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Transcript of Proceedings

UNITED STATES OF AMERICA

PRESIDENT'S COMMISSION ON THE ACCIDENT AT  
THREE MILE ISLAND

DEPOSITION OF: JESSE C. EBERSOLE

*- Annotated JK*

POOR ORIGINAL

Washington, D.C.

July 28, 1979

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UNITED STATES OF AMERICA

PRESIDENT'S COMMISSION ON THE ACCIDENT AT  
THREE MILE ISLAND

DEPOSITION OF:        JESSE C. EBERSOLE

Room 714  
2100 M Street, N.W.  
Washington, D.C.

July 28, 1979  
10:45 o'clock a.m.

APPEARANCES:

On Behalf of the Commission:

GARY M. SIDELL  
Assistant Chief Counsel  
2100 M Street, N.W.  
Washington, D.C. 20037

STAN M. HELFMAN  
Assistant Chief Counsel  
2100 M Street, N.W.  
Washington, D.C. 20037

On Behalf of the Witness:

MARIAN E. MOE  
1717 H Street, N.W.  
Washington, D.C. 20555

**POOR ORIGINAL**

I N D E X

WITNESS:

DIRECT

CROSS

REDIRECT

RECROSS

Jesse C. Ebersole

3

E X H I B I T S

NUMBER:

FOR IDENTIFICATION

Ebersole No. 1

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Ebersole No. 2

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Ebersole No. 3

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Whereupon,

JESSE C. EBERSOLE

having been duly sworn, was called as a witness herein and testified as follows:

DIRECT EXAMINATION

BY MR. SIDELL:

Q Mr. Ebersole, would you state your name for the record, please?

A Jesse C. Ebersole.

Q Your current position?

A I am a member of the Advisory Committee on Reactor Safeguards.

Q Have you ever had your deposition taken before?

A No.

Q Let me briefly then explain what we are going to do here. Even though we are in a conference room, a relatively informal setting, your testimony is sworn and under oath, and has the same effect as though it were before a judge or jury in a court of law.

Therefore, it is necessary to be as precise and as accurate in your responses to my questions as you can be. To avoid any confusion or misunderstanding, should you not understand any of my questions, please ask me for clarification, and I will try and explain what I am looking

1 for to help you better respond to the question.

2 Since we have a court reporter taking down your  
3 testimony, please answer audibly rather than nods of the head  
4 or gestures because she obviously cannot record such  
5 gestures.

6 Finally, I would ask that you make an effort to allow  
7 me to finish my questions before you complete or start your  
8 response even though you may know where the question is  
9 going. Again, we want the reporter to get everything down  
10 accurately.

11 I will also try to restrain myself and not ask a  
12 question before you have finished a response.

13 Do you have any questions about what I have just  
14 informed you?

15 A No.

16 Q When the deposition is finished, the reporter will  
17 transcribe the testimony, and we will present a copy of it  
18 to you for you to review and make any changes, if you feel  
19 them necessary.

20 However, you should be advised that if you do make  
21 changes and we consider those of a substantial nature, we  
22 are also entitled to make comments on those changes which  
23 may adversely affect your credibility. Again, the emphasis  
24 is as precise responses as we can have.

25 A Right.

1 Q Did you bring a resume with you?

2 A I did. It is the old one by which I was appointed  
3 here, the ACRS.

4 Q This is dated April 15th, 1976.

5 A Yes.

6 Q Have there been any substantial changes since that  
7 point in time?

8 A No.

9 Q The information contained in the resume is accurate  
10 and complete, to the best of your knowledge?

11 A Yes.

12 MR. SIDELL: We would like this marked as Exhibit 1  
13 to this deposition.

14 (Ebersole Exhibit No. 1 was  
15 marked for identification.)

16 MR. SIDELL:

17 Q I note from your resume that you were appointed  
18 April 15th, 1976 to the ACRS.

19 A That is correct. April 15th?

20 Q Yes. That is the date on the resume.

21 A It was mail April the 15th; as I recall, my  
22 appointment was on April the 1st.

23 Q Okay. Fine. Can you describe your activities and  
24 responsibilities with the ACRS?

25 A I am a member of ACRS like the other 14 members.

1 My activities tend to be in system analysis and system  
2 interaction areas rather than specialized areas like seismic  
3 performance or core performance or other similar areas.

4 Q What particular systems, if any, do you concern  
5 yourself with?

6 A All of them.

7 Q Okay. No particular interest in one area or other?

8 A No. I am interested in the interrelations of  
9 systems since they have interesting couplings that produce  
10 cascading with sometimes important terminal effects.

11 Q Can you describe the ACRS role concerning  
12 construction permits for nuclear reactors?

13 A I will describe it to the extent that I know it in  
14 a formal sense, which is merely I must write a letter.

15 A The ACRS?

16 A Writes a letter approving the construction.

17 Q Is the letter sent to the NRC?

18 A Yes, sent to the Commissioners.

19 Q As a basis for writing the letter, is there a  
20 review or an analysis that is performed by the ACRS?

21 A Yes.

22 Q What does that review include?

23 A A subcommittee is formed on individual projects,  
24 and these have the benefit of the SER's, which are reports  
25 that describe the plant rather briefly, but in a fundamental

1 sense, its design, and they have the benefit of supplementary  
2 information on any particular feature they desire on request.

3 Q There must be specific concerns raised by someone  
4 for the ACRS, for review rather than a general overview of  
5 the entire application?

6 A There is a general overview, and there are specific  
7 issues that are studied by the individual members more or less  
8 as specialized aspects of the design.

9 Q Their own individual interests?

10 A Right.

11 Q Do you know how a construction permit application  
12 finds its way to the ACRS? Does it come from the NRC or  
13 the individual applicant itself or some other method?

14 A Well, the request certainly originates with the  
15 applicant.

16 Q Directly to the ACRS?

17 A I am not going to say that I am familiar with the  
18 routines of document processing. It's the staff. We call  
19 the Regulatory Commission. They are working parallel  
20 on a schedule, and both are aware of a permit which is  
21 pending, and they are put on a schedule.

22 Q As far as you know, there is both an ACRS review  
23 as well as an NRC staff review?

24 A Of different character--the staff review is an  
25 intensive review in substantially greater detail than ACRS



1 performs.

2 Q Would I be correct in concluding that the ACRS  
3 review concerns itself with the more general essentially  
4 policy type concerns of an application?

5 A The general nature of the project and departures  
6 from past practice, novel features, unusual circumstances  
7 from established patterns.

8 MS. MOE: I would like to clarify something. Now  
9 when the ACRS reviews the application, do you have any  
10 additional ACRS staff, or is it just reviewed by the ACRS  
11 members?

12 THE WITNESS: The ACRS has its own staff who will  
13 pursue issues as they are addressed within the staff or  
14 carry those issues on up to consultants or whatever.

15 I would like to make a statement of clarification.  
16 I have not endeavored to familiarize myself with the  
17 machinery of the ACRS process so much as I have the  
18 physical nature of the plant, so I can't be proficient in  
19 this sort of administrative aspect.

20 BY MR. SIDELL:

21 Q You are more concerned with the substance rather  
22 than the procedure essentially?

23 A In essence.

24 Q Okay. Do you know at the time the ACRS reviews  
25 applications for novel features, for instance, what the

1 status of the NRC investigation of the same application  
2 might be?

3 A We know what the status of that investigation was.  
4 It would be an inquiry as to the status, where it was,  
5 whether it was partially completed, whether the plant  
6 was going to be permitted to start construction or operation  
7 with any pre-defined status.

8 Q In that case, have you ever found that as a general  
9 practice the NRC has completed their review process before  
10 the ACRS has completed its review process?

11 A Yes. The NRC staff generally completes the bulk  
12 of its investigations before ACRS is approached on the ground  
13 that ACRS should be left with only the important residuals.

14 On the other hand, typically there are numerous  
15 issues still unresolved at the time a given project comes  
16 to ACRS. It is one of the perennial complaints of ACRS--  
17 the degree of completion of resolutions is inadequate.

18 Q So you would rather, given an optimal situation,  
19 that the NRC do more than they do before the matter gets  
20 to you?

21 A We would like to do that, but more importantly, we  
22 would like to hear where the issues have been settled with  
23 difficulty because not to hear an issue, have it resolved  
24 in a manner that was difficult internally but not known to  
25 ACRS is another source of concern to us.

1 I think we like to hear where issues were difficult  
2 settled and how they were settled.

3 Q If, for instance, the NRC approves an application  
4 and they have essentially finished all their review of it  
5 when it gets to the ACRS, what is the ACRS' role in reviewing  
6 the same application?

7 Do they hold a veto power or can they make changes  
8 or what is the relationship between the ACRS and the NRC?

9 A They can refuse to write a letter of approval  
10 which is going to lead to a problem in processing the  
11 application if the issue prevails.

12 If that condition where there is no agreement  
13 between the staff and ACRS is ever reached, I can't recall  
14 just how it is settled, but I can recall a case of a plant <sup>The Bodega</sup>  
15 ~~somewhere~~ <sup>Bay Project</sup> in California in which the staff and ACRS took  
16 divergent views about the safety of the design with respect  
17 to seismic considerations. Excavation was already finished.

18 ~~I suggest you look up, if you are interested in~~  
19 ~~that project, look up the name of it. I can't recall the~~  
20 ~~name of it.~~ Quite a few million dollars were spent in the  
21 excavation.

22 ~~MS. MOE: It might have been Bodega Bay.~~

23 ~~THE WITNESS: I can't recall. I am not sure that~~  
24 ~~it was Bodega, but in general, the staff and ACRS come to~~  
25 ~~an agreement.~~

BY MR. SIDELL:

*Bodey*

Q With the exception of the one reference to the ~~plans in California~~ *San Diego* that you just made, can you recall any other instances where the ACRS and NRC--

A I can't recall of any where there were such strong issues raised as that.

Q Can you recall what the specific issue involved was?

A As I recall, it had to do with the potential for damage by earthquake I believe. My memory is not that good.

Q So it is essentially an external problem to the plant?

A Right. Oh, yes. It has to do with the siting.

Q So as best you can recall, in almost three and a half years that you have been a member of the ACRS, you have had no instances where the ACRS and the NRC essentially locked horns over an internal safety-related matter in a plant?

A Locked horns, but only on the level below that of ~~actually shutting, refusing to continue the progress on it.~~ *refusal to write a letter*

Q In those instances, do operators comply with the ACRS request for changes in their application?

A ACRS merely requests. The staff, the regulatory staff, issues the orders. The applicant might on his own initiative put modifications into the design or simply the

1 recommendations or suggestions of ACRS, but they might not,  
2 on the other hand. It is their option. ACRS is, as its  
3 name, an advisory body.

4 Q But nevertheless, still holding some veto power  
5 over the completion of a nuclear plant?

6 A In my view, they hold the power of non-approval.

7 Q Okay. We may be quibbling about semantics, but  
8 you can slow up, if not temporarily stop?

9 A You can make it difficult.

10 Q Okay. What is the ACRS' involvement with any  
11 review of an operating license as opposed to a construction  
12 permit?

13 A It is essentially the same process done on the  
14 basis of a great deal more information than was available at  
15 the time of construction.

16 Q Are there periodic reviews of various plants once  
17 they have sought or filed an application for an operating  
18 license?

19 A Yes.

20 Q How frequent are those reviews?

21 A Are you referring to reviews by ACRS?

22 Q Yes.

23 A I am not aware of an actual periodic review. There  
24 is on-going at this time a program to review the plant  
25 operation by the staff.

1 Q By the ACRS staff?

2 A No, no--the regulatory staff; this is on-going at  
3 this time.

4 Q Do you know if this is a result of the accident  
5 at TMI 2?

6 A No. It was already in being at the time.

7 Q Do you know how long it has been around?

8 A I think it has been around for a couple of years--  
9 not long.

10 Q You previously mentioned that the ACRS is concerned  
11 with more novel or interesting safety considerations of  
12 plant applications.

13 Can you recall any consideration by the ACRS of the  
14 B&W once-through steam generator?

15 A Well, now you are talking about ACRS in the last  
16 three and a half years that I could have known about this,  
17 and the prior years in which I worked for TVA prior to  
18 that time, and we were going to design and build a B&W  
19 plant.

20 In the context of ACRS taking particular concern  
21 about the once-through steam generator, I am unaware of  
22 their looking at this in any particular sense prior to  
23 my involvement in the project known as Pebble Springs.

24 I don't say that they had not, you understand.  
25 I haven't investigated.

1 Q From your experience?

2 A From my experience, but there are numerous  
3 interesting features of the once-through boiler that were  
4 made topics of an inquiry on the Pebble Springs project.

5 I elected, having participated in the Pebble Springs  
6 subcommittee activity, to write 26 questions dealing with  
7 this matter as well as with a matter that involved  
8 ultimately the TMI case.

9 Q We have some questions about your 26 questions, but  
10 let's just defer those for a few minutes.

11 I notice on your resume there is a paragraph  
12 relating to the fact that you had experience while at the  
13 TVA with the design of high temperature loops for research  
14 reactors and supervised technical groups assigned to start  
15 up, operate and perform analyses of experimental reactors.

16 Can you tell me what high temperature loops are?  
17 Are those the same thing as loop seals in a pressurizer?

18 A No. Those were part of the high temperature  
19 gas cooled reactor program in which gas temperatures were  
20 contemplated as high as 1200 degrees Fahrenheit. They were  
21 not light water type systems.

22 Q Is there any analysis that may be applied from a  
23 gas cooled reactor to a pressurized water reactor?

24 A Yes.

25 Q In principle, there is some similarity between the

1 two?

2 A There is indeed.

3 Q Would the seals that you just mentioned in a gas  
4 cooled reactor be similar to the loop seals in a pressurized  
5 water reactor?

6 A You are referring to a hydraulic seal instead of a  
7 mechanical seal. My first interpretation was that you were  
8 talking about a mechanical seal, but you are talking about  
9 the loop seal in a pressurized water reactor.

10 Q Yes.

11 A No. I can't recall a loop seal of that kind on any  
12 portion of the gas cooled machines.

13 Q Is that a relatively new characteristic, the loop  
14 seal?

15 A No, I can't say that is a new characteristic. I  
16 can't say that.

17 Q Do you know when the first instance proposed by an  
18 applicant was to include a loop seal in a pressurized water  
19 reactor?

20 A To my knowledge, the presence of a loop seal was  
21 not culled out. It was detected by the effort primarily  
22 from Mr. Michelson.

