

ORIGINAL

# OFFICIAL TRANSCRIPT PROCEEDINGS BEFORE

NUCLEAR REGULATORY COMMISSION  
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

DKT/CASE NO. 50-454 OL and 50-455 OL  
TITLE COMMONWEALTH EDISON COMPANY (Byron Nuclear Power  
Station Unit 1) - COMMONWEALTH EDISON COMPANY  
(Byron Nuclear Power Station Unit 2)  
PLACE Rockford, Illinois  
DATE March 7, 1983  
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REPORTING

440 FIRST STREET, N.W.  
WASHINGTON, D.C. 20001

UNITED STATES OF AMERICA  
 NUCLEAR REGULATORY COMMISSION  
 BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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 In the Matter of: : Docket Nos.:  
 COMMONWEALTH EDISON COMPANY : 50-454 OL  
 (Byron Nuclear Power Station Unit 1) :  
 COMMONWEALTH EDISON COMPANY : 50-455 OL  
 (Byron Nuclear Power Station Unit 2) :  
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United States District Courthouse  
 211 South Court Street  
 Rockford, Illinois

March 7, 1983

The hearing in the above-entitled matter  
 convened, pursuant to notice, at 2:30 P. M.

BEFORE:

IVAN W. SMITH,  
 Administrative Judge

DIXON A. CALLIHAN,  
 Administrative Judge

RICHARD F. COLE,  
 Administrative Judge

APPEARANCES:

On behalf of Licensee, Commonwealth Edison  
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12 DIANE CHAVEZ  
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14 BETTY JOHNSON  
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## C O N T E N T S

WITNESSES: DIRECT CROSS REDIRECT RECROSS BOARD

CARLSON-PLENIEWICZ  
Cross (Continuing.)

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1 JUDGE SMITH: Is there any preliminary business?

2 MR. COPELAND: Not at this time, your Honor.

3 MS. WHICHER: Judge Smith, if I may represent to  
4 the Board, on behalf of the Intervenors, there are parties  
5 who were meeting this morning in Chicago on the emergency  
6 planning issue who have not yet arrived back in Rockford;  
7 and we are in the process of negotiating changes in the  
8 proposed schedule because of some witness inability  
9 problem, and I suspect we may be able to report to the  
10 Board later this afternoon on these issues.

11 JUDGE SMITH: That's fine. Thank you.

12 You may proceed with your cross examination.

13 CROSS-EXAMINATION ON BEHALF

14 OF INTERVENOR DAARE/SAFE

15 BY MS. CHAVEZ:

16 Q Mr. Carlson, for preheat-type steam generators, was a  
17 feedwater bypass system developed and implemented to  
18 reduce the possibility of bubble collapse water hammer  
19 occurring in the preheat section?

20 A (WITNESS CARLSON) Yes, that is correct. Westinghouse  
21 conducted an experimental program to investigate the  
22 possibility of bubble collapse water hammer in a preheater  
23 of preheat-type steam generators.

24 Byron has the subtype referred to as counterflow  
25 preheat steam generators.

1           A one-eighth scale model of the preheat section was  
2           fabricated and tested in Pittsburgh.

3           The results of that test program led to the  
4           development of the feedwater bypass system.

5       Q   Did Westinghouse recommend two possible modifications to  
6           reduce the potential for a preheat water hammer, a  
7           feedwater bypass system and the temperature pegging  
8           system?

9       A   (WITNESS CARLSON) In the documentation that was sent to  
10          customers with preheat steam generators, of which Byron is  
11          one, two alternate approaches were proposed as a means of  
12          addressing the potential for bubble collapse water hammer  
13          in the preheater.

14          In every case, to my knowledge, except one, the  
15          customers with preheat-type steam generators elected to go  
16          with the feedwater bypass system, including Commonwealth  
17          Edison at Byron.

18          The other alternative that you mentioned is referred  
19          to as temperature pegging, which is going to be  
20          implemented at one plant, the Virgil Summer station.

21       Q   Were these two modifications recommended as a result of  
22           the test program you identified in Response 7 on Page 7 in  
23           your testimony, which Westinghouse undertook in 1977 and  
24           1978?

25       A   (WITNESS CARLSON) Yes, the answer to Question 7 makes

1 reference to that test program which was used -- which was  
2 conducted to develop -- to investigate the possibility of  
3 water hammer in a preheater region.

4 Q Thank you.

5 If it's possible to respond yes or no to my  
6 questions, that would probably speed up the process; and I  
7 will be touching on the points that you have just brought  
8 up later on. Okay?

9 In 1977 were you employed in the design of the  
10 high-pressure water hammer test facility involved in this  
11 program?

12 A (WITNESS CARLSON) The actual test program was conducted  
13 in 1977 for both subtypes of preheat steam generators.

14 The design work, the thermal and hydraulic design,  
15 of the preheater region and the actual fabrication took  
16 place approximately in 1976.

17 Q Were you responsible for the thermal hydraulic design of  
18 the test section in the test vessel?

19 A (WITNESS CARLSON) That's correct.

20 Q Did you design the one-eighth scale test models used to  
21 simulate the preheat steam-type generator such as the  
22 model employed at Byron?

23 A I did the thermal and hydraulic design work on the test  
24 sections, the one-eighth scale model test sections.

25 Q Did you supervise the related testing program?

1 A (WITNESS CARLSON) I was responsible for the day-to-day  
2 testing of those test sections while the testing was in  
3 progress.

4 Q Did the test use electrically-heated heater rods in place  
5 of steam generator tubes?

6 A (WITNESS CARLSON) That's correct.

7 Q Do you know of what material the tubes were constructed?

8 A (WITNESS CARLSON) The tubes -- by tubes I assume that you --

9 Q The rods.

10 A (WITNESS CARLSON) The electrically-heated rods?

11 Q Yes.

12 A (WITNESS CARLSON) I am not certain.

13 Based on my recollection, the outer covering of  
14 these electrically-heated elements were stainless steel.

15 Q Can you give a general description of the preheater test  
16 sections and the test vessels?

17 MR. COPELAND: Your Honor, I would like to  
18 object to this line of questioning.

19 It clearly has to do with a water hammer occurring  
20 in the test program that took place for study of a water  
21 hammer in a preheater section, which is beyond the scope  
22 of this contention.

23 MS. CHAVEZ: Your Honor, as a result of this  
24 test program, Westinghouse recommended the use of the  
25 auxiliary bypass system, which is directly relevant to the

1 question; and I want to show the connection and the scale  
2 of testing that was done on the preheaters and the bypass  
3 section in these tests.

4 JUDGE SMITH: Objection overruled.

5 (WITNESS CARLSON): Would you please repeat the  
6 question?

7 BY MS. CHAVEZ:

8 Q Yes.

9 Can you give a general description of the preheater  
10 test sections and the test vessel?

11 A (WITNESS CARLSON) Yes. The test section, as has been  
12 mentioned, was a one-eighth scale representation of the  
13 preheater region of the preheat steam generator.

14 In addition to the preheater region, it simulated  
15 the part of the steam generator on the other side of the  
16 partition plate.

17 The partition plate divides the lower part of the  
18 steam generator vessel into two parts, two halves, with  
19 the preheater on one side and the hot leg side on the  
20 other side of the partition plate.

21 On the preheater side we simulated the main  
22 feedwater nozzle of the preheat-type steam generator.

23 This scale model was enclosed in a test vessel,  
24 which was capable of operating at steam generator -- full  
25 sized steam generator conditions.

1           The heater rods that we have referred to now a few  
2 times penetrated the lower part of this test vessel  
3 through a massive flange and then further the heater rods  
4 were connected to the electrical power supply.

5           The test vessel was approximately 10 feet or so  
6 high.

7           The test section -- the one-eighth scale models were  
8 approximately two-and-a-half feet high in the lower part  
9 of the test vessel.

10          The facility included a significant amount of  
11 instrumentation to monitor variables such as the water  
12 level inside the test vessel with respect to the test  
13 model, temperatures of the fluid inside the test vessel  
14 and also in the main feedwater nozzle entering the test  
15 vessel.

16          Pressure instrumentation of two types were included:  
17 Instrumentation to measure the absolute pressure within  
18 the test vessel and, also, piezoelectric pressure  
19 transducers to measure pressure pulses as might occur --  
20 as would occur following a water hammer event.

21          The instrumentation was connected to an elaborate  
22 arrangement of data recording equipment, tape recorders,  
23 Visicorders, which would allow to monitor the activity in  
24 the test vessel while the test was in progress.

25          That would allow us to modify the conditions from

1 test to test if we determined or saw signs of interest.

2 The tape-recorded data was analyzed after the test  
3 in great detail. Some of the data was connected to tape  
4 recorders run at high speed; specifically the data from  
5 the piezoelectric pressure transducers. Other data was  
6 collected on another Visicorder run at a slower speed.

