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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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In the matter of :
  
: Docket No. 50-155-OLA
  
CONSUMERS POWER COMPANY : (Spent Fuel Pool
  
: Modification)
  
(Big Rock Point Nuclear Power Plant) :
  
:
  
-----x

5th Floor Hearing Room  
4350 East-West Highway  
Bethesda, Maryland

Thursday, March 24, 1983

Oral argument in the above-entitled case  
convened at 9:30 a.m., pursuant to notice.

BEFORE:

- JUDGE THOMAS MOORE.
- JUDGE JOHN BUCK.
- JUDGE CHRISTINE KOHL.

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25 DENISE WIKTOR, Legal Intern.

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P R O C E E D I N G S

1  
2 JUDGE KOHL: Good morning. The Appeal Board is  
3 hearing argument this morning on the appeal of Consumers  
4 Power Company from the Licensing Board's October 29, 1982  
5 partial initial decision concerning the neutron multiplication  
6 factor in this license amendment proceeding.

7 The argument is governed by the terms of our order  
8 of February 17th. As provided therein, each side is allotted  
9 one hour for their presentation of argument. Consumers  
10 Power, as the appellant, may reserve a portion of its time  
11 for rebuttal. If those arguing this morning would now  
12 introduce themselves for the reporter, we will then proceed.  
13 We'll start with the staff.

14 MR. BACHMANN: My name is Richard G. Bachmann,  
15 I'm counsel for the NRC Staff. With me at the table is Mr.  
16 Edward Reis, also counsel for the NRC Staff, and Mr. Richard  
17 Emch, who is the Project Manager for Big Rock Point.

18 MR. GALLO: Good morning, Judge Moore, and members  
19 of the Board. My name is Joseph Gallo with the law firm of  
20 Isham, Lincoln and Beale, 1120 Connecticut Aveue, N.W.,  
21 Washington, D.C. At the extreme end of the table is Mr.  
22 Peter Thornton of the same firm. Together we represent  
23 Consumers Power Company.

24 Seated between us is Mr. Jerry Umbarger; he is  
25 Operational Reactor Physics Administrator for Consumers

1 Power Company.

2 MR. O'NEILL: Good morning. My name is John O'Neill,  
3 II. I am an intervenor representing myself. I live in  
4 Maple City, Michigan.

5 MR. SEMMEL: I am Herbert Semmel from Antioch Law  
6 School. I represent Intervenors Christa-Maria, Mills and  
7 Beir. With me, to my left, is Denise Wiktor, a legal intern.

8 JUDGE MOORE: Mr. Gallo, you may proceed.

9 ORAL ARGUMENT BY JOSEPH GALLO ON BEHALF OF LICENSEE.

10 MR. GALLO: Members of the Board, I will, indeed,  
11 reserve a part of my time for rebuttal. I believe the issues  
12 are quite simple, and I'd like to start out by pointing out  
13 that the issue of supercriticality and whether or not this  
14 phenomenon might occur at the Big Rock pool, the spent fuel  
15 pool, first arose as a result of the Licensing Board's ruling  
16 on the motions for summary disposition. Basically, information  
17 was provided by the Intervenors in this case in connection with  
18 another contention, that prompted the Board to look at an article  
19 that appeared in Nuclear Technology, the 1980 edition. As a result  
20 of the inquiry, the Board determined it appropriate to issue a  
21 Board question asking that the Licensee and Staff explore the  
22 question of supercriticality in connection with the spent  
23 fuel pool application pending for the Big Rock Point plant.

24 When we received that Board question in the context  
25 of the summary disposition order and ruling by the Licensing

1 Board, our reaction was that arguably, such an inquiry was  
2 beyond the design basis, but in the context of that order we  
3 believe the matter could be easily addressed where the question  
4 of super-criticality only arises if you have a loss of water  
5 condition where you begin to have the fuel uncovered and you  
6 have a mist or steam environment.

7 That very question -- that is, the question of  
8 loss of water -- had been raised in connection with another  
9 contention which we refer to in this case as the TMI-II  
10 contention. That contention suggested that in the event of  
11 a loss of coolant accident rendering containment inaccessible  
12 for some indefinite period of time, the spent fuel pool  
13 cooling system might fail, and as a result, pool boiling  
14 would ensue and the water would boil off and you would have  
15 a resultant melting of the spent fuel in the pool.

16 In response to that contention, in our motion for  
17 summary disposition we pointed out that assuming those  
18 circumstances, that the licensee, Consumers Power Company,  
19 was committed to put in something called a remotely activated  
20 makeup line, and that makeup line would prevent the very  
21 problem anticipated by the contention; that is, the loss of  
22 water.

23 The Board found that proposition persuasive in its  
24 order for summary disposition with one exception; it found  
25 that there was not enough evidence in the pleadings to

1 determine whether or not the remotely activated makeup line  
2 was sufficiently reliable for its intended purpose, and set  
3 down that question, among others, for hearing and for the  
4 taking of further evidence.

5           Moreover, in a companion issue, again raised by  
6 the intervenor in their response to the motions for summary  
7 disposition, suggesting that a loss of water situation would  
8 cause a zircaloy/steam reaction, the Board found that none  
9 of the evidence and none of the information supplied by the  
10 Consumers Power Company in connection with its application  
11 addressed a zircaloy-steam reaction.

12           The Board suggested that the staff and the applicant  
13 had to address that question, but it also opined in its  
14 order that of course, if the makeup line was determined to be  
15 sufficiently reliable in connection with the other issue  
16 raised by the Licensing Board as a genuine issue of fact, we  
17 need not -- that is, the licensee need not address the  
18 consequences of the zircaloy-steam reaction.

19           So it's in that context we viewed the further Board  
20 question on the super-criticality issue. It seemed quite  
21 clear to the licensee that the makeup line, if it served the  
22 purpose of negating an inquiry into the consequences of the  
23 zircaloy-steam reaction, if it negated an inquiry into the  
24 consequences of melted fuel in the spent fuel pool, it had  
25 equal application to negate the need to do an analysis to



1 determine the consequences of a super-criticality accident.

2 JUDGE KOHL: Counsel, do you have any problem,  
3 then, with conditioning the finding on criticality on the  
4 subsequent determination of the reliability of the makeup line?

5 MR. GALLO: Absolutely not. In fact, we so  
6 stipulated in the findings of fact and material that we  
7 submitted at the conclusion of the hearing on this issue, and  
8 indeed, have asserted that in the brief before this Board.

9 Now, it is with the background of the analysis that  
10 I have just presented with respect to the summary disposition  
11 order of the Licensing Board that our witness, Dr. Kim,  
12 drafted his testimony. He made it clear in his testimony,  
13 both in his prepared written testimony and in his testimony  
14 under cross examination both by the intervenors and by the  
15 Licensing Board that basically his criticality analysis was  
16 on the basis of a sub-criticality analysis for the purposes  
17 of keeping reactivity in the spent fuel pool below .95 under  
18 conditions where the coolant water was maintained. And that  
19 for the super-criticality situation he was relying on the  
20 remotely-activated makeup line.

21 He did go further and attempt to address the Board's  
22 questions in the context of the matters raised by the article  
23 in the Nuclear Technology edition, but beyond that, his  
24 primary basis for his position was the makeup line.

25 Now, for the first time we discovered -- that was

1 when the Board issued its decision on this matter -- that the  
2 Board felt it could not give credit to the makeup line. We  
3 believe -- I believe that the Board ordinarily would have  
4 given credit for the makeup line, witness its actions in  
5 connection with the TMI-II contentions, witness its actions in  
6 connection with the zircaloy-steam reaction that it posed.  
7 But it felt constrained by its interpretation of the staff's  
8 Safety Evaluation Report to not give credit to the makeup line.

9 JUDGE KOHL: Counsel, don't the various staff  
10 Reg Guides and other guidance refer to the fact that these  
11 analyses, the criticality analysis, should be performed for  
12 all conditions so as to assure sub-criticality at all times?

13 I think at various points throughout the literature  
14 that phrase is used, and I think that's what the Licensing  
15 Board was relying on when it found that it could not take  
16 credit, as it were, for the remote makeup line.

17 MR. GALLO: We have argued in our brief that it is  
18 our belief that that, in fact, is what the Licensing Board  
19 was relying on. I might say, Judge Kohl, that I spent  
20 considerable time reviewing the Standard Review Plan,  
21 Regulatory Guide 1.13, Proposed Revision 2, the ANSI standard,  
22 and I find in none of those documents any statement that is  
23 an analog to the all-condition phrase to which you refer.

24 JUDGE KOHL: What about the branch technical  
25 position? There is a reference there to excessive loss of

1 water due to evaporation and/or because of fogging. What  
2 about that particular portion of the technical position?

3 MR. GALLO: Well, I believe the section to which  
4 you refer is included under a general caption. It's Section  
5 1.5 entitled, "Acceptance Criteria for Criticality," and the  
6 introductory phrase contains the very language that the  
7 Board cited in the Safety Evaluation Report. And it is our  
8 belief that the SER language is really a reiteration and, to  
9 some extent, a verbatim reiteration, of the prefatory  
10 paragraph under 1.5 of the branch technical position. That's  
11 appearing at page III-3.

12 JUDGE KOHL: Just flip over two pages to III-5  
13 where we're beyond the introductory or prefatory remarks.  
14 Under Section 5, Technical Specifications, .1, it says the  
15 neutron multiplication factor in the fuel pool shall be less  
16 than or equal to 0.95 at all times. Then dropping down below  
17 the explanatory material for that discrete section of the  
18 branch technical position is the portion that I'm referring  
19 to that does talk about an excessive loss of water and the  
20 fact that analyses of thermal loads should consider loss of  
21 all cooling -- all pool-cooling systems.

22 MR. GALLO: Yes.

23 JUDGE KOHL: What does loss of all pool-cooling  
24 systems mean, as used in here?

25 MR. GALLO: Every spent fuel pool has a mechanism

1 called the spent fuel cooling system for essentially  
2 dissipating decay heat that results from the spent fuel  
3 sitting in residence in the pool. The water heats up because  
4 the fuel generates heat, and as a result, the water heats up.

5 The spent fuel cooling system is a system that  
6 removes that heat to avoid a situation where the temperature  
7 would increase and ultimately reach a boiling condition.

8 JUDGE KOHL: So you are limiting that language to  
9 a failure of the cooling system itself, as opposed to a loss  
10 of the coolant.

11 MR. GALLO: That's correct. Well, I think there  
12 is even a more persuasive reason for that statement.

13 JUDGE KOHL: Let me just follow up on that, though.  
14 If that is your interpretation of that, how does that square  
15 with the immediately preceding sentence that does talk about  
16 excessive loss of water?

17 MR. GALLO: It's my view that what the staff meant  
18 when they drafted this paragraph was that they were worried  
19 about the effects of decay heat and the components of the  
20 concrete within the pool, because look at the remedy that  
21 they suggest. And I think that that is dispositive of  
22 whatever meaning can be given to this paragraph.

23 The remedy they suggest is that a tech spec limit  
24 should be considered. Not required; should be considered.  
25 And the limit should be the limit temperature. They don't

1 impose a condition to attempt to avoid the loss of pool  
2 cooling, such as a makeup line might do. They simply  
3 indicate a limit on the temperature level. My experts  
4 advise me that this --

5 JUDGE KOHL: But this is under the specific  
6 section that deals with criticality, is it not?

7 MR. GALLO: That's correct. But the whole section  
8 on acceptance criteria is kind of -- under Section 1.5 -- is  
9 kind of a potpourri of analyses and requirements to satisfy  
10 Criterion 62, and they deal with the conditions for the  
11 analysis, the type of calculations for the analysis, the  
12 type of accidents that need to be addressed, and finally, the  
13 technical specification section to which you refer.

14 So they clearly intend to impose a limit of .95,  
15 but this section -- and I'm referring now to the whole of  
16 Section 1.5 -- has to be read in the context of the entire  
17 branch technical position, which is clearly dealing with what  
18 the branch technical position believes to be a credible  
19 situation.

20 They use the term in the preamble, and beyond that,  
21 it defines -- that is, the branch technical position, and  
22 Section 1.5 in particular, -- defines the accidents that you  
23 need to address. And nowhere in any of this branch technical  
24 position is the loss of spent fuel pool coolant addressed,  
25 except in the point that you point out, Judge Kohl. And it

1 leads me to believe that the staff did not have in mind,  
2 when they wrote that paragraph on page III-5, a super-  
3 criticality situation.