23 Q You are referring I take it to Mr. Michelson's  
24 report of 1977?

25 A Yes. I don't think he referred to it as a loop seal



1 per se. He merely pointed out the physical problem.

2 Q Mr. Ebersole, it is my understanding that the  
3 ACRS can be involved in a review of possible safety  
4 problems if an applicant wants to essentially challenge an  
5 NRC initial reviewer's decision about a safety problem.

6 Are you familiar with the ACRS' actions in this  
7 matter, acting essentially as a reviewing body?

8 A Well, the ACRS acts as a reviewer in any case,  
9 whether or not there is an issue between the vender or  
10 architect/engineer or the applicant utility. They would  
11 tend to concentrate on issues that are unresolved between  
12 these participants more than those that are resolved, which  
13 may or may not be the correct thing to do.

14 Q This I think has reference to more precise or  
15 specific safety concerns in the review of a plant, for  
16 instance, an NRC initial reviewer which I believe is the  
17 correct title for this person, makes a finding that  
18 yes or no, there is or is not a particular safety concern,  
19 the applicant, should the utility not be in accord with that  
20 decision, may as I understand it appeal essentially to the  
21 ACRS for redetermination of that issue?

22 A Yes.

23 Q And the specific individualized safety concerns is  
24 what I am now looking for.

25 A They can bring it to the attention of the project

committee, and the advisory committee will participate  
with an unknown result, the prime case being the <sup>Byline</sup> one  
Bay Case referred to in California where ACRS, as I recall, and the  
staff never did agree.

The tendency is to, if there is apparent resolution  
without difficulty, given issues between the staff, the  
applicant, the architect/engineer and the vendor, then ACRS  
would generally give less attention to that particular issue  
than if some controversy still exists or did exist in the  
resolution of it.

One of the problems is to ascertain whether the  
issue was resolved with or without controversy.

Q From your perspective, the NRC has previously or  
at least up until now, not designated a resolution with  
or without controversy on safety matters?

A This matter was requested of them a couple of  
years ago to cull out where issues had been resolved with  
controversy, with difficulty, as being special issues that  
Hence the SER's which are the basic documents  
ought to be given a greater degree of examination than other-  
wise. <sup>for ACRS consideration, tended to obscure</sup> rather than reveal, the issues which ACRS  
<sup>difficulty associated</sup> should examine

The SER's, if they come to us without issues, might  
be looked at as a document that obscures rather than reveals  
what internal problems might be. If you get an SER that  
has no visible issues in it, you might be glad to think that  
there really were none of any significance, but that is not

1 necessarily true.

2 Q So the initial determination as to whether or not  
3 there really are problems that might interest the ACRS lies  
4 with, for instance, an initial reviewer at NRC?

5 A Yes. In my opinion--I want to make it clear I am  
6 speaking here in my own opinion--but the ACRS is dependent  
7 on issues being brought to them to a great degree, as well  
8 as raising them as a product of its own investigation. Since  
9 there is only 15 people, and there are many projects, we  
10 are dependent on issues being handed to us for solution to  
11 a great degree.

12 Q Can you say that universally you receive issues of  
13 concern to ACRS exclusively from the NRC, or are there  
14 alternative means?

15 A There are alternative means.

16 Q What are those methods?

17 A Well, the case in point, the issue of the small  
18 break accident has been a matter of concern to Mr. Michelson  
19 and myself for a good many years, going way back.

20 As a matter of fact, the small break accident was,  
21 I think actually originated in the experimental gas cooler  
22 reactor project in Oak Ridge in the years 1960 to '65.

23 It was learned at that time that the most obviously  
24 spectacular large break didn't necessarily produce the worst  
25 effects. In that particular instance, it was due to the

potential for stagnation of gas <sup>flow</sup> foil. It was produced by a small break that would not be produced by a large break.

In the years following that, it was recognized that the small break had interesting potential for severe damage that the large break presumably being solved by the mitigating systems that had been designed as a result of the investigations on NCCS systems, the small break accident was the type that one is less sure as to how the event would terminate, and I could certainly recall that in 1974 at a subcommittee meeting on Diablo Canyon, which is a Westinghouse design, that the small break issue was raised then, and I personally raised it, with essentially the same low quality answers as to how it would perform under these circumstances.

Q Where did the answers to your questions come from?

A They came from the Westinghouse Company in that case.

Q If you have questions concerning an application, do you usually get responses from the NRC staff or from the particular utility or designer involved?

A We may get it from any of the several sources there. Generally four possible sources is the applicant, the architect/engineer, his vendor, or the staff. We might get answers from any of these.

I think it is generally true that we will get

1 input through the NRC staff.

2 Q Do you don't deal directly with the architect or  
3 designers or applicants?

4 A A model for this is the response to the Pebble  
5 Springs questions. The questions are almost always directed  
6 to the applicant, yet more often or not, the applicant is  
7 the least qualified of all the participants to create the  
8 answer.

9 Q With reference to Pebble Springs, that was a B&W  
10 facility, was it not?

11 A Yes.

12 Q Am I correct in concluding that B&W itself responded  
13 to your question?

14 A Yes. They followed the standard routine. The  
15 questions are raised to the applicant, the applicant being  
16 generally a utility with more or less and sometimes very  
17 little technical expertise in the question areas, who hands  
18 the question over most frequently to the vender, which in  
19 this case was B&W.

20 The vender then writes the answers. That is handed  
21 back to the applicant. The applicant passes the answer  
22 through channels to the ACRS.

23 Q Are you aware of any instances where the applicant  
24 has made changes to the responses offered by the designer  
25 or architect?

1           A    I am sure such changes are made. I can't recall  
2 a specific one. The utility or the applicant is the  
3 customer of the vender and he holds some control over, or  
4 he certainly has to review the answer to see what potential  
5 impact it has as to whether he believes it to be true or  
6 whatever.

7           Q    Have you usually found that these responses offered  
8 by vendors would if the case warranted, point up a choice  
9 between operational convenience and safety as a tradeoff,  
10 or do they tend to downplay any safety concern if it is going  
11 to cost the applicant more money with the plant revisions?

12          A    You understand this is a personal opinion?

13          Q    That is what I am asking for.

14          A    I can't in any context talk about the committee.  
15 I am afraid I will be almost neutral on that question, but  
16 if there is any tendency to swing one way or the other, as  
17 was the case in this particular instance, it is the  
18 tendency of the vender to downplay issues raised by utility  
19 staff.

20                I think I can fairly make that statement. If it  
21 comes to a direct controversy, I don't know the general  
22 case, but I think the utility will generally be subordinate  
23 to the vender supplier in reaching a terminal decision,  
24 which doesn't sound legally correct, but nevertheless in a  
25 practical sense in my experience that has been the case.

1 Q As a result of that, if there were a choice to be  
2 made between safety and cost, it would be practical in your  
3 experience for the vender to err on the side of convenience  
4 for the utility rather than safety? Would that be accurate?

5 A I hesitate to say that, but my experience with the  
6 so-called ATWS case, the General Electric Company tended to  
7 support my opinion that the vender will downplay it.

8 This was the case with Brown Ferry. In this case,  
9 the utility suggested certain additions and improvements  
10 which the vender rejected.

11 Q Are you aware of any formalized procedures concern-  
12 ing ACRS questions and where they go within NRC to be  
13 answered?

14 In other words, do your questions go first to the  
15 NRC and then out to the applicant, or do you send them  
16 directly from the ACRS to the applicant?

17 A My business is handled through the NRC.

18 Q Do you know which specific part of the NRC?

19 A Well, the larger issues, the general issues are  
20 put in letters to the Commissioners and they come to NRC  
21 via that route.

22 The less significant issues, the dog and cat issues  
23 they are called, are handled informally I believe in our  
24 meetings. We only have two meetings, subcommittee meetings  
25 and general meetings, and there is never enough time in any

1 of these to pursue these issues in detail, but through  
2 the record of our meetings, we make requests to NRC which  
3 may come to us in an informal style without ever getting in  
4 anything more formal.

5 Q In the context of the informal requests or dealings  
6 with the NRC, do you ever deal with any individual in the  
7 NRC staff at a level less than the Commissioners?

8 A You are talking about personally?

9 Q Yes.

10 A Well, my most significant dealing was with Mr. Israel,  
11 who I gave this report to, feeling that in the small  
12 available time for discussion at the full committee hearing  
13 on the 205 plant I certainly couldn't cover the details that  
14 were leading to the questions that I produced on Pebble  
15 Springs.

16 These are the questions which were written and  
17 answered formally which you have, and also the same sort of  
18 questions which were raised in the full committee hearing.

19 You have two answers to these questions, by the  
20 way. You have the documented answer in this letter from  
21 the applicant on Pebble Springs, and you have the transcript  
22 of the subsequent meeting, so I guess we don't need to go  
23 into what those answers were.

24 Q We have a few specific questions about some of  
25 those questions which we will get to shortly.



1           A     But the informal approach, I don't know to  
2 what extent other members may approach. I have looked upon  
3 the staff as either antagonists or cooperative individuals,  
4 whichever I felt them to be, and in this particular instance,  
5 I knew Mr. Israel. At least I made a judgment for whatever  
6 reason that he was a cooperative investigator, which he  
7 was it turns out, and I handed this material to him  
8 informally to assist him in coming to the same sort of  
9 question-type conclusion that I had raised that we should  
10 investigate this area.

11           Q     How did you happen to know Mr. Israel?

12           A     I had seen him at numerous meetings and I made  
13 a personal judgment that he was a concerned and competent  
14 individual, not inclined to reject casually documentation  
15 offhand.

16           Q     Did you inquiry of anyone into his professional  
17 background?

18           A     No. I deduced that from just hearing his  
19 presentations.

20           Q     So he made presentations to the ACRS?

21           A     Yes.

22           Q     This was a time when you presented a copy of the  
23 Michelson report to Mr. Israel?

24           A     Yes.

25           Q     Was this a handwritten copy of the Michelson report?

1 A Yes, it was; I have a copy of it here.

2 Q I think we may have a few also. Let me show you  
3 a copy of a document entitled, "Case LOCA Removal Problems  
4 Associated with Recovery from a Very Small Break LOCA  
5 for the B&W 205 Fuel Assembly, PWR" dated September, 1977,  
6 and for the record, let me ask you if you have seen that?

7 A That is correct. That is the paper.

8 Q This has been previously marked as an exhibit  
9 to the Michelson deposition. This is the report that you  
10 provided to Sandy Israel?

11 A Yes, after the question-answer sessions. I believe  
12 it was after. I am not positive, but I think it is after  
13 the question-answer sessions.

14 Q At the ACRS meeting?

15 A Yes, correct.

16 Q Do you recall the date on which you provided this  
17 response to, or this report to Mr. Israel?

18 A It would have been at the pertinent meeting in  
19 Washington here that we were discussing that project, as I  
20 recall. I handcarried it to him, and I don't think I had  
21 the, I didn't send it to him by mail. It was simply handed  
22 to him at one of the meetings, and as I recall, that was at  
23 the meeting pertinent to the Pebble Springs one.

24 Q Could this have been the October 21st, 1977 ACRS  
25 meeting?

1           A    It could have been. Hang on just a minute. I do  
2 not have the minutes. Is that the date of the minutes in  
3 which we took up these questions?

4           Q    Well, let me ask you if you have any notes or  
5 memoranda or methods for recalling the precise date on which  
6 you provided Mr. Israel with a copy of this report?

7           A    The best I can tell you is I believe that I handed  
8 this material to him at the meeting at which we took up the  
9 questions and answers to the Pebble Springs question.

10          Q    Did you obtain from Mr. Israel a signed receipt  
11 acknowledging his receipt of this report?

12          A    I did. It is an informal signed receipt. There  
13 was no attempt to formalize this type of inquiry because  
14 there are literally dozens of such inquiries, written or  
15 unwritten.

16                    It happened in this case--well, I am talking about  
17 issues that remain a matter of concern. This happened to  
18 be adocumented case, at least in draft form.

19          Q    And the date on the signed receipt you obtained  
20 from Sandy Israel I would note is 10/21/77.

21          A    That is correct.

22          Q    Did you obtain this receipt the same day you  
23 provided the report to Mr. Israel, if you can recall?

24          A    No, no, no. It was some weeks after that.

25          Q    Mr. Israel mailed the receipt back to you?

1           A    Correct, so my handing of that document to him  
2 preceded that date by I would estimate something like two  
3 or three weeks.

4           Q    So we are talking about the first part of October  
5 of 1977?

6           A    Yes. I think that is the span of time. He  
7 retained it while he was looking it over.

8           Q    Let me ask you if at the time you provided this  
9 Michelson report to Mr. Israel you are aware of an event  
10 occurring at the Davis-Besse reactor on September 24th of  
11 1977?

12          A    I do not claim to be aware in any substantial way  
13 of that event.

14          Q    You were merely aware that there had been a problem,  
15 but not the specifics of the problem?

16          A    Right. I knew there were problems with valves  
17 refusing to close as a generic problem.

18          Q    How did you determine that it was a generic problem?

19          A    So far as I know, it has been with the industry  
20 ever since we have put valves on. The important thing in  
21 the ordinary safety valves in the fossil industry is that  
22 they open. You don't care much whether they stay open  
23 because there is no continuing source of energy once you cut  
24 the fires.

25                   With a nuclear plant, you can't cut the fires.

1 Therefore, you must retain the coolant, and this leads to  
2 sort of an inverse requirement on the valves. Not only  
3 must they open, they must also shut. It is a double  
4 requirement that didn't exist in the fossil case.

5 Q At the time you learned of the September 24th, 1977  
6 Davis-Besse problem, were you aware of what particular kind  
7 of valve was involved?

8 A Yes. I know the valves.

9 Q What kind of valve was that?

10 A As I have followed that accident, it is the valve  
11 that precedes the safety valve in opening.

12 Q The pressure-operated relief valve?

13 A Yes.

14 Q You were aware that it was this particular valve  
15 that failed to open at the time you provided Mr. Israel  
16 with a copy of the Michelson report?

17 A As I said before, I was not aware of that particular  
18 incident in any great degree of detail at the time I  
19 provided that report. This report stood on its own ground,  
20 on the knowledge that valves would fail to open and seals  
21 would fail and small lines would break like impulse or static  
22 lines, and we were almost surely to experience a variety of  
23 small breaks, unlike the massive large break accident which  
24 had been the subject of intensive study for many years. It  
25 was a sure thing, in other words, that we were going to see

1 this.