7 The overall purpose of this program was, first of  
8 all, to determine whether it would be possible to produce  
9 bubble collapse water hammer.

10 At the beginning of this program, we had no evidence  
11 that we could.

12 The second objective of the program was to determine  
13 the important parameters, as far as the water hammer  
14 phenomenon was concerned, and then use that data, that  
15 information, to develop a modification for the full-sized  
16 steam generator.

17 Q Mr. Carlson, in a typical preheat steam generator, where  
18 is the entrance to the auxiliary feedwater nozzle located  
19 in relation to the preheater and the main feedwater  
20 nozzles?

21 A (WITNESS CARLSON) Well, to place things in perspective  
22 here and just to make sure there is no confusion, the main  
23 feedwater nozzle in the full-size unit and in the test  
24 facility was located near the bottom of the vessel above  
25 the tube sheet.

1           In the full-size unit, the auxiliary nozzle, which  
2           is a smaller nozzle, is located in the supershell, in the  
3           upper part of the steam generator.

4           Now, in the test facility -- as I indicated before,  
5           the objective of this test facility was to investigate  
6           bubble collapse water hammer in the preheater region of  
7           preheat-type steam generators.

8           In the test model, the auxiliary nozzle was  
9           simulated by a separate nozzle near the bottom of the test  
10          facility entering -- through which water would enter near  
11          the bottom of the test section.

12       Q       So, in other words, the auxiliary nozzle in the test  
13               section was located beneath the main nozzle, contrary to  
14               actual conditions in a full-size steam generator, because  
15               the design of the test was to measure the possibility of  
16               preheater bubble collapse in the preheater section and not  
17               to simulate the conditions in a full-sized steam  
18               generator?

19               MR. COPELAND: Objection.

20               It's a compound question.

21               (WITNESS CARLSON): Could you simplify the  
22               question, please?

23       BY MS. CHAVEZ:

24       Q       Well, correct me if I am wrong, but the water hammer tests  
25               conducted were not designed to simulate the conditions



1 throughout a full-sized steam generator preheat generator;  
2 is that correct?

3 A (WITNESS CARLSON) That is not correct in the sense that  
4 the -- with respect to investigating bubble collapse water  
5 hammer in the preheater region, the placement of the  
6 simulated auxiliary nozzle near the bottom of the test  
7 section is a more conservative location than a  
8 corresponding -- than an auxiliary nozzle corresponding to  
9 the -- located corresponding to the auxiliary nozzle in  
10 the main steam generator, and the reason for that is that  
11 in the full-sized steam generator, in order for water  
12 introduced in through the auxiliary nozzle to reach the  
13 preheater -- and, as I indicated, it's the bubble collapse  
14 water hammer in the preheater that we were interested in.

15 In the full-sized steam generator, the water has to  
16 flow down an annular passage between what is referred to  
17 as the wrapper and the steam generator vessel, an annular  
18 passage.

19 Now, in the full-sized steam generator, in making  
20 that move from the upper nozzle to the preheater, the  
21 water would heat up, and we know from our experimental  
22 work that the occurrence of bubble collapse water hammer  
23 is dependent on feedwater temperature.

24 Q Mr. Carlson --

25 A (WITNESS CARLSON) May I finish my point, please?

1 Q All right.

2 A (WITNESS CARLSON) In the full-sized unit, then the  
3 feedwater, which has been introduced through the auxiliary  
4 nozzle, is heated up before it reaches the preheater  
5 region.

6 Now, in our test model, we injected the feedwater  
7 below the preheater region, so that it did not have an  
8 opportunity to heat up. It would enter the preheater  
9 region without any heating, and, therefore, would be more  
10 likely to result in bubble collapse water hammer; and I  
11 might say, too, that in all that testing that we did with  
12 the simulated auxiliary nozzle, we were not able to  
13 produce any water hammer.

14 Q Mr. Carlson, I understand that the test was set up for the  
15 purposes of investigating preheater water collapse water  
16 hammer potential.

17 What I am trying to establish is whether or not  
18 there was any testing or operation done by Westinghouse,  
19 following the preheater water hammer tests or during them,  
20 which led it to conclude that the bypass system would be  
21 successful in minimizing preheater water hammer without,  
22 in turn, inducing water hammer in the bypass system  
23 itself?

24 A (WITNESS CARLSON) Well, you said in your question there,  
25 "preheater water hammer."

1 Q Right.

2 A (WITNESS CARLSON) That was the objective of the test.

3 Q Mr. Carlson, you are anticipating my questions, though, in  
4 your response.

5 What I am trying --

6 MR. COPELAND: Your Honor, I object to this  
7 badgering of the witness. She is arguing.

8 JUDGE SMITH: It's not badgering. She is trying  
9 to explain to him what her objective is.

10 MS. CHAVEZ: That is right.

11 If you can restrict yourself to responding strictly  
12 to my questions in the future.

13 My next question will reach a further objective,  
14 which would show you what I wanted -- what direction I am  
15 going.

16 (WITNESS CARLSON): Would you repeat your  
17 question, please?

18 MS. CHAVEZ: Okay.

19 BY MS. CHAVEZ:

20 Q Whether any testing or operation done by Westinghouse  
21 following the preheater water hammer tests or during these  
22 tests which led it to conclude that the bypass system  
23 would be successful in minimizing preheater water hammer  
24 without, in turn, inducing water hammer in the bypass  
25 system itself?

1 A (WITNESS CARLSON) Well, there seems to be two parts to  
2 your question there.

3 The first part I agree with. The purpose of the  
4 test program was to investigate water hammer in the  
5 preheater.

6 But then the second part here is what throws me.

7 Q Okay. Let me repeat the question.

8 Was there any testing or operation done by  
9 Westinghouse in these tests which led it to conclude that  
10 the bypass system would be successful in minimizing  
11 preheater water hammer without, in turn, inducing water  
12 hammer in the bypass system itself?

13 A (WITNESS CARLSON) There was no testing, as part of that  
14 program, to investigate the possibility of bubble collapse  
15 water hammer in the bypass line.

16 Q Was there any testing done following those test programs  
17 to investigate the possibility of bubble collapse water  
18 hammer occurring in the bypass line?

19 A (WITNESS CARLSON) That type of water hammer in piping was  
20 the subject of testing which I refer to as being conducted  
21 in 1975, I believe.

22 Prior to the program to investigate bubble collapse  
23 water hammer in preheaters, Westinghouse was involved in  
24 investigating bubble collapse water hammer in feedwater  
25 lines associated with feed ring-type steam generators; and

1           that testing -- and I -- that testing is applicable to the  
2           bubble collapse water hammer that occurred in the KRSKO  
3           plant.

4       Q     Is that the only testing which Westinghouse has conducted  
5           which it might apply to determine as to whether or not  
6           there was a possibility for bubble collapse water hammer  
7           in the preheat -- I mean bypass line?

8       A     (WITNESS CARLSON) The investigation of bubble collapse  
9           water hammer associated with the feedwater lines of the  
10          feed ring-type steam generator was conducted over a period  
11          of a year or so.

12               It was initiated as a result of the water hammer  
13          incident at Indian Point 2 in 1973, which is a feed  
14          ring-type steam generator.

15       Q     So, in other words, Westinghouse, aside from using the  
16           results of test programs associated with feed ring-type  
17           steam generators, have not done any further testing about  
18           the water hammer potential of the bypass line?

19       A     (WITNESS CARLSON) Well, there was a major effort involved  
20           in dealing with the bubble collapse water hammer in the  
21           feedwater lines, specifically near the steam generator, in  
22           response to the Indian Point incident, and that  
23           development led to modifications of the preheat-type steam  
24           generator, such as the J tubes, which Mr. Serkiz mentioned  
25           last Friday.

1           So until the KRSKO event occurred, there was no real  
2 motivation to investigate further bubble collapse water  
3 hammer in lines because we felt that that is under  
4 control.

5       Q     Mr. Carlson, the test that you referred to at Indian Point  
6 was, again, a feed ring test.

7           So I take it that your response to my question, as  
8 to whether or not there was any other information that  
9 Westinghouse used in determining that water hammer was not  
10 a potential problem in the bypass line, is no --

11           MR. COPELAND: I object to the question.

12 BY MS. CHAVEZ:

13       Q     -- is that correct?

14           MR. COPELAND: She has changed the premise to  
15 the -- from testing to information in that question, and I  
16 would like it cleared up.

17           MS. CHAVEZ: Okay. Let me use the word testing  
18 throughout then.

19           (WITNESS CARLSON): Would you repeat your question,  
20 please?

21 BY MS. CHAVEZ:

22       Q     Can you give me a yes or no response on this question?

23           Aside from the feed ring-type steam generator tests,  
24 did Westinghouse use any other information in determining  
25 that it was not -- that water hammer was not a potential

1 problem in the bypass line of counterflow steam  
2 generators?