4 They, I believe, had in mind a situation of avoiding  
5 a matter where the decay heat might adversely affect the  
6 concrete, or might adversely affect some other component  
7 involved in the spent fuel pool cooling.

8 JUDGE KOHL: If they have the fourth postulated  
9 accident, then, going back towards the beginning of the  
10 branch technical position where it does enumerate various  
11 accidents that must be considered in the analysis -- the  
12 fourth one, again, there is loss of all cooling systems or  
13 flow under the accident conditions unless the cooling system  
14 is single failure proof.

15 Again, you are reading that to limit it to loss of  
16 the system itself, as opposed to the loss of the pool  
17 coolant, and you don't regard that postulated accident  
18 scenario as encompassing what the Licensing Board had in  
19 mind here?

20 MR. GALLO: No, no, I do not. In fact, Dr. Kim  
21 did exactly what item 4 indicates. He conducted a criticality  
22 analysis where a pool boiling situation which results from  
23 the occurrence of the loss of the cooling system, and the  
24 answer, of course, as I have indicated, was that he gave  
25 credit to the spent fuel pool makeup line. There is nothing

1 in that section that says what you need to do is to assume  
2 the condition the Board did and then analyze for it in terms  
3 of maintaining your criticality below .95.

4 JUDGE KOHL: All right. If we assume that nothing  
5 in any of the staff guidance, be it Reg Guides or branch  
6 technical positions or whatever, requires the analyses  
7 ordered by the Licensing Board, is there anything in that  
8 that would prohibit it under certain circumstances? In  
9 other words, are these just minimum requirements?

10 MR. GALLO: Well, I believe that the -- I wish to  
11 stress that our discussion of the interpretation of the  
12 branch technical position and the other NRC staff guidance  
13 is simply for the purpose, in my judgment, of trying to  
14 understand how the Licensing Board went wrong.

15 The Licensing Board, to answer your question,  
16 should have been controlled by Criterion 62. That's the  
17 only binding regulation that applies in this situation.  
18 Criterion 62 says quite clearly that you can meet its  
19 requirements to prevent criticality, and we read that to  
20 mean also, super-criticality; that you can meet that  
21 requirement in two ways, either by geometric configuration,  
22 even though that's the preferred method, or by physical  
23 systems. And we submit that the makeup line is just such a  
24 physical system.

25 JUDGE KOHL: What's your support for that? I know

1 that's the position I believe the staff takes also, and I  
2 am curious as to what information we have and what was meant  
3 by the expression "physical systems" in Criterion 62.

4 MR. GALLO: Well, the legislative history, if I can  
5 use that phrase, on Criterion 62 does not disclose exactly  
6 what the term "physical systems" means. The early formulation  
7 of Appendix A to Part 50 did establish the design criterion  
8 and had as a part of it a separate section that addressed a  
9 subject called "engineered safety features." It was a separate  
10 section and it explained how engineered safety features play  
11 a role in the overall design of the safety of a nuclear power  
12 reactor.

13 In the final formulation of Appendix A, that specific  
14 section was deleted, and instead, in a rather terse statement  
15 in the statement of considerations it said the section on  
16 engineered safety features was deleted, and instead, the  
17 concept was integrated into the various design criteria.

18 We believe, based on that statement, that the term  
19 "physical features" is one manifestation of that implementa-  
20 tion. And by the plain meaning of the words, it can have  
21 no other meaning.

22 You've got a geometric configuration which means  
23 rack placement, spacing, and physical features means some  
24 other mechanism for maintaining reactivity beyond .95 or,  
25 in this case, below -- in excess of 1.



1 JUDGE KOHL: Might it not refer, though, to the  
2 character of the racks themselves as opposed to a separate  
3 system like the makeup line?

4 MR. GALLO: No, I don't think so because then  
5 the term "physical features" would be redundant and unnecessary  
6 because the term "geometric configuration" takes into account  
7 the rack, design, the spacing and --

8 JUDGE KOHL: Well, the spacing. But what about  
9 the type of racks used, for example? Racks that have a  
10 neutron-absorbing material in the rack itself, which I take  
11 it this particular proposal does not have?

12 MR. GALLO: That's correct, does not have. No, I  
13 can't agree with that because I think such an interpretation  
14 would just do violence to the plain meaning of those words  
15 because the insertion of a boron-absorbing or a poison  
16 element into the rack, as I understand it, is physically  
17 integrated into the spent fuel pool reactor in its  
18 fabrication, and it essentially absorbs the neutrons. The  
19 rack itself and its design accomplishes the spacing. That's  
20 what is meant by geometric configuration.

21 "Physical system" has to mean something else, and  
22 in this case, we submit it's the makeup line.

23 JUDGE KOHL: I'm not sure you ever answered my  
24 question as to whether or not, assuming that there is  
25 nothing in any of the staff requirements or guidance, that

1 would require a mandate that the Licensing Board did here.  
2 Is there anything to preclude it? The same statement of  
3 consideration that you referred to for general design criterion  
4 62 does state that those are only minimum requirements that  
5 are being established.

6 MR. GALLO: Yes.

7 JUDGE KOHL: Given that the Big Rock Point spent  
8 fuel pool is in a different situation from any other plant  
9 insofar as it is within the containment building itself as  
10 opposed to a separate auxiliary building, perhaps it is just  
11 the special circumstance that might require exceeding the  
12 minimum guidance or the minimum requirements.

13 MR. GALLO: Well, of course, our position is that  
14 criterion 62 is controlling on the Board. But to answer your  
15 question specifically, there is no actual predicate below  
16 which would support that the Licensing Board's action of  
17 departing from criterion 62 in this case -- there is no  
18 factual predicate or other evidentiary basis upon which the  
19 Board could have asserted its conclusion.

20 Indeed, it didn't attempt to do it on any factual  
21 basis; it attempted instead to bottom its interpretation on  
22 the interpretation of the safety report issued by the NRC  
23 staff.

24 I agree with you that Appendix A to Part 50 does  
25 indicate that those are minimum requirements, and it does

1 indicate there may be circumstances under which there are  
2 additional requirements in that situation, though a factual  
3 predicate, a technical basis, has to exist in order to  
4 support such a departure, and that doesn't exist in this record.

5 JUDGE BUCK: May I get into this for a few minutes?

6 MR. GALLO: Please do, Dr. Buck.

7 JUDGE BUCK: I think there is a lot of confusion --  
8 there seemed to be on the part of the Licensing Board -- as  
9 to the reason for the Big Rock spent fuel pool being, shall  
10 we say, over moderated. The lack of, or the conservation of,  
11 a  $k_{eff}$  of below .95 was basically a spacing thing. The  
12 rack out there is made up of stainless steel. Stainless steel  
13 itself is a poison just like boron is; not quite as effective  
14 but it is a poison. The only difference between this and  
15 many other pools -- not all other pools -- is the fact that  
16 the water spacing here is greater than other pools and you  
17 have more water than you need.

18 If you boil some of that away, you get the density  
19 down and your criticality tends to go up, and I think this  
20 is what seemed to have the Board worried. That if you did  
21 heat this thing and you got bubbles in there, your density  
22 went down and criticality went up for a short time. If it  
23 got below that as it boiled down further, the criticality  
24 curve goes down.

25 And for some reason or other -- and I think the

1 Board got completely confused about this and got worried  
2 about it, because if I am correct, then the applicant's  
3 calculations were all done on new fuel. And I think Dr. Kim  
4 stated that the  $k_{\text{eff}}$  of the fuel would be about .15 or more,  
5 or greater than the spent fuel. Is correct?

6 MR. GALLO: I believe that's correct.

7 JUDGE BUCK: Was that controverted by anybody in  
8 this hearing? I didn't see it, but as far as I know, it is  
9 correct because the spent fuel would have a lot more actual  
10 fissionable fuel in it after having been through the reactor.

11 One question is, do you -- or when do you put  
12 fresh fuel into this pool.

13 MR. GALLO: My understanding, Judge Buck, is it  
14 would only occur under one circumstance. That you might load  
15 the reactor with fresh fuel at a refueling.

16 JUDGE BUCK: But you do go through this pool in  
17 loading, don't you? Do you put the fresh fuel into the -- ?  
18 you don't? In some reactors you put it into this pool and  
19 then --

20 MR. GALLO: My understanding is that the fresh  
21 fuel is stored in a vault, so to speak, right near the  
22 reactor head.

23 JUDGE BUCK: That's a dry vault. But you're moving  
24 into loading it and you've got to get it underwater  
25 somewhere to move it into the tunnel, to the reactor.

1 MR. GALLO: May I refer to my expert?

2 JUDGE BUCK: Surely.

3 MR. GALLO: How do we move it from the dry vault  
4 into the reactor?

5 MR. UMBARGER: In general, it does not go through  
6 the spent fuel area, but it could possibly go in there if you  
7 had something happen to a bundle and you wanted to remove it,  
8 you wanted to take it apart and put another pin in it, or  
9 you wanted to do an experiment.

10 I believe during the refueling you might take a  
11 new bundle in there, work on it and then move it.

12 JUDGE BUCK: All right. You're telling me that  
13 you move a new bundle directly into the -- in the passageway  
14 into the reactor itself. Is that right? You don't have to  
15 put it into the pool first?

16 MR. UMBARGER: To the best of my knowledge, that's  
17 true.

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JUDGE BUCK: So the only time you would have a lot in there -- for example, you put a new loading of a third of the reactor into the reactor, and then for some reason just on startup something happened that you have to unload the whole thing, then you would have that one-third load as fresh fuel in the pool, is that correct?

MR. GALLO: That's correct, sir.

JUDGE BUCK: But that's about the only time that would happen?

MR. GALLO: That's correct.

JUDGE BUCK: Do you know anything about how they would load that in the pool if they did it?

MR. GALLO: Well, they would remove the assemblies from the reactor in a spent fuel transfer cask and then transport the cask into the pool and unload the fuel assembly.

JUDGE BUCK: Do you know anything about how they would place it? Would they place it all together, or would they place it --

MR. GALLO: They would put it in the existing spent fuel pool racks that have already been analyzed for purposes of criticality. Does that address your question?

JUDGE BUCK: No. What I'm asking is if you brought out a third of that reactor as fresh fuel and put it into the pool, would you spread it around the pool? Is that the normal circumstances?

1 MR. GALLO: I believe they would. They would not  
2 concentrate it in one area, that's correct, sir.

3 JUDGE BUCK: All right.

4 Now, the other thing is it's my understanding that  
5 you can't possibly cause overheating in the pool with fresh  
6 fuel. Is that correct?

7 MR. GALLO: I really can't address that.

8 MR. UMBARGER: That's true.

9 JUDGE BUCK: So that you only have boiling in the  
10 pool if you had a high level of spent fuel in there. That's  
11 where the heat comes from.

12 MR. GALLO: That's correct. Primarily, Judge Buck,  
13 from the spent fuel that was removed at the prior refueling.  
14 That's where most of the decay heat generates from.

15 JUDGE BUCK: You see, what's bothering me about this  
16 thing, and I think we've caused a lot of confusion on the part  
17 of the Board, is the calculations were all done on a complete  
18 fuel pool loading of fresh fuel to get a reactivity level  
19 or a  $k_{\text{eff}}$  level of .95 under Dr. Kim's and Dr. Lantz's calcula-  
20 tions. Under those circumstances you can't possibly boil any  
21 water in the fuel, so you'd have to have some other untoward  
22 accident if you did have it in there. But if you had  
23 old fuel in there when you could possibly get boiling, the  
24  $k_{\text{eff}}$  is so far down that there's no reason to worry about it.  
25 And I wondered -- as far as I can see, the Board just got

1 completely confused by the calculations being done on  
2 completely fresh fuel.

3 MR. GALLO: I think Dr. Kim testified to just the  
4 point you're making now, Judge Buck. He pointed out that there  
5 was just conservatism upon conservatism built into this  
6 criticality analysis. At the end of two and a half days of  
7 cross examination he was permitted to make a statement, and  
8 in that statement he pointed out that the criticality analysis  
9 bore no relation to the real world of what the environment  
10 in the pool was. So I think that's correct.

11 JUDGE BUCK: I've read that statement, and to me  
12 it just pleaded for a little bit of communication or under-  
13 standing, and I couldn't quite understand why this was gone  
14 through.