2 Q Essentially it was anticipated?

3 A One has to argue that a small break must in fact  
4 be anticipated.

5 Q Okay. On that basis, did you consider the PORV  
6 failing to open to be a safety-related problem?

7 A Oh, yes.

8 Q Did you consider it to be that at the time you  
9 provided Mr. Israel a copy of the Michelson report?

10 A Yes, right. On the other hand, there is a degree  
11 of mitigation ~~afforded by the opening of such a valve~~ *provided in case the valve fails to close* Such

12 valves are provided with a blocking valve in series with the  
13 valve *itself* *there is* Therefore, ~~they have~~ at least one chance, not two,

14 but one, to close *the line in case the valve sticks in*  
15 *open. This is a case of "single track" mitigation*

16 Q Were you aware at the time you provided the  
17 Michelson report to Mr. Israel that the PORV was deemed not  
18 *unreliability of these valves to close, that redundant*  
19 *blocking valves be provided* to be a safety-related item?

20 A It is a hybrid item. Sorry. You are correct. It  
21 is not a safety-related item. Now that is in the standard  
22 context of current design. It is not a safety-related item  
23 since its function is primarily to relieve at high pressure,  
24 but that function is taken care of by the mechanical safety  
25 valve, which is of much simpler design. It is the old-  
fashioned spring valve, so what the PORV is, it is an  
anticipatory valve to preclude frequent lifting of the simple

safety valve, and so prevents it from sticking and damaging itself.

It is not a safety-related function in the context of providing over-pressure relief. However, it is a safety-related problem in that if it sticks open--

Q Its consequences of failing are safety?

A It is a small break--not the valve itself, but the whole line containing the backup valve. It is a case where an event which is a small break is mitigated at that point without redundancy.

*in the sense that it is present in the*

Now the theory is redundancy is provided ~~in the~~ <sup>in</sup> the mitigating ~~capability of the system actually continuing to~~ ~~relieve the small break.~~ *for the small break which might occur somewhere such that the break cannot be*

Q In approximately the first week in October, 1977, <sup>closed</sup> was it a concern of yours that the PORV, the consequences of failing to open, were safety related, although the valve itself was not deemed to be a safety-related item?

A In my view, the potentiality for a small break, while I think it is largely localized in the PORV leaking through, but has mitigating potential in the valve if operated properly, that the small break case can be considered as almost an anticipated condition because of the prevalence of many small lines subject to operational failures, the presence of seals such as those on the main cooling pumps; there are many possible points of origin of small breaks, so

1 in my own view, small breaks are with us in fact, and they  
2 need to be mitigated with virtually no <sup>serious</sup> affect.

3 Q Were you aware at the time you provided Mr. Israel  
4 with the Michelson report that there were no indication  
5 lights in the control room concerning the position of the  
6 PORV?

7 A No, I was not aware of that, but I was aware of the  
8 generic design practice of providing some indication as  
9 regard to continued leakage of the valves.

10 Q Would that be an increase in temperature at the  
11 quench tank?

12 A I don't know how. I can't say how it <sup>was</sup> ~~might be~~ done.  
13 <sup>in that case</sup>  
14 It might be done by several ways, but I don't know what  
15 range of design practice there is in this. The temperature  
16 is usually the means employed to detect continuing leakage.

17 Q What specific reference points were you referring  
18 to when you indicated that there were methods for  
19 determining the PORV would be open or closed without an  
20 enunciator light?

21 A I guess I don't understand that question.

22 Q You previously stated that there were methods in  
23 the design that would indicate the position of the PORV  
24 even though at the time of the September 24th Davis-Besse  
25 problem it did not have a warning light.

My question is now--



1 A What I think was there?

2 Q Right.

3 A I would think, and I would think even now, that  
4 there would be valve position lights on the backup valve  
5 indicating open or closed.

6 Q Actual positions?

7 A Yes, green and red, for instance. That doesn't  
8 indicate anything other than the operative position. It  
9 doesn't say the valve has in fact physically closed.

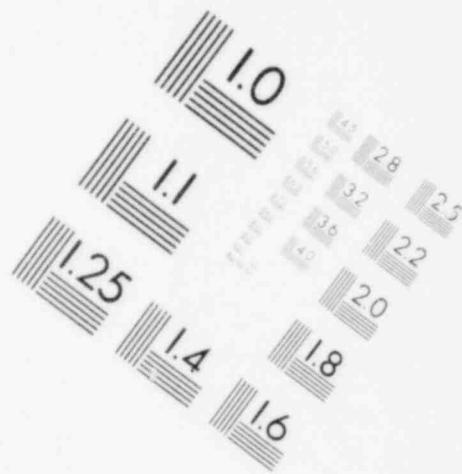
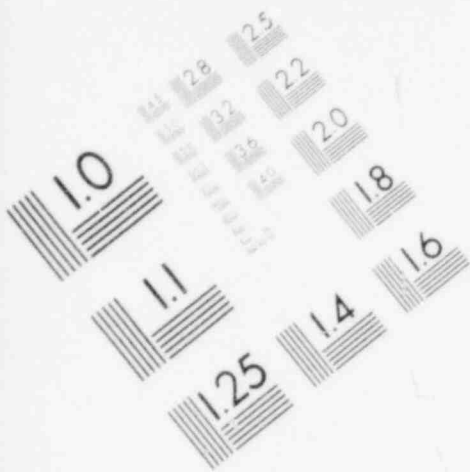
10 Q We are talking about an indication that determines  
11 whether or not a signal has been sent for the valve to open?

12 A From a given unit, not necessarily on the valve  
13 itself, but it is a secondary form of indication and says  
14 the valve should have shut by virtue of seeing the lights.  
15 It is not necessarily a confirmation that it did.

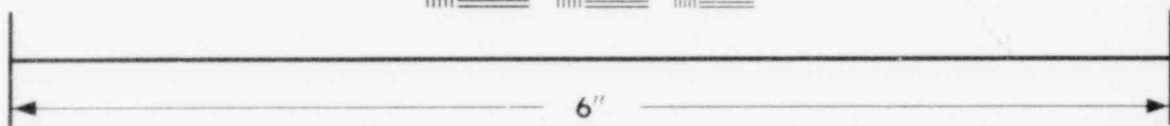
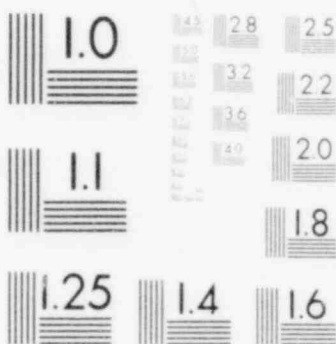
16 I would expect to see that on that valve. I would  
17 also expect to see some temperature information, but I would  
18 expect to see personally that temperature information be  
19 analyzed at the beginning to confirm whether it could  
20 discern between a nuisance-type similar leak and a substantial  
21 leak.

22 Q And this analysis of the temperature changes would  
23 be done by the plant operator?

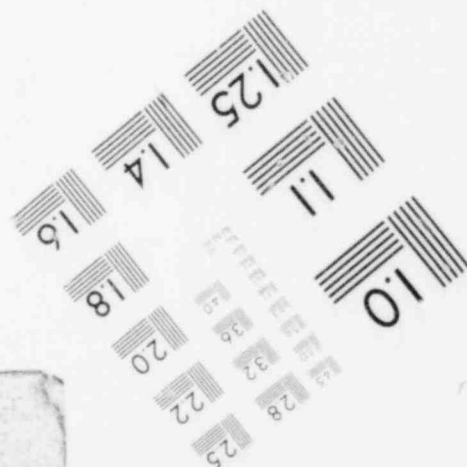
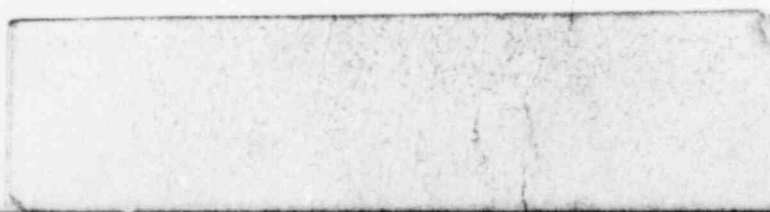
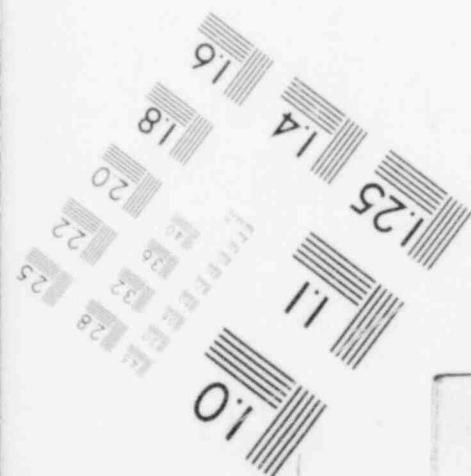
24 A Well, the plant operator would be told in recipe  
25 form what he would see, and he should have been informed by



**IMAGE EVALUATION  
TEST TARGET (MT-3)**



**MICROCOPY RESOLUTION TEST CHART**



1 the plant designer who would have previously done the  
 2 analysis how the temperature would relate to the degree of  
 3 ~~leakage~~ weakness. <sup>The operator</sup> I would not expect to sit there and  
 4 deduce something that the designer hadn't been able to ~~do~~ <sup>deduce</sup>  
 5 in advance.

6 Q At the time you provided Mr. Israel with a copy  
 7 of the Michelson report, did you indicate to him any  
 8 relation that report may have had to question 6 dealing  
 9 with the Pebble Springs application?

10 A I did not specifically state. I am sure it was  
 11 obvious to him.

12 Q Why do you conclude it was obvious to him?

13 A Well, the report itself deals with the level ~~of~~  
 14 problem, the lack of margin, substantial margin to the  
 15 damage, the expected low levels that B&W had calculated, and  
 16 in my view, the relatively small margin to damage.

17 One of my themes was in handing it to him was to  
 18 ultimately, and I did not pursue this, ultimately try to  
 19 get the staff to define the margin to danger in this  
 20 particular aspect.

21 ~~Supposedly~~ it had only been one inch from the top  
 22 of the damaged level point. Where does one cut off? It  
 23 was clear in the report written by Mr. Michelson that one  
 24 was approaching a damage-producing level very closely.

25 Q When you say it was clear in the Michelson report,

1 it was obviously clear to you?

2 A Well, the pictures were very graphic. They were  
3 colored in the back. You can't miss them. Mine are colored.  
4 I don't know whether your Xeroxes are.

5 Q Unfortunately, ours are not.

6 A I will be glad to furnish these if you want to go  
7 through the labor.

8 Q We would certainly I suppose appreciate color  
9 copies.

10 A You can give me a receipt like Mr. Israel did  
11 for my colored copies.

12 Q Can I ask you whether or not Mr. Israel was  
13 provided with colored diagrams?

14 A Yes. These were the ones that I gave him. The  
15 color does enhance them.

16 Q It certainly does.

17 A This is combustion. Wait a minute. Incidentally,  
18 I have annotations on this copy that Mr. Israel got which  
19 were not on Mr. Michelson's original, but you have got copies  
20 I guess which are Mr. Israel's.

21 Q We have I believe a copy of Mr. Israel's, at least  
22 the Michelson report. I don't know whether or not the copy  
23 that we received from Mr. Israel had your notations.

24 A I will take the other Xerox there, the narrative  
25 that he has got. All you need is the colored picture.

1 You don't need that. He has got it.

2 This is the Combustion equivalent analysis.

3 Q Were these diagrams to the Michelson report on  
4 B&W reactors colored by Mr. Michelson?

5 A Either that or some draftsman or secretary that  
6 helped him. I don't know.

7 Q In other words, when you received a copy of the  
8 Michelson report, you received them with the diagrams  
9 already colored?

10 A Oh, yes.

11 Q Do you recall when you received the Michelson report  
12 dealing with B&W reactors?

13 A I would have to say it was within a week or a few  
14 weeks of his having written it. It was dated September the  
15 1st, isn't it?

16 Q Yes, that is correct.

17 A So it would normally be within a week. I didn't  
18 keep any record of the date. I didn't expect it to  
19 culminate in this sort of activity.

20 Q If you received it a week or two after he wrote it,  
21 September 1st, 1977, you would have received it shortly  
22 before the Davis-Besse transient of September 24, 1977.  
23 Would that be correct?

24 A I presume that, yes.

25 Q Do you recall now any relation with the two events?

1           A    No, I do not recall pursuing the Davis-Besse  
2 transient.  Whether or not it had been a transient known  
3 to me would have been almost irrelevant.  We were sure to  
4 have the transient sooner or later.  In my view, it was  
5 just a matter of time until we experienced small breaks  
6 on virtually any plant--not so with the large break that we  
7 studied to death.  I hope we never see one.

8           Q    When you are referring to the large break, is that  
9 the 30 inch diameter pipe break with the guillotine cut?

10          A    Yes.

11          Q    Originally that was presumed to include all lesser  
12 size breaks in terms of the consequences to the reactor?

13          A    I think that is generalizing too much.  It is  
14 different equipment.  If you are aware of the General  
15 Electric reactors, they have a very effective way to turn  
16 a small break into a large break, and therefore make it  
17 manageable.

18          Q    In other words, it is easier to deal with a large  
19 break than a small one?

20          A    It depends on the kind of equipment you have got  
21 available to handle the problem.  A small break generally  
22 requires the presence of the continued operation of high  
23 pressure pumps.

24                    If for one reason or another you lose those, you  
25 are obligated to reduce the primary low pressure which you

1 can do by pulling the ripcord and making a small break into  
2 a large break, and the General Electric plant, it is called  
3 a semi-automatic relief system.

4 Q I believe you previously stated that you provided  
5 a copy of the Michelson report to Mr. Israel at the close  
6 of the ACRS meeting?

7 A That is my recollection. I don't know that to be  
8 positively the date. I only come to Washington for that  
9 purpose. I am sure it was in Washington.

10 Q You did not mail the Michelson report to Mr. Israel?

11 A No, no, I didn't mail it to anybody. It was all  
12 hand carried, and the presentation was accompanied with some  
13 mild discussion about what the content was.