3 A (WITNESS CARLSON) The information that we had in relation  
4 to whether or not bubble collapse water hammer would occur  
5 in piping systems, such as the KRSKO bypass line, is based  
6 on what I believe is pertinent information developed in  
7 response to the bubble collapse water hammer in the  
8 feedwater lines, particularly near the nozzle, that was  
9 collected for the preheat-type steam generator.

10 JUDGE SMITH: That is the Indian Point?

11 A (WITNESS CARLSON) (Continuing.) That's Indian Point, yes.  
12 I might -- yes, that's true.

13 I might also say that -- and I guess I have  
14 indicated this to a certain point -- as a result of the  
15 Indian Point incident, this testing work that was done in  
16 1975, 1976, recommendations were developed to deal with  
17 the potential for bubble collapse water hammer in preheat  
18 steam generators -- pardon me -- in feed ring-type  
19 generators; and those modifications --- one of which is to  
20 administratively control feedwater flow, another is the  
21 installation of J tubes on the feed ring -- they have been  
22 tested in plants other than Indian Point.

23 So I feel that we have a significant body of  
24 information on the phenomenon of bubble collapse water  
25 hammer in pipe.

## 1 BOARD EXAMINATION

2 BY JUDGE COLE:

3 Q Mr. Carlson, the Indian Point steam generator, that's not  
4 a preheat type?5 A (WITNESS CARLSON) That isn't, that's true. It is a feed  
6 ring-type steam generator.7 Q So the information you collected on the Indian Point would  
8 be related to preheat generators only with respect to the  
9 pipelines coming in?

10 A (WITNESS CARLSON) That's correct.

11 Q Okay.

12 A (WITNESS CARLSON) The point I am trying to make is that  
13 the data and information that we have collected for the  
14 piping associated with main feedwater line on feed  
15 ring-type steam generators is applicable to the KRSKO-type  
16 water hammer which also occurred in piping.

17 JUDGE COLE: Okay.

18 BY MS. CHAVEZ:

19 Q Mr. Carlson, I am not disputing the fact that that test  
20 information may or may not be applicable to counterflow  
21 preheat-type steam generators.22 My question to you is to whether or not there is any  
23 specific test data, with respect to preheat counterflow  
24 steam generators, that Westinghouse used in determining  
25 that the bypass line modification was not subject to water



1 hammer potential.

2 Can you answer that?

3 A (WITNESS CARLSON) Are you referring to work that was done  
4 now after the KRSKO event or prior to the KRSKO event?

5 Q No. I am referring to work done prior to the KRSKO event.

6 A (WITNESS CARLSON) Well, my answer to that is that the  
7 only work that was done was in relation to bubble collapse  
8 water hammer in the main feedwater piping associated with  
9 preheat steam generators.

10 Q Thank you.

11 JUDGE COLE: Did you mean the main feedwater  
12 piping of the feed ring-type or did you mean to say  
13 preheat type?

14 (WITNESS CARLSON): Pardon me.

15 What I meant to say was that the data that I am  
16 referring to, the information that I am referring to, with  
17 respect to bubble collapse water hammer in piping, was  
18 that related to the main feedwater line of feed ring-type  
19 steam generators.

20 JUDGE COLE: Okay. Thank you.

21 You said preheat before and you misspoke.

22 (WITNESS CARLSON): I am sorry.

23 BY MS. CHAVEZ:

24 Q Mr. Carlson, has Westinghouse at any time in the past or  
25 presently advocated a test program to determine the

1 potential for bubble collapse water hammer in the  
2 feedwater bypass system?

3 A (WITNESS CARLSON) No, we have not.

4 Q Okay. Then essentially has Westinghouse determined that  
5 bubble collapse water hammer in the feedwater bypass  
6 system is not the same phenomenon as bubble collapse water  
7 hammer occurrences in the main feedwater system?

8 A (WITNESS CARLSON) When you say main feedwater system,  
9 what type of steam generator are you referring to?

10 Q Of the preheat, counterflow.

11 A (WITNESS CARLSON) The potential for bubble collapse water  
12 hammer in the main feedwater line of a preheat steam  
13 generator is very, very low, because the water level is  
14 well above the preheater region.

15 Under an accident situation -- unless it's under an  
16 accident situation of some kind, such as a feed line  
17 break, the water level in the steam generator would never  
18 get down to the main feedwater nozzle, and, therefore, it  
19 wouldn't be possible for steam to enter the main feedwater  
20 line as it did through the upper bypass line at the KRSKO  
21 plant.

22 Q The purpose of your tests, Mr. Carlson, to investigate  
23 preheat water phenomena, water hammer phenomena, was to  
24 investigate upset conditions as well as normal conditions;  
25 is that correct?

1 A (WITNESS CARLSON) We group normal conditions and upset  
2 conditions together.

3 Q Okay. Did your tests investigate both?

4 A Yes.

5 Q Okay. As a result of these tests, did Westinghouse make  
6 other recommendations to the utilities to minimize the  
7 fatigue rate of steam generator internals and piping due  
8 to pressure pulses and related fatigue?

9 MR. COPELAND: I object to the relevance of this  
10 question, your Honor.

11 JUDGE SMITH: Would your objection still pertain  
12 if it were limited to water hammer-type impulses?

13 MR. COPELAND: I believe she has -- I believe we  
14 are concerned with the occurrence of the water hammer; and  
15 she is asking about the fatigue rates associated with it.

16 MS. CHAVEZ: With water hammer.

17 MR. COPELAND: Perhaps I don't understand her  
18 question.

19 JUDGE SMITH: Would you explain?

20 MS. CHAVEZ: Can I elaborate?

21 JUDGE SMITH: Yes.

22 MS. CHAVEZ: Your Honor, the tests in these  
23 instances resulted in two sets of recommendations.

24 Westinghouse made the recommendation that utilities  
25 implement the bypass feedwater system or the temperature

1           pegging system.

2           The other recommendations that Westinghouse sent to  
3           utilities concerned its concern with water hammer pressure  
4           pulses that were generated and observed in these tests;  
5           and this is my line of questioning.

6           MR. COPELAND: I believe all of these  
7           recommendations concern the preheater.

8           I would stick with my objection.

9           MS. CHAVEZ: Your Honor, my next question to the  
10          witness would be, "Can these same -- similar water pulses  
11          occur in the bypass feed line?"

12          JUDGE SMITH: If he answers both questions, will  
13          you be satisfied then?

14          MR. COPELAND: I would still like to have a  
15          clarification of what she is asking about in regards to  
16          the fatigue rate.

17          JUDGE SMITH: Well, do you understand the  
18          significance of the question, Mr. Carlson?

19          (WITNESS CARLSON): I am not sure. Could --

20          JUDGE SMITH: That would be controlling.

21          (WITNESS CARLSON): I would like to have it  
22          repeated, please.

23          BY MS. CHAVEZ:

24          Q       Well, there were a series of questions, Mr. Carlson.

25          A       (WITNESS CARLSON) Yes.

1 Q With respect to the first question I asked: As a result  
2 of these tests, did Westinghouse make other  
3 recommendations to the utilities to minimize the fatigue  
4 rates of steam generator internals and piping due to water  
5 hammer pressure pulses and related fatigue?

6 JUDGE COLE: Which tests are you talking about,  
7 Ma'am?

8 MS. CHAVEZ: These tests that Westinghouse  
9 conducted in 1977, in 1978.

10 MR. COPELAND: Your Honor, I guess what I am  
11 objecting to is the premise of the question is the  
12 recommendations for the reduction of fatigue; and the  
13 recommendations were, as Mr. Carlson stated, for the  
14 purposes of reducing the occurrence of a water hammer.

15 There is nothing in the water -- there is nothing,  
16 in the tests that she is referring to, in the record yet  
17 about this fatigue recommendation from Westinghouse.

18 MS. CHAVEZ: Your Honor, I refer the Board to  
19 the document that I passed out, upon which I indicated I  
20 might base cross examination questions.

21 This document is entitled, "Commonwealth Edison  
22 Company, Byron and Braidwood stations, Units 1 and 2,  
23 preliminary steam generator water hammer criteria." It is  
24 dated August 13, 1980.

25 MR. COPELAND: Can we have a moment, your Honor?

1 I am not familiar with this document that she is  
2 looking at.

3 JUDGE SMITH: Yes.

4 MR. COPELAND: Your Honor, I am afraid I have  
5 not seen this document or had a chance to study it and I  
6 am not sure the witness has, either.

7 If I may ask the witness?

8 JUDGE SMITH: Well, it depends upon whether Ms.  
9 Chavez wants the witness at this time to familiarize  
10 himself with it.

11 MS. CHAVEZ: Your Honor --

12 JUDGE SMITH: If we really understood, if it is  
13 not destructive to your strategy, if we really understood  
14 where you are going and what you are trying to prove, it  
15 might be helpful to the witness. I know that it would be  
16 helpful to the Board.

17 MR. COPELAND: Well, if she is going to be  
18 asking questions from this document, I want the witness to  
19 have a chance to look it over.