15 JUDGE KOHL: Mr. Gallo, if I could ask one clarifica-  
16 tion here. Doesn't the Staff requirements always require  
17 for spent fuel pool criticality calculations that built-in  
18 conservatism of new fuel? Isn't that a --

19 MR. GALLO: Yes. My understanding is that's one  
20 of the criterion of the Staff's guidance in this area, that  
21 you do your analysis on the assumption of new fuel.

22 JUDGE KOHL: Thank you.

23 JUDGE MOORE: Mr. Gallo, excuse me.

24 Assume for the moment that the Licensing Board has  
25 misread the Staff guidance and its reliance on its



1 interpretation of what the Staff guidance meant by "under all  
2 conditions." The Board concluded, did it not, that even with  
3 that assumption, that even if it were in error on the first  
4 point, it said, "Second, even while we do apply more lenient  
5 standards to the pool, we would accept a portion of Dr. Kim's  
6 testimony adverse to the position of this claim in this pro-  
7 ceeding that the calculational methods so far employed for  
8 this fuel pool are not adequate to give confidence that  $k_{eff}$   
9 will remain below .95 once the density of water had declined  
10 below .50."

11 That's on page 22 of the Licensing Board's opinion.

12 MR. GALLO: I recall the statement.

13 JUDGE MOORE: Does that statement indicate that  
14 should we disagree with the Licensing Board's reading of the  
15 Staff guidance that we also must disagree with the Board's  
16 reading of the testimony in order to reverse in this case?

17 MR. GALLO: I'm sorry. The last part of your ques-  
18 tion, must we also agree --

19 JUDGE MOORE: Must we also disagree with the  
20 Licensing Board's reading of Dr. Kim's testimony to reverse  
21 in this case?

22 MR. GALLO: I think that -- well, I think the  
23 answer is yes, and I think the Board did mischaracterize  
24 Dr. Kim's testimony. He said what the Board indicated, but  
25 it was in the context of setting aside for the moment taking

1 credit for the makeup line. Dr. Kim's talking about his  
2 calculations and his analysis, and he quite candidly points  
3 out that his calculations and his analysis don't go to the  
4 point of analyzing for purposes of reactivity the condition of  
5 supercriticality.

6 It is in that context he makes that statement, but  
7 in making the statement he was not abrogating reliance on the  
8 spent fuel pool makeup line; and that's the important point  
9 here.

10 JUDGE MOORE: Assume that we agree with you that it  
11 was error not to take into account an engineered safety feature,  
12 your Criterion 62, Appendix A of Part 50 of the Commission's  
13 regulation, and that the Licensing Board should have waited  
14 until it had heard testimony and decided that issue before it  
15 decided the  $k_{eff}$  issue.

16 Assume that. In the present posture of this case  
17 what steps should we then take?

18 MR. GALLO: Well, the Licensee's position is that  
19 the Licensing Board's order should be vacated, no requirement  
20 to do the analysis, and that the contention itself -- that is,  
21 the criticality contention -- essentially be dismissed, and  
22 not, as the Staff suggests, be held in abeyance pending the  
23 outcome of the Board's consideration of the reliability of the  
24 makeup line.

25 By implication, what I'm saying, of course, you have

1 to give credit to the makeup line in order to dismiss the  
2 criticality issue.

3 Now, let me explain why I say that.

4 JUDGE MOORE: But aren't you asking us, Mr. Gallo,  
5 to essentially overrule what amounts to a credibility finding  
6 of the Licensing Board and how they credited Dr. Kim's  
7 testimony?

8 MR. GALLO: No, because if the Board erred as a  
9 matter of law in failing to give credit to the makeup line,  
10 Dr. Kim's testimony is no longer material to the issue.

11 JUDGE MOORE: Fine.

12 JUDGE BUCK: Going back to Judge Kohl's question,  
13 I took your answer to her questions about the cooling ensuing  
14 under normal conditions as being something that was part of  
15 the structure and processes of normal maintenance of pool  
16 water, is that correct, as against the safeguard situation  
17 of having a separate control on for emergency conditions?

18 MR. GALLO: Yes, that's the separate condition  
19 of the temperature specifications. Yes, that's correct.

20 JUDGE MOORE: Mr. Gallo, your time is about up.

21 MR. GALLO: I would like to make just one last point,  
22 and that is on the remedy. The Staff and the Licensee disagree  
23 on whether or not the criticality contention should be dismissed.  
24 They believe it should be held up pending a resolution of the  
25 reliability of the makeup line.

1           In our view, the criticality issue should be  
2 dismissed because -- and I would analogize as a reason for  
3 doing that -- is because, to digress for just a second, the  
4 only difference between our position and the Staff position  
5 is a procedural one. The reason why we take our position is  
6 we want the doctrine of repose to apply. This issue has been  
7 pending for some time. If it remains in its present state,  
8 the ability to reopen issues with respect to it is very, very  
9 iffy. If the issue is dismissed, then it can only be reopened  
10 subject to complying with the Vermont Yankee judgment for  
11 reopening records, and the Board would still have jurisdiction  
12 to do so if they so decided. I might also point out,  
13 parenthetically, that if the Board found against us on the  
14 reliability issue, it does not mean automatically that we  
15 have to do the analysis. We simply have to make it reliable  
16 in whatever respect the Board found it was insufficient.

17           Thank you.

18           ORAL ARGUMENT OF R. BACHMANN, ON BEHALF OF THE STAFF.

19           MR. BACHMANN: Before I give you my argument, I would  
20 like to reserve five minutes for rebuttal if necessary. I  
21 did not put it in my letter, but if that is all right --

22           JUDGE MOORE: Fine.

23           MR. BACHMANN: It is indicated by Mr. Gallo the  
24 Licensing Board has ordered the Licensee to perform criticality  
25 calculations under conditions postulated by the Board; that is

1 a significant loss of water in the pool. This is by the  
2 Board's own wording in its decision.

3 General Design Criterion 61, which was not mentioned  
4 by Mr. Gallo, requires that spent fuel pools be designed in  
5 such a manner to prevent a significant loss of coolant inventory.  
6 To comply with that particular general design criterion, the  
7 Licensee has proposed a remotely activated water makeup line.  
8 Therefore, it is the Staff's position that the Licensing Board  
9 has erred in not considering this remotely activated makeup  
10 line which is required by General Design Criterion 61.

11 JUDGE KOHL: Mr. Bachmann, you said in your brief,  
12 I believe, that you do regard the remotely controlled makeup  
13 line as a physical system under Criterion 62.

14 MR. BACHMANN: That's correct.

15 JUDGE KOHL: So, in other words, you would regard  
16 that as applicable to both of these criteria.

17 MR. BACHMANN: That is correct.

18 JUDGE KOHL: Then you disclaim somewhat in your  
19 brief the close relationship or the linkage between the two  
20 criteria that Applicant's counsel demonstrated in its brief  
21 or argued for in its brief.

22 Are you now closer in agreement with counsel for  
23 Applicant, or what is your position on that?

24 MR. BACHMANN: We stated in a footnote that the  
25 Staff did not support the "strong interplay" between 61 and

1 62 that Mr. Gallo indicated was there. It is the Staff's  
2 position, however, that a physical system can be, by inference,  
3 this remotely activated makeup line.

4 JUDGE KOHL: Do you have anything further to add  
5 by way of other Staff guidance or legislative history on that  
6 matter other than just the logical inferences that you asked  
7 us to draw and the wording of the passage itself?

8 MR. BACHMANN: I cannot cite any legislative history,  
9 but I can tell you that it is on the advice of the technical  
10 staff of the NRC that I make these statements. We have a  
11 number of people who are involved in applying these criteria,  
12 and I discussed it with them; and they say yes, a water  
13 makeup line in general can be considered a physical system to  
14 prevent criticality under certain circumstances.

15 The point I'm trying to make there is that General  
16 Design Criterion 61 precludes the significant loss of coolant  
17 inventory. Where the conditions do exist as postulated by  
18 the Licensing Board, the Licensee would be in violation of a  
19 Commission regulation, and we would not grant the license  
20 amendment. Therefore, they are being asked to do calculations  
21 and analyses in a situation that would preclude getting the  
22 amendment to rewrite the spent fuel pool. It is not logical  
23 to ask them to postulate conditions we would not permit to  
24 exist.

25 JUDGE KOHL: In other words, if you're in compliance

1 with Design Criterion 61, you cannot have the scenario that  
 2 was postulated by the Licensing Board.

3 MR. BACHMANN: Exactly, exactly. The Staff also  
 4 went on to argue and support as a secondary argument to support  
 5 our first argument that the conditions postulated for 0.95  
 6 neutron multiplication factor is supposed to be with a full  
 7 pool, and this also goes back to General Design Criterion 61.  
 8 You are not allowed not to have a full pool by our regulations.

9 JUDGE KOHL: By a full pool you mean full of water?

10 MR. BACHMANN: Yes. I cannot cite you the exact  
 11 page, but there are at least two occasions in the initial  
 12 decision the Licensing Board stated that this low density  
 13 water condition could only occur were there to be almost a  
 14 total loss of water in the pool.

15 JUDGE MOORE: Is it your argument then that the  
 16 Licensing Board has posited an incredible scenario, and it  
 17 shouldn't have?

18 MR. BACHMANN: Yes, sir. Exactly.

19 JUDGE KOHL: Is it incredible giving credit to the  
 20 makeup line?

21 MR. BACHMANN: Yes.

22 JUDGE KOHL: Or is it incredible without giving  
 23 credit to the makeup line, since I believe your analysis --  
 24 the SER, and Mr. Blanchard, I believe, in his statement did  
 25 say there were analyses done taking account of the fact that

1 there would be no makeup line. The analyses were done to  
2 show what amount of makeup would be necessary to prevent this  
3 from happening.

4 MR. BACHMANN: Let me backtrack for just a second.  
5 The General Design Criterion 61 says you will not have  
6 significant loss of coolant inventory. That is primarily  
7 designed to make sure they do not uncover the fuel and cause  
8 a fuel melt and therefore a release of fission products. That  
9 is the primary purpose of it. That's the reason why before  
10 I said we did not agree with the Licensee on the strong inter-  
11 play between 61 and 62. You keep the pool full of water so  
12 you don't melt the fuel.

13 The secondary benefit of that is it helps prevent  
14 criticality.

15 Now, were there not a makeup line -- I also must  
16 go back again. Sixty-one says the pool must be designed under  
17 normal and accident conditions. Now, the accident condition  
18 we are considering is the loss of the cooling system. If the  
19 cooling system is lost, then there is no access into the  
20 containment under an accident condition, which is a credible  
21 scenario, then how do you prevent the bad effects of what  
22 happens in the pool?

23 Well, you then must come up with something -- and  
24 the Licensee has proposed a remotely activated water makeup  
25 line. This would keep the pool full, assuming that you lost



1 the cooling system and there was boiling in the pool and you  
2 were losing water, you must make that up and keep the pool  
3 full. As a secondary benefit it keeps the pool full and pre-  
4 vents the scenario the Licensing Board postulated for which  
5 criticality must be calculated.

6 Did I lose anyone on that one?

7 Our second phase of our argument is the misapplication  
8 of the Staff guidance. The Board is not bound by using Staff  
9 guidance, but they chose to "rigorously" apply it. If you  
10 go back through the Standard Review Plan, as Mr. Gallo alluded  
11 to, it says we will apply American Nuclear Standard 57.2,  
12 0.95 with a pool flooded with unborated water.

13 Those are the conditions. If one chooses to apply  
14 this guidance, one should apply all of the guidance; and this  
15 test considers this a second source of error by the Licensing  
16 Board.

17 JUDGE KOHL: Counsel, I have a question about the  
18 Standard Review Plan.

19 Back in Part 2 under "Acceptance Criteria" where  
20 it refers to General Design Criteria 61 and 62, for example,  
21 in the part relating to Criterion 62, it says, "Acceptance  
22 for meeting this criterion is based on conformance to positions  
23 C-1 and C-4 of Reg Guide 1.13 and the appropriate paragraphs  
24 of ANS 57.2."

25 Turning to Reg Guide 1.13, the two reference sections

1 C-1 and C-4 refer to the fact that the facility should be  
2 designed to Category 1 seismic requirements and that the  
3 controlled leakage building should enclose the fuel pool.

