Q Now, do you ever consider in your analysis that
10 unrelated things will fail at the same time? Or is it
11 always limited to this single failure analysis with the
12 special qualifications that you just stated?
13 A What do you mean by "unrelated things?"
14 Q In other words, the containment spray nozzeles,
15 let's say you were assuming now that the spray nozzles break.
16 Do you also assume at the same time that the pumps that are
17 bringing the emergency core cooling water to the reactor,
18 break? I am just assuming for the moment that you couldn't
19 say there is some causal connection, so that the breaking of
20 the nozzles would somehow or other be related to the breaking
21 of the pumps?
22 Do you ever make those kinds of assumptions?
23 A Not in that manner. However, in many respects the
24 design that is generated on the basis of the single failure
25 criteria results in a system which can accommodate multiple

1 failures. There may be a particular combination of multiple
2 failure which cannot be tolerated.
3 For example, if the pump and the -- if the pump
4 and the spray nozzles -- that you have suddenly decided for
5 some reason the spray nozzle is all plugged up, if the pump
6 and the spray nozzles were in the same subsystem, it would
7 not effect the safety at all.
8 Q I understand.
9 A It would have t o occur in a preferential way.
10 Q Okay.
11 Now, so there are times in which the single failure
12 analysis will involve the failures in other components, not
13 only the failure that triggered the need for the safety
14 feature, but also these causally connected ones. How do you
15 decide which failures you won't consider?
16 For instance, you told me you won't consider that
17 everything fails and your answer was because it is incredible.
18 How do you decide that less than all of the components fail,
19 but only one less, or only two less or only three less -- what-
20 ever it is that you won't consider those failures also?
21 What is your criteria, your standard for designing
22 -- for deciding that when you do your analysis?
23 A I am not sure I understand what it is -- I understand
24 I think all of the question except what the decision is you
25 are talking about.

1 Q The decision is when you are analyzing the safety
2 of the plant, you do not consider multiple failures of
3 unrelated components, at least you don't consider all of those
4 situations. There are some where multiple failures are related
5 in different ways. But as a general matter, you dn't consider
6 them all multiple failures of the safety components of the
7 plant.
8 I am trying to find out what is the basis for that
9 that is not credible, that that will occur?
10 A The basis for it is I believe in the fact that
11 provisions are made in the operation of the plant for
12 surveillance and testing of the items which are important to
13 safety of the plant, to assure that they will be in operation
14 and where appropriate, to have instrumentation to indicate
15 the condition of various systems so that in consideration of
16 this, it becomes incredible for this to occur, or it just
17 would not expect -- you just would not expect these failures
18 to occur in this manner.
19 Q Why is it that that inspection and so forth doesn't
20 prevent the single failure from occurring?
21 A Oh, it may do that as well. We haven't had a lot
22 of failures. But there are going to be pieces of equipment
23 which for one reason or another stop running and require
24 maintenance.
25 Q How do you know that that won't happen to all of
the pieces at once? Or that it won't happen to a great many

1 of them at once?

2 In other words, if I understand correctly, in order

3 to do your single failure analysis, you have to assume that

4 these inspections and the machining and the quality criteria

5 and so forth, that somehow or other they fail, and that

6 the part which -- in other words, you don't design the plant

7 in order to have certain things -reak or not function. It

8 is designed so that none of them will break or fail to

9 function.

10 Now, in some situations, you assume that certain

11 ones won't function. What is different about your assumption

12 that certain ones of those won't function that is not

13 equally true for all of them not functioning, or a large number

14 of them not functioning?

15 A Just it is not our experience that failures

16 occur in this way.

17 Q You mean in other words it is based on prior

18 experience?

19 A Just the general knowledge that these things aren't

20 fall apart all at once; that every piece of equipment is an

21 individual piece of equipment, within certain limits,

22 and they don't -- while they may -- while a particular component

23 may experience the same general type of problem, because the

24 service on them is each slightly different, they will exhibit

25 characteristics commen, even if they are common, exhibit them

at different times. When you discover something that doesn't work properly in the course of the checkout and testing of the plant, you correct that situation and at the same time check the other equipment and in many cases preventative maintenance is performed as required to avoid this.

Q But all of that doesn't, in your opinion, rule out the pssibility that there will be a single failure; is that right? In other words, not rule it out to the point where you don't think it is prudent to consider the possibility of a single failure?

A I think that we have been in agreement that this is a conservative way to design nuclear power stations.

Q What I am trying to find out is how do you decide that it isn't appropriately conservative to consider two failurs or three failures?

A We make the design on the basis of the single failure, and them impose certain other requirements as far as the capability to test and perform surveillance during operation to see if these systems will function as designed.

Q But you have already had to assume that your surveillance and so forth won't work in order to get to the points of having a single failure analysis?

A These principles are set forth in the general design criteria contained in the Commission's Regulations, and they are subject to an input from a great deal of experience and a

1 large amount of engineering background judgment.

2 CHAIRMAN JENSCH: May I interrupt?

3 Could you identify what regulations prescribe the

4 single failure or double failure philosphy?

5 THE WITNESS: I believe the single failure criteria

6 is elaborated upon in the Appendix -- General Design Criteria

7 -- is that Appendix A?

8 MR. TROSTEN: Appendix A to 10 CFR Part 50.

9 THE WITNESS: Mr. Jensch, I am looking at Definitions

10 and Explanations, and the first reference I find to single

11 failure, I believe, is a definition of the term --

12 CHAIRMAN JENSCH: This is in Appendix A?

13 THE WITNESS: Yes.

14 CHAIRMAN JENSCH: To part 50?

15 THE WITNESS: Yes, sir.

16 CHAIRMAN JENSCH: If you have the looseleaf edition,

17 it is page 162-B.

18 THE WITNESS: I would be difficult to pick out all

19 of the places where this is listed, but an example which I

20 happened to run across is the criterion 24, which says,

21 "Protection system shall be separated from control systems to

22 the extent that failure of any single control system component

23 channel --" et cetera.

24 I think if one reads through all of the general

25 design criteria, you will find in it at various appropriate

1 places reference to the single failure requirement for
2 design and then with the definition in the beginning of
3 this --
4 CHAIRMAN JENSCH: Well, this is adopted March 16,
5 1971. Is that correct?
6 THE WITNESS: Yes, sir. However, many of the
7 things included in these General Design Criteria have been
8 things which have been done since the time of the Yankee Rowe
9 plant and Shippingport reactors were designed. The criteria
10 themselves were in a draft state for quite a number of years,
11 where the basic principles had been expounded. There have
12 been various revisions. But the single failure criteria it-
13 self has been one which has been used the entire time I have
14 been involved with reactor safety evaluation, which dates
15 back to 1960 or '61.
16 CHAIRMAN JENSCH: Thank you.
17 BY MR. ROISMAN:
18 Q Mr. Wiesemann, is it your position -- or what is
19 your position on the question of the basis for your determina-
20 tion to use the single failure as opposed to the multiple
21 failure analysis? Is it because that is what this Appendix A
22 criteria says, or is it also an independent judgment of yours?
23 A Because that criteria, when considered in conjunction
24 with all of the other requirements in those general design
25 criteria, provide, as far as I am concerned, more than adequate

1 assurances that we don't have to worry about the multiple
2 failures causing a safety problem.
3 Q You are not, in other words, saying that you are
4 basing your conclusion that you should not have more than
5 single failure analysis upon the fact that it says so here; you
6 are saying independently?
7 A I agree with what it says there. In my professional
8 judgment I think that is justified. It may be in certain
9 respects I believe conservative, and in certain very particular
10 circumstances even overly-conservative.
11 Q What I am trying to find out then, is in your
12 own professional judgment, now, because we will have
13 the representatives of the Staff talking about how they reach
14 the conclusion that that was a valid design criteria, upon
15 what basis do you conclude that more than single failure is
16 not to be used?
17 A Just the general experience of how things have
18 happened in various facilities and knowledge of the things
19 that are done to prevent failures from occurring. We agree that
20 the program of prevention is not going to prevent all failures.
21 But we have assurances with the combinations of things that
22 are done, both in the quality of the equipment that is pro-
23 vided and then the programs used to keep that equipment in the
24 original quality in terms of its ability to perform its
25 intended function, that it just isn't going to happen.