20 JUDGE SMITH: You may or may not have that  
21 option depending on what she establishes. I suspect that  
22 you will, but maybe she wants to test his knowledge of the  
23 document before he sees it. I don't know if that is her  
24 objective but I agree that if that is not her objective  
25 and she wants him to testify concerning the substance of

1           that document, he better have access to it.

2           MS. CHAVEZ: Your Honor, I had several questions  
3 directed to the witness about the recommendations that  
4 Westinghouse made and they were general questions.

5           This document happens to be a reference for those  
6 questions.

7           I have no objection to the witness or counsel seeing  
8 the document and reviewing it prior to those questions,  
9 but I don't feel that it's absolutely necessary unless he  
10 wishes to do so.

11          JUDGE SMITH: Well, that, I think, will be  
12 between counsel and his witness.

13          MR. GOLDBERG: Judge, can I make an objection  
14 here?

15          JUDGE SMITH: Mr. Goldberg.

16          MR. GOLDBERG: The contention is directed at a  
17 1981 event at KRSKO and its implications at Byron.

18          I am not sure what relevance a 1980 Commonwealth  
19 document has to the contention at issue, as many of Ms.  
20 Chavez' questions have involved --

21          JUDGE SMITH: Simply because of the timing of  
22 the --

23          MR. GOLDBERG: I think that the timing can be  
24 central, yes. We are talking about post-KRSKO measures  
25 taken by Commonwealth Edison at Byron. I am not sure that



1 we may not be going beyond the scope of the contention by  
2 talking about events that predate the incident.

3 JUDGE SMITH: Well, if they relate to the same  
4 type of phenomenon or physical laws and they are relevant  
5 in that respect, the timing of it, I don't believe, would  
6 be controlling.

7 MR. GOLDBERG: But we have evidence suggesting  
8 that KRSKO is the first such event in a steam generator of  
9 this type.

10 JUDGE SMITH: What is your alternate? On this  
11 phase of your cross examination, what is your alternate  
12 objective? You don't have to tell us, if you think it's  
13 going to interfere with your tactics; but, usually, I  
14 think everybody would better help you if we knew exactly  
15 what you are trying to prove.

16 MS. CHAVEZ: Your Honor, the KRSKO water hammer  
17 event occurred in the bypass line of the KRSKO plant.

18 My line of questioning concerns the origination in  
19 the development of that bypass line and the concerns that  
20 Westinghouse expressed about the possibility of water  
21 hammer occurring in both the preheater and, you know,  
22 whether or not they fully investigated the potential of  
23 these events occurring in the bypass line and I think in  
24 the end my questioning will be relevant.

25 MR. COPELAND: I would object to this line of



1       questioning. I think it's distracting away from the issue  
2       which is raised by the contention. It seems to me the  
3       Intervenors just want to bring out the history of the  
4       development of this bypass system and it's serving no  
5       useful purpose for understanding of it now occurring at  
6       Byron.

7               JUDGE SMITH: What part of this reference  
8       document would you be examining on? Could you point to us  
9       something in the reference document which you believe is  
10      relevant to the contention?

11             MS. CHAVEZ: Your Honor, I would like to read a  
12      paragraph from this document. "Pressure oscillations  
13      exist continuously over the life of the plant."

14             JUDGE COLE: What page is that?

15             MS. CHAVEZ: This is Page 3, the last paragraph.

16             "Pressure oscillations exist continuously over the  
17      life of the plant and can significantly affect the fatigue  
18      usage factors of steam generators. Analysis are being  
19      performed to define the allowable frequency content of  
20      balance of plant generated continuous pressure pulsations  
21      in the feedwater piping of the feedwater inlet nozzle of  
22      the steam generator."

23             Your Honor, at the time this document was written,  
24      Westinghouse's concern was directed solely toward the  
25      possibility of water hammer occurring in the preheater and

1 the adjacent feedwater line.

2 Since the occurrence of the KRSKO plant my question  
3 to the witness is essentially: Are these same concerns  
4 relevant to the KRSKO event and any future events where  
5 there is the possibility of water hammer occurring in the  
6 feedwater line -- I mean the auxiliary feedwater bypass  
7 system.

8 JUDGE SMITH: Can you answer that question?

9 A (WITNESS CARLSON) Well, the reference that Ms. Chavez  
10 just read has nothing to do with bubble collapse water  
11 hammer.

12 That reference to continuous pressure oscillations  
13 refers to pressure pulses introduced into the feedwater  
14 system by, for example, the main feedwater pumps, that  
15 might travel down the feedwater line and enter the  
16 preheater region.

17 That is more in the class of acoustic water hammer  
18 or classical water hammer. There is no bubble collapse  
19 phenomenon involved there.

20 JUDGE SMITH: All right. Then what you are  
21 saying is the basis for her question, her concern, is  
22 inaccurate.

23 Then can you address your question directly?

24 MR. COPELAND: I object, your Honor, to having  
25 him have to answer that question directly. I think you

1 have just stated that the -- the witness has just stated  
2 that it concerns an acoustic water hammer and is not  
3 relevant to this -- and, therefore, it is not relevant to  
4 this contention. --

5 I would object to the question and I would ask for a  
6 ruling on this.

7 JUDGE SMITH: He wants a ruling, so let's go  
8 back to the question.

9 MS. CHAVEZ: Okay.

10 JUDGE SMITH: Let's let the reporter read the  
11 question back, the last question.

12 Well, let's deem the question the explanation -- the  
13 explanation to the Board as to where she is going and then  
14 I think I interposed the question.

15 (The question was thereupon read by the  
16 Reporter.)

17 JUDGE SMITH: That's a fair question, and the  
18 problem is he quite courteously gave an explanation but he  
19 didn't give a direct answer to the question. I think that  
20 is what Ms. Chavez wants.

21 Is your objection still unsatisfied?

22 MR. COPELAND: I am not sure I understand the  
23 relevance of this, of reading from this document then,  
24 your Honor.

25 JUDGE SMITH: Well, we have already been through

1           that. We understand.

2           Now, she was motivated to ask the question on a  
3           misapprehension of what the document or what the witness  
4           says is a misunderstanding of what the document implies,  
5           that it was a bubble collapse water hammer.

6           But to this moment she still has not really received  
7           a direct response to the question.

8           He disagrees with the unstated premise of the  
9           question, the basis for the question. He disagrees that  
10          she had any basis to ask the question from the bottom of  
11          Page 3, because that related to classical water hammer,  
12          but, nevertheless, the question remains unanswered.

13          MR. COPELAND: I will await your ruling, your  
14          Honor.

15          JUDGE SMITH: Overruled. Well, do you persist  
16          in the objection after this discussion? If so, I need  
17          some more explanation. If there is an objection before me  
18          that you still think is valid after this discussion, then  
19          I need more explanation.

20          MR. COPELAND: I will withdraw my objection.

21          A       (WITNESS CARLSON) Is it important that I know where this --  
22          what this document is that Ms. Chavez is reading from.

23          JUDGE SMITH: I don't think so. I think that --  
24          unless you need more information.

25          If you don't understand the question, well, all

1 right, then, that can't be helped. She will have to  
2 explain it again.

3 A (WITNESS CARLSON) I am sorry, but would you repeat the  
4 final question one more time?

5 MS. CHAVEZ: Okay. Could I have the reporter  
6 read the question?

7 (The question was thereupon read by the  
8 Reporter.)

9 JUDGE SMITH: The question to be answered begins  
10 with the word, "since."

11 A (WITNESS CARLSON) Your Honor, it's such a complicated  
12 question, even in a simplified form, that I am really  
13 having trouble.

14 JUDGE SMITH: Since the KRSKO event and because  
15 of the KRSKO event, is Westinghouse concerned about a  
16 bubble collapse water hammer phenomenon in the auxiliary  
17 feedwater line?

18 A (WITNESS CARLSON) Yes.

19 JUDGE SMITH: Is that what you intended by your  
20 question?

21 MS. CHAVEZ: Can I expand on that a little?

22 JUDGE SMITH: Well, answer me.

23 Was that the major direction of your question?

24 MS. CHAVEZ: No, no.

25 JUDGE SMITH: It was not, okay. Then so far

1 none of the principals understand it.

2 BY MS. CHAVEZ:

3 Q Okay. Mr. Carlson, all the things that Westinghouse  
4 investigated in your 1977 test program, are any of those  
5 things relevant to the KRSKO event or what might happen in  
6 a case of water hammer occurring in a bypass feedwater  
7 line?

8 MR. COPELAND: I object to the question. It's  
9 compound, it's vague and that it refers to things.

10 JUDGE SMITH: I think the complication is that  
11 you are using too many compound questions.

12 On the other hand, at this point you have been  
13 frustrated in getting anybody to understand what the  
14 purpose of your question is.

15 Just what is it you are trying to prove through this  
16 direct examination? What do you think is the case? What  
17 are you afraid may be the case? Just say who that is and  
18 maybe we can help you more.