14 Q Did Mr. Israel inquire of you as to essentially  
15 what the thesis of the report was?

16 A No, not at the time I don't remember that he did.

17 Q What was the substance of your conversation with  
18 Mr. Israel?

19 A I told him that this would help clarify the nature  
20 of the questions, why they were raised, and act as a backup  
21 in general to the issue of a small break problem.

22 I may have said something about this that did not  
23 convey to him in any way one of my earlier primary and continuing  
24 concerns, which is the matter of blockage by non-  
25 condensable gases rather than condensable vapors.

1           This is vapor blockage here. The whole thesis here  
2 is vapor blockage and vapor blockage can be managed by  
3 raising pressure and reducing temperature, which condenses  
4 the vapor and solidifies the system.

5           That is not true for gas blockage, not on a fast  
6 schedule certainly.

7           Q Do you recall whether or not Mr. Israel was present  
8 during the ACRS meeting discussion of question 6?

9           A I can't recall. He might have even been out of  
10 the room if he were there.

11          Q Do you recall seeing him in the meeting?

12          A I think I recall him at the meeting. I am saying,  
13 of course, I think that is the meeting I handed this to  
14 him, so he may have been in and out. I don't know.

15          Q Do you recall where you physically gave  
16 Mr. Israel a copy?

17          A I think it was in the conference room or in the  
18 hall just outside--1717 H Street, on the 10th floor.

19          Q And that is where the ACRS meetings occur?

20          A Always take place, yes.

21          Q Do you happen to know where Mr. Israel's office  
22 was located at the time?

23          A I do not.

24          MS. MOE: It would not have been on H Street.

25          THE WITNESS: I know it wouldn't be there.



1 MR. SIDELL: Can we stipulate at the time it was  
2 in Bethesda in whatever building?

3 MS. MOE: As far as I know, it could have been in  
4 any of maybe five different buildings.

5 MR. SIDELL: Outside of Washington?

6 MS. MOE: Either Bethesda or Silver Spring, most  
7 likely Bethesda.

8 BY MR. SIDELL:

9 Q Can you recall whether or not you related the  
10 Michelson report to any of the questions involving Pebble  
11 Springs to Mr. Israel when you provided him a copy of the  
12 report?

13 In other words, did you indicate to him this report,  
14 referring to the Michelson report, concerns questions 1,  
15 5, 6?

16 A No. To my recollection, I made no attempt to  
17 point that out. I felt confident that would be picked up  
18 by him.

19 Q You were of the opinion that the subject matter  
20 involved was so obvious it just didn't bear--

21 A One didn't need to point it out specifically.

22 Q Did the Michelson report in your opinion bear  
23 information that was so obvious it related to all the Pebble  
24 Springs questions, or were there any in particular?

25 A Only about three of them I believe.

1 Q Three of the six questions?

2 . Yes. The Pebble Springs questions were on a much  
3 more general, these questions were additive to a set of  
4 questions that was going to take place in any case.

5 Q Which questions if you can recall dealing with  
6 Pebble Springs were related to the Michelson report?

7 A Well, let's see.

8 Q I have a copy of what is informally known as the  
9 Tedesco report, which has been marked as an exhibit to the  
10 Tedesco deposition. The number of the report is new reg  
11 0560 titled, "Staff Report on the Generic Assessment of  
12 Feedwater Transients in Pressurized Water Reactors" designed  
13 by the Babcock and Wilcox company, and has an appendix which  
14 lists question 6 and question 26 with the appropriate  
15 responses to those questions posed by the ACRS dealing with  
16 Pebble Springs.

17 Let me show you this and ask if those in fact are  
18 the three questions you have previously referred to.

19 A Yes. Five is not, in my view, pertinent to the  
20 problem. It is a secondary pressure problem. Question 6  
21 is certainly pertinent.

22 Q That question 6 would have been involved with the  
23 Michelson report?

24 A Correct. Is there another one?

25 Q Yes--26 I believe.

1 A Yes. Twenty-six is pertinent.

2 Q And question 26 also would have been involved with  
3 the substance of the Michelson report?

4 A Yes.

5 Q Let me ask you on what basis--

6 A Pardon me.

7 Q Certainly.

8 A I think there is another question. If you want me  
9 to run through here and try to pick it out, I will do so.

10 Question 6 is pertinent. Question 12--what is the  
11 status of the investigation of the methods of the primary  
12 vessel coolant level indication system for use in close  
13 local cooling for small breaks?

14 Q At the time the question concerning Pebble Springs  
15 was posed, what were the methods of indication for inventory  
16 in the core?

17 A None.

18 Q At all?

19 A Well, there were very distant secondary level  
20 indications in the pressurizer.

21 Q There were no direct methods?

22 A Correct.

23 Q What were the indirect methods?

24 A So far as I recall, there were even no indirect  
25 methods defined. I am going to resort now to personal opinion.

1 The question has been raised many times with combustion at  
2 Westinghouse and Babcock and Wilcox as to why there was not  
3 a positive, unambiguous level indication for post-LOCA  
4 verification of the level of the coolant inventory.

5 The answers generally fell into the area of what  
6 would you do with it if you had it?

7 Q The direct indication?

8 A Yes, since presumably you would be doing everything  
9 you could do to keep the water running through at all times,  
10 and the calculations have shown that you had even a surplus  
11 of water going through whatever break there was to keep it  
12 flooding, and if it was a break sufficiently small so that  
13 you needed secondary side heat rejection, you would have the  
14 secondary side because it was provided in the redundant  
15 configuration.

16 Q The secondary side was not valved out?

17 A Yes. The secondary side I want to make clear is a  
18 vital aspect of the heat rejection system until proven  
19 otherwise, and I do not know now of any design basis on  
20 PWR's that attempt to qualify the primary having integral  
21 heat rejection capability without the system of the secondary  
22 side for small breaks in near zero break conditions.

23 The answer is what will you do with it if you had  
24 it since you would be doing all you could do anyway. All  
25 one could do after that was I guess run.

1 Q Was that your opinion?

2 A No. I was bothered in that aspect by the  
3 general absence of the constraints on the operator who would  
4 certainly be later on to judge that he should cut down his  
5 maximum effort to cool. If he had three pumps running, he  
6 would cut it to two or to one or to whatever, and on what  
7 basis would he do that? Well, of course, that is what he  
8 did.

9 Q And there was no adequate response provided by any  
10 of the designers?

11 A He had no way of telling that he had the privilege  
12 of turning off the running pumps. I believe the analyses  
13 show that satisfactory results are obtained when you set up a  
14 running condition which is then stable and unaltered, and  
15 they don't proceed to look into the variations and  
16 perturbations that the operator is not deliberately  
17 instructed to avoid.

18 Q So essentially the designers did not tell the  
19 operator during a small break, don't turn off the PHI system?

20 A That is correct. As a matter of fact, this is a  
21 single instance of a larger problem--the too frequent absence  
22 of the negative set of instructions which should always  
23 accompany the positive set. Do this, but do not ever do that.

24 A set of instructions is not complete unless you  
25 have had both sides.

1           Q    Is there any automatic method for determination  
2 of the HPI system on, for instance, the B&W reactor that you  
3 were aware of?

4           A    I know of no automatic system for terminating that.  
5 In certain designs, you terminate to hold boiler level, so  
6 don't flood the sink out, the turbine. That would be  
7 on the secondary side. The question is always raised about  
8 whether that particular feature should be safety graded or  
9 not.

10          Q    In B&W reactors, since there is no automatic method  
11 for termination of the HPI system, necessarily does that  
12 imply that the operators at some point in time must turn off  
13 the HYP system?

14          A    I don't think there is implication that he must.  
15 Obviously he must sooner or later, but there is no implication  
16 that he has in the ordinary timeframe.

17          Q    So eventually the operator must turn off the system.  
18 The question is open as to when he should do that?

19          A    In my view, it is open, and there is inadequate  
20 guide system as to when he can do this.

21          Q    The method for the operators to determine the precise  
22 time to turn off the HYP system concerns itself with the  
23 level of the inventory in the core, is that correct?

24          A    Well, since you can't see level of inventory in  
25 the core--

1 Q That is my next question. Before we got to that,  
2 the primary characteristic that the operator should be  
3 concerned with before turning off the HPI system--

4 A Is whether he has water on the core.

5 Q In order for the operator to determine what is going  
6 on in the core with the level of inventory, he needs if not  
7 a direct measurement which we know does not exist, and the  
8 operator or the designer Babcock and Wilcox said you don't  
9 need it, he must rely on an indirect means of measurement?

10 A Yes.

11 Q That indirect means of measurement primarily relied  
12 upon by the operator previously was the level indication  
13 in the pressurized system?

14 A Yes.

15 Q Therefore, it is essential, am I correct that the  
16 accuracy of the level indication in the pressurizer be  
17 unquestioned?

18 A Yes, as long as you are going to use a level as the  
19 primary parameter of interest; in the long run after all  
20 cladding temperature, and if one had to a greater or less  
21 degree the information available, the systems told you what  
22 temperature it was, the vertical profiles, you could judge,  
23 but you are not really primarily interested in where the  
24 water is. You are interested in whether the core is cool.  
25 If it is cooled by air, it is cooled, so if you had an

adequate measure of temperatures, you could judge whether adequate cooling was being provided.

Q Do you know whether or not it is difficult from a design perspective to have direct readings from thermal couples in the core?

A In my view, it is not difficult at all. For that matter, there are level gauges that use temperature not to determine the level per se, but determine the cooling quality of even two-phase mixtures.

These are probes that are synthetically heated by electric probes in segment with an array of thermal couples that also are related to the heat source, and they are used for such awkward level measurement as sewage where the level instrument will not work very well under difficult circumstances.

Do you follow me? I am saying there are level devices that do not use the K. C. Jones rationale of hydrostatic gauge glasses. My understanding is such things are <sup>now</sup> ~~not~~ under consideration.

Q Do you have any ideas as to the amount of time necessary to install direct readings from thermal couples as opposed to merely reliance by the operator on pressurized level indication?

A No, I don't know how long it would take, but instrument packages are put in and taken out on a routine



1 basis.

2 Q So it wouldn't appear to you that it would present  
3 any substantial problem?

4 A No.

5 Q Do you recall the date when you expressed your  
6 concerns about the lack of any direct measurement of core  
7 inventory to CE, B&W and Westinghouse? Approximately. I  
8 don't mean a specific day of the month.

9 A I can't recall when it was ascertained that the  
10 indirect method of measuring pressure level was unreliable.  
11 I would have to say it was with the Michelson presentation  
12 itself.

13 On the other hand, let me say this. There has been a  
14 standing concern that a void formation in the primary loop  
15 might occur predominantly in the designs that have no  
16 opportunity for venting, which is **C**ombustion in Westinghouse.

17 In the steam generators, these are the multiple tube  
18 types. I always personally felt that the Babcock and Wilcox  
19 design was beautiful in respect to the potential for venting.  
20 However, it didn't have venting. That was a matter that  
21 could be gotten around to later.

22 Q So the B&W design went one step further than CE  
23 and Westinghouse?

24 A In respect to venting capability, all one had to  
25 do was provide high point ventage. Unfortunately, in the

1 other two designs, you can't do that since it is impossible  
 2 to vent the numerous tubes <sup>in the steam generator</sup> that form natural vapor blocks,  
 3 so when you talk about inadequate level representation on the  
 4 pressurizer, my long-standing concern was that the level  
 5 might be presented, but there would be no cooling anyway  
 6 because you would stop the cooling transport, and that would  
 7 then culminate in vapor formation which would lead into  
 8 expulsion of water and an unreliable level indication no  
 9 matter what design the pressurizer would have.

10 Q And that would be what we now refer to as the  
 11 manometer effect in the pressurizer?

12 A It would be due to thermal heating of the water in  
 13 the region of the core without any heat rejection process.  
 14 It would not be a manometer effect as we are talking about  
 15 here for the Babcock and Wilcox design, so I guess to return  
 16 to a direct answer, the <sup>general</sup> inadequacy of ~~the~~ <sup>level</sup> pressurizers ~~is~~ <sup>as</sup>  
 17 level reference <sup>for the core itself</sup>

18 I don't recall pointedly taking up that issue itself  
 19 before this picture here.

20 Q In reference to the Michelson report, let me read  
 21 you question 5, the questions posed by the ACRS to I guess  
 22 it is Portland General Electric Company on Pebble Springs:  
 23 "Does applicant know the time dependent levels will occur  
 24 in the pressurizer steam generator and reactor vessel after  
 25 a relatively small primary coolant break which causes coolant

1 to approach or even partly uncover fuel pins? What does  
2 operator do in respect to interpreting level in pressurizer?"

3 Mr. Ebersole, was the Michelson report instrumental  
4 in producing that section of question 6?

5 A Yes, it was.

6 Q Do you conclude that the substance of question 6  
7 which I have just related to you was inescapable to  
8 Mr. Israel when you presented him with a copy of the  
9 Michelson report?

10 A I would conclude that it was inescapable.

11 Q Primary concern of the question was the accuracy  
12 or the ambiguity of the indication in the pressurizer's  
13 level?

14 A Right.

15 Q Mr. Ebersole, have you had occasion to see a copy  
16 of what is referred to as the Novak memorandum of January 10,  
17 1978? That has been marked as Exhibit 5 to the Foster  
18 deposition.

19 A Yes, I have that.

20 Q Do you recall when the first time was that you saw  
21 that memo?

22 A As I recall, that was first sent to me after the  
23 accident.

24 Q Referring to TMI 2 as the accident?

25 A Yes. I believe I first got that from Mr. Myers.

1 Q Who is Henry Myers?

2 A He was with Udall's group.

3 MS. MOE: He is on the Subcommittee of Environment  
4 and Public Works, the subcommittee on--it is the Udall  
5 subcommittee.

6 (A discussion was held off the record.)

7 BY MR. SIDELL:

8 Q You have now had a few minutes to look over the  
9 Novak memorandum of January 10, 1973.

10 A Yes.

11 Q Do you know who produced the Novak memorandum?

12 A Well, I judge here Sandy Israel.

13 Q Why do you come to that conclusion?

14 A Well, it says at the bottom, "Contact Sandy Israel,  
15 N.R.C."

16 Q Have you spoken with Mr. Israel about this?

17 A I have not. I tried to call him on the day the  
18 accident occurred, but he was busy.

19 Q He did not return your call?

20 A As a matter of fact, I believe he had gone to  
21 Harrisburg.

22 Q After reading Exhibit 5 to the Foster deposition,  
23 the Novak memorandum of January 10, 1973, Mr. Ebersole,  
24 what do you conclude is the primary concern expressed by  
25 Mr. Israel and Mr. Novak?