Q Don't be afraid of the words, go ahead. Not credible?

A I hesitate to use those words.

Q Please do. You shouldn't be ashamed of your own use of language. I am not ashamed that I like to use the word probable, don't you be ashamed that you like to use the word credible.

Are you saying it is not credible to have two failures, but it is credible to have one?

A That is correct.

Q Okay.

And the basis for that is experience with other plants? In other words, to your knowledge, there have never been any incidents of any kind at plants in which two components, other than two related in the wya in which this design criteria and the way you explained earlier, two components failed at the same time? And it is on the basis of that experience with nuclear reactors thatyou say this?

A Are you speaking of -- would you repeat the question, please?

Q All right.

We are talking -- let's simplify it a little bit. Let's take out of consideration those multiple failures that fall into the design criteria here in Appendix A, multiple failures because the first thing that fails is related to the

1 second thing. You have said generally speaking you consider
2 single failure analysis but not double or triple or
3 quadruple, or all failures of all components. Now, I am asking
4 you when you do that, do you rule out, as incredible, two
5 components failing on the basis of experience with other
6 reactors?
7 In other words, there has never been two components
8 which failed? I don't mean necessarily emergency core cooling
9 system and the containment spray system, but any of the kinds
10 of components which you consider when you do a single failure
11 analysis?
12 A It is not related to that. There are, I don't know,
13 the satisfactory use of the term -- quite often multiple lines
14 of defense in their description of this. We have various
15 systems which keep the reactor within its intended operating
16 limits and if those systems were to fail completely -- in
17 other words, if they weren't there, the abstract situation, maybe
18 we could somehow get to a situation where you might have a
19 failure of a reactor component pipe of some wort, whether it
20 was a leak or big break doesn't matter for this purpose -- at
21 which time then we have to have the emergency core cooling
22 system come into operation; which in itself requires some
23 additional failures to occur, so that before you get -- if
24 you start at the very beginning, rather than starting at
25 the middle or halfway down this road, if you start at the

1 middle, you find when applying the single failure criteria to
2 individual systems, together with all of the other criteria
3 that are involved there regarding protection equipment,
4 instrumentation controls, and design criteria of various
5 types, that you end up, when you go back to the thing and
6 say, "I am starting with a plant that is operating normally.
7 Now, what has to happen for me to get into trouble?" Then
8 you find in all of the instances which involve any kinds of
9 serious consequences, that would be desirable to avoid, that
10 you have to have multiple failures to get there.
11 And if you take the other route, the route I choose
12 to take was the one of operating, control of operating
13 conditions, but there is also the surveillance of the vessel
14 material, the piping, and so forth -- these things that
15 require multiple failures before you could get to a situation
16 where you would begin to be concerned about the consequences
17 -- so it is not a matter of saying I am going to make a plant
18 that is safe if one little bolt fails or one little valve
19 fails. Each system has to survive the single failure test.
20 And then we have the systems which back up systems which
21 back up systems.
22 Q In terms of the single failure analysis of compon-
23 ents, is each individualaccumulator on the coolant loops,
24 is each one of those a component or are all four of them
25 a component in terms of just using this term?

END#10

A Each accumulator in itself is a component.

Tp 11 DB-1

1 CHAIRMAN JENSCH: Come to order, please. Mr.
2 Roisman, are you ready to proceed?
3 MR. ROISMAN: Yes, sir.
4 CHAIRMAN JENSCH: The witness has resumed the witness
5 stand. Propound the next question.
6 BY MR. ROISMAN:
7 BY MR. ROISMAN:
8 Q Mr. Weisemann, when we were talking before I had
9 started to ask you a question about the accumulators. I think
10 we had established, or you had indicated that the four
11 accumulators that are on the plant, each one is in the context
12 of this component failure analysis, each one is a separate
13 component. And I was then getting ready to ask you if then
14 I am correct in assuming that in doing the failure analysis you
15 do not consider the failure of more than one accumulator at a
16 given time.
17 A The accumulator sustem is a different type of
18 system, it is not an active system. I direct your attention
19 to your open book there --
20 CHAIRMAN JENSCH: Excuse me. I wonder if we could
21 have the question re-read, and you can explain it, but I
22 think we are getting away from what he asked you. If you
23 can answer it yes or no, and then explain it.
24 (Question read.)
25 THE WITNESS: That is correct.

DB-2

BY MR. ROISMAN:

Q Now in the FSAR, in Section 14, the analysis is done of the effects of the loss of coolant accident. And there are charts, I don't know if you are familiar with these, or if I am getting over into the emergency cooling system area where you are not qualified. But if you are familiar with it, do you remember those charts which show at certain temperatures based upon the assumption of two accumulators not operating, they show two out of four accumulators operating?

Are you familiar with those charts, or aware of their existence in the FSAR?

A Yes, I am.

Q How is it determined for the purpose of making that analysis, do you know how it is decided to assume that two accumulators fail, or didn't work?

A Well, the assumption of one accumulator failing is a causal relationship type failure.

In other words, the assumption is that the accumulator water from a broken loop, attached to the broken loop, spills out on the floor.

Now the question during the review of the Indian Point application came up as to whther or not it would be prudent to or possible to take one accumulator out of service by closing valves which are normally open during operation, close those valves, take them out of service, in order to perform some

DB-3

1 maintenance function, to take care of maybe a problem
2 on instrumentation associated with that particular accumulator
3 or something of that sort.
4 And that analysis was performed then for one accumulator
5 not failed, but turned off.
6 Q You mean you forgot to turn it on?
7 A No, intentionally turned off. Inother words, to
8 determine what power level would be safe to operate the
9 reactor at with one accumulator turned off in order to
10 determine what limits should be placed on operation for that,
11 should it become necessary to operate the plant in that mode.
12 That was the purpose of that analysis .
13 Q I see. Are you familiar with the AEC Interim Guide-
14 lines fot the Operation of the Emergency Core Cooling System?
15 I don't mean do you know them in detail, but have you read
16 them?
17 A I have read an interim policy statement of AEC.
18 Q Yes. Does that document include in it the assum-
19 ption that all four accumulators , the effect of the cooling
20 from all four accumulators is to be disreagarded in the course
21 of the emergency core cooling system performance?
22 A Your characterization of what I said is
23 incorrect.
24 Q State it as you understand it.
25 A My understanding is that the water which would be

DB-4

injected in the accumulators during the course of a blow-down is assumed to be effective in cooling the core.

Q In other words, the accumulators don't perform their function; the assumption is made they don't?

A No. That is not what that says.

Q What is the function of the accumulators?

A It says that the accumulators are delayed in performing their function until the end of the blow-down.

Q All right.

A And they still perform their function.

Q But they don't --

A You will have to read the information given to you this morning.

Q Yes. I want to keep this from going into any more of the semantic problems if possible.

So you are using the term that the function is delayed. All right. Now is that an assumption which had been previously made by you or by Westinghouse or by Con Ed in evaluating the performance of the safety systems on this plant?

A Would you repeat that?

Q Is the assumption that there will be a delay in the time in which the accumulators will perform their function, is this an assumption which had been made previously, before this interim statement by the AEC came out, by Westinghouse or by Con Ed in evaluating the performance of this plant?