19 MS. CHAVEZ: I am concerned that the problems  
20 that were investigated by Westinghouse relating to bubble  
21 collapse water hammer occurring in the preheater area may  
22 also pertain to bubble collapse water hammer occurring in  
23 the feedwater line to the bypass system.

24 JUDGE SMITH: Okay. Now, can't you ask that  
25 question? Does that --

1 MS. CHAVEZ: I --

2 JUDGE SMITH: I thought you asked a question  
3 very close to that once before.

4 MS. CHAVEZ: Yes, I did; yes, I did.

5 JUDGE SMITH: How does that differ from the  
6 question that I postulated, in that you just described the  
7 KRSKO event and then I asked if it raised concerns about  
8 bubble collapse water hammer in the auxiliary feed line?

9 MS. CHAVEZ: Well, your Honor, I think your  
10 question asked whether or not they were -- whether or not,  
11 since KRSKO, Westinghouse is concerned with bubble  
12 collapse water hammer occurring in the feedwater lines of  
13 the bypass system; and my question is whether or not  
14 Westinghouse is concerned about any of the things they  
15 were concerned earlier with occurring in the preheater  
16 section of the steam generator also occurring now in the  
17 bypass lines.

18 JUDGE SMITH: Is the question technically a  
19 reasonable question?

20 A (WITNESS CARLSON) Yes, I think so.

21 JUDGE SMITH: Can you answer it?

22 A (WITNESS CARLSON) The bubble-collapse phenomenon has the  
23 common elements regardless of where it occurs with an  
24 enclosed, confined volume of steam being rapidly condensed  
25 when cold water is brought into contact with it.



1           That definition applies to the preheater region as  
2 well as to the KRSKO water hammer in the bypass line.

3           I should add that the phenomenon is dependent on the  
4 geometries involved. Obviously, the geometry of the  
5 simulated preheater to bundle at baffle plates is greatly  
6 different than a pipe.

7 BY MS. CHAVEZ:

8 Q       Mr. Carlson, with bubble collapse water hammer occurring  
9 in the preheat section of a steam generator, there are  
10 fatigue factors associated with that, are there not?

11 A       (WITNESS CARLSON) For the normal upset class of events,  
12 yes.

13 Q       So, therefore, if water hammer -- a bubble collapse water  
14 hammer also occurs in a piping section such as a bypass  
15 line, there would be fatigue factors associated with that  
16 occurrence, also, would there not?

17 A       (WITNESS CARLSON) I don't -- I am not sure that they are  
18 the same.

19           The -- if I can go back one step here, the test  
20 program involving the high-pressure test and the  
21 one-eighth scale model looked at two categories of events.  
22 One was the normal upset-type event, "normal" meaning  
23 events that would occur or could occur during normal  
24 operation, "upset" corresponding to a faulted event, such  
25 as a main feed line break.



1           The fatigue issue that you raise has to do with the  
2           number of times that a normal fatigue or fatigue-type  
3           event is expected to occur over the life of the plant.

4           I have not -- and that, if I can go one step  
5           further, that is the -- where the number ten comes in  
6           that, I believe, has been mentioned.

7           I don't see any comparable situation involving the  
8           bypass line. The number ten has to do with the control  
9           system of the feedwater bypass system.

10       Q     Mr. Carlson, the only reason the number ten exists is  
11           because Westinghouse, as a result of the tests that they  
12           conducted in 1977 and 1978, felt that it was necessary to  
13           make a recommendation to utilities that that number not be  
14           exceeded in the number of bubble collapse water hammer  
15           occurrences that the preheater and associated piping would  
16           experience over the lifetime of the plant.

17           MR. COPELAND: Objection, your Honor. Is this a  
18           question?

19           MS. CHAVEZ: My question comes after.

20           MR. COPELAND: Well, could she ask questions and  
21           save her argument until later?

22           JUDGE COLE: Were you going to add: Is that  
23           true?

24           MS. CHAVEZ: That is right.

25           Is that true?

1 A (WITNESS CARLSON) As I just indicated, the number ten --

2 MS. CHAVEZ: Your Honor, could I get an  
3 instruction from the Board to have the witness respond  
4 either yes or no?

5 JUDGE SMITH: What was his response?

6 MR. COPELAND: I am going to object to this,  
7 your Honor. She is asking the witness to say yes or no  
8 and we haven't even had the question out yet, a question  
9 that is understandable and deserves a yes or no answer.

10 JUDGE SMITH: He didn't have the answer out.  
11 The question was completed.

12 MR. COPELAND: Well, okay.

13 JUDGE SMITH: But I did not hear the answer, to  
14 which --

15 MR. GALLO: He was interrupted.

16 JUDGE SMITH: What you were telling me is he  
17 hasn't completed his question yet -- his answer yet.

18 MR. COPELAND: What I am objecting to is, first  
19 of all, he was not given a chance to finish his answer;  
20 and now the representative of the Intervenors wishes to  
21 instruct him to -- wishes to have his explanation cut off.

22 JUDGE SMITH: No, no. She wants the answer.  
23 She didn't recognize that the answer was forthcoming and  
24 you are now pointing out.

25 So proceed with your answer.

1 A (WITNESS CARLSON) May I have the question again, please.

2 MS. CHAVEZ: Would the reporter read the  
3 question, please?

4 (The question was thereupon read by the  
5 Reporter.)

6 A (WITNESS CARLSON) The number ten did not come directly  
7 from the test results. The number ten came from the  
8 expected operation of the feedwater bypass system which  
9 was developed as a result of the test data.

10 A probability evaluation was performed by  
11 Westinghouse to determine how many times over the 40-year  
12 life of the plant, the upset-type -- normal upset-type --  
13 bubble collapse event could occur.

14 It would only occur if the feedwater bypass system  
15 did not operate as intended.

16 The basic idea of the bypass system is whenever the  
17 feedwater is cold, to not introduce it in through the main  
18 nozzle into the preheater but rather through the auxiliary  
19 nozzle in the upper part of the shell.

20 The control logic which directs the flow to either  
21 one of those two nozzles is control grade logic. It's not  
22 protection grade logic, so to allow for that fact, as I  
23 believe I indicated a minute ago, a probability evaluation  
24 was conducted for all the preheat type steam generator  
25 plants evaluating the bypass system as they implemented

1 it.

2 In the case of Byron the expected number of failures  
3 of the bypass system was four. However, to be  
4 conservative and to allow using the same value for all  
5 plants, the number ten was selected.

6 Now, I would like to go one step further. I said  
7 that for the Byron plant, based on our probability  
8 evaluations the bypass system could fail four times,  
9 meaning that the cold water being injected, for example,  
10 through the upper nozzle, was inadvertently injected  
11 through the main nozzle into the preheater; but that  
12 doesn't necessarily mean there is going to be a bubble  
13 collapse water hammer. It just means that there could  
14 possibly be a bubble collapse water hammer in the  
15 preheater.

16 BY MS. CHAVEZ:

17 Q Mr. Carlson, I would like to read to you from the last  
18 paragraph of Page 1 of the document entitled, "Steam  
19 Generator, Water" -- "Feedwater System Interface Design  
20 Criteria."

21 MR. COPELAND: Your Honor, I will again restate  
22 my objection. We have not been given notice that this  
23 document would be used. The witness does not have a copy  
24 of it and I believe she stated that she gave a copy to  
25 each member of the Board However, she never informed us

1 that she would be using it, let alone gave us a copy of  
2 it.

3 If she is going to be asking questions of the  
4 witness from this document, I insist that he be given a  
5 copy and given a chance to review it.

6 MS. CHAVEZ: Your Honor, the few lines that I am  
7 going to read is in direct response to the witness'  
8 question and it is to clarify to him something that he has  
9 just said and it is not to base -- it is not designed to  
10 be used for an extended period of time on questioning.

11 JUDGE SMITH: Of course, your point is correct,  
12 that if she is going to have a pervasive cross examination  
13 of the witness from a document, you should have a chance  
14 to familiarize himself with it, so that it is  
15 characterized correctly and he has it in context.

16 Why don't we let her read the part, and if it is  
17 necessary for him to read the document, then we will  
18 provide for that opportunity.

19 MR. COPELAND: Your Honor, I believe she is  
20 trying to impeach the witness and I believe all rules of  
21 evidence, if the witness is going to be impeached by a  
22 document, he should be given -- he is entitled to have a  
23 chance to read the document. --

24 I will stick with my objection.

25 JUDGE SMITH: It's going to be a very, very long

1 hearing, Mr. Copeland, a very long hearing; but we will  
2 permit him to read it, because -- not because of the  
3 correctness of your position but because of persistence of  
4 it.

5 MR. COPELAND: Well --

6 JUDGE SMITH: Let's let him read it.

7 MS. CHAVEZ: Okay. Your Honor, the lines I am  
8 going to read are on the bottom of Page 1 of the document  
9 and they read as follows.