1           A    Well, in the next to the last paragraph he says,  
2           "The operator could erroneously shut off makeup flow and  
3           significant void occurs elsewhere in the system, loss of  
4           inventory is continuing."

5           Q    We have previously discussed the fact that the  
6           operator is turning off makeup flow which I take it is the  
7           same thing as the HPI system?

8           A    Yes, the reason being the operator has not got that  
9           negative set of instructions I referred to earlier.

10          Q    But the reason the operator is terminating the make-  
11          up flow is based on his reading of the level indication on  
12          the pressurizer, is that correct?

13          A    That is my understanding, and his concern that if  
14          he allows the loop to go solid, he will surely suffer some  
15          damage because of possible two-phase flow or water delivery  
16          out the relief valve.

17          Q    What kind of damage are you referring to?

18          A    I don't know what it would amount to--mechanical  
19          damage in the long run. The valve is not designed for two-  
20          phase relief.

21          Q    Let me direct your attention to the last two  
22          sentences of the first paragraph of the Novak memorandum  
23          which states, "Under these circumstances, the additional  
24          loss of primary system inventory or shrinkage in the primary  
25          system may not be indicated by pressurizer level. This

1 situation has already occurred at Davis-Besse I when a  
2 relief valve stuck open."

3 Is there any question in your mind what the  
4 essence, the main thrust of the Novak memorandum is?

5 A No. I think the issue is clearly borne out that  
6 the problem is that the operator may take measures to reduce  
7 flows when he has no actually valid basis for doing that.

8 Q With your knowledge now as of July 28th, 1979,  
9 looking back at the September 24, 1977 Davis-Besse problem,  
10 can you conclude that Mr. Israel, Mr. Novak incorporated  
11 the concerns of the Michelson report into the Novak  
12 memorandum as well as the actual event of Davis-Besse?

13 A Yes. I think this is a very concentrated version  
14 of the principal issues.

15 Q So essentially Mr. Israel and Mr. Novak tied all  
16 the parts of the puzzle together?

17 A They did. However, I attempted to give this a  
18 little study when I first saw it and tried to judge why it  
19 did not receive the attention that it obviously didn't  
20 receive.

21 Q Did you come to any conclusions?

22 A At first I did not, but then finally I did. I  
23 looked at the subject. It says "Loop Seals and Pressurizer  
24 Surge Line." I looked at that, and I concluded that no  
25 newspaper writer would ever write it that way. The title

1 has a tendency to obscure the seriousness of the issue.

2 Q A little too academic perhaps?

3 A It might well have said potential for serious core  
4 damage or some other, put in some of the context where it  
5 would have been less easy to deny as being significant. That  
6 is my only criticism.

7 Q Nevertheless, the concerns expressed by Mr. Israel  
8 and Mr. Novak in this January 10, 1978 memo are unmistakably  
9 expressed?

10 A Right, but if a person is so busy he can only read  
11 the titles, this title would never have culled out what the  
12 true nature of the problem was.

13 Q But for those people who at least have the time or  
14 should have the responsibility for looking at more than  
15 titles, the import of this document should have been clear  
16 on its face, should it not?

17 A Well, it depends on his technical background. If  
18 he is a production manager, it might not have received much  
19 attention.

20 Q Would the import expressed in this memo have been  
21 clear to Mr. Novak?

22 A Oh, yes.

23 Q Do you know a Denny Ross at the NRC?

24 A Yes.

25 Q Would it have been clear to Mr. Ross?

1 A I believe it would.

2 Q Are you acquainted with a Brian Grimes at the NRC?

3 A Only casually.

4 Q Do you know whether or not Mr. Grimes would have  
5 been capable--

6 A I don't know. I can't say. I think so.

7 Q And Mr. Grimes would have been capable of assessing  
8 the import of this document?

9 A Yes. In answer to that question, I think one has  
10 to qualify it a little bit about how busy the man is, how  
11 well he reads or does not read--the catch lines.

12 Q Catch line you are referring to is the subject  
13 matter?

14 A Yes, right.

15 Q But is there any question that the concerns  
16 expressed in this memo are dealt with in very express terms,  
17 not by implication or indirectly?

18 A I think it was dealt with in express terms. I  
19 don't, for instance, think that everybody would immediately  
20 understand what loop seals and pressurizers and surge line  
21 even means.

22 Q By everyone, are you referring to the general public?

23 A Even people in the general engineering business--  
24 what is a loop seal? You might find various interpretations  
25 of loop seal. When you were talking about loop seals, my



1 first impression was you were talking about mechanical seals  
2 in gas systems which are loop seals, but this should be put  
3 in quotes. It is just a particular way of identifying the  
4 physical condition.

5 (A discussion was held off the record.)

6 MR. SIDELL: Before I forget, let me mark as  
7 Exhibit 2 I believe to this deposition the diagrams which  
8 are colored and were a part of the handwritten September,  
9 1977 Michelson report.

10 MS. MOE: It is a 7 page document titled "Modes  
11 1 through 5B represent stages in cooling process after small  
12 break," with several different colored colors on it.

13 (Ebersole Exhibit No. 2 was  
14 marked for identification.)

15 BY MR. SIDELL:

16 Q Mr. Ebersole, with reference to the Novak memorandum,  
17 you suggested that the title or subject of the memorandum  
18 might obscure the importance of the information contained  
19 in the memo itself?

20 A Yes, I suggested that.

21 Q Now that was predicated primarily on the fact that  
22 someone reading the document would limit themselves to  
23 reading the title or the subject alone, is that correct?

24 Q If they did not have the technical competence to  
25 understand the subject matter I think they might say to

1 themselves well, it doesn't appear to have any significance  
2 just looking at the title, so why should I go further?

3 Q If someone having the technical competence to  
4 understand the subject matter of the memorandum were to  
5 read the one page--

6 A He would know.

7 Q Without question?

8 A I think so. In my opinion, having read that, he  
9 would quickly come to a conclusion that he had an imminent--

10 Q If someone with the adequate technical competence  
11 were to read the Novak memorandum, he might choose to put  
12 a different title on it or a different subject on it?

13 A I think he would push the crash button to do  
14 something.

15 Q When you say push the crash button, what do you mean?

16 A ~~Call~~ <sup>Call</sup> out urgent instructions for potential problems  
17 that might arise at any minute. That is because I view the  
18 potential for small breaks as being practically a day-to-day  
19 problem.

20 Q Well, when you say that someone should push the  
21 crash button or notify someone, take the information  
22 contained in the memo to heart, would this have been the  
23 expected response before the Three Mile Island accident?

24 A Would this have been--pardon me. I am going to  
25 have to get clarification.

1 Q Would someone reading this and understanding it  
2 have been sufficiently concerned about the subject matter  
3 of the memo before the Three Mile Island accident?

4 A Yes.

5 Q So we are not talking about a situation where the  
6 accident raises the concerns mentioned in the memo, but the  
7 reverse?

8 A No. The concern exists in this document itself, but  
9 the concern is obscured a little bit, and herein is a  
10 problem. This accident in my view could have been prevented  
11 by someone picking up a telephone and telling the operator  
12 now do this, in which case you would have to argue the  
13 design was adequate, but there was a piece of it missing,  
14 which was the proper interpretation of the operator and the  
15 proper function of operators, so that is a critical aspect  
16 of the design in it.

17 It was non-existent, but the party reading this  
18 might not have known of the absence of that fraction, the  
19 fact that the operator didn't know this, and he might have  
20 read this and understood what it said and then said to  
21 himself, oh, but I believe that the operators already know  
22 this and therefore they <sup>would</sup> ~~were not~~ ~~were~~ not ~~were~~ to cut back on the  
23 established flows.

24 Q Dealing with your specific concern you just  
25 mentioned, would you refer to the last sentence on the Novak

In carefully rereading the Novak memorandum it becomes clear that there is no particular sense of urgency in taking action. The phrases "for CP review memorandum, which states, "For OL reviews," which I take and "for OL reviews" imply a relaxed schedule it to be operating license reviews, "...procedures should be, for action. The word "should" implies no responsibility reviewed to ensure adequate information before the operator other than advisory in nature. I do not know terminates makeup flow."

whether the memorandum was based on examination of  
A Yes. I think that would be the second thing I  
emerging and abnormal operating procedures  
would do. Are you asking me what would--  
or merely an assumption that the operator

Q Would that not adequately alert people who should  
~~be~~ did not have instructions  
be informed of the missing part of the design?

A It implies to me, I don't know what it really means  
with proper restraints  
when it says procedures should be reviewed. It may mean  
that there should be urgent information sent to all operators  
to review their procedures for this problem, or it may on  
the other hand mean that NRC should review procedures to see  
that this constraint existed.

I don't know which of these it meant, but in  
retrospect I guess it means that orders should be issued  
to the operators to review their procedures for this.

Q The design problem as it may exist expressed in  
the Novak memorandum ultimately affects the operator of  
the reactor?

A Oh, yes, the design problem ultimately affects the  
operator.

Q So that the substance of the memo in whatever form  
should be conveyed to the operator rather than the NRC staff  
as the ultimate person to whom the concern exists with?

1 A It should be conveyed to both because the NRC staff  
2 is reviewer of safety.

3 Q But the person you want to make sure gets the  
4 information is the plant operator?

5 A Is the operator; now it is my current understanding,  
6 and I guess I can't quite justify this, that emergency  
7 and abnormal procedure are not as a routine reviewed by the  
8 NRC staff, which I personally consider a deplorable matter.

9 Certainly ~~it is on more than a spot-check basis~~ and thorough  
10 *should be done on at least*  
*done on a "standard plant" basis*

11 Q Have you conveyed your concerns about the NRC  
12 reviews of emergency systems to the NRC?

13 A I have not in any way other than casual. I first  
14 heard of this in the last full committee meeting.

15 Q When was that?

16 A That was two or three weeks ago.

17 Q Within the last month?

18 A Yes. It is in the first part of July when Mr. Mattson  
19 presented his findings.

20 Q That was after TMI?

21 A Yes.

22 Q Do you conclude that the information expressed in  
23 the Novak memorandum expresses an urgent concern, or is this  
24 something that could be dealt with at a later time?

25 A May I make a correction. I can't say that  
Mr. Mattson's presentation first revealed this to me. I

1 have been in telephone conference with the inspection audit  
2 group and I learned from them, their investigation, that  
3 they determined that the operating--sorry, not operating,  
4 the emergency and abnormal procedures are not rigidly  
5 reviewed by NRC.

6 The second time that I learned that there was no  
7 reviewing of this material was in the July meeting of the  
8 full committee from Mr. Mattson.

9 Without such a review, you don't see whether the  
10 design is adequate or not because inadequate designs can  
11 be at least in part compensated by very adequate operation.  
12 It is an integral package that you have to consider, and  
13 you are not done when you just hand over something like a  
14 design of this sort to an operator without instructing him  
15 how to ~~perform~~<sup>operate</sup> it and how not to ~~perform~~<sup>operate</sup> it.

16 Q Would you consider the consequences of at least  
17 the design at TMI 2 to be of the type that could have been  
18 compensated by operator action?

19 A Yes.

20 Q In order to have had that proper operator action at  
21 TMI 2, would this memo, the Novak memorandum, have been of  
22 any assistance?

23 A I think it would have prevented TMI if it had  
24 been handed to operators who were ~~scrupulous~~<sup>perspicacious</sup> enough to see  
25 what it meant, but I think that handing over should then

1 have been followed by a review process.

2 Q So there should have been a step following the  
3 memo?

4 A Yes. I think this piece of paper here handed to  
5 operators would have avoided TMI 2.

6 Q Do you happen to know the educational and  
7 professional qualifications of a nuclear plant operator?

8 A Only in the most general context.

9 Q What would those be?

10 A What level of operator are you talking about?

11 Q I am also probably on a substantially greater level  
12 of ignorance about qualifications for plant operators. I  
13 am referring generally to the, I imagine it would be the  
14 average level nuclear operator which has only a high  
15 school education.

16 A I will go toward the minimum sort of level. The  
17 top of the line, it will be a graduate engineer with  
18 intensive training in the generalized aspects of reactor  
19 operation, and then in the unique features of the plant  
20 that he has to deal with.

21 I don't know whether you are asking me to extend  
22 into the opinion field here.

23 Q Well, based on what I will call the average type  
24 nuclear reactor operator with a high school degree and  
25 some training on the particular plant involved, would you

conclude that if that type of reactor operator was  
provided with a copy of the Novak memorandum, TMI 2 would  
have been prevented?

A The average operator, I would be somewhat hesitant  
certainly. The senior operators I would expect to interpret  
quickly what this meant.

Q What are the qualifications for a senior operator?

A It varies.

Q Give me a range.

A The NRC just recently set high standards for these  
operators, and I can't comment on the program of education.  
I think I can comment on one aspect of it which may be  
worthwhile, that the operational area tends to be another  
jurisdictional area where a plant is handed to operators  
and it virtually becomes their property to operate, ~~and~~  
strong jurisdictional lines exist between the operator and  
the engineering design areas such that the operator takes a  
position of command so to speak without necessarily having  
the engineering technical background of how the plant was  
designed with its particular weaknesses and strengths, ~~and~~  
~~so~~ the flow of information from the designers who design in  
the weaknesses and the strengths doesn't necessarily always  
occur such that the operator knows these built-in  
peculiarities of the plant.

He tends to be educated by the general red process



1 of education by teachers and investigators who teach him  
2 how to operate, quote, without necessarily knowing that in  
3 this room over here there is a conjunction of critical  
4 features such that you should never bring a welding bottle  
5 or something like that; in short, I am being critical of the  
6 flow of information between the designer teams and the  
7 operator teams, saying that these are jurisdictional areas  
8 which never tend to marry.

9 I can recall cases where the operator group tends  
10 to believe that they can deduce how the plant can be operated  
11 without information which is set down on the conceptual  
12 basis as to how to operate.

13 In that connection, one doesn't need, when you are  
14 talking about the flow of information here, to go to  
15 infinite detail. The engineering design team can simply  
16 put out conceptual or fundamental constructions for general  
17 operation which convey the critical aspects of such operation  
18 without actually going to switching <sup>and</sup> valve numbers.

19 <sup>Would</sup> ~~is~~ that essentially include instruction to an  
20 operator by the designer to the effect don't turn off the  
21 HPI system?