DB-5

1 A I don't believe we specifically addressed that in
2 the Safety Analysis Report. However, it is included in the
3 document you received this morning.
4 Q Yes, I understand that. But I am trying to get
5 at what was prior to that.
6 Now do you know why it was not considered before?
7 A Do I know why it wasn't considered before?
8 Q Yes. Why wasn't it considered before on this plant?
9 Why an analysis was not done for the performance of the
10 emergency core cooling system in this plant, which assumed
11 there would be a delay in the function of the accumulators?
12 A Our analysis of the emergency core cooling system for
13 this plant satisfied us that the system was adequate. Our
14 re-evaluation of that as a result of the re-evaluation and
15 the interim policy statement confirms that.
16 Q But that is the general answer. I am asking you
17 specifics, why specifically did you not assume that there
18 would be a delay in the function of the accumulators?
19 A I can only say that you would have to address that
20 question to the person who was directly responsible for per-
21 forming the analysis.
22 Q Do you know who that individual is?
23 A The person which has been identified to answer
24 those questions is Mr. Moore.
25 Q Earlier you stated that the possibility of a failure

DB-6

1 of more than one component, accumulators being a component,
2 is something which you considered to not be credible.
3 Was your answer based upon information that Mr. Moore
4 had given you, or was it based upon your independent judgment?
5 A My independent judgment is that it is incredible for an
6 accumulator to fail to operate, forgetting about the causal
7 relationship.
8 We do assume that water will spill from the one that is
9 connected to the broken loop.
10 Q Right, I understand that.
11 A But the failure of the accumulator to provide water
12 in such quantity, I believe I would consider the failure of
13 even one to do this incredible.
14 Q Why then did the FSAR include an analysis which
15 assumed that there would be a failure of one?
16 A We didn't assume the failure of the accumulator at
17 all in the initial analysis. What we assumed was we had four
18 accumulators, one of them being connected to the broken loop,
19 and we just for simplicity assumed the water went out the
20 break, rather than into the core. The other three delivered their
21 water to the core. The exception to that was the one where
22 I described the failure of a single one -- not a failure, but
23 the assumption it was closed off for maintenance purposes, which
24 did not assume failure. The accumulator system is a passive
25 system, it is a tank, pressurized with nitrogen. The tank is

DB-7

1 connected directly to the reactor coolant system.

2 All that is required to initiate the operation of

3 that is for the pressure to fall in the system and the water

4 level to begin to fall in the reactor coolant system, and

5 the only thing that is separating the reactor coolant system

6 from the accumulator are check valves.

7 These check valves are such that the force of the water

8 is so large that even if the valve pins were welded to the

9 flapper, it would shear the weld and open the valve. It is

10 incredible in my engineering judgement that that system would

11 fail to deliver its water to the reactor coolant system in

12 the event the water and pressure were lost from the reactor

13 coolant system.

14 Q Well, it would fail to deeliver it at all, or

15 is it your position it would fail to deliever it in the time

16 originally assumed in the FSAR? Which failure do you think

17 is incredible?

18 A It is incredible that it would fail to deliever a

19 sufficient quantity of water to limit the reactor core temper-

20 atures to those which would be safe.

21 Q That is not really the question I asked you.

22 In the FSAR you assumed or claimed that the

23 accumulators will deliver their water to the reactor vessel in

24 a certain period of time, "x" number of seconds.

25 Now if the accumulators deliver the water to the system

DB-8

not at all, you consider that to be incredible, that that should not be assumed. Do you also consider to be incredible that they would deliver it later than the time that you have indicated in the FSAR?

A I didn't address myself to that question.

Q I am asking you to do so.

A It is possible that it might arrive somewhat later. However, we have calculated --

Q Wait. Now I thought we got pretty well along on the word "credible". Do you want to tell me what you just meant by the word "possible"? That is a different word than the word "credible" before. You can change the a snwer, put in a different word, if it was a slip of the tongue. If you meant something other than the word "credible", tell me what you meant when you just used the word "possible"?

A I do not have enough information in my possession to form a complete judgment on this matter. Because now you are asking me a question of defining what is likely to occur or not likely to occur in an area which I would have to define as a gray area.

We have done analyses which encompass this area, which show regardless of what set of assumptions you choose to make, that the core temperatures are limited to safe temperatures. Now you are asking me where we will really end up in between here. I don't know. But I think we are satisfied

DB-9

1 that on the basis of our own analysis, plus the additional
2 analysis we performed which you just received today, that
3 even under the worst assumptions the core, the termperature is
4 kept well within the safe region.
5 Q I am not sure that I understand what you mean when
6 you say the worst assmumptions. I have got some that are worse
7 than you have got. Like I would assume if all the components
8 fail. That is what I call a pretty worst assumption. But you
9 are not assuming that assumption when you say under the worst
10 assumptions, is that correct?
11 MR. TROSTEN: Mr. Chairman, I am constrained to
12 object to Mr. Roisman's further probing into what I consider
13 to be the details of the emergency core cooling system. I
14 have refrained from objecting on the grounds that I understand
15 Mr. Roisman is going to question another witness further. But
16 I simply feel that he is pursuing this matter too far now
17 with this particular witness whom we have previously stated
18 is not the witness to respond to detailed questions on the
19 emergency core cooling system.
20 MR. ROISMAN: Mr. CHairman, this witness has stated that
21 wth regard to certain total consequences of accidents in the
22 reactor, that certain things are incredible or not possible
23 or which ever one of the terms he is using at the time.
24 I am trying to find out whether he has in his own
25 knowledge a basis for making that conclusion. If he is

DB-10

1 inadequate or not able to testify with regard to the detailed
2 questions on the emergency core cooling system, then it
3 seems to me his attempt to represent the position that he
4 himself knows that it is incredible, that certainly events will
5 occur in the reactor, must be a conclusion which he can't
6 support, that we need to have instead of Mr. Weisemann, we
7 need to have the component specialist for each one of the
8 individual components that might fail.
9 It was my understanding when Mr. Weisemann came on the
10 witness stand from our initial discussion he was sort of the
11 specialist with regard to all of the components.
12 I am not asking him, or I didn't think I was asking
13 him in terms of the great detail about the emergency core
14 cooling system. We are trying to find out or at least I
15 am trying to find out how he makes judgments or how judgments
16 are made in determining certain events and assuming that they
17 will or won't occur.
18 I think that he has no basis for making that except an
19 innate belief that he has never articulated. He believes that
20 he has a basis for stating it and I am trhing to find out or
21 hoping to have him tell me what that basis is. That is the
22 reason I am asking the question.
23 In other words, I don't want to know whether or not the
24 emergency core cooling system analysis that Westinghouse has
25 made is valid or not. I want to know how they conclude that

DB-11

it was valid in terms of ruling out as incredible certain occurrances. That is all I am really trying to find out. Because this witness is not able to give me or doesn't seem to want to give me a definition of the words credible" and "possible." In general terms I am trying to get one with reagrd to specifics each time he uses the word. I hope he will then be able to explain to me.

I still had asked him earlier what he meant by possible when he used that term, and it didn't help.

MR. TROSTEN: Mr. Chairman, I would simple submit that when it comes to a matter of determining the sort of questions that Mr. Roisman is raising, with regard to the emergency core cooling system, that it is preferable , if he is asking questions concerning the likelihood of certain events occuring or the factors that go toward making the judgment of whether ceratin events will take place, to address these questions to the witness who is most intimately familiar with the emergency core cooling system, analysis .

And I simply feel that Mr. Roisman has at this point reached the stage where he has gone over the line, where these questions ought to be addressed to Mr. Moore rather than Mr. Weisemann.

CHAIRMAN JENSCH: Ithink a large part of the interrogation has been invited by the witness in using certain language. Now as I understand this C-1 or H-1 reference, in answer to

DB-12

1 questions from the intervenor, it does represent the
2 language of this witness. Now merely by way of illustration,
3 as I understand it, we have gotten into these specifics of
4 what kind of a component is that which might be within the
5 realm of probability or credibility, whatever it is.
6 I have understood the witness to be merely using those
7 components by way of illustration for his answer.
8 Now whether the emergency core cooling system will or
9 will not work I think as you have indicated belongs within the
10 province of witness Moore. But I think whatever be the compon-
11 ent selected for the illustration of the meaning-of probability
12 or possibility, it will always be met with an objection about
13 John JOnes handles the door knobs or Richard Smith handles the
14 little bulbs and so forth.
15 But we are just using components by way of illustration
16 to determine what is incredible or improbable and that sort
17 of thing. I didn't think we -- I think the qualifications
18 this witness has already given will preclude anybody from
19 believing that he is going to assert that the door knob will
20 work or not, he doesn't know. We are just using that for the
21 purpose of assuming the door handle doesn't turn, then what
22 happens? Somebody else can testify that the door knob will
23 always turn, that sort of thing, Mr. Moore can tell us about
24 the emergency core cooling.
25 I understood this was merely by way of illustration and
not a precise examination into the particular system which

DB-13

would have to be supported by somebody else.

The objection is overruled.