4 Point C-8 is the one that refers to makeup systems  
5 and makeup lines.

6 Can we infer anything from the fact that the Standard  
7 Review Plan does not refer to C-8, the makeup line provision?  
8 Is that a significant provision in the Standard Review Plan?  
9 Does it have any significance? What does that tell us about  
10 these documents?

11 MR. BACHMANN: I would say it's an omission but  
12 not significant. In fact, I had the exact same question of  
13 the technical staff myself. It just simply did not get put  
14 in there.

15 JUDGE KOHL: Can you elaborate on what was meant  
16 by the appropriate paragraphs of ANS 57.2? Is there any  
17 further elaboration other than the entire ANS document?

18 MR. BACHMANN: Yes, Judge. If you will look at  
19 page 11 of our brief where we specifically zeroed in on the  
20 particular paragraph of ANS 57.2.

3-joy-1 1 JUDGE KOHL: You are referring to the requirement  
2 that the calculations are done on the basis of a fully-flooded  
3 pool.

4 MR. BACHMANN: Yes, ma'am. I cannot emphasize too  
5 strongly the fact that the Board chose to apply Staff guidance  
6 as applicable law in this decision and then seems to have  
7 selectively picked parts of it and then not applied all of it.  
8 It is basically the Staff's position as its second argument  
9 that if you are going to use our guidance, use it properly.

10 JUDGE KOHL: Do you agree with Mr. Gallo's explana-  
11 tion my question on the Branch technical position and the  
12 references in there to the loss of all pool cooling systems  
13 and flow and the excessive loss of water? I think his expla-  
14 nation was that is talking about a loss of the system itself  
15 as opposed to the coolant.

16 Does the Staff agree with that interpretation of  
17 its own document?

18 MR. BACHMANN: Yes, we do to the extent that the  
19 makeup line is proposed under the accident condition of loss  
20 of coolant and therefore that is the reason -- in other words,  
21 the accident we are looking at is loss of coolant, How do you  
22 prevent bad things happening if you have loss of coolant? You  
23 propose a makeup line. And if indeed that makeup line proves  
24 adequate to prevent the significant loss of coolant inventory  
25 as required by General Design Criterion 61, then they will

3-joy-2 1 fill that and the scenario postulated by the Licensing Board  
2 could not exist.

3 JUDGE KOHL: Now, the various references in the  
4 different Staff papers that refer to "under all conditions,  
5 under all certainties at all times," et cetera, you again  
6 would say that that is limited by the Reg Guide 1.13 and  
7 Standard Review Plan that says that you are talking about a  
8 fully-flooded spent fuel pool; that that is the basic start-  
9 ing point from which you do these calculations and from which  
10 you must apply all other Staff guidance, interpretations,  
11 whatever?

12 MR. BACHMANN: Exactly. In fact, I might point out  
13 that the Standard Review Plan does take precedence over a  
14 branch technical position and an SER, Safety Evaluation Report.  
15 A Standard Review Plan is more binding, shall we say, than  
16 these other letters that have been forwarded.

17 JUDGE KOHL: I thought the SER was plant-specific.  
18 That is a piece of evidence in this case, is it not? It was  
19 prepared specifically for the spent fuel pool. Wouldn't that  
20 have a higher level? The Standard Review Plan just tells the  
21 Staff how to go about doing an SER and other analyses.

22 MR. BACHMANN: When the Staff does a plant-specific  
23 review, it will of necessity paraphrase other guidance that  
24 it has, and rather than repeat all of the words of the  
25 Standard Review Plan, certain phrases were chosen. Perhaps

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1 we did not choose the right phrases and thus the Licensing  
2 Board may have been a bit confused.

3 JUDGE KOHL: So when the SER says under all condi-  
4 tions, we refer back to the generic Staff guidance that exists  
5 at all times for our interpretation of what "under all condi-  
6 tions" means.

7 MR. BACHMANN: That is correct. That is correct.

8 I have just one more point, and that is I would  
9 like to address something that Mr. Gallo said earlier, and that  
10 is about dismissing the contention. It is still the Staff's  
11 position that while the Licensee need not perform the calcu-  
12 lations given, what we consider incredible conditions, we have  
13 not yet litigated this. The Staff cannot say that this con-  
14 tention should be just dismissed until such time as we are  
15 assured that the makeup line is adequate to give us this full  
16 pool and the 0.95.

17 I might add that it is probably a very good inference  
18 that the Licensing Board, had they found the makeup line  
19 adequate and had they determined that the pool would remain  
20 full, would have found that  $K_{eff}$  would remain below 0.95.  
21 But we have not yet litigated the makeup line. We did  
22 litigate it but the Licensee withdrew its proposal, and it  
23 still had to be heard in an open public hearing.

24 JUDGE KOHL: When are those further hearings  
25 scheduled, or are they yet?

3-joy-4 1 MR. BACHMANN: Our best estimate is sometime this  
2 summer at this point, but we would ask this Appeal Board to  
3 vacate the order making the Licensee perform these calcula-  
4 tions under conditions of extremely low water density,  
5 what the Staff considers incredible conditions but remand  
6 back to the Licensing Board until such time as the makeup  
7 line has been litigated and we can determine the conditions  
8 under which these calculations must be done if these calcu-  
9 lations are required.

10 JUDGE BUCK: The Licensing Board seems to place a  
11 great deal of weight on one of the Intervenor's exhibits,  
12 the supercriticality through optimum moderation of nuclear  
13 fuel. Do you have any comments on the comparability of the  
14 type of fuel element that was being studied in that paper as  
15 compared to the Big Rock fuel elements?

16 MR. BACHMANN: I can only tell you, since I am not  
17 an engineer but a lawyer, the advice I have gotten from my  
18 technical staff is that the type of fuel element is somewhat --  
19 is it somewhat analogous to -- excuse me, sir.

20 MR. EMCH: There were some differences in general.  
21 Lantz felt that what was presented in this article was not a  
22 departure from the Staff method. He agreed with it.

23 MR. BACHMANN: Yes, that's the best of my recollec-  
24 tion of what I was told, that they were similar enough but  
25 that at the same time, through some form of calculation,

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whatever, our technical advisers have said this article supports the Staff's position. They did some interpolation with the graphs given there and came out with the fact that there was no problem, assuming the pool was full.

5 JUDGE BUCK: On the basis of it, the supercriticality experiments were done with much larger fuel elements and a lot higher loadings, so you would have to interpolate down on loading and size to come down to a comparable fuel element to the Big Rock, as I see it; but I don't think the Licensing Board did that. That is what is bothering me.

11 MR. BACHMANN: Well, we had done it when we presented our testimony. The Licensing Board chose not to accept the Staff's testimony so I have not pursued that any further, but we are just arguing on what they have done here.

15 JUDGE BUCK: Thank you.

16 JUDGE KOHL: I thought one reason the Board didn't accept the Staff's testimony was that the calculations had been done for a different type of fuel than was used at Big Rock. Wasn't there some reference to the fact -- I think it was Mr. Lantz' calculations were done -- do you recall the section of the Licensing Board's --

22 MR. BACHMANN: I do recall that. We did not pursue that any further on this basis. The Licensing Board by its own admission adopted Mr. Gallo's findings of fact virtually verbatim and then drew different conclusions. Since they did

3-joy-6 1 not accept the Staff's testimony, we did not pursue our  
2 theory any further than that. I can't tell you any more than  
3 that. We were willing to adopt the testimony in findings that  
4 the Licensee submitted, and we did not pursue that any  
5 further.

6 JUDGE KOHL: Does it matter for purposes of the  
7 supercriticality article that Dr. Buck referred to that this is  
8 a mixed oxide fuel? Isn't that what Big Rock is?

9 MR. BACHMANN: May I consult with my technical  
10 person?

11 MR. EMCH: They had not in recent years loaded any  
12 mixed oxide fuel. There may still be some mixed -- there may  
13 possibly be some mixed oxide fuel left in the reactor, and  
14 there certainly is some left in the pool, but they do not --  
15 they are getting ready to go down for refueling soon and they  
16 won't be loading mixed oxide fuel. They didn't last time.

17 MR. BACHMANN: Does that answer your question?

18 JUDGE KOHL: Yes.

19 JUDGE BUCK: One other thing while you are standing  
20 there. The Board in its decision on page 14 makes the  
21 statement, "We cannot accept as a basis for safety assurance  
22 a technical review that starts with a questionable assumption  
23 (that changes in  $K_{eff}$  are density dominated) and reaches its  
24 conclusions from questionable inferences about a graphical  
25 analysis of data for a type fuel we are not considering."



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Do you know where in the evidence here the Licensing Board would have picked up the idea that the changes in  $K_{eff}$  are density dominated is a questionable assumption?

MR. BACHMANN: No, sir, I don't. I accepted that as the Staff's position. That was the testimony we filed. Mr. Lantz was cross-examined at the hearing on it. At no time until they had written this decision did I believe that they would consider that a questionable assumption.

JUDGE BUCK: I am a little puzzled by it because every diagram of the criticality function here is shown, including this Exhibit 5 here which shows the variation of criticality with the density of the water, as it should be because you are relying on the hydrogen atoms to slow down your neutrons.

So I wondered if you knew whether somebody had given evidence to that effect. I didn't find it, but this statement came out in the decision.

MR. BACHMANN: Mr. Lantz' testimony -- this was a Staff witness at the hearing -- went specifically to the fact that reactivity is a function of water density. All I can suggest is perhaps Mr. Lantz was not a persuasive witness. That was the Staff testimony and it was not accepted.

JUDGE BUCK: Okay, thank you.

MR. BACHMANN: If you have no other questions, I will conclude at this point.

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JUDGE MOORE: Before we hear from Mr. Semmel, we  
will take a five-minute break.

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END 3

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(Recess)

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## 1 ORAL ARGUMENT BY HERBERT SEMMEL

2 ON BEHALF OF INTERVENORS, CHRISTA-MARIA, MILLS &amp; BEIR

3 JUDGE MOORE: Proceed, Mr. Semmel.

4 MR. SEMMEL: I am going to take not more than 30  
5 minutes, after which Mr. O'Neill will speak for not more than  
6 the balance of the time. I'd like to begin by just reminding  
7 us what this hearing is about.8 There has been enormous fanfare here over a rather  
9 simple question of whether the licensee has to perform a  
10 study which the Licensing Board thought was necessary to  
11 determine the safety of this pool; a study which is not  
12 terribly difficult to perform, not terribly time consuming,  
13 and in view of the expense that has been undertaken in this  
14 proceeding, is not relatively expensive.15 There were varying estimates as to how long it  
16 might take to complete this study. For example, in the  
17 deposition of Mr. Brooks, one of the staff experts that was  
18 deposed in late December and early January of this year, he  
19 estimated that if certain data was already available on  
20 computer cards, that the study could be completed in two weeks.21 There was other testimony during the hearing that  
22 it might take two months, and Mr. Brooks said someone thought  
23 it might even take six months.

24 MR. GALLO: Excuse me, I am going to object.

25 JUDGE MOORE: Mr. Gallo, this is an oral argument

1 at the appellate level, and your objection would be out of  
2 order. We are listening to Mr. Semmel's presentation. You  
3 have your rebuttal time, we will hear from you then.

4 MR. GALLO: All right, I apologize to the Board.

5 MR. SEMMEL: Whatever the time limit, it is also  
6 worth noting to put this all in context that the Board's order  
7 was in October; it is now March, five months later. Had  
8 the licensee prepared this report we probably would have had  
9 it now under the worst of circumstances. The expense of  
10 preparing the report I doubt would exceed the expense that has  
11 gone into this appeal in which, for example, not only do we  
12 have all of the counsel time, the licensee has flown in one  
13 attorney from Chicago --

14 JUDGE KOHL: Mr. Semmel, hasn't all this delay  
15 worked to the detriment of the applicant in this case?  
16 I'm not sure that the argument that you're pursuing here is  
17 a proper basis for us to make a decision. We do have an  
18 appeal before us. The applicant had a right of appeal. It  
19 may have been a bad judgment in your view, strategically and  
20 otherwise, to take the appeal, but nonetheless, it is before  
21 us. I think we have to decide it on the basis of the law  
22 and the record that was developed below.

23 MR. SEMMEL: I agree with that, but I think it's  
24 relevant to the interpretation of various legal provisions  
25 to the discretion of the Licensing Board in this case.

1 JUDGE KOHL: Was this a decision that was made in  
2 the Licensing Board's discretion? I thought the Licensing  
3 Board felt it was obliged by various staff documents to order  
4 the analysis that it did.