22 A Exactly, but without telling him what the valves  
23 were--under no circumstances turn off these pumps, the kind  
24 of instructions which now prevails. These would be in the  
25 basic concept of operation of given systems.

1 Q And that information is essentially what the Novak  
2 memorandum includes?

3 A Exactly right. This kind of information should  
4 come from designers and then it should be put into its  
5 detailed form, <sup>which</sup> valve numbers, which instrument numbers,  
6 et cetera, and the substance of those procedures would be  
7 reviewed then by the designer not necessarily in the context  
8 of examining the numbers, but simply the conceptual thread  
9 of operation that is in the procedures.

10 Q Could you conclude that based on the information  
11 contained in the Novak memorandum, if someone had been  
12 aware of the significance of the information contained in it,  
13 the NRC could have informed operators, don't turn off the  
14 RPI system?

15 A Yes.

16 MS. MOE: That is your own personal opinion?

17 THE WITNESS: That is my opinion, yes.

18 BY MR. SIDELL:

19 Q That opinion is based on--

20 A You are saying could NRC?

21 Q Just a minute. Let me finish this question, if I  
22 may. That experience or opinion is based on experience  
23 since 1969 working for the Tennessee Valley Authority, in  
24 addition to acting as a member of the Advisory Committee on  
25 Reactor Safeguards for some three and a half years, reviewing

1 general upper level safety problems, is it not?

2 A Yes. I would like to have that clearly brought  
3 out now. Will you repeat the question so I can know  
4 precisely what you have said?

5 MR. SIDELL: Can you read the question back?

6 (The question was read by the reporter.)

7 THE WITNESS: I am saying that yes, I would conclude  
8 that the NRC could act as an intermediary to instruct the  
9 operators what to do in greater detail than presented here.  
10 They could elaborate on this single page letter, including  
11 diagrammatic representations of the problem.

12 BY MR. SIDELL:

13 Q As Mr. Michelson presented?

14 A Exactly.

15 Q I notice that as an attachment to the copy of the  
16 Michelson report of September, 1977, that you provided to  
17 Mr. Israel, there is an Appendix B entitled, "Small Break  
18 LOCA Analysis" by Babcock and Wilcox, which is dated  
19 10/30/75, and appears to be produced by R. C. Jones, B. M.  
20 Dunn, and C. E. Parks.

21 Do you have that?

22 A I have a copy here.

23 Q Can you briefly and in layman's terms explain to  
24 me what this appendix concerns itself with?

25 A I will try to do this. It is an analysis of the

1 full field of breaks down to the small breaks, but it is  
2 presented in a manner that shows core pressures, the inter-  
3 vessel liquid volumes. It shows in essence what is produced  
4 on the colored diagrams.

5 Q Problems that concern Mr. Michelson?

6 A Right.

7 Q Do you know if this appendix was produced or how it  
8 came to be in Mr. Michelson's possession?

9 A Well, Mr. Michelson worked for TVA and the vender  
10 normally furnishes reports of this sort to the owner  
11 operator. It is customary.

12 Q Would this have been provided as a direct response  
13 to a request by Mr. Michelson of B&W?

14 A I think it would have been provided without any  
15 request as a normal information flow.

16 Q So that B&W would have been looking into the same  
17 problem Mr. Michelson was?

18 A B&W has looked into the small break problem because  
19 it surely has been present. It is just the way in which it  
20 has been looked at.

21 Q Well, based on this Appendix B to the Michelson  
22 handwritten report of September, '77, can you conclude  
23 that the engineers who performed the analysis at B&W were  
24 at least apprised of the same concerns Mr. Michelson had in  
25 his report?

1           A    I think they would be apprised, if that is the proper  
2 word, of the concerns, but they might be deluded into  
3 thinking that there was operating procedure which would  
4 produce the results they calculated when in fact there was  
5 not, which is constraint on the operator.

6           Q    Are you aware of whether or not the designer, in  
7 this case B&W, would be the party to provide operating  
8 instructions?

9           A    By all means they should, and I believe the vender,  
10 we will call it the vender, should provide such critical  
11 information in all cases, particularly where critical  
12 restraints or constraints are involved.

13          Q    Such as manual or premature turning off of the HPI  
14 system?

15          A    I don't think one can simply separate operations  
16 from design. I see no basis for saying a design is adequate  
17 without seeing in fact that it can be operated and without  
18 undue skill and intelligence and instrumental displays.

19          Q    So on the one hand the vender, B&W, is aware of  
20 essentially the same concerns Mr. Michelson had about small  
21 breaks?

22          A    Yes.

23          Q    And on the other hand, they are informing the ACRS  
24 we don't see why we need any direct core inventory measure-  
25 ment methods?

1           A    Well, one can argue in support of that, that  
2 the design was adequate if they simply had appropriate  
3 constraints on operator performance that they didn't need  
4 to see. He would fly blind so to speak, through this  
5 critical region.

6           Q    As we now know, they did not have those operational  
7 constraints?

8           A    Correct. This is the generic absence of the  
9 negative set of instructions, and it doesn't merely apply  
10 to this. It applies in general to operating instructions  
11 in the emergency and abnormal category, across the board.

12          Q    Do you recall whether the vender B&W's response  
13 to the ACRS questions concerning Pebble Springs was limited  
14 to Pebble Springs, or was that also a generic response  
15 concerning the--

16          A    My view is it is generic.

17          Q    That was concerning the direct method of indication  
18 of core inventory?

19          A    That's right. Basically it is B&W 205, but the  
20 B&W plants looked pretty much the same. There is different  
21 geometry about the loop seal, as you know, but they are  
22 all super heat plants, steam generators.

23               MR. SIDELL: Let's mark as Exhibit 3 to this  
24 deposition the handwritten note by Sandy Israel to  
25 Mr. Ebersole dated 10/21/77, which returns a handwritten

1 copy of the Michelson report to Mr. Ebersole.

2 (Ebersole Exhibit No. 3 was  
3 marked for identification.)

4 BY MR. SIDELL:

5 Q Mr. Ebersole, we have previously marked as  
6 Exhibit 2 to this deposition several colored diagrams that  
7 were attached to the Michelson report.

8 Were these colored diagrams marked as Exhibit 2  
9 to this deposition included with the report written by  
10 Mr. Michelson that you produced to Mr. Israel?

11 A Yes.

12 Q So that Mr. Israel's memorandum or note acknowledging  
13 receipt of the Michelson report, which is now Exhibit 3  
14 to this deposition, acknowledges receipt to both the written,  
15 handwritten report as well as the colored diagrams?

16 A Yes.

17 (A discussion was held off the record.)

18 BY MR. SIDELL:

19 Q With reference to question 6 of the ACRS questions  
20 of Portland General Electric on Pebble Springs' application,  
21 prior to Three Mile Island, did you conclude that the BGE  
22 responses to question 6 were adequate?

23 A No. I concluded that they were confusing.

24 Q What specific concerns?

25 A They never answered the questions that were raised.

1 Q B&W never answered question 6?

2 A Right. They proceeded to go off into a more or  
3 less relev .--

4 Q Excuse me. Did you say irrelevant?

5 A No. More or less relevant, which includes  
6 irrelevant, discussion, never getting to the black and white  
7 nature of the question, sort of gobbelie-gook.

8 Q Specifically with reference to the second question  
9 in the first paragraph, "What does operator do in respect  
10 to interpreting level in pressurizer"--

11 A I don't see any answer to that question. There is  
12 a discussion here of why the system ought to work.

13 Q Is there an answer to date from B&W?

14 A After the accident.

15 Q But up until March 28th, 1979, did you conclude  
16 that there was any response by B&W to the question I just  
17 raised?

18 A I guess in retrospect I have to say I concluded  
19 that although I didn't get an answer, I certainly advertised  
20 the problem to all participants, and an answer must have  
21 been lurking somewhere even though it didn't appear in the  
22 written response because the competent people wrote the  
23 answer. The nature of the question was clear. The discussion  
24 here avoided an answer, or certainly didn't take up an  
25 answer.



1 In the usual course of events, in responding to  
2 ACRS questions, are the answers written as opposed to oral?

3 A No, they are not written. This is a somewhat  
4 unusual case. I came in <sup>late</sup> on the <sup>B+W</sup> 205's. This is really B&W  
5 205, of which Pebble Springs was a case, and I came in and  
6 not having known what questions had or had not been raised  
7 by the committee, I just generated 26. It could have been  
8 56, and probably should have been, and then I added to this  
9 three which were pertinent to Mr. Michelson's work.

10 Q The two or three that you previously referred to  
11 include question 6?

12 A Right. I did not get a hard answer to this. I  
13 got a very muddy answer, and in fact, I didn't get an answer  
14 at all to the specific questions. I got a good deal of  
15 discussion with a more or less inferred response that even  
16 though I raised the question clearly and I didn't get a clear  
17 answer, everything certainly must be all right.

18 Q Let me ask you this. After the Three Mile Accident  
19 I believe you said you did get a response from B&W  
20 concerning question 6?

21 A I didn't get it. The other participants got it.

22 Q ACRS?

23 A ACRS, NRC, everybody got it.

24 Q Which responded directly to question 6, is that  
25 correct, essentially what does the operator do when he sees

1 a pressurizer level indication?

2 A Yes. These questions are answered now.

3 Q Are the answers as now provided by B&W adequate  
4 from your perspective?

5 A On an interim basis I think they are until we get  
6 better instrumentation.

7 Q But as the system currently exists those answers  
8 are adequate?

9 A Yes, I think they are adequate as they are, but  
10 they are not the ultimate solution.

11 Q Do you know whether or not between the time the  
12 questions were originally posed, specifically question 6,  
13 and the time when B&W provided their short-term adequate  
14 answers, there was any further clarification of question 6  
15 to B&W?

16 A I don't know of any further clarification.

17 Q So that the question was clear enough to have been  
18 answered?

19 A Pardon me. I will withdraw that and say that yes,  
20 I am aware of the fact that this document here, this  
21 handwritten document, was ultimately produced in typed form,  
22 with some additional calculations I believe.

23 Q Are we referring to the Michelson memorandum?

24 A Yes, that's right, and submitted to Babcock and  
25 Wilcox. This was in early 1978, but his experience was the

1 answers that were returned to him from B&W were of little  
2 better quality than this, if any.

3 Q Well, the folks at B&W who ultimately responded to  
4 question 6 from our perspective now properly reviewed the  
5 Michelson report that they were provided with, the annotated  
6 Michelson report to question 6? Would that be a fair  
7 conclusion?

8 A I think it would be a fair conclusion that although  
9 it was in different words, the context was there, but  
10 there was an issue about the sensitivity of the pressurizer  
11 level or its adequacy as a secondary means of indication.

12 Q There is no reference in the Michelson report, either  
13 the handwritten or the typewritten, that says this part of  
14 my report refers to question 6 by the ACRS? *his study*

15 A No, no. This is my question generated from ~~the~~  
16 it was an attempt to consolidate the Michelson report to a  
17 form suitable for manipulation in the typical subcommittee.

18 Q So that B&W was able to conclude properly from the  
19 Michelson report what the precise answer to question 6 would  
20 be, although you concluded Mr. Israel should have concluded  
21 that question 6 was also based on--

22 A I think B&W would have concluded, and also in  
23 retrospect, I understand that, and I have simply heard this  
24 via newspaper information, that internally there was an  
25 activity going on at B&W similar to the Michelson activity.

*what the principal problem was*

1 Q You are referring to the Dunn memorandum?

2 A I do not recall the engineers involved, but there  
3 were certainly engineering-type investigations taking place  
4 that culled out essentially the same precaution.

5 Q I would represent to you that that matter does deal  
6 with the Dunn memorandum.

7 A Does it?

8 Q By Bert Dunn, who was one of the three individuals  
9 who apparently developed Appendix B to the handwritten  
10 Michelson report which we have referred to previously in  
11 this deposition.

12 A There is an Appendix B to this? Okay. That is  
13 the one that pre-existed, yes.

14 Q The B. M. Dunn I believe is Bert Dunn.

15 A I see. Thank you.

16 Q I am merely making the inference that the B. Dunn  
17 referred to in the Michelson report is in fact Bert Dunn  
18 of Babcock and Wilcox.

19 A Okay. I understand.

20 Q I don't know that as a fact, but I think the  
21 inference is reasonable.

22 I believe you indicated that the B&W response to  
23 question 6 which you received after the Three Mile Island  
24 accident was adequate to, at least on the short-term basis  
25 to question 6?

1           A    First of all, I didn't receive it per se. I didn't  
2 receive it. It was received by all the NRC participants.

3           Q    Okay.

4           A    And I got copies of it.

5           Q    With that caveat, that answer you concluded to be  
6 adequate?

7           A    On an interim basis, right.

8           Q    Did that concern the pre-TMI operating procedures  
9 or the post-TMI operating procedures?

10          A    I don't quite know how to answer that since it  
11 concerns deficiencies in the pre-TMI procedures and  
12 corrections thereto in the post-TMI procedures.

13                   I am saying in essence that the operators are now  
14 told not to turn off the pumps whereas before they had not  
15 been so told.

16          Q    Do you know who told the operators not to turn off  
17 the pumps after the accident?

18          A    My understanding now is this information comes from  
19 Babcock and Wilcox, the engineering department in B&W.

20          Q    Are you aware of I&E bulletin 7905, which was  
21 issued I believe April 1st of this year by the NRC, I&E  
22 being Inspection and Enforcement?

23          A    I don't recall this particular number. I read most  
24 of this material.

25          Q    Are you aware of the I&E bulletin which advises

1 B&W plant operators not to turn off the HPI system for 20  
2 minutes?

3 A I know of the existence of it, but I can't tell  
4 you I am intimately aware of the contents.

5 Q Okay. I will represent to you that that  
6 specifically numbered I&E bulletin does include a command  
7 to plant operators not to turn off the HPI system for 20  
8 minutes.

9 A That was part of crash--

10 Q Nevertheless, it is representation by both NRC and  
11 B&W of the same result--don't touch the HPI system?

12 A Right. One could infer from this document the need  
13 for that.

14 Q Do you know what if any responsibility NRC has for  
15 providing operating procedures or instructions to operators  
16 of nuclear reactors?

17 A I know of none that NRC has for providing such  
18 procedures, or for that matter at the moment now I don't  
19 know of any requirements that they review such procedures,  
20 or for that matter review the routines which are used to  
21 produce such procedures, which is even more generalized.