THE WITNESS: Well, the question, the answer to your question that you raised just alittle bit ago is that I think that there may be some differences of opinion or technical judgment as to the amount of, specifically the amount of cooling water which will reach the core during the blow-down phase.

The assumption has been made that it doesn't cool the core during the blow-down phase, and that is very conservative, to just assume none of it does. And when I said even under the worst assumption, I am saying under the situation where there is a question in some people's minds as to how much water, how much of the accumulator water would get into the core during the blow-down phase, the worst assumption one could make is assume that it doesn't, none of it does, during the blow-down phase.

CHAIRMAN JENSCH: Excuse me, may I interrupt? When we are talking about these different systems, you are talking about, as I understand it, two or maybe more systems. You have an injection system directly for core cooling. Then you have the accumulator system for core cooling. What else do you have? You have the double pipe?

THE WITNESS: We have a recirculation system which is duplicated inside and outside the containment.

DB-14

CHAIRMAN JENSCH: So when you are talking about a system of accumulators, you are just talking about one type of device that has been set up, is that correct?

THE WITNESS: That is correct. It is the device which for a large break operates to get water in very quickly to the core.

CHAIRMAN JENSCH: Maybe this isn't a question I should ask, but if you have four accumulators, I wondered if that could be related to four tires on a car? The four tires on a car blow out at the same time. I don't know whether that is within the realm of probability that you are seeking or not.

THE WITNESS: It is really -- that is helpful, but we don't have any mechanism for, in the case of the accumulators, for wearing these accumulators out like tires would wear out. And so in this situation we don't have -- there are no valves which open the accumulator system other than some flapper valves which are kept closed by the reactor coolant system pressure, which is a 2200 pound normal operating pressure, or thereabouts. And the accumulator is at something like 600 pounds -- don't hold me to that number. But as soon as the pressure drops down in the reactor coolant system, this 600 pounds pressure just pushes those check valves open and it is like my holding this ash tray up in the air and when I take my hand away, there is one thing that will happen, it will fall.

DB-15

There is nothing that caN keep the water from entering the reactor coolant system now.

Now the problem that Mr. Roisman has been raising is really realted to the crux of the re-evaluation by the AEC staff of the emergency core cooling system recently which was culminated in the interim policy statement and which has resulted in this document which was presented this morning which addressed this concern, where this task force of the AEC went through all of these problems and decided on a set of assumptions which were sufficiently conservative that it eliminated the questions involved.

And if a reactor vendor is able to show that his system using the appropriately conservative models that have been reviewed and accepted by the Commission, if he can show that he meets the acceptance criteria that have been set forth, also which have been reviewed by these people in light of all of the facts that are known about these things, that the system is adequate.

CHAIRMAN JENSCH: I don't think in discussing this with Mr. Trosten and Mr. Roisman a moment ago, I don't think he is asking you to tell us whether the injection system will or will not work or what the computer codes will be, but merely by way of illustration, taking the accumulators as one of the sets of devices or one device out of the several you have and assuming certain conditions for these accumulators, when

DB-16

1 do you reach the scope of the definition of probability
2 and possibility that you have used in your answer?
3 Is that your premise?
4 MR. ROISMAN: Yes, Mr. Chairman. I n fact, in
5 answering that you came closer to maybe some example that we
6 can get together on, Mr. Weisemann. You held up the ash
7 tray and said in effect you were comparing the chance that the
8 ash tray would not fall if you dropped it to the chance that
9 the water in the accumulators would not enter the coolant
10 system, in the case of a pressure drop.
11 Am I correct in saying that you were making that
12 comparison?
13 THE WITNESS: Yes.
14 BY MR. ROISMAN:
15 Q Would you say that, if we can keep it to the
16 simplest one, the ash tray, if you hold it up, is it your
17 position, using these terms we have been talking about, that
18 it is impossible for the ash tray to fall? If you held
19 it up and released it by your hands?
20 A Is it possible that it wouldn't fall?
21 Q Yes.
22 A I guess in the abstract it is possible.
23 Q What do you mean by in the abstract?
24 A Well, there might be something else holding the ash
25 tray up besides my hand.

DB-17

Q Can you give me an example?

A Like a string tied to the ash tray hooked onto the ceiling, for example.

Q That particular ash tray. Is there a string?

A This particular ash tray will fall.

Q And it is impossible that it wouldn't fall, is that right?

A Well, I don't know.

Q You mean because you haven't studied the ash tray as well as you have studied the emergency core cooling system?

I am serious now. Why is it you don't know whether that ash tray will fall if you let it go?

A Under these circumstances, in this particular set of circumstances that we are in right now, I am sure the ash tray will fall.

Q Would you say it is impossible that it wouldn't fall?

A Without changng any of the circumstances?

Q Right now. You are going to hold it up.

A It would fall.

Q Is it impossible that it will not fall?

#12
1n1

MR. TROSTEN: Mr. Chairman, the witness has been asked the question and he has answered the question.

MR. ROISMAN: He has not answered yes or no.

CHAIRMAN JENSCH: Overruled. Go ahead.

BY MR. ROISMAN:

Q Is it impossible the ash tray will fall?

A No.

Q It is not impossible?

A No.

Q Is it incredible?

A Sure.

Q Is there a difference then between impossible and incredible?

A In the case of the ash try, no.

Q There isn't? Then why is it not also impossible that the ash tray will fall if it is also incredible it will fall?

A You asked me, you said is it impossible that the ash tray would fall and it is possible for the ash tray to fall, so I have to say no.

Q I am sorry. Is it impossible -- I thought I said is it impossible for the ash tray to not fall. Assuming you lift it up and let go?

A IN my professional opinion the answer to that question is yes.

ln2

Q It is impossible. All right. Now, with regard to the accumulators, in the event of a pressure drop, is it impossible that the accumulator water will enter the reactor coolant system? Excluding that one loop that breaks now; take that out of consideration.

A Again, the answer is no.

Q Is it not impossible? I am sorry. Let me reframe it.

You have got me confused. Or I have got me confused.

Is there any possibility that the accumulator water will not enter the reactor cooling system if the pressure drops?

A Yes.

Q What is that?

A It might be the accumulator attached to the broken loop and it spills on the floor.

Q Other than that?

A It might be turned off for maintenance.

Q Have you done an assumption -- excuse me, have you done an analysis that assumes that more than one of them are turned off?

A No.

Q If more than one of them were turned off, would any water from the accumulator that was turned off enter the reactor cooling system from the ones that were turned off when they are turned off, can the water get into the reactor cooling

ln3

system?

A No, not unless -- it depends on the nature of the connections. I would have to refresh my memory, but I believe there was a safety injection signal to these valves, if the valves are not turned off for maintenance purposes, it is my recollection that there is a safety injection signal to the valves which would cause them to open.

Q You mean if they are turned off?

A If they were turned off when they were not supposed to be turned off.

Q When would that safety signal operate?

A That is the signal which starts the rest of the engineered safety features, when the reactor coolant system pressure and level fall.

Q And how is that signal given? Is it an electronic signal?

A It is basically an electronic signal, yes.

Q If the signal weren't given, what would cause the water from the accumulator that had been turned off to enter the reactor coolant system?

A Another signal.

Q You mean there is a backup signal?

A Yes.

Q And if that backup signal didn't operate, what would make the accumulator water go in?

ln4

A I would have to check the circuits to determine whether it is one out of two or two out of three logic. It would depend on how much redundancy there were.

Q You mean other signals, not something other than signals?

A That is right.

Q Now, as I understand it, you have assumed that the combination of events, that more than one accumulator is turned off for maintenance, and that in the event of a loss of coolant accident, all of the backup safety signal systems fail --

A I didn't assume that.

Q You have not. I say you have assumed that will not occur. Is that right? In other words, you have assumed in making --

A I have not assumed that. We have put provisions in the operation, operating instructions, and in the design of the system to preclude this from happening.

Q Provisions, you mean such as the instructions that you are not to have more than one accumulator turned off at one time for maintenance?

A And if it were turned off. I would have to check the technical specifications on that matter. The technical specifications in fact may even preclude operation with one accumulator turned off at the present time.