5 MR. SEMMEL: Well, we would submit that the Licensing  
6 Board was, in fact, so obliged, but also, that this is well  
7 within the discretion of the Licensing Board.

8 JUDGE KOHL: Why was it obliged to do that? Let's  
9 focus on that aspect of the Reg Guides and Standard Review  
10 Plan, et cetera, that says that criticality calculations shall  
11 be done for a fully flooded pool. Now, given that as the  
12 basic starting point, how can there ever be a requirement  
13 that you do analyses for criticality on the assumption that  
14 the coolant has completely boiled off, or at least substan-  
15 tially boiled off?

16 MR. SEMMEL: First, let me located General Design  
17 Criterion 62 which says criticality shall be prevented by  
18 physical systems or processes, preferably by use of  
19 geometrically safe configurations.

20 JUDGE KOHL: Is a remotely-controlled makeup line  
21 a physical system?

22 MR. SEMMEL: We would content that that is not what  
23 is referred to as a physical system.

24 JUDGE KOHL: We heard from Mr. Gallo and Mr. Bachmann  
25 as to what they think that means. What is your interpretation

1 of that?

2 MR. SEMMEL: The physical system is the normal  
3 cooling systems of the type that is in effect, but which  
4 requires access to the containment in this particular plant,  
5 because the spent fuel pool is within containment. And so,  
6 postulating an accident that would deny access to containment,  
7 that physical system would fail or might fail.

8 What the Licensing Board wanted to know is what  
9 happens if you have that kind of failure. But what I want  
10 to draw your attention to is the end of General Design  
11 Criterion 62 which says that the criticality shall be prevented  
12 by physical systems or processes, preferably by use of  
13 geometrically safe configurations, and that's why I submit  
14 it was within the discretion of the Licensing Board to simply  
15 ask that the licensee get them information about the route  
16 which the general design criteria says is preferable.

17 They want to know what would happen, based on  
18 geometrically safe configurations, in the event of loss of  
19 coolant because then they can determine whether that loss of  
20 coolant is a situation that has to be taken into account.  
21 It may affect a number of considerations including the extent  
22 of reliability of the makeup line.

23 JUDGE BUCK: Is it your contention that this is not  
24 a safe configuration?

25 MR. SEMMEL: It is not a safe configuration if

1 super-criticality could be reached in the event of a loss  
2 of coolant.

3 JUDGE BUCK: But it is a safe configuration if the  
4 pool is full of coolant; is that correct?

5 MR. SEMMEL: Our position is that the configuration  
6 is not safe even if it's full. That is, it has not been  
7 demonstrated because of what we argued at the hearing were  
8 non-conservative assumptions that were made by Dr. Kim in  
9 his testimony. That is not an issue here, and we did not --

10 JUDGE BUCK: If you're arguing that we don't have  
11 a safe configuration, I'd like to know on what basis you're  
12 arguing that this is not a safe configuration. First of all,  
13 with a full pool, and secondly, what are the deficiencies.

14 MR. SEMMEL: In the original testimony -- excuse me.  
15 In the original application, Dr. Kim made calculations based  
16 on a steam void which extended the full length of the fuel.  
17 After the denial of summary disposition when the Board also  
18 indicated that it wanted the temperature used in the calcula-  
19 tions increased from 212<sup>o</sup> to the Board's suggestion of 243<sup>o</sup>,  
20 Dr. Kim recalculated, and in those recalculations only used  
21 a figure for steam void at the top quarter inch of the fuel.  
22 And also, only used average temperature between the bottom  
23 of the pool, which would be -- they postulated 212<sup>o</sup> and  
24 the highest temperature at boiling, which would be 243<sup>o</sup>, and  
25 we submitted that both of those were non-conservative

1 assumptions and that the higher figure should have been used.  
2 If you use the higher figures, the calculation comes to  
3 greater than 0.95.

4 Now, as you may recall, when we opposed hearing  
5 this case at this time we mentioned there were issues --

6 JUDGE MOORE: Mr. Semmel, can you tell me how it  
7 would exceed 0.95 if you're talking about spent fuel now and  
8 only spent fuel could boil water, and the reactivity of the  
9 spent fuel is less than the new fuel?

10 MR. SEMMEL: Let me answer you in this way because  
11 I'm not an expert on this, but the calculation that was  
12 submitted in the final testimony by Dr. Kim was slightly  
13 just -- I forget the exact figure, but it was just slightly  
14 below 0.95. Computing the steam void at a lower value than  
15 he had done previously when he computed for the entire length  
16 of the rod.

17 JUDGE KOHL: That was based, though, on the  
18 evidence, as I understand it, that there would not be a steam  
19 void the entire length of the rod but rather, it only  
20 extended for the top -- I think it was .276 inches -- at  
21 the very top. And, therefore, his calculations were  
22 assertedly more accurate as recomputed.

23 MR. SEMMEL: That was his position, but our  
24 position was that he indicated clearly what he regarded as  
25 a conservative calculation when he did it the first time, and



1 it was only when it became clear that if you increase the  
2 temperature and you kept the fuel constant you would be going  
3 above 0.95 that the licensee determined that it was suffi-  
4 ciently conservative and described it as over-conservative.

5 JUDGE BUCK: I'm not sure the evidence says that,  
6 because as I recall it, first of all, Dr. Kim was making the  
7 conservative assumption that this was fresh fuel in there;  
8 not only fresh fuel, it was higher in uranium content than the  
9 fuel that was going to be used at Big Rock. And with those  
10 figures and the 212 or whatever the temperature used before  
11 he came out, as I recall, with a number of .946. Then when  
12 he changed his temperature, the temperature has some effect  
13 but not very much on the criticality, and he came up with  
14 exactly .95 on the basis that fresh fuel, which was greater  
15 enrichment than presently used.

16 Now, why are those calculations not conservative,  
17 even assuming now that we are looking at a situation which  
18 is not required, shall we say, in the rules that we have?  
19 Full pool water. That's assuming that we're getting the  
20 boiling. Why are those figures not correct?

21 MR. SEMMEL: Just so we're getting boiling.

22 JUDGE BUCK: I don't know how you can get boiling  
23 with the fresh fuel which he calculated. So am I asking  
24 why, under those circumstances, you come out with .95 with  
25 fresh fuel in using a greater concentration of uranium than

1 Big Rock does. Why is that figure not very conservative when  
2 the pool itself is going to be filled with used fuel?

3 MR. SEMMEL: It may be conservative in the sense  
4 of different fuel. However, the guidelines first require the  
5 calculations to be conservative, use fresh fuel, and  
6 secondly, that you must take into account steam voiding if  
7 it will exist. And the calculation only took into steam  
8 voiding in a way which we believe is not conservative.

9 Now, in fact, when this is all over we do intend to  
10 move to reopen on this point because we have now obtained  
11 what we think is additional evidence through these depositions  
12 that calculating steam void only at the top was a non-  
13 conservative calculation.

14 But it was my understanding that that was not an  
15 issue in this appeal, that the Board ruled that we could not  
16 appeal since we had prevailed, and therefore, we did not ask  
17 the Board to hear this matter at this time. And indeed, now  
18 we think it would preferable if we could make a complete  
19 record on this point and the conservatism of the steam void  
20 calculation.

21 JUDGE KOHL: Counsel, let's focus on what I think is  
22 the critical issue here -- no pun intended -- and that is  
23 whether or not credit may be taken for the engineered  
24 safety feature, the remote-controlled makeup line

25 I take it your position is that it cannot; that

1 that is not even permitted under staff guidance.

2 MR. SEMMEL: That's correct.

3 JUDGE MOORE: Excuse me, counsel. If that's your  
4 position then how do you arrive at your position that one has  
5 to calculate  $k_{eff}$  taking into account steam voids? Because  
6 it would seem to me one is the left glove and one is the  
7 right glove.

8 So when you answer Judge Kohl's question would  
9 you then follow and answer mine?

10 MR. SEMMEL: The question of steam void was used --  
11 I think it's a different issue, but the question of steam  
12 void was used in the calculation postulating boiling, but  
13 not necessarily boil-off. The calculation that was not made  
14 here and which the Board simply wanted was what happens if  
15 you have a situation where the water boils down below the  
16 level of the fuel rods.

17 The calculation that we were talking about and  
18 that was discussed in the testimony was steam void assuming  
19 the pool reaches boiling, but the pool still remains full.  
20 You haven't had any boiling there as yet, and that was the  
21 difference in the calculation there. The makeup water line  
22 doesn't come into play until the pool begins to boil down.  
23 Until some water has left the pool you can't put anymore water  
24 in it, if the pumping system is not working.

25 JUDGE KOHL: Let me restate my question again.

1 For purposes of the scenario that you posit, why can't we  
2 take account of an engineered safety feature when engineered  
3 safety features are taken account of for other postulated  
4 accidents considered for purposes of the criticality calcula-  
5 tions?

6 MR. SEMMEL: First, there's sort of a formal  
7 matter that the Grimes memo -- which is the staff guidance  
8 here -- specifically spoke about taking into account all  
9 uncertainties under all conditions.

10 JUDGE KOHL: But the prefatory letter on that  
11 branch technical position states that this guidance is really  
12 a compilation in a single document of the pertinent portions  
13 of other applicable references, the Standard Review Plan,  
14 Reg Guides, et cetera, that are needed in addressing spent  
15 fuel pool modifications. No additional regulatory requirements  
16 are imposed or implied by this document.

17 Where, in addition, then, to the branch technical  
18 position do you find support for the fact that under all  
19 conditions means a spent fuel pool that has had substantial  
20 or complete boil-off?

21 MR. SEMMEL: I'm not sure if it's actually  
22 contained in any of the previous regulations or rulings, but  
23 it's not precluded by anything else. I mean, there is the  
24 possibility here that you would have a TMI type accident  
25 which prevents access to the containment, and then even if

1 there was a makeup water line that the makeup water line  
2 might not operate under those circumstances.

3 JUDGE KOHL: Well, that is a function of the  
4 reliability, though. If the reliability of the makeup line  
5 is established, in your view is there any need, then, to  
6 perform the criticality analyses that you request?

7 MR. SEMMEL: Yes, because reliability is just a  
8 relative matter; it doesn't mean that it's not possible for  
9 these two events to occur at once. It simply means that the  
10 chances of the two events occurring and of the water line not  
11 functioning is substantially decreased, but that it is still  
12 a possibility.

13 JUDGE BUCK: Well, let's assume that you had a  
14 TMI-II type accident and you did not have your water line.  
15 One of the safeguards that is used against an accident such  
16 as this is the containment spray, and in this case, you'd  
17 probably be using the containment spray for the TMI-II accident,  
18 and that overhangs the pool and goes into the pool -- part of  
19 that spray goes into the pool as well as into the containment.  
20 So that safeguard would prevent you from boiling off, would  
21 it not?

22 MR. SEMMEL: I must confess that I'm not sure. I  
23 don't understand --

24 JUDGE BUCK: The point I'm trying to make here is  
25 there are engineered safeguards for all kinds of accidents,

1 and these are required. They are not considered in looking  
2 at whether the accident can happen or something like that;  
3 they just say if it happens, this is what we've got to do, and  
4 you put in an engineered safeguard. I don't see that a line  
5 that is being proposed by the applicant here, which is  
6 controlled from outside the building, as I understand from  
7 a separate water source and all that sort of thing, does not  
8 require building power or anything of that nature to turn it  
9 on, is nothing more than a safeguard similar to all the other  
10 safeguards that we have in a nuclear reactor. And I think  
11 this is what Judge Kohl was asking.

12 MR. SEMMEL: I can't answer about the sprays, but --

13 JUDGE KOHL: What about the point along the same  
14 lines -- I'm sorry to interrupt, but maybe we can focus  
15 this discussion a little better. Mr. Gallo in his brief, I  
16 believe, refers to one of the postulated accidents that  
17 should be considered for criticality purposes, and that is  
18 the cask drop, and one of the -- Reg Guide 1.13 describes  
19 several mechanisms that can prevent, or that you can use to  
20 mitigate the effects or, indeed, prevent such an accident  
21 from occurring. They may be considered engineered safety  
22 features.

23 Can we not analogize to this situation focusing  
24 on the accident scenario that you postulate, and that is  
25 pool boil-off. Isn't there a relevant comparison here

1 between the engineered safety features designed to prevent  
2 dropping of a heavy load and engineered safety features of  
3 a remotely-controlled makeup line designed to prevent boiloff?