22 Q Is your response that you are unaware whether or not  
23 such procedures exist at the NRC or merely that there are  
24 no such procedures?

25 A I was unaware that these procedures were certainly

1 picked up on random instances, on a random basis and looked  
2 at. In short, I will have to tell you I did not know and do  
3 not even at this moment know what now exists in the way of  
4 requiring procedures to be handed over to NRC for  
5 examination.

6 I have on occasion asked for procedures, the emergency  
7 and abnormal kind.

8 Q Of the NRC?

9 A I have asked it of the operators and in due time  
10 I ~~get equipment~~<sup>not</sup> or procedures in such a preliminary form  
11 that they were hardly worth reading.

12 Q From the operators themselves?

13 A Yes, right, and I generally looked them over quickly  
14 and I concluded that ~~we~~<sup>they</sup> are not through yet. I think I had  
15 a growing concern that this was an area, generic area, that  
16 needed further attention, the ground being again that no  
17 design is complete without the procedures.

18 (A discussion was held off the record.)

19 BY MR. SIDELL:

20 Q Mr. Ebersole, after you provided the Michelson  
21 report in handwritten form to Mr. Israel, was there any  
22 understanding between the two of you as to what he would do  
23 with the Michelson report?

24 A No.

25 Q Did you intend for him to do any particular analysis?





1 to be followed up in any manner? The last paragraph of the  
2 Novak memorandum suggests further review.

3 A Yes. I hoped that that would take place.

4 Q Within the NRC?

5 A Yes, but that is part of a long, continuing problem  
6 for greater investigation of detail, in detail of the small  
7 break case, the reason being that one tends to lose the heat  
8 sink in these cases. It is less obvious as to what the heat  
9 sink really is.

10 Q Do you conclude now that a time period of  
11 approximately a year would have been sufficient for the  
12 review called for by Mr. Novak in his memorandum?

13 A I believe it would have been, but in very general, a  
14 vague way, investigations into the small break area have  
15 been going on for a long time.

16 Again I will go back to the Diablo Canyon investi-  
17 gation which I recall was in the spring of '74, the question  
18 of small break was raised there, and the efficacy of the  
19 cooling process being dependent upon natural convection was  
20 questioned, with the same general sort of quality. <sup>in the answer</sup> The  
21 answer was produced verbally at those hearings at San Luis  
22 Obispo.

23 The main theme there, however, was a concern which  
24 is still standing, that the process <sup>which</sup> ~~is~~ may give the  
25 greatest trouble, the potential for non-condensable binding

1 of the particular steam generator designs used by Westinghouse  
2 and of course combustion since there appears to me no design  
3 exit for rejecting such gas accumulations from the system.

4 Q At this point in time, do you have any knowledge  
5 of the distribution of the Israel or Novak memorandum after  
6 TMI?

7 A Let's see. I don't have a written record of such  
8 distribution. I have been told that it was, and this is in  
9 the course of discussions with inspection and audit with the  
10 NRC, that it went out in parallel to about six or eight  
11 recipients, and I interpreted this sort of handling of it as  
12 being indicative of the fact there was no focal point in  
13 the system to which to address this concern, and they handled  
14 it shuttle style hoping it would fall on a point of  
15 effectiveness somewhere, which evidently it didn't.

16 Q Have you previously observed similar action on the  
17 part of inspection and audit in distributing memoranda?

18 A No. I am not aware of any internal distribution  
19 pattern.

20 Q Are you aware that in the Incident Response Center  
21 in Bethesda of the NRC, the Israel or Novak memorandum was  
22 available shortly after the accident?

23 A I am not aware of that.

24 Q Nevertheless, you are aware that after the accident  
25 several people who were not named on any distribution

1 received copies of it?

2 A Oh, yes.

3 Q Does that indicate to you that the NRC is capable  
4 of reacting on short notice to urgent problems?

5 A In my view, I think that is true. They can act,  
6 but there is a difficulty also in my view that in order to  
7 act, they must involve many people with pieces of the  
8 problem rather than a consolidated approach to the problem.

9 Q What makes you conclude that the NRC must involve  
10 many pieces, many people, different areas?

11 A This is a general criticism I guess--this again is  
12 my personal view--that NRC as well as the industry tends  
13 to concentrate its design and review activity along what  
14 is called parochial or channelized or disciplinary lines  
15 without using the system interface and system analysis.

16 Q Does that essentially mean that there are a group  
17 of individuals at the NRC and in the industry who concern  
18 themselves, for instance, with the 12 valves, another group  
19 who might concern themselves with the 11 valves, another  
20 group who might concern themselves exclusively with PORV's?

21 A And another group who concern themselves with the  
22 mechanical aspects of the valves, and another group who  
23 concern themselves with the electrical aspects and another  
24 with impulse lines which controls the signal transducers.

25 Q Essentially concern with very isolated, finite

1 pieces of the entire system rather than an overview  
2 of the system as a whole?

3 A I characterize it often when I am talking to  
4 people on the subject as being a jigsaw puzzle that you can't  
5 turn over because there is no glue between the pieces.

6 Q And that is your representation or opinion of the  
7 NRC, a jigsaw puzzle with no glue?

8 A No, no. I think that is too severe really, but  
9 ~~anyhow it is a convenience.~~ it is a convenient analogy

10 Q You wouldn't mind including a little glue on the  
11 back of the jigsaw puzzle?

12 A Yes. I will modify that. I am just saying it is  
13 a convenient analogy, that it is hard to get the whole  
14 picture in tact.

15 Q Within a finite, short-term time period?

16 A Yes.

17 Q Eventually the picture comes out?

18 A Yes, but it is a long, drawn-out, complex process.

19 (A discussion was held off the record.)

20 BY MR. SIDELL:

21 Q Mr. Ebersole, do you have any particular concerns  
22 or problems with the lack of a centralized body within the  
23 NRC for an overview of systemic concerns?

24 A I have a problem in that I think that such an  
25 organization should exist with overview responsibility on  
the activities or the jurisdiction or channelized or

disciplinary contributions to the review process.

Q How long have you had these concerns?

A I have had these maybe the best point in time is to say 1966.

Q Why would that be the best point?

A That is when we ~~was~~ in the TVA <sup>91+</sup> in the business of designing nuclear plants, and with a background of fossil plants ~~that had the more near~~ <sup>which did not have the nearly</sup> potential for self-damage, as well as damage to the public.

There are two schools of thought here. Nuclear plants can commit permanent and irreparable damage to themselves. You ~~use~~ <sup>must protect</sup> the commercial investment even though, ~~they don't hurt the public,~~ <sup>the accidents would not</sup> and then the more guarded one <sup>(concentrate on the accident</sup> ~~is~~ <sup>which might be a hazard</sup> to the public. This requires an activity of this sort much more so than certain fossil plants.

I guess I would have to argue hydroplants, you have to certainly be careful that natural events don't take the hydroplant down, but the nuclear plant is particularly significant. One might say it could be compared to the design of an airplane versus a truck. <sup>with a given failure</sup> One has a potential for severe impact, although ~~they are both~~ <sup>Similar</sup> mechanical devices. <sup>may be under consideration</sup>

(A discussion was held off the record.)

BY MR. SIDELL:

Q Mr. Ebersole, what review if any did the ACRS perform on reactors, B&W reactors specifically, who had

1 already had their operating licenses after the concerns  
2 raised by Mr. Michelson were made known?

3 A I know of none that were investigated in this  
4 context.

5 The general reviews of projects and operations  
6 continued and may have involved some B&W reactors, but not  
7 in this particular context.

8 Q Do you know whether or not the NRC was reviewing  
9 any operating reactors in light of Mr. Michelson's concern?

10 A I do not know, and I might offer as a consideration  
11 toward that, again I understand that the NRC review doesn't  
12 take into account the emergency abnormal procedures, which  
13 are new.

14 Q Do you know whether or not the standard review,  
15 plan review on operating reactors to have emergency  
16 procedures?

17 A Well, I don't know. The standard review plans are  
18 a vast body of instructions as to how to review particular  
19 aspects of the designs. There is no particular logical  
20 beginning or end of these things.

21 As a matter of fact, they started, the first one  
22 started from Browns Ferry. It was the problem of the so-  
23 called NPSH on the pumps--net positive suction head--and  
24 from then the problems have grown into a vast collection of  
25 instructions.

1 Q After the Michelson concerns became known, did you  
2 expect that the NRC staff would be involved in reviewing  
3 operating B&W reactors in light of those concerns?

4 A Yes. I had a conviction certainly that this  
5 document that I gave to Mr. Israel would promote an  
6 investigation that would look into whether or not the  
7 operators would respond to contradict the engineering  
8 weaknesses if you want to call them that of this design, and  
9 that could have been the case.

10 Q Did you also assume that if Mr. Israel found that  
11 operators did not have adequate information concerning their  
12 manual operation of automatic systems, he would in turn  
13 take some affirmative action to correct the problem?

14 A If he had so found this to be the case, but  
15 evidently his response was simply to identify the design  
16 problem, and then relate to the design problem a needed  
17 operational procedure which evidently he didn't know whether  
18 already such adequate procedures existed or did not. He  
19 merely said in his last line, procedures should be reviewed.

20 Q Well, is it not the implication of review of  
21 procedures to correct procedures if they are found lacking?

22 A Yes, right.

23 Q So that tacitly, if not expressly, Mr. Israel  
24 suggested in the Novak memorandum to fix procedures that  
25 may have been lacking?

1 Q Are Mr. Michelson's concerns as valid for  
2 operating reactors as they are for reactors in the state of  
3 applying for either a CP or OL?

4 A To the extent that such reactors have this particular  
5 loop seal design, yes.

6 Q So in other words, Rancho Sigo, for example, in  
7 California, are you aware of whether that plant has a loop  
8 seal?

9 A I have not checked that. I don't know.

10 Q Is a loop seal generally characteristic of a B&W  
11 plant?

12 A I think it is not.

13 Q Do you know whether or not Davis-Besse has a loop  
14 seal?

15 A I don't think so, but I am not certain. To  
16 determine this one would simply consult a checklist.

17 Q Which is precisely what we are now doing.

18 A I don't know. I think these are all laid out. A  
19 point of clarification--whether or not there is a loop seal,  
20 there is the generic problem of the continuity, the reliability  
21 of the natural convection process. Whether or not there is  
22 a loop seal, that process can be influenced by any relatively  
23 small and weak influence such as non-condensable gas which  
24 will bind the flow process.

25 There is insufficient storage in the natural



1 convection process to purge the system as it is done on  
 2 normal startups. Normal startups use one or more 3,000  
 3 horsepower pumps to scavenge the systems. Subsequent to  
 4 an accident, <sup>due</sup> to two principal effects, the probable loss  
 5 of main power to run these pumps, and the probable loss of  
 6 a satisfactory environment in which the pumps normally run,  
 7 you can't claim with any reliability that you have the  
 8 capacity to purge.

9 We, therefore, rely on a comparatively small amount  
 10 of differential pressure that you can create by thermal  
 11 differences to cause a transport of energy.

12 Q In view of the fact that Mr. Israel in the Novak  
 13 memorandum mentions expressly the problem at Davis-Besse  
 14 with reference to fail to <sup>close?</sup> open POR, and therefore loss of  
 15 inventory from the primary system, would that not necessarily  
 16 indicate that Davis-Besse also has a loop seal?

17 A Let me see. I would infer from that that Davis-  
 18 Besse has a loop seal.

19 Does in fact Davis-Besse have a loop seal? I don't  
 20 recall.

21 Q I would also infer from your reading of the Novak  
 22 memorandum that it does, particularly since the diagram  
 23 attached to the Novak memorandum--

24 A Let me simply say this. <sup>I do not now know</sup> ~~It is not known~~ which  
 25 plants do have loop seals, and I am not going to attempt to

1 identify them.

2 Q Do you know whether or not TMI 1 has a loop seal?

3 A I do not, but I want to get back to the point  
4 that whether or not there is a loop seal, there is a  
5 standard, more generic, problem of a loss of natural  
6 convection process that must be resolved.

7 Q Which is inherent in the B&W design?

8 A Inherent in pressurized water reactors--period.

9 Q Across the board?

10 A Yes, and as a matter of fact, tend to be more  
11 difficult to cope with <sup>in</sup> ~~than~~ the <sup>rank</sup> Combustion Westinghouse  
12 designs because there is no potential for venting in these  
13 designs.

14 Q Do you recall when you received the typed  
15 Michelson report?

16 A I believe it was in January of 1978. It would  
17 again be a matter of a week or so after the typed one was  
18 received.

19 Q What did you do with the typed copy of the  
20 memorandum?

21 A I did not use it in any way other than just for  
22 reference back to the original document. I concluded that  
23 the original draft document had the essence of the  
24 information, and it would be unnecessary to follow up.

25 Q So that the handwritten Michelson report which you

1 provided to Mr. Israel provided all that was necessary to  
2 determine what the problem was?

3 A I cannot now remember. I may or may not have  
4 shown it to someone, or even given a copy, but I would not  
5 say that I know this to be the case.

6 At first, I thought that I probably did, but then  
7 on second thought I can't say that. At that time, again,  
8 I was pretty much withdrawing from active participation  
9 because of other problems.

10 (A discussion was held off the record.)

11 BY MR. SIDELL:

12 Q Mr. Ebersole, did you have any contact with  
13 Mr. Israel after you provided him a copy of the handwritten  
14 Michelson report?

15 A None.

16 Q Have you had any since TMI?

17 A No.

18 Q Do you know whether or not during your term on  
19 the ACRS there was any review of safety problems involving  
20 the PORV?

21 A I can't recall specific cases. The PORV if it  
22 fails has several ways to handle the problem. The first  
23 and easiest is to stop its failure by closing the valve  
24 which is in <sup>Series</sup> serious configuration failure.

25 Q The block valve?

1           A    The block valve; that process, as I stated earlier,  
2           is not done with redundant configuration, and therefore that  
3           valve might not work, in which case you would have a LOCA.  
4           A LOCA is in the field of events which is studied on a  
5           standard basis, so now you have a LOCA, and it is of small  
6           size and should be mitigated with comparatively little,  
7           if any, damage to the core, so I don't know of any particular  
8           attention being paid to this enhanced potential for having  
9           small LOCA's which I think was identified even before this  
10          time.

11           I presume but I am not sure that the PORV stuck  
12          open problem is the principal contributor to small breaks.  
13          I am not sure that that is the case, since the plants have  
14          numerous seals, small impulse lines, various attachments,  
15          each one of which could be the point of origin of a small  
16          break accident.