10 JUDGE SMITH: Wait a minute. Are we satisfied  
11 with his opportunity to read it?

12 MR. COPELAND: I would ask the witness that,  
13 your Honor.

14 JUDGE SMITH: All right.

15 A (WITNESS CARLSON) Your Honor, Ms. Chavez indicated the  
16 sentence or two she was going to read to me.

17 JUDGE SMITH: Well, we have arrived no place.  
18 We are no farther ahead than we were when you first made  
19 your objection.

20 A (WITNESS CARLSON) Well, could I say one point further? I  
21 do recognize the document that she is reading from.

22 JUDGE SMITH: Of course, you don't know what the  
23 question is yet. So I don't know. It's up to you,  
24 counselor.

25 MR. COPELAND: I will ask let her ask the

1 question. I will withdraw my objection.

2 BY MS. CHAVEZ:

3 Q Okay. "The utility should verify that the combined number  
4 of events which could result in water hammers during  
5 normal and upset conditions transients will be limited to  
6 a maximum of ten during the design life of the plants."

7 Mr. Carlson, would this concern also relate to the  
8 possibility of water hammer occurring in the bypass  
9 feedwater line?

10 A (WITNESS CARLSON) No. This applies specifically to  
11 bubble collapse water hammer in the preheater and the  
12 operation of the feedwater bypass system to prevent bubble  
13 collapse water hammer events.

14 Q Do you feel that -- do you feel that it would also be a  
15 concern which should be taken into consideration in the  
16 design of the feedwater bypass line?

17 A (WITNESS CARLSON) As I indicated before, this number ten  
18 or number four is a parameter related to the operation of  
19 the bypass system.

20 I don't see a connection between it and the  
21 KRSKO-type water hammer event.

22 MS. CHAVEZ: Can I instruct the Board -- I mean  
23 can I request the Board to instruct the witness to respond  
24 yes or no to the question?

25 JUDGE SMITH: Can you? In addition to your



1 explanation, can you provide a yes or no answer to the  
2 question?

3 A (WITNESS CARLSON) Would you mind stating it once again,  
4 please?

5 JUDGE SMITH: Let's have the reporter read it  
6 back.

7 (The question was thereupon read by the  
8 Reporter.)

9 JUDGE SMITH: Do you understand what the concern  
10 referred to is: The concern which the event should be  
11 limited to ten, as I understand it.

12 A (WITNESS CARLSON) No.

13 BY MS. CHAVEZ:

14 Q Mr. Carlson, is that because of the fact that the word is  
15 number ten?

16 A (WITNESS CARLSON) I am assuming that when you indicate  
17 that the number wouldn't have to be exactly ten, that you  
18 are still referring to where the ten comes from; and if  
19 that's the case, it does not apply to the KRSKO-type water  
20 hammer in the bypass line.

21 Q Mr. Carlson, did Westinghouse's concern about water hammer  
22 in the preheat section of the steam generators -- was that --  
23 was that as a result of their concern that it would --  
24 more water hammers would result in more usage of the  
25 fatigue margin of the steam generator preheat section?



1 MR. COPELAND: Your Honor, I am going to restate  
2 the relevance objection at this point.

3 We have been dwelling on the preheater section here  
4 for quite a long time and I don't think she has tied it up  
5 with the KRSKO water hammer event.

6 MS. CHAVEZ: Okay.

7 MR. COPELAND: The witness has stated that the  
8 fatigue study had no relevance to the concerns about a  
9 KRSKO water hammer event.

10 MS. CHAVEZ: Your Honor, then it's just that  
11 point which I have been trying to establish, whether or  
12 not water hammer in the bypass feed line would result in a  
13 fatigue usage, just as it does in the preheater.

14 JUDGE SMITH: Is that your question now? You  
15 withdraw the earlier question and ask this one?

16 MS. CHAVEZ: Yes, yes.

17 JUDGE SMITH: Objection?

18 MR. COPELAND: I am sorry. Could I have it  
19 restated, read back to me, please.

20 (The question was thereupon read by the  
21 Reporter.)

22 MR. COPELAND: I believe the question has been  
23 asked and answered.

24 JUDGE SMITH: Answer it, anyway.

25 A (WITNESS CARLSON) The fatigue issue is more significant

1 in terms of the preheater because of the rather  
2 complicated preheater structure, the combination of tubes  
3 and baffle plates and partition plate.

4 I don't believe that fatigue is a concern with  
5 respect to the bypass piping such as -- in which the KRSKO  
6 event occurred.

7 JUDGE SMITH: As a result of the KRSKO event?

8 A (WITNESS CARLSON) Yes.

9 JUDGE SMITH: Or is that a limitation to your  
10 answer?

11 A (WITNESS CARLSON) The KRSKO event --

12 JUDGE SMITH: Well, I am not asking for more  
13 explanation. I am just wondering. You say fatigue is not  
14 a problem or fatigue as a consequence of bubble collapse  
15 water hammer?

16 A (WITNESS CARLSON) As a consequence of bubble collapse  
17 water hammer.

18 JUDGE COLE: In the piping?

19 A (WITNESS CARLSON) In the piping, yes.

20 JUDGE COLE: Okay. Thank you.

21 BY MS. CHAVEZ:

22 Q Can you describe the water hammer event that occurred at  
23 the KRSKO plant?

24 A (WITNESS CARLSON) As has been stated previously at this  
25 hearing, the KRSKO bubble collapse event is believed to

1 have occurred during hot functional testing, which took  
2 place in July of 1981.

3 The fact that an event had occurred was not  
4 discovered until early in August of 1981, as a result of a  
5 routine inspection of piping.

6 As a consequence, it's not possible to specify  
7 exactly what the conditions were when the bubble collapse  
8 event occurred.

9 Because of the nature of the testing and the damage  
10 that was observed, we have reconstructed, as best we can,  
11 how we believe it happened.

12 Q So is it correct to state that the magnitude of the event  
13 is not known?

14 A (WITNESS CARLSON) That is true.

15 Q Isn't it correct, also, to state that the amounts of steam  
16 and water interaction are not known?

17 A (WITNESS CARLSON) One of the observations made during the  
18 investigation, once the damage was discovered, was to try  
19 to reconstruct the conditions which may have existed.

20 One bit of evidence was the fact that the paint on  
21 the auxiliary feedwater system piping at the pump -- the  
22 auxiliary feedwater pump discharge area was blistered.

23 This indicated that steam or hot water at some point  
24 in time had leaked back through the bypass piping and into  
25 the auxiliary feedwater system and then up to the vicinity

1 of the auxiliary feedwater pumps.

2 We also understand that during this -- during the  
3 time -- during the hot functional testing, that the  
4 auxiliary feedwater pumps themselves were being tested, in  
5 which case cold water would have been introduced into the  
6 auxiliary feedwater system piping and then following that  
7 into the bypass piping.

8 So that much indicates that there was the potential  
9 of steam in the bypass piping and also the introduction of  
10 cold water into that steam, which are the two elements  
11 needed.

12 It was also noted after the fact that an impact  
13 noise was heard during this auxiliary feedwater pump  
14 testing, which is another bit of evidence indicating a  
15 bubble collapse water hammer.

16 Then, finally, from the nature of the damage to the  
17 bypass piping, including a bulged region, the combination  
18 of all of those things led us to the conclusion that a  
19 bubble collapse water event had occurred.

20 Q Is it possible to determine the amount of cold water that  
21 was sent through the bypass system as a result of the pump  
22 operation?

23 A (WITNESS CARLSON) Well, again, that's difficult, because,  
24 as I indicated before, the auxiliary feedwater pumps were  
25 being tested. They were being started and stopped during

1           this time.

2           I think it would be very difficult to assign a  
3           particular flow rate to the time when the bubble collapse  
4           event occurred.

5       Q     Can you assign a particular volume to the amount of water?

6       A     (WITNESS CARLSON) Well, of course, the auxiliary  
7           feedwater system and the bypass system have definite  
8           volumes, so we would know how much volume it would take to  
9           fill them up; but I don't see how we could assign a volume  
10          to what was introduced at the time the event occurred --  
11          up to the time the event occurred.

12      Q     Is it known specifically where the water hammer event  
13          occurred?

14      A     (WITNESS CARLSON) Judging from the damage to the pipe  
15          hangers, the location of the bulge, the water hammer  
16          appears to have occurred in the horizontal leg of piping,  
17          approximately 20 feet below the auxiliary nozzle.

18           On that point, if I --

19      Q     Yes. Is this indicated in Figure 3 of your testimony?

20      A     (WITNESS CARLSON) Yes. As indicated in the testimony,  
21          the numbers in the oval rings represent hanger numbers,  
22          pipe hanger numbers that were affected by the water hammer  
23          event.

24      Q     Is it possible to determine how much steam was present in  
25          the line prior to the water hammer?