4 MR. SEMMEL: There is some similarity.

5 JUDGE KOHL: Isn't it more than a similarity,  
6 though? We're talking about the very same general matter,  
7 and that is calculation of criticality in the neutron multi-  
8 plication factor. What's the difference? Why is it okay  
9 to consider one engineered safety feature for one type of  
10 postulated accident but not to consider a different engineered  
11 safety feature for a different postulated accident?

12 MR. SEMMEL: Well, I would, for one thing, suggest  
13 that perhaps when those regulations were drawn, that there  
14 was a greater degree of confidence for one reason or another  
15 in certain kinds of safety engineering features. I think  
16 it is much simpler to provide nets and double-failure safety  
17 features to prevent a cask drop than to provide this makeup  
18 water line.

19 This makeup water line comes into the plant and  
20 runs all around the plant, through the reactor and ends up  
21 in the pool.

22 JUDGE BUCK: But easy or not easy, it's an allowable  
23 feature, is it not?

24 MR. SEMMEL: The safety features for the cask are  
25 allowable; it's been specifically stated they're allowable.

1 I would draw the opposite inference; namely, that by not  
2 discussing a makeup water line in the context of criticality  
3 and discussing it in other areas, that it was simply not  
4 intended that that that would be a sufficient engineering  
5 feature.

6 JUDGE KOHL: Perhaps it was not discussed because  
7 the basis for calculating criticality assumed a fully flooded  
8 pool. If you're assuming the same guidance says that when  
9 you do the criticality calculations you must assume a fully  
10 flooded pool with unborated water, if that's your basic assump-  
11 tion, then there's no need, is there, to consider a makeup  
12 line? There would have been no purpose in mentioning it in  
13 that context.

14 MR. SEMMEL: That may be true, that may be the  
15 reason why they left it out. You know, I can't speculate on  
16 that. But I think that --

17 JUDGE KOHL: Well, it is important, though, because  
18 the Licensing Board was relying on the various staff docu-  
19 ments for its finding that these additional analyses were,  
20 indeed, required.

21 MR. SEMMEL: The Grimes memo -- the branch technical  
22 position was fairly clear. I think they were perfectly  
23 right. It says including all uncertainties under all  
24 conditions, and there is an uncertainty -- if there is an  
25 accident which prevents access to the containment where the



1 pool is and for one reason or another the makeup line is  
2 also not operative, it seems to me that the Licensing Board  
3 was correct. They said let's have the information, let's  
4 find out what happens. Maybe nothing happens, maybe it doesn't  
5 become critical even under those circumstances. But we're  
6 simply entitled to that information. We're entitled to  
7 present expert testimony on the subject as intervenors, and  
8 then the Board can make its decision based on that information.

9 JUDGE KOHL: Did you present any expert witnesses  
10 on this matter before the Licensing Board?

11 MR. SEMMEL: We did not present any witnesses on  
12 this matter before the Licensing Board. There was, in fact,  
13 no real testimony because the calculations had never been  
14 made as to what would happen under these circumstances.

15 The other point I want to get back to, though,  
16 which I think also raises it in terms of this particular case,  
17 is that the General Design Criterion 62 says that criticality  
18 shall be prevented by physical systems or processes, preferably  
19 by use of geometrically safe configurations. And that would  
20 be within the discretion of the Licensing Board to give  
21 consideration to that preference and to see whether in the  
22 event of loss of coolant the criticality would be achieved or  
23 not achieved or reached simply by geometrically safe configura-  
24 tions with partial or substantial loss of coolant.

25 And so, under that criteria, the Board would have

1 the right to ask for that information. Whether --  
2 If they did it for some other reason, which I would submit  
3 is correct, but even if you disagreed with it, they should  
4 be allowed to request that information under General Design  
5 Criterion 62.

6 JUDGE KOHL: Mr. Semmel, what about the argument  
7 that staff counsel makes; that is, that General Design  
8 Criterion 61 requires the prevention of a significant reduction  
9 in coolant inventory under accident conditions? He argues  
10 that if the applicant or licensee is in compliance with that  
11 design criterion, then the scenario that you postulate simply  
12 cannot happen. And for that reason, performing the analysis  
13 is really an unnecessary and redundant exercise.

14 MR. SEMMEL: Well, in that case, to a certain  
15 extent, what it really means is that you can never take into  
16 account an accident in applying General Design Criterion 62  
17 because the Board --

18 JUDGE KOHL: No, a specific accident. We're not  
19 talking about any accident; we're talking about the accident  
20 that you postulate and the Licensing Board focused on, and  
21 it was a loss of significant coolant inventory.

22 MR. SEMMEL: It would mean you could never take  
23 into account significant loss of coolant inventory under  
24 General Design Criterion 62 simply because 61 says you've  
25 got to prevent certain kinds of accidents or mitigate the

1 effects of certain kinds of accidents.

2 JUDGE KOHL: Doesn't the one thing follow from  
3 the other, though, logically? If you really are in compliance  
4 and assume for purposes of this that the plant is able to  
5 meet and to prove compliance with that criterion, then  
6 logically, that isn't the kind of criticality accident that  
7 General Design Criterion 62 is focusing on. It might be  
8 another type of criticality accident but it's not one that  
9 is a result of a loss of coolant.

10 MR. SEMMEL: Well, we would still submit that the  
11 question of the reliability of the makeup water line in  
12 preventing a loss of coolant still is different than the  
13 question of what would happen in the event that that fails.  
14 There's no system that is absolutely fail proof. All they  
15 are is saying we are making reliable to a certain degree.

16 JUDGE KOHL: But I said for purposes of my  
17 question, assume that it's reliable.

18 MR. SEMMEL: Assuming it's reliable within Design  
19 Criterion 61, I would still submit that 62 says let's take  
20 a look and see whether you can meet the criticality require-  
21 ments in the event that one of those so-called reliable  
22 safeguards still, nevertheless, fails, because there's always  
23 the possibility of failure even though they're deemed to  
24 be reliable. There's no suggestion that reliable means  
25 100 percent perfection. Otherwise, nothing would ever be

1 reliable. And so 62 is looking at that and what would happen  
2 in the event of a failure with those contingencies.

End Tp4

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2 JUDGE BUCK: Do I understand that you have no  
3 question at all about the fact that the pool will be non-  
4 critical with a full load of used fuel as long as the water  
5 level is maintained at the top of the pool?

6 MR. SEMMEL: We question that. If the pool began  
7 to boil -- if the pool began to boil, we question whether or  
8 not the pool could become critical even though the water had  
9 not boiled down below the level of the rods. That is what  
10 I was referring to before when I said there was a dispute at  
11 the hearing over the conservatisms of the calculations postu-  
12 lating a full pool but at 212 degrees at the surface.

13 JUDGE BUCK: All right. But assuming boiling,  
14 your curves that are shown in this exhibit of yours, I  
15 believe it is, indicate that if you are overmoderated, as  
16 this pool is, your  $k_{eff}$  will go up to a point and then go down  
17 again.

18 In the calculations that I remember that come from  
19 Dr. Kim is that the density of the water which would have  
20 the highest  $k_{eff}$  would be a density of somewhere around .98,  
21 I think it was, or something of that order.

22 Do you agree with that?

23 MR. SEMMEL: I think that's my recollection, yes.

24 JUDGE BUCK: So that it would go up from a full  
25 density of the water, and the  $k_{eff}$  would go up until the water  
got to a density now of .98 or thereabouts, and then it would

1 tend to go back down again. Do you agree with that?

2 MR. SEMMEL: The  $k_{eff}$  would go back down again?

3 JUDGE BUCK: Yes.

4 MR. SEMMEL: No, that wasn't my understanding. My  
5 understanding was that the  $k_{eff}$  might increase up to a density  
6 of .5.

7 JUDGE BUCK: Where do you get that?

8 MR. SEMMEL: I can't tell you where I get that right  
9 now, but it seemed to me that the chart, Figure 1 on page 13A  
10 of the Board's decision, indicates  $k_{eff}$  rising between 0 and  
11 .4 -- actually, not 0, but there is a dip. It starts at 1,  
12 goes up at .98 as you indicate. It then slightly goes down  
13 and starts going up again somewhere around 20 percent void.  
14 As the Board indicated, this was only the first six calculations.

15 JUDGE BUCK: Well, the points up above there show  
16 the high peak of this thing at -- well, they don't go below  
17 .5 on this; that's the problem. If you look at your exhibit,  
18 your 5, all of your curves there, if you compare them and  
19 put them down to the same spacing in the same fuel level as  
20 Big Rock rather than what you have in this particular experiment  
21 there, they would come down and agree pretty well with Dr.  
22 Kim, somewhere between .9 and 1.

23 MR. SEMMEL: Actually, I believe that this exhibit  
24 that we are referring to was prepared by Dr. Kim.

25 JUDGE BUCK: Was what?

1 MR. SEMMEL: Was prepared by Dr. Kim. We put in  
2 testimony on certain of Dr. Kim's calculations.

3 JUDGE BUCK: I'm talking about this supercriticality  
4 paper here that I think was your exhibit.

5 MR. SEMMEL: Are you referring to Exhibit Intervenor's --

6 JUDGE KOHL: He's referring to the article by  
7 Cano, Caro, Martinez-Val.

8 MR. SEMMEL: The Figure 1 here on page --  
9 which is indicated on the next page, was a calculation by  
10 Dr. Kim. In the middle of the next page it says Dr. Kim did  
11 similar calculations from G-3 fuel.

12 JUDGE BUCK: This is Dr. Lantz's calculation actually.

13 MR. SEMMEL: You're talking about Mr. Lantz's  
14 calculation, Exhibit 5. But, you see, there's just a typo-  
15 graphical mistake there because it says here the numbers  
16 apparently came from work by Dr. Kim, presented graphically  
17 at page 133 of Intervenor's Exhibit 5, see Figure 1. Figure 1  
18 comes from the calculations made by Dr. Kim, and then the  
19 Board added to that.

20 JUDGE MOORE: Mr. Semmel, your time is up.

21 JUDGE KOHL: The Board superimposed the darker  
22 triangle, and it was to represent Mr. Lantz's testimony, and  
23 the circles below represent the exhibit as it was originally  
24 prepared by Dr. Kim.

25 MR. SEMMEL: That's my understanding.

1 Thank you very much.

2 JUDGE KOHL: I have one question about the super-  
3 criticality article. Was that ever introduced into evidence?

4 MR. SEMMEL: I actually don't recall it being  
5 introduced into evidence. It was used on the motion for  
6 summary disposition, but I cannot state for certain whether  
7 it was ever actually introduced into evidence at the hearing.

8 JUDGE KOHL: Thank you.

9 ORAL ARGUMENT BY JOHN O'NEILL, II

10 ON BEHALF OF HIMSELF

11 MR. O'NEILL: Good morning.

12 I would like to treat one item that seems to trouble  
13 the Board quite a bit, and then revert to my prepared statements  
14 and kind of flesh those out in the statement.

15 The Board has asked over and over again can credit  
16 be taken for the makeup line, and I believe there are five  
17 reasons why credit cannot be taken for the makeup line.

18 First of all, we have to look at the precedent that  
19 was cited by Consumers Power. These are the cases on evacua-  
20 tion in which environmentally-qualified systems are assumed  
21 to fail and analyses even in light of that are made.

22 The second is the makeup line itself may not be  
23 able to be proven to be reliable. The makeup line is dependent  
24 upon the emergency core cooling system, and the emergency  
25 core cooling system has several lifetime exemptions from single



1 failure criteria. Also, there may be conditions that could  
2 occur the makeup line could not remedy, such as failure of the  
3 concrete due to thermal stresses, as outlined in the testimony  
4 of Mr. Herring, a Staff witness.

5 Third, even if the makeup line does fail, even if  
6 it is considered single failure-proof, there is no remedy. The  
7 pool is not accessible. That's a very important point. And  
8 that principle of accessibility was the main principle on which  
9 the Zion Board made its decision.

10 Four, the reg guides say that criticality should  
11 be looked at under all conditions. And, five, the regulations  
12 themselves say that criticality shall be prevented, preferably  
13 by geometry. You have to have a strong burden of proof to go  
14 beyond that requirement of preferably the geometric configura-  
15 tion.