17          Q    Can you recall whether there have been any ACRS  
18          reviews of loss of pressurizer level indication before TMI  
19          by the ACRS?

20          A    No, none to my knowledge.

21          Q    Has there been any ACRS review of premature manual  
22          override of the HPI system before TMI by the ACRS?

23          A    No. I think I can say categorically that ACRS  
24          as well as apparently the staff, and I say apparently for  
25          that reason, it did not make it a practice to investigate the

1 operational procedures in any manner.

2 Q When you are referring to staff, is that the NRC  
3 staff?

4 A Yes. As a personal observation, I think the general  
5 thesis has been that you can get over the transient, or  
6 emergency, for a short term. If you can, you are home free.

7 Q Do you think that might have contributed to the  
8 lack of review of the September 24, 1977 problem at Davis-  
9 Besse wherein the pressurizer level indication was off  
10 scale high?

11 A I can say it might have contributed. The evolutions  
12 that follow in the long term after a transient or accident  
13 have tended to be those related to the long-term operational  
14 problems associated with a LOCA, loss of cooling accident,  
15 or even the large-size LOCA.

16 Q Can you recall which particular B&W plants the ACRS  
17 reviewed for either a CP or an OL after you had the Michelson  
18 report?

19 A No, I can't recall.

20 Q Would it be possible to provide us with that  
21 information?

22 A I am sure it can be obtained from, for instance,  
23 Mr. Fraley. You can get it from him.

24 Q Could you request that information of Bill Fraley?

25 A Which B&W plants have been reviewed subsequent to--

1 what was your beginning point?

2 Q After you had the Michelson report, B&W plants  
3 reviewed for both CP and OL.

4 MS. MOE: What was the date of that?

5 THE WITNESS: That was September 1, his first  
6 report.

7 MR. SIDELL: You would have that two to three weeks  
8 later, the latter part of September, 1977.

9 MS. MOE: Both CP's and OL's?

10 MR. SIDELL: Right.

11 THE WITNESS: May I comment here in this connection,  
12 B&W plants more recently trend toward what is called the  
13 standard plan, like B&W 205, and the review process doesn't  
14 necessarily go by project, so much as it does by generic  
15 designs of several projects, and in the review process, one  
16 frequently enters into a project-type review on the ground  
17 that the basic plant design has already been reviewed and  
18 therefore there is no point to raise new issues.

19 BY MR. SIDELL:

20 Q In view of the fact that you consider Mr. Michelson's  
21 concerns to be generic to essentially B&W plants, was there  
22 any discussion during ACRS reviews of the problem  
23 Mr. Michelson raised?

24 A Not to my knowledge, after the discussion of these  
25 questions that we discussed earlier, the three questions.

1 Q Dealing with Pebble Springs?

2 A Yes.

3 Q And that was in October, early October, 1977?

4 A Yes, right. If they had been raised since then, I  
5 am simply not aware of them.

6 Q Have you been at all the ACRS meetings between early  
7 October, 1977 and March 28th, 1979?

8 A No. I stopped my activity about in April, 1978  
9 because of some personal problems, illness, and I have only  
10 in the last month resumed.

11 Q So between April, '78 and July, 1979, you were not  
12 as active as you previously had been?

13 A I had been on a what you might call a medical  
14 sabbatical.

15 Q Do you know whether or not the ACRS reviewed the  
16 Midland Plant application?

17 A I am not aware of review at all. I don't know.

18 Q What about for Green County?

19 A No. I participated in one of the Green County  
20 reviews, I think in 1978 sometime--sorry, 1977. I don't  
21 remember the date.

22 Q Do you remember the subject matters of the review?

23 A No. I would have to look it up.

24 Q What notes would you consult or what would you be  
25 looking for in your review of Green County?

1           A    I would go back to the subcommittee meetings and  
2 determine which of them I might have attended and what the  
3 transcript was.

4           Q    So you would be reviewing the transcript of the ACRS  
5 meeting?

6           A    Yes, and the subcommittee meetings.

7           Q    Could we request that we have transcripts of any  
8 and all ACRS meetings dealing with Midland or Green County  
9 reviews, if they were reviewed?

10          MS. MOE:  Yes.  I will request them, but it might  
11 be best to also have a letter sent to Mr. Fraley, but I will  
12 be glad to ask them.  Those two specific plants?

13          MR. SIDELL:  Yes.  All right.  Let's have all B&W  
14 plants for CP and OL.

15          MS. MOE:  Since September, '77?

16          MR. SIDELL:  Make it October 1, '77.

17          BY MR. SIDELL:

18          Q    When you provided the Michelson report to Sandy  
19 Israel, was it fairly clear from your perspective that you  
20 were concerned from a safety problem perspective of the  
21 concerns Mr. Michelson raised?  It is more safety related than  
22 an operational convenience situation?

23          A    Oh, yes.  Virtually everything I do is safety  
24 related.

25          Q    From your perspective, would there have been any



1 other conclusion that Mr. Israel could have reached other  
2 than safety?

3 A No. Well, he might have concluded apart from safety  
4 that there was substantial risk for capital investment,  
5 without public jeopardy.

6 Q Was that within the scope of Mr. Israel's functions?

7 A No. It isn't within the scope of the regulatory  
8 function at all.

9 A Basic regulatory function is safety related?

10 A Public safety; protecting the capital investment  
11 falls out as a result of that.

12 Q That would be a concern obviously of the utility  
13 involved?

14 A Yes. Theoretically you could build a reactor with  
15 a sufficiently strong containment so it could destroy  
16 itself without hurting the public, but there is a terrible  
17 potential for doing damage to the commercial investment.

18 Q In other words, the costs of such a construction  
19 would be prohibitive?

20 A Yes. Well, also the reasonability of even building  
21 it would be.

22 Q I just have a few more questions and then we will  
23 be finished. After your review of the Michelson report,  
24 did you conclude that Mr. Michelson's thesis was that  
25 essentially in layman's terms the analysis of assuming a

1 large break LOCA was insufficient to include the possible  
2 consequences of smaller breaks in the system of a nuclear  
3 reactor?

4 A I think that conclusion existed prior. As a  
5 matter of fact, one had to do a small break analysis, but  
6 rather than that, I concluded as I think Mr. Michelson did  
7 that in the small break context, there existed an  
8 instructional void I guess I would call it, with operators  
9 as to how to handle it.

10 The adequate instructions would have been  
11 compensatory, but he didn't know, and I didn't know and  
12 apparently not many people if any knew that such instructions  
13 did or did not exist.

14 Q And again, that would have been the function of the  
15 NRC to determine what procedures exist?

16 A *I believe it should have been the NRC function*  
17 *The B and W plant*  
18 ~~It~~ does not appear to have potential for gas binding. ~~You~~  
19 ~~cannot, at least~~ At this point in time I know of no PWR  
20 that designs the primary <sup>system</sup> ~~loop~~ with intrinsic capability to  
21 reject decay energy without assistance from the <sup>secondary</sup> ~~primary~~ side,  
22 and therefore without needing a fluid system with adequate  
23 coupling <sup>between</sup> the primary and secondary side and <sup>in the</sup> ~~best~~ transfer  
24 context.

24 This type of coupling can come from either solid  
25 fluid natural convection transport flow, or it can come from

reflux

what is called ~~reflux~~ boiling, in which case the primary vessel is only partly filled and the convection process is due to steam carryover and the subsequent condensation from the rising tubes of the steam generator.

Unfortunately, the condensation process has to redeliver the coolant right down through the same pipes that ~~are~~ <sup>provided</sup> the condensation, which are very small, and we do not, so far as I know, now we do not know whether the ~~condensation~~ <sup>process</sup> will work.

Q I believe I may have asked you previously, but just to make sure we have it, is the reason for your giving the Michelson report to Mr. Israel the fact that he was involved with the ECCS systems and that rather than going through normal channels of asking questions of the NRC staff, this was a much more expeditious method?

A A more expeditious method, and it was made ~~to carry~~ <sup>done</sup> ~~to have the~~ <sup>to present</sup> details which they would not otherwise have and which certainly it seemed inappropriate to formalize for several reasons.

Q Essentially if the concerns that were raised in the Michelson memo and the Novak memo were properly reviewed or noticed for the substantial safety matters that they raised, is it your opinion that the accident occurring at TMI 2 on March 28th, 1979 could have been avoided?

A Not merely if they had reviewed, but if action

1 subsequent to the review, preventive action appropriate to  
2 the problem, had taken place.

3 Q If they had been reviewed, they would have found  
4 omissions in procedures and those omissions should have been  
5 corrected?

6 A Yes.

7 Q And therefore, avoiding the accident at TMI 2?

8 A Yes.

9 Q In your position as a member of the ACRS, would the  
10 NRC have been responsible for causing the review and  
11 correcting any omissions from procedures?

12 A In my personal view, they should have been  
13 responsible for doing that and are now, so far as I am  
14 concerned.

15 On the other hand, it is the operator's responsi-  
16 bility to consolidate the contributions of the designer, the  
17 operator, the vender, the architect-engineer, in a cohesive  
18 way rather than permitting the operator to sit  
19 jurisdictionally apart and decide how he wants to operate  
20 the plant.

21 Q But I believe you previously stated that the  
22 operator is essentially the last person along the line to  
23 receive information as to how the machine works from the  
24 vender?

25 A I am not sure that in all cases he ever receives

that information.

Q And at best, he might be the last person?

A I would be the first to say I would be suspicious that in certain cases operators may deduce, <sup>show to operate</sup> which is a dangerous process. He must operate a complex machine.

Q And that is the regulatory function of the NRC, is it not?

A What is that?

Q To provide specific guidelines to vendors and the industry in general.

A First of all, it is the responsibility of the design teams <sup>IM</sup> ~~and~~ the architect-engineer and vendor areas.

Q Subject to NRC review?

A To at least define the conceptual basis for operating procedures, and in my view this is enough. One does not need to descend to the tremendous amount of detail beyond the conceptual basis for operation.

Do you understand the difference? I can say in 10 pages put out a conceptual basis of operation and point out the shortfalls and the difficulties.

It may take 100 pages to implement this conceptual instruction with valve numbers, switch numbers, positions of equipment, various alignments, et cetera.

Q But the NRC reviews even the operational matters and procedures of reactors as well as their conceptual basis?

1           A    They do not, not to my knowledge.  They do not do  
2 this.

3           Q    The NRC, if it does not provide specific procedures  
4 or corrections to procedures, can require the vendor to  
5 provide specific procedures to a utility, can it not?

6           A    Oh, yes.  It can require submission, as it has in  
7 recent days, <sup>on</sup> ~~at~~ the Salem and Sequoia Plants, and we are  
8 getting these procedures now.

9           Q    And is that the method by which you would have  
10 expected the NRC to implement the Michelson suggestions?

11          A    No.  I think to get the procedures as I have  
12 received and will receive in the future of these two plants  
13 in particular, the Salem and Sequoia, I will get them in the  
14 highly amplified form which will contain I presume a great  
15 deal of information I would consider extraneous from which  
16 I will have to derive the conceptual approach.

17                   The inverse process ought to be followed.  The  
18 conceptual basis should not be derived from the details, but  
19 rather the detailed procedures ought to be built on the  
20 conceptual instruction provided by the architect-engineer  
21 and vendors.

22          Q    But the NRC reviews the processes suggested by the  
23 designer?

24          A    No.  I think one of the outstanding findings in  
25 respect to this incident has been that NRC does not in fact.

Q Do you believe they should?

A <sup>Yes</sup> ~~To the degree that~~ I suggest, <sup>a</sup> spotcheck of detailed procedures, a full-scale <sup>review</sup> of the conceptual basis for all procedures which is a much reduced review problem. In this connection I suggest you look at Mr. Mattson's, ~~transcript~~ transcript of his discussion in the July meeting of ACRS where he has adopted an alternative approach to applying pressures on the utility operators.

Q And that is pressure exerted by the NRC?

A Yes. My understanding is that he is not really staffed up to undertake this, and this is a common problem, and <sup>apparently</sup> ~~certainly~~ he sees no apparent hope of getting on this.

I am here to suggest that you look at that <sup>transcript</sup> if you want to get a better answer.

Q If the NRC determines that a specific procedure to deal with a problem such as that raised by Mr. Michelson, Mr. Novak, does not exist, is it your understanding that the NRC could require the vendors to establish a procedure?

A Absolutely. No question.

Q And in your opinion as a member of the ACRS, is not requiring the vendor to provide a procedure what as a matter of fact could have been done to prevent TMI 2?

A Right. My understanding is these procedures have not been required on a routine basis.

MR. SIDELL: Okay. I have nothing further. Marian?

MS. MOE: No, not at this time.

MR. SIDELL: Mr. Ebersole, after approximately three and a half hours of a deposition today, and a few breaks in between, you have had an opportunity to reflect and consider your testimony today.

Is there anything that you wish to change now about what you have stated?

THE WITNESS: After I see the transcript I might, but I don't know of any at this time. I am sure the language is going to get twisted.

MR. SIDELL: Hopefully not. We will rather than adjourn the deposition, merely recess it in the hopefully unlikely event we come up with any further questions we need answers to, we can recall you. We shall make every effort to avoid that, so rather than adjourning the deposition, we will recess it on a temporary basis.

Thank you very much.

(Whereupon, at 2:05 p.m., the deposition of Mr. Ebersole was recessed.)

I have read the foregoing pages, 1 through 102, and they are a true and accurate record of my testimony therein recorded.

*Jesse C. Ebersole*  
 \_\_\_\_\_  
 JESSE C. EBERSOLE

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 1979.

*As annotated*

\_\_\_\_\_  
 Notary Public



CERTIFICATE OF NOTARY PUBLIC

1 I, Katherine Boyd, the officer before whom the  
2 foregoing deposition was taken, do hereby certify that the  
3 witness whose testimony appears in the foregoing deposition  
4 was duly sworn by me; that the testimony of said witness  
5 was taken stenographically by me, and thereafter reduced  
6 to typewriting by me, or under my direction; that I am  
7 neither counsel for, nor employed by any of  
8 the parties to the action in which this deposition was  
9 taken; and further, that I am not a relative or employee  
10 of any attorney or counsel employed by the parties hereto;  
11 nor financially or otherwise interested in the outcome  
12 of the action.  
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Notary Public

My Commission expires; 8/31/82