1 A No, it's not. The only evidence that we have that --  
2 well, we know, of course, that steam was present; but with  
3 regard to how much, the only evidence we have is that the  
4 paint on the discharge piping of the auxiliary pumps was  
5 blistered, which is significantly upstream of the piping  
6 that is on this sketch, that is outside of containment.

7 Q Has the KRSKO water hammer event been determined to have  
8 been a severe one?

9 A (WITNESS CARLSON) The function -- in response to that  
10 question, I would answer in terms of the consequences.

11 The bypass piping where the water hammer event  
12 occurred was not ruptured. The function of the auxiliary  
13 feedwater system was not impaired as a result of this  
14 event.

15 Does that answer your question?

16 Q No. Could you give me a direct yes or no answer to my  
17 question?

18 A (WITNESS CARLSON) Would you restate how you phrased it,  
19 please?

20 MS. CHAVEZ: Can the reporter read back my  
21 question?

22 JUDGE SMITH: Is it necessary?

23 MS. CHAVEZ: No.

24 JUDGE SMITH: Well, you got an answer. You  
25 remember what the question was.

1 Do you regard the events as being severe?

2 BY MS. CHAVEZ:

3 Q Is the KRSKO water hammer event classed as a severe water  
4 hammer occurrence?

5 A (WITNESS CARLSON) Well, that is a relative term. I don't  
6 know how to respond that.

7 I am saying that as a consequence of the event, the  
8 pipe was not ruptured, the operation of the auxiliary  
9 feedwater system was not impaired.

10 I would say from that point of view it was not  
11 severe.

12 BY MS. CHAVEZ:

13 Q Let me ask the question again.

14 As far as bubble collapse water hammer events go in  
15 types pipes of the same diameter as the pipe section in  
16 the KRSKO plants, was the KRSKO water hammer event a  
17 severe one?

18 MR. COPELAND: Objection. Asked and answered.

19 MS. CHAVEZ: It's not been.

20 MR. COPELAND: He just stated it was not a  
21 severe event.

22 JUDGE SMITH: That question wasn't asked and  
23 answered. I don't know if it's any better a question, but  
24 that particular question was not asked and answered.

25 MR. COPELAND: Well, she started out the



1 sentence by saying she is going to repeat the question.

2 JUDGE SMITH: Well, she didn't.

3 With that --

4 MR. COPELAND: I would like to -- at this point  
5 I would like to interject another objection, that the term  
6 "severe" is vague and I believe that's why the witness is  
7 having difficulty with that. If she could state by which  
8 standard it should be classified, perhaps that would help  
9 the witness.

10 MS. CHAVEZ: Okay.

11 JUDGE SMITH: That's your entire difficulty. If  
12 he had answered the question the first time off in a  
13 simple no or a yes, then you would be stuck with almost  
14 useless information, but he has made a severe effort to  
15 try to give relative answers and parameters to his answer  
16 and that seems to annoy you, too.

17 MS. CHAVEZ: Well --

18 JUDGE SMITH: You can't have it both ways.

19 MS. CHAVEZ: Well, my question is: As far as  
20 water hammer events of the KRSKO nature go, was the KRSKO  
21 plant water hammer event severe?

22 MR. GOLDBERG: Judge, I object. I am not sure  
23 there was another KRSKO event. It's the only KRSKO event  
24 there has been.

25 JUDGE SMITH: Well, in any event, counselor is



1 right. Severe is a relative term. The answer is going to  
2 necessarily -- if you don't define the reference, then  
3 necessarily the witness will have to define it any way he  
4 wants to or any way that he wants to describe.

5 This last time you talk about the effects upon the  
6 piping.

7 Is that what you are asking him? With respect to  
8 the effects upon the piping -- what do you call that, the  
9 aneurysm?

10 A (WITNESS CARLSON) The hangers.

11 JUDGE SMITH: The hangers. If you could limit  
12 your statement to the effects upon the hangers. I thought  
13 it was the piping, too.

14 MS. CHAVEZ: It is the piping, too.

15 JUDGE SMITH: The piping and the hangers, if you  
16 could say within your view of whatever you regard as  
17 severe, and limiting your answer to the effects upon the  
18 piping and the hangers, do you regard it as severe?

19 If you can answer. If you can't, if you don't have  
20 any reference point, then that's another thing. If you  
21 can't answer it, you can't.

22 A (WITNESS CARLSON) I would answer that once the damage was  
23 discovered, that the hangers were repaired and the pipe  
24 section with the bulge was replaced.

25 So it was considered enough to take some action.

1  
2 JUDGE SMITH: I don't see how he could give you  
3 any better information than that.

4 MS. CHAVEZ: Okay.

5 JUDGE SMITH: I just don't think, by use of the  
6 word "severe," without your own better reference point,  
7 that you can fairly expect this witness to come up with  
8 one for you.

9 BY MS. CHAVEZ:

10 Q Why was the KRSKO water hammer event not discovered until  
11 a month or so after it was believed to have occurred?

12 A (WITNESS CARLSON) Because there was no evidence that it  
13 had occurred available to the operators or other people  
14 associated with the plant.

15 Q Was the hammer noise then disregarded by the operators?

16 A I am afraid I don't know how the operators interpreted  
17 that hammer noise.

18 Q What were the conditions in testing during the most likely  
19 time that the water hammer occurred?

20 MR. COPELAND: Objection. Asked and answered,  
21 your Honor.

22 I believe the witness has stated to the best of his  
23 ability.

24 JUDGE COLE: I believe that's also stated in his  
25 testimony, Ms. Chavez.

1 JUDGE SMITH: Objection sustained.

2 BY MS. CHAVEZ:

3 Q Can you tell me if you are aware of any problem with the  
4 functioning of the valves utilized for the switching flow  
5 in the main feedwater line to the auxiliary feedwater  
6 line?

7 A (WITNESS CARLSON) I am not aware of any problems.

8 Q Can you tell me what was the significance of the damage or  
9 the back leakage that occurred through the check valves at  
10 the KRSKO plant?

11 A (WITNESS CARLSON) Well, the damage we have talked about  
12 before, the damage consisted of damage to the pipe hangers  
13 and the bulge in the piping itself.

14 Q Can you tell me the significance of the damage to the  
15 check valves?

16 A (WITNESS CARLSON) I am not aware of -- let me -- which  
17 check valves are you referring to?

18 Q The check valves which malfunctioned and permitted back  
19 leakage.

20 MR. COPELAND: Objection, your Honor.

21 There has been no statement that there has been any  
22 damage to the check valves as a result of --

23 JUDGE SMITH: I don't recall any such testimony.

24 Has there been? Was there?

25 A (WITNESS CARLSON) After the tests, the check valves were

1 examined and it was determined that the valve seats were  
2 scratched, I believe, and dented, perhaps, but there was  
3 no damage that I am aware of that resulted from the bubble  
4 collapse event.

5 BY MS. CHAVEZ:

6 Q Well, can you tell me the extent of back leakage through  
7 those check valves?

8 MR. COPELAND: Objection, your Honor.

9 This has been asked and answered already, I believe --

10 MS. CHAVEZ: Okay.

11 MR. COPELAND: -- during the course of the  
12 explanation of the event.

13 BY MS. CHAVEZ:

14 Q Can you tell me --

15 JUDGE SMITH: Wait a minute.

16 Please answer that one, the extent of the back  
17 leakage through the check valve.

18 A (WITNESS CARLSON) The indication of the extent of the  
19 back leakage is the evidence of blistered paint on the  
20 auxiliary feedwater pump discharge piping.

21 This is in the area of at least one of those check  
22 valves.

23 BOARD EXAMINATION

24 BY JUDGE COLE:

25 Q That means to you, sir, that the check valves must have

1           been leaking before steam got in the line or before the  
2           water hammer event?

3       A     (WITNESS CARLSON) Well, I would suggest that the steam  
4           entered the bypass line and the auxiliary feedwater system  
5           as a result of the fact that two check valves were  
6           leaking.

7                 If those valves -- if either one -- well, I will  
8           just leave it as that.

9                 If there were no back leakage through the check  
10          valves, there would be no steam in the line.

11       Q     So the leaking in the valves was not as a result of some  
12           water hammer event which might have damaged the seals; the  
13           leakage might have been afterwards, but it was also before  
14           the water hammer event based upon the evidence?

15       A     (WITNESS CARLSON) That's true.

16                     JUDGE COLE: Okay. Thank you.

17       BY MS. CHAVEZ:

18       Q     Did the steam travel through the main feedwater line at  
19           all?

20       A     (WITNESS CARLSON) The KRSKO steam generator is a  
21           preheat-heat steam generator, just as the Byron steam  
22           generator is.

23                 The main feedwater nozzle is located in the lower  
24           part of the test vessel -- pardon me -- the steam  
25           generator vessel and it's well below the water level.