However, if the technical specifications allow

ln5

operation with one accumulator, there would be a limitation placed on the maximum power level, so that that would be safe. There are also prerequisites for operation of the reactor which require certain, the valves, for example, to be open as required and this is not only by the Applicant in his routine operation of the plant, but also by the Compliance who oversee the operation of the plant.

Q You mean Compliance of the AEC? Compliance Division?

A Yes.

Q Now, those various events, the inspections, the safety system signals, the technical specifications and so forth, do the combination of all of those make you conclude that the possibility that more than one accumulator will fail to function is as low as the possibility that that ash tray you had in your hand wouldn't fall?

A I don't know how to compare them. I am sure that both the ash tray will fall and this system will work but I can't give you a gradation, whether they are just as -- I don't know how to express it in those kinds of terms.

Q Well, would it be possible to perform a mathematical analysis in which you would put into your analysis the results of -- let's concentrate on the more serious half of it, the accumulator -- the possibilities or the occurrence of the failure of the safety system signal to operate when there is a closed accumulator, or the failure of the warning light, as I

ln6

assume there is on the board, to light up to show that an accumulator is off or the failure of a workman to follow the technical specifications and not turn off more than one accumulator at a time.

Is it possible to have a mathematical analysis made to find out how likely that combination of events is to occur?

A I suppose you could do a calculation and come up with a number.

Q Has that been done?

A I don't know that the number would be meaningful.

end 12

1 CHAIRMAN JENSCH: That isn't the question. Has
2 the calculation been done, do you know?
3 THE WITNESS: I am not aware of a calculation of
4 the type that he described.
5 CHAIRMAN JENSCH: Very well.
6 BY MR. ROISMAN:
7 Q How are you able, then, to quantify your concept
8 that a particular system of component in the reactor will
9 or will not work -- in this case the accumulators, if you have
10 not done a mathematical analysis?
11 What kind of analysis have you done to have you
12 reach your conclusion that it is not possible for more than
13 one accumulator to fail to open, again not counting that
14 accumulator on the broken loop?
15 A I think we are back at the beginning again.
16 Q I hope so.
17 A The fact is I don't quantity the use of analytical
18 techniques;to assign numbers is an attempt by people to put
19 a quantification on these things. However, decisions of
20 this type are made on the basis of other judgments, and I
21 think that if you had a number for this, I don't know what you
22 would use it to compare against to decid -- I don't know where
23 you would get the number you would use to compare against it to
24 determine whether the number you calculated was adequate,
25 inadequate or so-so.

1 But the numerical analyses are very useful for
2 the purposes of determining whether you are gaining some
3 significant improvement in making changes in systems one
4 over another. But in terms of coming up with an absolute number
5 that has absolute meaning, that, I think, there is general
6 agreement that this is not appropriate, not an appropriate
7 use of the probability calculational techniques, but
8 rather is as a means of arriving at a method of comparing
9 one system to another system.
10 Q Would you look at this document for me and please,
11 read the front page of it?
12 A You want me to read the front page?
13 Q Please.
14 A Do you mind if I look at the document?
15 Q No, go ahead. Thumb through it.
16 A The title of this document is "For Consolidated
17 Edison Company, a Study of the Probability of Aircraft Hitting
18 Indian Point No. 2," by J. M. Valance, Packard, Lowe, and
19 Associates, Washington, D. C., June 21, 1971.
20 MR. ROISMAN: Mr. Trosten, is this the document you
21 gave me this morning?
22 MR. TROSTEN: This appears to be the same document.
23 MR. ROISMAN: Thank you.
24 BY MR. ROISMAN:
25 Q Mr. Wissemann, I would like you, if you would, to

read, as I have marked here on page 2 of the document, beginning with the word -- well, read that title, and then down to this bracket, please?

A Just the part in brackets?

Q Yes, and the title of the page, too, please.

A It is II, Results "As derived in subsequent sections of this report, the estimated probability of a hit by an aircraft into the reactor containment, the spent fuel or control room buildings is PE equals $9X10^{-6}$ per year. Stated in other ways, one hit would be expected in 11 million years. (2) The probability of having a hit in a year is a zero," -- then it is followed by seven zeros and a 9; "or a chance in one in 11 million per year."

That is the end of the section marked on this page. However, I feel that it is my ethical responsibility to indicate that we are dealing with a subject that is different than, in a different context than the subject on which we are discussion or were discussing a short time ago.

Q Do you mean different because it has been something you don't know about or --

A No, it is different in the sense that this is dealing with a subject, the use of probability in a different context than we were speaking of before. We were talking before about the probablities of an accumulator discharging or not discharging, I believe; and that was the context, and I feel

that it is important to point out that there is a difference between calculating the probability of an accumulator discharging its water into the reactor coolant system, and the calculation of the probability that was performed in that particular analysis.

Q could you or would you elaborate on that to some extent in terms of where the differences are other than the fact that this has to do with airplane crashes and the other has to do with accumulators?

A Basically, it is the availability of statistics.

Q You mean the availability of statistics in order to have done this evaluation that are not available for purposes of doing the evaluation on an accumulator?

A That is correct.

Q So that this type of a probability analysis could be done with regard to the functions again of the accumulators if you had or such statistics were available, but in the absence of those statistics, it cannot be done?

A In the absence of statistics, it becomes a problem of determining the probability number to assign to each particular failure that goes to make up the total failure analysis. Therefore, depending upon the degree of uncertainty in those numbers, you can get wide variation in numbers as an answer.

There is in order to do probability evaluations on

a more or less absolute basis, you have to have good statistics. It is possible to use the reliability techniques or probability analysis for comparative purposes even in the absence of good statistics, because when you are comparing two systems, the uncertainties tend to disappear because you make the same type assumptions for the same type of failures.

Now, this has to be done with caution, but generally speaking, that is true. However, where good statistics are available, which generally result from having a large amount of experience, it is possible to do meaningful probability studies.

Q Would you say that where the experience exists and lots of statistics are available, that this type of probability study is a more reliable basis for evaluating the probability of something happening than it not happening, than the kind of basis thatyou have to use where you don't have your good statistics on the basis of substantial experience?

A No, I don't think that you ever discard anything. You consider all of the evidence thatyou have. I don't feel that I can characterize whether one is more reliable than the other without knowing the specific situation. It depends on -- each specific situation has to be considered on its own merits.

Q Let me say for instance that with regard to our accumulator problem again that you had 10 years of operating

1 experience in a thousand reactors of the size of Indian
2 Point No. 2, and that in those 10 years you had compiled
3 statistics on things like how often the little warning lights
4 did or didn't work, or how often the little safety signal
5 did or didn't come on, or how often a workman ignored the
6 tech specs, and did or didn't turn off the accumulators when
7 he was supposed to. Would you be able, assuming you had done
8 a good job of gathering your statistics in that 10 year
9 period, would you be able to come up with a more reliable
10 analysis in which you could say that we have a very low
11 probability of more than one accumulator failing to operate
12 as a result of these events occurring?
13 A You might be able to put a more reliable number
14 on it, but as far as how you interpret that number, it depends
15 on other factors.
16 Q When you say a more reliable number, have you
17 put any number on that event occurring now? As I understood
18 it, you don't have a n umber on it.
19 A I thought you said if I had the 10 years experience,
20 could I --
21 Q Would your analysis be more reliable --
22 CHAIRMAN JENSCH: Excuse me -- I don't think he
23 finished the answer.
24 THE WITNESS: Well, the answer that comes from the
25 analyist would be more accurate if you had more statistical
data, but I can't say definitely that just because you

spend 10 years that you would have any more statistical data. For example, 10 years of experience where nothing happens doesn't give you very much statistics on the occurrence itself. It just simply says that for 10 years it didn't happen.

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BY MR. ROISMAN:

Q In other words, the length of time during which you are able to gather the statistics helps make the statistics more reliable?

A No, -- well, length of time only because it is related to the number of occurrences. It is the events, the number of events that occur.

Q In other words, 50,000 occurrences gives you better statistics than 10?

A For something that is very reliable, it takes a long time, because it is a long time between failures. For something that is unreliable, it does not take you very long at all. That is one of the basic scientific principles we have going for us. If these systems were unreliable, we would know it. Because from unreliability comes frequent failure.