16 JUDGE KOHL: What about this specific incident or  
17 scenario or discussion in Mr. Gallo's brief about the fact  
18 that an engineered safety feature can be taken into account  
19 to prevent criticality occurring from the dropping of a heavy  
20 load?

21 I ask you the same question I asked Mr. Semmel:  
22 Why can't a different engineered safety feature, i.e., the  
23 remotely controlled makeup line, be used in the same way here  
24 to present the scenario that you postulated -- the loss of  
25 pool coolant?

1 MR. O'NEILL: That's a good question, and I think  
2 I dealt with that quite convincingly on pages 18 through 21 of  
3 my brief. The differences are if the cask drop were to fail,  
4 I don't think there have been any scenarios that indicate that  
5 containment would then be accessible so that the workmen on  
6 the scene could take action to remedy the situation.

7 JUDGE KOHL: What if that happened in the scenario  
8 that you posited, though, a TMI-2 type incident? That, as I  
9 understand it, is the basic starting point for your contention  
10 that if that happens, that's what makes the building accessible.  
11 And over and above that incident, if you have another failure  
12 in the pool cooling system, that's when the problems begin,  
13 as you see it.

14 Let's assume the same thing with the heavy load  
15 drop. Let's assume a pre-existing accident situation that  
16 makes the building inaccessible, and then you have that  
17 incident occur.

18 MR. O'NEILL: It would be impossible to operate  
19 the crane while the containment is inaccessible. The operator  
20 rides right along in the gantry crane, and that's within the  
21 containment, so I don't think that scenario could ever occur.

22 JUDGE KOHL: But you have a worse scenario. At least  
23 with remotely controlled makeup line, though, you can, assuming  
24 its reliability -- that could be operated to mitigate the  
25 effects of the loss of pool coolant scenario.

1 MR. O'NEILL: I'm afraid I don't understand.

2 JUDGE KOHL: I'm trying to understand the consistency  
3 and how we can take credit for engineered safety features,  
4 when can we do so and when can't we and why. I don't see much  
5 difference, frankly, between the remotely controlled makeup  
6 line as a mechanism to prevent the accident that you posit and  
7 the various mechanisms that can be used to prevent a different  
8 type of accident.

9 MR. O'NEILL: Well, I think there are about three  
10 criteria.

11 One is is there a remedy to the failure of the  
12 proposed system, so if the safety slings on the cask drop  
13 failed, is there a remedy. Well, there would be because the  
14 pool would be accessible. People would be in there.

15 Number two, what are the consequences of it failing?  
16 In an emergency evacuation if the environmentally qualified  
17 systems, which are considered incredible as far as failing,  
18 if they fail, what are the consequences?

19 Well, the consequences dictate that the area has  
20 to be evacuated or the site has to be a low density population  
21 site. I don't know -- well, to go on, concerning the possi-  
22 bility of a safety feature failing, Mr. Gallo cited the idea  
23 of the zircaloy/steam reaction; what would happen if the makeup  
24 line failed and the racks were uncovered.

25 Well, the zircaloy accident would only occur after

1 about a month of boiling and only after the pool water  
2 came down to the level of the racks. I believe that's  
3 according to Blanchard's testimony, although I'm not sure.

4 But concerning criticality, significant questions  
5 begin to arise after the water level drops to only about four  
6 feet. The Board said according to a guess of Dr. Prelowitz,  
7 you could have significant steam void fractions anywhere from  
8 the point four feet below the normal level of the pooled water  
9 down to the level of the racks. So the significant questions  
10 exist very early on.

11 In extrapolating from the testimony, again I believe  
12 of Blanchard, I came up with the figure that after a TMI-type  
13 accident this water level could drop within about five and a  
14 half days, so that's a much more critical event. I think  
15 your criticality accident would happen before that.

16 JUDGE KOHL: But the racks are still covered in that  
17 situation.

18 MR. O'NEILL: Right. The pressure is just relieved  
19 enough so that steam bubbles form and exist along the --

20 JUDGE BUCK: Suppose the pool boils dry and gets down  
21 below the level of the elements. Would you still have  
22 criticality?

23 MR. O'NEILL: I think the Board wants to know. I  
24 don't know.

25 JUDGE BUCK: I'm asking you specifically if you have

1 fresh fuel, you store it dry, okay? Now we've got burned  
2 fuel, a lot less radioactive -- a lot less reactive, I should  
3 say. And if we boil out all the water, is there any possi-  
4 bility of criticality?

5 MR. O'NEILL: Well, I think --

6 JUDGE BUCK: No. Don't you go and think. Is there  
7 any possibility of it, because what enables criticality?

8 MR. O'NEILL: The neutrons.

9 JUDGE BUCK: Right. Neutron movement and what else?  
10 What has to happen to the neutrons?

11 MR. O'NEILL: The speed of the neutrons.

12 JUDGE BUCK: What slows those neutrons down?

13 MR. O'NEILL: Water, boron, et cetera.

14 JUDGE BUCK: If you take all the water out, I'm  
15 asking you can you have criticality?

16 MR. O'NEILL: I think there's a significant question  
17 about that in the Board's mind.

18 JUDGE BUCK: I'd like to know on what basis.

19 MR. O'NEILL: Well, I'm not a criticality expert.  
20 I also understand that the optimum moderating conditions are  
21 mist conditions, not dry conditions.

22 JUDGE BUCK: All right. Let's assume we have  
23 criticality as to what really happens in here. You have  
24 criticality on parts of your rod. Is that right? You boil and  
25 you get boiling. You have criticality. And then we heat those

1 rods up some more so you'll have more boiling. And you will  
2 very rapidly empty that pool because you've got more heat in  
3 there, so it will empty very rapidly.

4 As it empties, the void gets larger, and you get  
5 down to the dry condition where there is no criticality, so  
6 what happens? Nothing, except your fuel will get overheated.

7 MR. O'NEILL: I think there's a Sandia report in  
8 this article that was just discussed that significantly  
9 questioned that, that there is significant question.

10 JUDGE BUCK: Of what? Of what? Significant question  
11 of what?

12 MR. O'NEILL: Of criticality occurring.

13 JUDGE BUCK: Suppose it does occur for a while. The  
14 point I'm getting at, as it boils dry do you maintain criti-  
15 cality?

16 MR. O'NEILL: I don't know if you would boil dry  
17 before you had significant deformation of the rod assembly.  
18 I just don't know.

19 JUDGE BUCK: Well, you're not going to get any more  
20 significant deformation if you go through criticality and  
21 then you dry out and then your criticality stops; then you're  
22 back to where you were before. If you don't have criticality,  
23 all you do is you heat the fuel elements up.

24 MR. O'NEILL: Well, I'm saying while those conditions  
25 of mist exist you might have derormation of the racks. The

1 other thing is you mentioned the containment spray. Even  
2 though the pool would be boiled away, you would still have  
3 this containment spray raining down a certain amount of water.  
4 I don't know how much. I think it's fairly moderate.

5 JUDGE BUCK: Only if you turn it on.

6 MR. O'NEILL: Well, I think as a result of a  
7 reactor accident it would probably go on, wouldn't it?

8 JUDGE BUCK: Let's take a pool accident by itself  
9 under the conditions we've got here. You don't have to turn  
10 it on. You've got other water supplies, for example. Supposing  
11 you don't turn it on?

12 MR. O'NEILL: Well, I think in a pool accident  
13 itself it would be unlikely the containment would be isolated,  
14 although it's possible; and therefore, you could make up  
15 the water through a fire hose or something.

16 JUDGE BUCK: If you had broken fuel elements and  
17 you were pushing radioactivity up there, wouldn't you have  
18 to get out of the containment?

19 MR. O'NEILL: Right. It seems to me that if the  
20 temperatures were high enough, you know, if you had that  
21 criticality and the water was boiling, you could begin -- you  
22 begin the questionable period --

23 JUDGE BUCK: What questionable period?

24 MR. O'NEILL: According to Perlowitz's testimony.  
25 Just to jump back for a second, you said Lantz's testimony

1 was thrown out because it said the criticality is based on  
2 density. Well, I think the critical question --

3 JUDGE BUCK: Wait a minute. Wait a minute. It was  
4 thrown out?

5 MR. O'NEILL: It was disregarded by the Board.

6 JUDGE BUCK: Because he said what?

7 MR. O'NEILL: Because he said criticality is  
8 dependent upon density.

9 JUDGE BUCK: Isn't it?

10 MR. O'NEILL: Yes. But the big question is what  
11 are the temperatures and how do they affect density. I think  
12 that's the main question.

13 JUDGE BUCK: How do they affect it?

14 MR. O'NEILL: As temperatures go up, steam voids  
15 form.

16 JUDGE BUCK: All right. But what else does it  
17 affect?

18 MR. O'NEILL: What does this temperature affect?

19 JUDGE BUCK: Yes. It also affects the neutron  
20 velocity, too, doesn't it?

21 MR. O'NEILL: I defer to your judgment. But the  
22 point is if the water drops to a level of three or four feet  
23 below the top level of the pool, then you have this area  
24 where the evidence does not substantiate saying that the  
25  $k_{eff}$  level is below .95. There's a real question about the



1 temperature of the water coming up to the bottom of the racks  
2 and the steam void fractions, and so it's possible that you  
3 could have boiling in those rods, significant boiling and  
4 significant steam void fractions as you drop from the level  
5 of four feet all the way down the bottom of the pool. And  
6 that's the time that you would have this critical period;  
7 that's the time we conservatively have to consider that  
8 you have the steam void fractions that would cause criticality.

9           And that time would be about 25 days, and I think  
10 that would be enough time to cause a serious problem with  
11 criticality and meltdown, et cetera. But the real question  
12 arises --

13           JUDGE BUCK: I'm sorry. I missed your point, because  
14 what time is 25 days?

15           MR. O'NEILL: According to the Blanchard testimony,  
16 the boiling water would take 30 days for the water to enter  
17 the pool down to the level of the racks, okay?

18           JUDGE BUCK: Okay.

19           MR. O'NEILL: I drew from that that in about five  
20 and a half days the water level would drop about four feet  
21 by calculating how much water was in the pool.

22           JUDGE BUCK: How far are you above the top of the  
23 fuel elements at that point?

24           MR. O'NEILL: I believe you are about 25 feet or  
25 so.

1 JUDGE BUCK: Okay.

2 MR. O'NEILL: You have 25 feet, and then all the way  
3 down to the bottom of the pool you have 25, maybe 30 feet of  
4 water to boil away. And during that entire time you have a  
5 question about the criticality of the rods, because you don't  
6 know what the effect will be on the steam void fractions. So  
7 you have to conservatively assume that that water will boil  
8 on a significant portion of the racks for 25 feet -- I'm sorry --  
9 that whole level from four feet below the top level of the  
10 pool down to the bottom of the pool. That would give you  
11 about 25 days of boiling. To be conservative, you'd have to  
12 consider 25 days of criticality, and that would be enough  
13 to form a gross distortion of the racks in significant  
14 radioactive releases.

15 JUDGE BUCK: How are you going to change the tempera-  
16 ture at the bottom of the pool? As long as you have 30 feet  
17 over the top of the rod, you're going to have cold water  
18 from the top flowing down to the bottom and being recycled.

19 MR. O'NEILL: Well, according to the testimony, sir,  
20 the steam void fractions were in question once you drop four  
21 feet below the level of the water, of the original water.

22 JUDGE BUCK: Do you know where in the testimony?

23 MR. O'NEILL: I can find it very quickly.

24 JUDGE BUCK: Don't do it now, but you can give it  
25 to me later on.

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MR. O'NEILL: Okay.

1           The regulatory guides -- the regulations themselves  
2 are the rules in effect. The regulatory guides, according to  
3 the Gulf State Utilities Company, 6 NRC 760 1977, say that the  
4 regulatory guides are not regulations per se and are not  
5 entitled to be treated as such.

6           And skipping down a little bit, in other words, the  
7 guides set forth one, but not necessarily the only, method  
8 in which an applicant may choose to employ in order to conform  
9 to a regulatory standard. While the Staff will accept such a  
10 method, an applicant is not precluded from utilizing some other  
11 method which it can demonstrate is appropriate in the particular  
12 case. Nor are other parties precluded from demonstrating that  
13 the prescribed method is inadequate in the particular  
14 circumstances of this case.