Q And with relatively good reliability, you have relatively good performance and with great reliability you have great performance. Do all of those follow?

A Well --

Q Poor systems fail often, mediocre systems fail not nearly as often, good systems fail less often, great systems fail even less often than that? Is that fair?

A I think in a general way that is true. There are in certain circumstances counterbalancing things which maybe make something that lasts too long not so great. But --

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Q Right. You mean like cross-examination.

(Laughter.)

THE WITNESS: That is a good analogy.

BY MR. ROISMAN:

Q Well, at least we agreed on one example. I just have a couple more questions for you. Let me see if I am clear on this.

You are telling me that at this point you do not have, and as far as you know, you are not aware of something that comes up with a number in terms of probability such as this analysis of the airplane accident, indicating the probability, say, of the failure of all of the components in the reactor, or that indicates in a numerical sense the failure of more than one accumulator to operate, or the failure of systems to operate that would produce a major meltdown of the core?

A That is right.

Q There isn't a number on that?

A No.

Q I seem to remember a document, and I unfortunately have it with me, that has been prepared with respect to this plant called, I think, "A Failure Tree Analysis" that relates to one aspect of the plant.

Are you familiar with that document?

A I believe that is related to anticipated transients

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without a trip?

Q That is right. Was that analysis similar to this in the sense it came up, if I remember correctly, with a number?

A We are talking about a different kind of -- again here is another situation, we are talking about a system in which a very preponderance of the components involved are electronic components where even if we don't have statistical information on the specific component itself, we have at least generic information on types of components because of a large amount of work that has been done.

Q You mean like transistors, which are part of the system?

A Or relays or whatever.

Q So that there you are able to get some statistics even though you haven't had a long experience with regard to the completely integrated system, a number of the parts of the system have been used in other situations?

A And so many of them have been used, that is right.

Q I see. Do you think that there are other aspects of the plant that might be susceptible to that kind of analysis, other than this no trip analysis that has occurred?

Do you know of any, are you familiar with any?

A I suppose there probably may be some others that are susceptible to the analysis. Whether or not there would be a value in performing that analysis is another question. Here

ln14

again, I go back to the kinds of assumptions we make. Where I am uncertain about something, we generally make an assumption that is conservative enough to be on the safe side of any uncertainty band that is involved.

So that whereas if you had chosen, say, the money value of some experimental result, there would be some chance of the result, the actual condition being on either side of the money value of experimental result.

However, if you make an assumption that is far enough in one direction, in the safe direction, you can eliminate that.

Likewise, if we have, for example, double redundancy on certain components, rather than to perform an analysis, it is sometimes simpler to just add redundancy.

end 14

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DB-1

Q I understand. In the analysis of the probabilities, possibilities, and credibilities of events occuring with regard to this plant for which these probability analyses have not been and in your opinion need not have been done, are you able to grade, are you able to say that as to some events that are improbable, some are more improbable than others?

For instaNce, we talked about the accumulators, the failure of the water to leave more than one accumulator.

Can you say that that is less probable?

A Do you mean are there some things that would happen more often in a plant than some other things?

Q Bad things, if you will, yes.

A Yes.

Q How do you do that grading? How are you able to say that?

A I would refer you to the document recently put out by ANS, it is the Criteria for Design of Pressurized Water Reactors -- I am not sure that is the exact title. But in that document, which is publicly available, Ibelieve you will find a series of four conditions of occurrences which include as condition one, routine operating conditions, condition two faults of moderate frequency which would be expected to occur several times say in the lifetime of the plant. Condition three which is -- I have forgotten the words. But generally speaking they are conditions that

DB-2

would occur maybe once in a lifetime of aplant. And then there are limiting faults, doncition four, which aren't expected to occur at all.

CHAIRMAN JENSCH: That word "faults" is f-a-u-l-t-s?

THE WITNESS: Yes.

CHAIRMAN JENSCH: Thank you.

BY MR. ROISMAN:

Q Do you know how those rankings are given? Are you adopting those rankings as your own?

A I participated in the ANS Subcommittee that developed those in an activity that covered at least two years of deliberations before the final criteria were put out.

Q How were judgments made as to which category, 1, 2, 3 or 4, various events would be put in? Was it based upon these probability statistics, or some other thing?

A Based on the combined judgment, engineering judgment of the parties involved and also considered were comments by individuals to whom the document was submitted for review during various stages of its development.

Q What kind of engineering judgments? Can you give me some examples of an engineering judgement that would result in something being put in category 2?

A Well, an example would be something which required a simple failure say of a switch or relay for example. That would be something you would expect to

DB-3

occur and put in condition 2. Something which required something tohappen, a failure to -- I think maybae the best way to illustrate this is to look at some of the things that are in the various categories.

A rod withdrawal accident for example, control rod withdrawal accident or transient is in condition 2. It is something which an operator might possibly, though it is unlikely, might possibly withdraw a control rod from the reactor. Or it could be initiated by some electrical malfunction to cause the rods to come out and then the analysis of that and the evaluation of the protection provided to terminate that transient safely is done under condition 2.

Condition 3 includes leaks in the reactor coolant system, minor things of that sOrt, leaks in the generator tubes,maybe .

Condition 4 includes things like a big loss, or design basis accident.

Q But what is there, if those were specific examples, what is there about the leak occuring in the piping that makes it less probable by that analysis than the mechanism failing and causing the rod withdrawal?

A Just the nature of the -- a review of the kinds of things which could lead to that incident, and how many things there are that could -- of course that would require review of each specific plant if you were talking about a

DB-4

1 specific plant. But in general,one has to look at the kinds
2 of things that would be required to lead up to this event.
3 Q Do hou also look at the possibility or probability
4 of those kinds of things happening? In other words, if there
5 are eight things that would have to happen before a certain
6 thing would occur, and another thing there are only two things
7 that would have to happen before it would occur, to some extent
8 we would all have a temptation to say well, if only two things
9 have to happen, that one is more likely to occur than the one for
10 which there are eight things that have to happen.
11 I am asking you do you take into account the probability
12 of the occurrence of the two things and the probability of the
13 occurrence of the eight things in assessing wheher the
14 thing should be considered more or less probable?
15 A The nature of these failures and the experience
16 relative to these types of failures is considered.
17 Q Are you coming up with statistics?
18 A No.
19 Q Well, what I am trying to find out is when you get
20 to the point where you dont have statistics, how do you
21 decide?
22 Is it just as simplistic as Isuggested? In other
23 words, if something that will fail needs eight things to
24 happen before it fails, and you don't have any statistics for
25 the thing failing, or statistics for the eight things that

DB-5

would lead up to failing, and something else would fail with only two things happeneing and you don't have any statistics for knowing whether that thing will happen or whether the two things will fail, do you merely conclude the one with the eight steps is less likely to occur than the one with two steps?

A It depends on why you don't have statistics. If the reason you don't have statistics is because the thing has been in operation for sometime and nothing has happened, that is one thing. If you don't have statistics because it is something brand new, that has never been used before in any other application, that is another thing. Of couse there are all shades of gray in between.

Q And how do you go about ranking those shades of gray? Would that be the only consideration that entered into your jdugment as to whether a set of statistics, or the absence of a set of statistics should result in us considering the event more or less likely to occur?

A No, we might have a lot of experience, but no statistics, simply because nobody wrote things down.

I think to a large extent that is the situation we are in now, that most of the components in a nuclear power plant have been used for years and years, and the technology is well-developed. I will grant there have been improvements in various aspects of these components, pumps with better seals and better

DB-6

bearings, and use of better materials that have been developed since maybe the first time somebody built a pump.

But there is a lot of experience but it is very difficult to go back and get statistically meaningful data because it is not sufficient to know whether or not a piece of equipment failed to operate, you have to know in what manner it faled to operate, you have to know under what conditions it failed, was it because something was wrong with the equipment, or was it because somebody englected it, or was it used in an application for which it was never intended?

There are many factors that are required in order to make up valid statistics. And most of the components that we are talking about are components which have seen a great deal of service in other applications.

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Q All of those things you just suggested sound like very relevant things one would want to know. It makes it sound as though the statistics would be very useful things to have. In their absence, what do you have that is as useful?

A I think you have to recall that we arrived at the situation we are at today not in one step, but through evolution, that the pumps we buy today are the way they are because of all of the experiences that the manufacturers and the designers who have worked on these pumps and the people who have bought these pumps and used them have had over the years.

Con Ed buys a pump in 1914 and they put it into service and they have a problem with leaky seals, so they get back to the manufacturer, he works on this problem and comes out with a modification of the pump and solves that problem.

Later on the same pump develops some other problem because it is now used in a different application, and that problem is solved. And each time one of these steps is taken, the component improved. And we have a tremendous amount of experience -- you are suggesting maybe, or maybe you are not suggesting it, but it does not serve any useful purpose to go back to 1914 and try to dredge up all of the information about these things and try to factor that into what we are doing today because it is probably impossible and the further you go back in time the more impossible it is to get the specific

ln2

information you need. And the fact is that the people who were involved in the problems at that time investigated those problems, got the answers they needed, and implemented design changes, improvements to the components, which have through the years led to the situation we are in right now.

And there is a parallel development in the codes and standards that are applied to the design of these components. The people who have been responsible for development of the ASME boiler and pressure vessel codes and the American Standards Association, which now has a different name, but there are standards on piping, the experience as it has developed is a factor fed back into the code.

The people look at the current system and say is this a deficiency in our design, is there something we should be doing differently, and they modify this. So that we keep updating these things and we reach a point where these standards together with the manufacturing and design capabilities that have been developed in this country make it possible to put together extremely reliable systems.

Q I take it if Indian Point No. 2 gets an operating license, its operational experience will help to make some plant in the future a "better plant" on the basis of things that are learned at this plant, more experience, more bases for working out kinks and things like that.

Is that a fair statement?

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A I think undoubtedly we will learn something from the operation of this plant.

Q I take it if this plant should malfunction in a way that produced a release of a substantial amount of radioactivity into the atmosphere, that once we were able to get back into the area, an analysis of the plant could be done in order to make sure it didn't happen, that particular failure didn't happen with some other plant.

In other words, as I understand it, statistics in a way get better, that is better for purposes of making judgments on them when you have failures. It is when you have successes that you keep coming up with zero.

A I think you just walked through the lookingglass.

I don't know how you got from the question of would we learn something on this plant to what you are talking about now.

Q If the plant had a failure, would you learn something in terms of finding out what might cause failures in other plants?

A And my answer is if we have failures in the plant, we will learn something from those failures. But I will also say that I don't believe, from my professional judgment, that any of these failures we are going to experience in Indian Point, whatever they may be, will result in any release of

ln4 1 radioactivity of the type you are describing. I don't know
2 how you got this.
3 Q In other words, you believe that this process of
4 development and experience, that today it has evolved to the
5 point where the failures that may be experienced with the plants,
6 with Indian Point, will be failures that won't involve releases
7 of radioactivity?
8 A We have multiple lines of defense against releases
9 of large amounts of radioactivity.
10 Q Right. Would you have made the same statement,
11 assuming that it was physically capable of building a reactor
12 of this size, if the reactor had been built in 1951?
13 A Would it be physically possible in '51?
14 Q If it were physically possible in 1951 to build a
15 reactor of this size, would you then have made the statement
16 as of 1951 that sufficient experience existed to feel confident
17 that the plants could operate without being concerned that
18 there would be radioactive releases to the public of the type
19 I mentioned?
20 A I have no basis for answering that question.
21 Q You mean you don't know what the situation was in
22 '51?
23 A You are hypothecizing a situation and I don't know
24 what my knowledge would be in that situation.
25 Q A minute ago you talked about the history of the

ln5 1 development of the components for nuclear power plants as
2 indicating to you that the history had now evolved to the
3 point, there had been enough failures and analyses on operating
4 experience, so you could say with some confidence that this
5 plant would operate without having these major accidents occur
6 where there would be releases of radioactivity to the atmosphere.
7 I am wondering whether that is based upon some historical
8 analysis of the state of the art, if you will, through the years,
9 or whether it is just you sort of feel here we are, it must not
10 happen.
11 A Just knowing how we got to where we are, and having
12 been involving in getting to where we are in the last ten years.
13 Q The critical years were the last ten?
14 A But I don't understand the relationship of building
15 a plant in 1951 to this question of whether this plant we are
16 building in the 1970s, I don't understand how it is related.
17 Q The relationship is you are talking about a historical
18 development, in other words, we haven't reached the point where
19 you can do one of these kinds of probability studies on the
20 whole plant based on statistics.
21 You indicate some of the problem has to do with the
22 failure of people to keep statistics all along and we are now
23 in a situation in which you are relying on something other
24 than statistics for your conclusion that the type of accident
25 which would have to occur in order for there to be a major

ln6

1 release of radioactivity to the environment is incredible or
2 impossible or improbable, whichever one of those terms you
3 happen to be using at the moment.
4 I am trying to find out whether or not those events
5 will be with us from time immemorial, whether they started --
6 in other words, when did the development reach that stage? You
7 must understand the development well enough to have made your
8 answer.
9 Was it at that stage in '51, in '61, in '63? Did
10 we just get there in 1970? Was it yesterday? When did we
11 reach the point where you were able to say that historical
12 occurrences now made the plant "reliable" or did we always
13 have it?
14 A I guess that would have occurred in my judgment
15 before I was involved with the nuclear power program.
16 Q When was that?
17 A Well, prior to 1961, because I think that the
18 operating experience on quite a large number of nuclear
19 submarines which at least to my knowledge there has been no
20 serious problems involved with the operation of those, together
21 with the commercial type activities, the Shippingport reactor,
22 Yankee Rowe, and Dresden 1 and the plants that followed, I
23 think that there is ample evidence that in just the operating
24 history of these plants that they have operated safely.
25 Q Size was not a factor then?

ln7 1 A I can only assume if we had the capability of building
2 a plant this size then it would have operated just as well as
3 the ones that we built then.
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Q In other words, in assessing the reliability of the experience with Shippingport and Yankee Rowe and the submarines, the fact that those reactors were smaller than this reactor is not a critical factor, is that your testimony?

A If that was a critical factor -- your question had the premise that we were able, capable of building the bigger plant back in 1951.

Q Your answer had the assumption that the data which you are now using for the purposes of this plant -- capable of building it means you could put that many fuel rods into a reactor vessel and you could heat it up and so forth.

I am asking in your experience, as you state it now, it is based on the performance of reactors which we all know are smaller than this one.

You don't feel the size of those reactors affects the reliability of the statistics?

In other words, you can take the data from Shippingport and apply it to this plant?

A Not directly, no, in terms of statistics.

Q I understand that. But I mean in terms of making your judgment that this plant will operate without any problem. That is what I am saying?

A This is a hypothetical question. The actual development of where we stand today involves several steps along the way from Shppingport to Indian Point Unit Number 2.

DB-2

And each step along the way was based on the experience gained from the previous step with appropriate allowances for the uncertainties that remained after we had had some experience with the earlier plant.

Q What is an appropriate allowance? Is that a statistical allowance, or is it the use of this term conservative, a conservative assumption you made?

A Yankee Rowe was designed on the basis of a lot of conservatism in the design. And then when the plant was actually operated, it was found that the plant had excess conservatism, as demonstrated by the fact that the power in that plant has been upped several times to the point where it is no longer possible to, because of the physical limitations, to increase the power any higher. And in future plants the initial design took advantage of those facts.

Q In other words, conservatism is used to compensate to some extent for the fact that the data on plants like SHippingport and Yankee Rowe involved smaller plants, these involve bigger plants, and you can't caarry the statistics over one for one, so you put some conservatism into the equasion to compensate for that uncertainty?

A Not across the board. I mean size is not always a factor.