15           JUDGE KOHL: Doesn't that cut against Mr. Semmel's  
16 argument then that because General Design Criterion 62 says  
17 that criticality shall be prevented preferably by geometrically  
18 safe configurations, when what you just read suggests that  
19 if the applicant feels some other method, i.e., a remotely  
20 controlled makeup line, is preferable for its purposes, that  
21 it can then do so?

22           MR. O'NEILL: No, because this decision is talking  
23 about regulatory guides and using the regulatory guides. It's  
24 not talking about regulations themselves. It's saying that  
25 the regulatory guides are guidelines. I will get to that

1 question of Criterion 61 and 62.

2           The regulatory guides themselves, I don't think I  
3 need to reread those. I think we are pretty familiar with  
4 those.

5           But 62 is short, and it's quite important. Criticality  
6 in the fuel storage and handling systems shall be prevented by  
7 physical systems or processes, preferably by the use of  
8 geometrically safe configurations. This is exactly what the  
9 licensing board required. Proof that criticality would be  
10 prevented by a geometrically safe rack configuration. To  
11 ensure that criticality not be reached the .95 value used by  
12 the Staff was the standard not to be exceeded, Staff and  
13 Consumers Power glossed over the rule's insistence that  
14 geometric configuration is preferable. Yet deciding between  
15 engineering safeguards, such as a water makeup line, and  
16 geometrically safe rack configurations is not a matter left  
17 to the board's discretion. The geometric solution is by the  
18 regulations preferable.

19           Applicant must bear a considerable burden of proof  
20 to set this aside. It must prove that the engineered safeguards  
21 are as good or better than the geometric configurations.

22           JUDGE KOHL: Well, isn't that just what it proposes  
23 to do in the upcoming hearings with respect to the makeup line?

24           MR. O'NEILL: Well, as I said, there are several  
25 very important questions concerning that, including the fact

1 that emergency core cooling system has been granted certain  
2 lifetime exemptions from the single-failure criterion, and also  
3 the possibility of accidents that would not be remedied by the  
4 makeup lines, such as thermal failure of the concrete base, as  
5 is --

6 JUDGE MOORE: Mr. O'Neill, you requested 20 minutes.  
7 Your 20 minutes just expired.

8 MR. O'NEILL: Can I sum up?

9 JUDGE KOHL: I have one question: What's wrong with  
10 remanding to the licensing board with directions to defer  
11 ruling on the criticality until the matters you just raised  
12 with respect to the reliability of the makeup line are  
13 litigated and hopefully satisfied?

14 MR. O'NEILL: I think the evacuation cases cited  
15 by the Consumers Power strongly cut against that. And the test  
16 in those is that what are the consequences of the failure with  
17 even environmentally qualified systems? The reg guides are  
18 very, very specific that the emergency core cooling system  
19 should be single-failure-proof, that the containment shall be  
20 such as to prevent significant escapes of gases. And yet in  
21 these cases, as I quoted passages not stated by Consumers Power,  
22 significant degradation, if not complete failure, of these  
23 systems is considered in the evacuation cases. And I think  
24 that's very important. Those pages are pages 4 through 7 in  
25 my brief. I think that's a very important precedent.

1           The point that it goes to is what are the  
2 consequences of the failure of a particular system, whether it  
3 be single-failure-proof or not?

4           JUDGE KOHL: Well, don't those same --

5           MR. O'NEILL: And in this case, the consequence is  
6 very serious because you can't get in the pool to remedy the  
7 situation. That access is the principle in Zion. Excuse me.

8           JUDGE KOHL: Assuming the worst of all cases, and  
9 that there is some accident, the remotely controlled makeup  
10 line doesn't work, and there are releases to the environment.  
11 Don't the same evacuation plans come into effect or operation  
12 if there were a reactor accident? Don't they also apply if  
13 there's an accident of this nature to the spent fuel pool?

14           MR. O'NEILL: Well, Big Rock has a very small  
15 evacuation zone. It's only 5 miles. That's based on the fuel  
16 inventory of the reactor. It's not based on the fuel inventory  
17 of the pool, which will be significantly greater than the fuel  
18 inventory of the reactor.

19           Also, that fuel is not standard fuel. There is  
20 a mixed oxide fuel in the reactor. There is experimental fuel  
21 and there is high burnup fuel in there.

22           So the consequences of a pool accident escaping  
23 containment would be far greater than the evacuation that would  
24 be required as a result of the reactor accident.

25           JUDGE BUCK: When you say "significantly greater,"

1 the fuel in the pool is significantly greater than that in the  
2 reactor, exactly what do you mean?

3 MR. O'NEILL: Basically, quantitatively there is far  
4 more fuel in the fuel pool.

5 JUDGE BUCK: You mean the number of fuel elements?

6 MR. O'NEILL: Sure.

7 JUDGE BUCK: How about the amount of radioactivity?

8 MR. O'NEILL: Well, I think in certain elements, such  
9 as iodine, that the reactor fuel would be less benign than  
10 the pool fuel. But in the long-lived elements, such as  
11 the plutonium and the others, the consequences of a pool  
12 emptying are far greater than the reactor.

13 JUDGE BUCK: But the immediate effect of a reactor  
14 accident, such as the TMI-2, if that had gotten out, for example,  
15 and all of that fuel had broken up, the short half-life far  
16 overpowered the radioactive levels of the other elements. And  
17 that is far, far greater. And that's the ones you're afraid of  
18 in getting the evacuation. It's the short-term stuff.

19 MR. O'NEILL: Nonetheless --

20 JUDGE BUCK: Well, I am getting at the actual  
21 radioactivity, I think if you look it up, I think that you're  
22 not correct in saying that the reactivity may get out, the  
23 radioactivity that may get out from the fuel elements is far  
24 less than that could possibly get out of an operating reactor.

25 MR. O'NEILL: The fuel inventory of the longer-lived



1 elements, and in many of those you are correct that the  
2 longer-lived elements are more of a concern during evacuation,  
3 but say, if plutonium is ingestible through the air passages,  
4 that is -- the inventory in the pool is much greater, especially  
5 since most of the mixed oxide fuel is in the reactor pool, not  
6 the reactor itself.

7 JUDGE BUCK: Well, it's got to be airborne, of course.

8 MR. O'NEILL: I had one or two points that I wanted  
9 to make. I would like to point out an internal consistency  
10 in the Staff's brief. The Staff maintains that the .98 KEFF  
11 value provides fuel is not applicable here. They want to stick  
12 to the .95 level in analyzing spent fuel under dry or mist  
13 conditions. But there is no point in analyzing the spent fuel  
14 under dry or mist conditions if that's a condition that you  
15 can never analyze.

16 So in arguing that the .95 level should be maintained,  
17 they are, in effect, granting in a backward way the fact that  
18 there are conditions under which you must analyze the KEFF  
19 under mist conditions.

20 As I say, Big Rock is a very small plant. The  
21 precedent set by this case should be rather limited. I  
22 understand that there may be no other operating reactors that  
23 have a spent fuel pool in containment. If there are, there are  
24 less than five. I checked this out with the Staff and project  
25 managers.

1 I would also -- well, I think that is the main purpose  
2 of my arguments, and I would like to recommend you especially  
3 to the evacuation cases to show the engineering safeguards.

4 JUDGE MOORE: Thank you, Mr. O'Neill.

5 Mr. Gallo.

6 REBUTTAL ARGUMENT BY JOSEPH GALLO, ESQ.,

7 ON BEHALF OF LICENSEE

8 MR. GALLO: Thank you. I would just like to make  
9 essentially two points. Mr. Semmel, in response to a question  
10 from Judge Kohl, conceded that the spent fuel pool cooling  
11 system was a system that was "a physical system within the  
12 context of Criterion 62," as that term "physical system" is  
13 used in the design criterion.

14 I suggest that statement concedes the point that  
15 licensee is making on its appeal, that physical system means  
16 a system like the spent fuel pool cooling system or the makeup  
17 line.

18 Finally, Staff guidance. Now, there seems to be some  
19 confusion as to -- because there is a number of documents as to  
20 what the Staff guidance is. I will say what Mr. Buck was unable  
21 to say, is that I do believe there is some confusion because of  
22 the proliferation of documents that exists that constitutes  
23 Staff guidance. I would simply point the Appeal Board to  
24 Revision 2 of Reg Guide 1.13, where I believe the Staff has,  
25 although albeit in proposed form, has pulled together all the

1 pieces that implement Criterion 61 and 62 and demonstrate  
2 the strong interplay between the two design criteria  
3 maintained by the licensee.

4 JUDGE KOHL: Well, Counsel, you don't expect us to  
5 rely on something that is only in draft form?

6 MR. GALLO: Well, I don't expect you to rely on it  
7 for purposes of substance, but for purposes of indicating the  
8 state of mind of the Staff in dealing with their disclaimer in  
9 the footnote in their draft. It seems to me that while it's not  
10 an effective position of the Commission, or albeit the NRC Staff,  
11 it is proposed by the Staff, it seems to me it contradicts their  
12 suggestion that this strong interplay doesn't exist. I am  
13 offering it for that limited purpose.

14 Thank you.

15 JUDGE KOHL: Perhaps you can answer one question I  
16 asked earlier. Is the supercriticality article, was that  
17 ever offered into evidence?

18 MR. GALLO: To my recollection, it was not.

19 JUDGE KOHL: It was attached to the motion for --

20 MR. GALLO: Yes. It was attached -- or referred to --

21 JUDGE KOHL: Submitted at the summary disposition  
22 level?

23 MR. GALLO: It was referred to, but not attached, is  
24 my recollection. So it would be intervenor's material. It was  
25 referred to by citation in an affidavit by Dr. Hoover, and the

1 board found the article, as everyone did. The article is used  
2 for cross-examination purposes extensively throughout the  
3 hearing, but it was not itself admitted into evidence.

4 JUDGE BUCK: The board didn't put it in itself?

5 MR. GALLO: That's my recollection, yes, sir.

6 JUDGE BUCK: I was under the impression that the  
7 board put it in itself, but I guess I am mistaken.

8 JUDGE MOORE: If the board didn't, did it have any  
9 business relying on it in any way in its decision?

10 MR. GALLO: Well, I would like to say no, but in  
11 candor, I believe that the board used it like the --

12 JUDGE KOHL: Didn't everybody use it at one time or  
13 another for purposes of examination?

14 MR. GALLO: Licensee never tried to use it for the  
15 truth or falsity but merely used it for the purposes of answer-  
16 ing the board questions as a predicate for that purpose.

17 JUDGE KOHL: Didn't Dr. Kim testify that at least  
18 some portion of it was consistent with some beliefs?

19 MR. GALLO: Yes. He interpreted the document as he  
20 understood it. But to answer your question, Judge Moore, I  
21 believe the board used the document in its opinion as a  
22 cross-examination tool and used it in that context rather than  
23 relying on it for substantive findings. They merely used it as  
24 a tool for raising the question in their mind as to the need  
25 for further analysis rather than using it as a dispositive

1 decision for a substantive point. And I think that is  
2 appropriate.

3 JUDGE BUCK: They used it also to defend the double  
4 peak situation, as I recall it. And I thought that was --

5 MR. GALLO: I believe they used it to justify their  
6 further inquiry into that. Maybe that's the difference without  
7 a distinction from a substantive point.

8 JUDGE MOORE: Fine. Thank you.

9 MR. GALLO: Thank you.

10 MR. MOORE: Mr. Bachmann, do you have anything  
11 further to add?

12 MR. BACHMANN: Unless this board has further  
13 questions, the Staff has nothing further to add.

14 MR. O'NEILL: Point of information. I would just  
15 like to tell you the page number on which dropping the water  
16 level is indicated in the board's decision per your request.  
17 That is page 18 in the order.

18 JUDGE MOORE: Thank you.

19 JUDGE BUCK: That's in the board decision, you say?

20 MR. O'NEILL: Correct.

21 JUDGE MOORE: The case is submitted. Thank you.

22 (Whereupon, at 11:40 a.m., the Board was adjourned.)

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CERTIFICATE OF PROCEEDINGS

This is to certify that the attached proceedings before the  
ATOMIC SAFETY & LICENSING APPEAL BOARD  
in the matter of: BIG ROCK POINT NUCLEAR POWER PLANT  
date of proceeding: March 24, 1983  
place of proceeding: Washington, D.C.  
were held as herein appears, and that this is the  
original transcript for the file of the Commission.

ANN RILEY  
Official Reporter - Typed

*Ann Riley*  
Official Reporter - Signature