Q I understand. Like on these little electric relays

DB-3

1 we were talking about. If it is the same size electric
2 relay, whether it is a big plant or little plant, you might
3 be able to carry it over?
4 A Or size of a piece of pipe, for example, wouldn't
5 matter so much, as long as the same principles were applied
6 in its design.
7 MR. ROISMAN: I have no further questions.
8 CHAIRMAN JENSCH: Mr. Scinto, do you have some
9 cross-examination?
10 MR. SCINTO: I would like to ask some questions.
11 CHAIRMAN JENSCH: Would it be convenient to
12 interrupt -- the reporter has been at it pretty long, we
13 started at 9:30 this morning. Would it be convenient for
14 Mr. Weisemann to be here tomorrow?
15 MR. RROSTEN: Yes, sir.
16 MR. SCINTO: They will be very brief.
17 CHAIRMAN JENSCH: Are you going to be here tomorrow?
18 MR.SCINTO: Yes, sir.
19 CHAIRMAN JENSCH: THen I think at this time we
20 will recess to reconvene in this room --
21 MR. TROSTEN: Mr. Chairman, may we have just a
22 brief discussion of the agenda for tomorrow? And also two
23 other related matters.
24 It is my understanding, Mr. Chairman, that we will
25 continue with Mr. Roisman's cross-examination tomorrow.

have the witnesses ready and willing and able to proceed so this case moves along.

I anticipate that probably by Thursday it might be advisable to take a couple of days recess for whatever further material can be re-evaluated and resume sometime the following week. Is that within the realm of possibility?

MR. TROSTEN: It certainly is.

CHAIRMAN JENSCH: Or probability or credibility?

MR. TROSTEN: Yes, it certainly is, Mr. Chairman.

CHAIRMAN JENSCH: Very well, let's keep that in mind.

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Is it your intention to, after the cross-examination, to discuss the matter of the fuel loading motion?

CHAIRMAN JENSCH: Any time convenient to the parties we will consider it and discuss it.

MR. TROSTEN: The other matter I wish to inquire about, Mr. Chairman, is the status of the Board's disposition of Mr. Roisman's offer into evidence of the B & W report.

My understanding of the Board's ruling is that the offer into evidence has been denied subject to further discussion of matters of foundation.

I wish to ask, Mr. Chairman, for the opportunity, when ths matter is considered again, to present further argument on the admissibility of this document.

CHAIRMAN JENSCH: Oh, all parties will have a chance to consider any other matters, certainly.

MR. TROSTEN: And in that connection, Mr. Chairman, to submit a memorandum to the Board.

CHAIRMAN JENSCH: Either way. We feel the foundation matter at the present time precludes acceptance into evidence. If any founcation evidence is offered, all parties will have an opportunity to address themselves to it in one form or another.

Let me inquire, what is the schedule that the parties have considered for tomorrow? Mr. Weisemann will be on the stand and then who is next? I understand Mr. Moore is off

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1 for the day.

2 MR. ROISMAN: My understanding at least from our

3 standpoint is we won't have any cross-examination for Mr.

4 Moore until some substantial time after the staff has done

5 its analysis of the emergency core cooling system question

6 and we have had a chance to study it, the documents we have

7 requested have been produced.

8 I don't envision that occurring in the course of this

9 session of the hearing.

10 CHAIRMAN JENSCH: Who is the next witness?

11 MR. ROISMAN: The witness from the staff to

12 discuss the same question that we have discussed with Mr.

13 Weisemann.

14 CHAIRMAN JENSCH: Have you completed then with all

15 of the witnesses for the applicant?

16 MR. ROISMAN: No, I was planning to do it issue

17 by issue rather than siee by side. In other words, go ahead

18 and discuss further the question or probability.

19 The next witness after that staff witness would be

20 the staff witnesses on the question of risk-benefit analysis,

21 and finally then witnesses from both the staff and the appli-

22 cant on the question of the meanings of these concepts of s

23 design margin and conservatism.

24 CHAIRMAN JENSCH: Whatever the parties agree upon I

25 am sure will be agreeable to the Board. We just wanted to

MR. KARMAN: Mr. Chairman, I didn't understand your scheduling, as to Thursday of this week or next week, are you talking about?

CHAIRMAN JENSCH: I just wondered if we would run out of witnesses and recess Thursday night and come back Monday or Tuesday of next week.

MR. KARMAN: I see. Thank you.

MR. ROISMAN: Mr. Chairman, on that question, we anticipate, and it is hard to predict these things, that our cross-examination of witnesses should be completed by the end of the day tomorrow or Thursday, at the latest. I am not putting into that formula the possibility, say, of cross-examination by other parties of the same people we are cross-examining. At that point the only thing that will remain insofar as our portion of the case is concerned would be one, the cross-examination of a witness from New York State on the emergency plan, and the emergency core cooling system cross-examination.

If the other parties have nothing else to do, say after the end of the day Thursday, but those things, we would suggest that the hearing be adjourned until such time as we have had a chance to analyze the emergency core cooling system data that comes in from the Staff in conjunction with what the Applicant provided us and submit to the Board a prehearing brief of the type we have done on these other

1 issues, identifying again the questions we want to examine,
2 the points upon which we will rely, and the cross-examination
3 we want to conduct, and then another session of the hearing
4 be convened and then the New York State witness be asked to
5 come at the start of that session. And he has now, through
6 service on Mr. Scinto, an idea of what we want to talk to him
7 about.

8 I don't know what the other parties have planned
9 for the rest of this week or next week, but I would anticipate
10 we can wind up our case by the end of the day Thursday.

11 MR. TROSTEN: Mr. Chairman, as I indicated at the out-
12 set, we are quite anxious to conclude the entire hearing
13 with the exception of the emergency core cooling session in
14 this part, in this continuous session of hearings. We are
15 prepared to adjourn Thursday night if this is the Chairman's
16 desire, and resume on Monday or Tuesday, and this would
17 give, it seems to me, a reasonable opportunity for the
18 parties to consider all of the documentary material that has
19 been submitted in the last several days, and so we see a
20 highly useful function to be served by reconvening next week,
21 assuming we are not able to conclude.

22 It seems to me that there is no likelihood that I
23 can see that we are going to be able to conclude all matters
24 with the sole exception of the questioning by Mr. Roisman of
25 the New York State witness.

1 CHAIRMAN JENSCH: I think that will have to be the
2 guiding arrangement for this proceeding, that we will sit
3 here, either this week or next week to try to conclude every-
4 thing if we can, except the emergency core cooling. And if the
5 parties believe that we are not going to be able to finish
6 by Thursday night, we will set up a session for next week,
7 even though it will involve coming back. Because I do
8 think when the Board have endeavored to set aside this time
9 to in a sense go as far as we can with everything, and if it
10 means we have to have a hiatus over the weekend, with a Friday
11 and Monday free for work, I think we will have to arrange it
12 that way. Because it may be we can work through Friday and
13 finish up everything except Mr. Davies, and I take it that
14 Mr. Davies won't be such an interruption to the ECCS final
15 session that we couldn't postpone him until that time.
16 MR. TROSTEN: That is the part we do object to,
17 Mr. Chairman. We feel in view of the significance which the
18 Citizen's Committee for the Protection of the Environment has
19 attached to this aspect of its case, and to this aspect of
20 the testimony introduced in this hearing, that it would be
21 extremely inadvisable to postpone the consideration of that
22 matter until the time that the emergency core cooling system
23 matter is raised. The nature of these proceedings is such that
24 it is quite important to go through as much of it as we
25 possibly can and to get these matters resolved.

It may be, for example, that if Mr. Roisman raises questions in his cross-examination that the Applicants or the State of New York would wish to introduce additional testimony. Now that could be done next week, sir.

I think that postponing this until a later time would involve the potentiality of a considerable amount of delay and a slowing down of the hearing process.

CHAIRMAN JENSCH: Well, I think we will have to keep that in mind and not let that happen. It may be that in view of the fact that we could take Mr. Davies some day next week, that maybe not coming on Tuesday, we might come Wednesday or Thursday with the thought at least that we will get that done at this session of hearings and then if there is anything further involved, we will have to see what the situation is at that time.

I do appreciate the burden of coming back up here by the intervenors, but we have endeavored to set aside this time for some while, and we have been anxious that when we set this down for July that we would do everything we could now and if there is any possibility of some additional evidence besides Davies', I think we should provide that opportunity now.

In any event, at this time let us recess to reconvene in this room tomorrow morning at 9:30.

(Whereupon, at 5:30 p.m., July 13, 1971, the hearing was recessed to reconvene 9:30 a.m., Wednesday, July 14, 1971.)

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