1                   So I don't see how steam could move back in the main  
2                   feedwater line.

3       Q       So I take it your response is no?

4       A       (WITNESS CARLSON)   Yes.

5       Q       What is the estimated time it took for the steam to travel  
6                   the length of the bypass line and the auxiliary line?

7       A       (WITNESS CARLSON)   We don't have good data on which to  
8                   base an answer to that question.

9                   The information that we have from the plant site  
10                  indicates that the pumps were stopped and started during  
11                  this testing and that, at least in some of the testing,  
12                  that interval between stopping and starting was on the  
13                  order of 30 minutes.

14                 So one possibility would be that during that  
15                 30-minute interval steam leaked back through those check  
16                 valves.

17                 MR. COPELAND:   Your Honor, could we have a  
18                 recess at this time?

19                 I believe the witness has been on for almost two  
20                 hours.

21                 JUDGE SMITH:   Do you want a recess, Mr. Carlson?

22                 (WITNESS CARLSON):   I would appreciate a few  
23                 minutes, yes.

24                 JUDGE SMITH:   All right.   We will take five  
25                 minutes.   That will be sufficient.

1 (Recess.)

2 JUDGE SMITH: Is everyone ready?

3 (No response.)

4 JUDGE SMITH: Ms. Chavez.

5 BY MS. CHAVEZ:

6 Q Mr. Carlson, is the Figure 2 in your testimony a fair  
7 representation of the KRSKO water -- KRSKO feedwater  
8 system?

9 A (WITNESS CARLSON) That figure does present the basics of  
10 the feedwater bypass system as they exist at KRSKO.

11 Q Okay. Is it also a fair representation of the feedwater  
12 system at Byron?

13 A (WITNESS CARLSON) Yes, it is.

14 Q Do you know whether or not the KRSKO plant will implement  
15 modifications which will extensively alter the feedwater  
16 system as it is shown here --

17 JUDGE SMITH: With respect to --

18 BY MS. CHAVEZ:

19 Q -- with respect to proposals to resolve flow-induced  
20 vibrations?

21 MR. COPELAND: Objection, your Honor.

22 It's irrelevant to the contention.

23 She is now getting into a matter which is the  
24 subject of a later contention that will be brought up in  
25 this hearing.



1 MS. CHAVEZ: Your Honor, I am just trying to  
2 establish that some time in the future KRSKO plant may  
3 have its feedwater system extensively modified, for one  
4 reason or another, and so it may not be represented  
5 accurately here in the future.

6 MR. COPELAND: I would object to the relevance  
7 of the question, again.

8 JUDGE SMITH: Is the relevance, therefore, that,  
9 in view of the possible modifications, the recommendations  
10 which the utility asserts will avoid KRSKO events may not  
11 be germane, may not be controlling or effective?

12 MS. CHAVEZ: Insofar as what I would like to ask  
13 the witness is whether or not the Byron plant will be the  
14 first one to go operational which will actually use those  
15 modifications and which will, essentially, have a  
16 feedwater system representative of the type of feedwater  
17 system KRSKO plant had at the time of the water hammer.

18 JUDGE SMITH: Why?

19 MS. CHAVEZ: Well, I want to know whether or not  
20 Westinghouse will have any other operational experience  
21 with the proposed modifications other than at Byron.

22 JUDGE COLE: That makes sense.

23 JUDGE SMITH: Why don't you ask that? The  
24 proposed modifications for the -- to avoid water hammer.

25 (WITNESS CARLSON): I am confused now.



1           Are we talking relative to a flow-induced vibration  
2           or --

3           MR. COPELAND: Your Honor, can we have a clear  
4           statement of a question here, please?

5           MS. CHAVEZ: We will take it by specifics.

6           BY MS. CHAVEZ:

7           Q     Are the check valves to be used -- to be located at Byron  
8                 or located at Byron in exactly the same position that they  
9                 were at KRSKO prior to the water hammer event?

10          A     (WITNESS CARLSON) I believe that's generally true, yes.

11                 I am hesitating because the Byron auxiliary  
12                 feedwater system will have one more check valve in the  
13                 pump discharge line.

14                 However, that's not effective as far as producing --  
15                 resulting in bubble collapse water hammer.

16          Q     Okay. This question is addressed to Mr. Pleniewicz.

17                 On Page 4 of your testimony, you identify  
18                 temperature sensors which will be installed at the Byron  
19                 plant.

20          A     (WITNESS PLENIEWICZ) Yes, that's true.

21          Q     Can you tell me or identify for me the reason why Edison  
22                 earlier indicated that they would not install these  
23                 temperature sensors?

24          A     (WITNESS PLENIEWICZ) Edison earlier was going -- the  
25                 strategy was to have continuous flow through the auxiliary

1 nozzle; and we have determined that there are times in the  
2 plant operation, such as heating up and maintaining hot  
3 standby conditions, that continuous flow is not desirable  
4 or attainable.

5 Q Can you specify the number of such likely times?

6 A (WITNESS PLENIEWICZ) Any time we would heat the plant up  
7 or maintaining it at a hot condition prior to criticality.

8 Q Would that include hot functional testing?

9 A (WITNESS PLENIEWICZ) Yes.

10 Q Mr. Pleniewicz, temperature sensors -- correct me if I am  
11 wrong -- are essentially used to determine if there is  
12 back leakage; is that correct?

13 A (WITNESS PLENIEWICZ) That's true; that's true.

14 Q So what other recommendation -- what other modifications  
15 will Edison implement which will correct the situation  
16 once back leakage is identified?

17 A (WITNESS PLENIEWICZ) I am sorry. Would you repeat that  
18 question?

19 Q On the top of Page 5 of your testimony, the first  
20 paragraph, you identify procedures to slowly refill the  
21 pipe.

22 A (WITNESS PLENIEWICZ) Yes.

23 Q Can you give an estimate as to whether or not there would  
24 be any back leakage at all during such a procedure?

25 A (WITNESS PLENIEWICZ) Well, when we would introduce this

1 low flow rate to purge the piping of steam, there wouldn't  
2 be back leakage at that time.

3 Q Can you tell me whether or not the purge valve and loop on  
4 the main feedwater line serves a similar function as this  
5 procedure identified in your testimony?

6 MR. COPELAND: I object to the relevance, your  
7 Honor.

8 JUDGE SMITH: Overruled. You may answer.

9 (WITNESS PLENIEWICZ): I guess I am not really  
10 sure what your question is, when you say in purge piping  
11 on the main feedwater system.

12 Was that your statement?

13 MS. CHAVEZ: Yes.

14 (WITNESS CARLSON): Can I respond to that?

15 (WITNESS PLENIEWICZ): I am just trying to see  
16 if I understand the question.

17 A (WITNESS CARLSON) You are asking about the purging  
18 operation in the main feedwater line and -- well, the  
19 purging operation in the main feedwater line is one of the  
20 steps taken during the operation of the feedwater bypass  
21 system.

22 Basically, its purpose is to slowly push into the  
23 steam generator, through the main feedwater nozzle, cold  
24 water that may be between the main feedwater nozzle and  
25 going upstream the first isolation valve, the feedwater

1 isolation valve.

2 That's a step -- that purging operation is required  
3 prior to switching feedwater flow from the upper nozzle to  
4 the main nozzle during the operation of plant loading.

5 Its function is to reduce the likelihood of a bubble  
6 collapse water hammer in the preheater during the loading  
7 operation, which is a normal upset-type operation.

8 BY MS. CHAVEZ:

9 Q Okay. Mr. Carlson, on Page 17 of your affidavit, your  
10 response to Question 18, you state that if these  
11 recommendations are adopted and implemented and  
12 Commonwealth Edison Company installs the proposed check  
13 valves in the auxiliary feedwater system, the likelihood  
14 of occurrence of a KRSKO-type feedwater event is reduced  
15 to an acceptable level.

16 MR. COPELAND: Your Honor, may we have a  
17 clarification?

18 This was written testimony and not an affidavit.

19 JUDGE SMITH: Yes.

20 BY MS. CHAVEZ:

21 Q Would you care to correct that statement to say that the  
22 possibility of water hammer would be eliminated?

23 A (WITNESS CARLSON) I can't say that it can be eliminated.

24 I can say that, because of the steps taken, it  
25 should not occur; and, specifically, what I have in mind

1 is that the first requirement is that the steam leak back  
2 into the bypass piping.

3 Now, as Mr. Pleniewicz has just indicated here,  
4 generally -- or specifically during power operation, for  
5 example, flow -- feedwater flow -- is introduced through  
6 the auxiliary nozzle.

7 That being the case, there is no possibility of  
8 steam moving back into the bypass line.

9 At low power operation, from zero to 20 percent or  
10 approximately 20 percent, all the feedwater flow is  
11 introduced through the auxiliary nozzle.

12 At higher power levels, after the feedwater flow is  
13 switched to the main nozzle, a tempering flow -- what is  
14 referred to as a tempering flow -- is maintained through  
15 the auxiliary nozzle.

16 So under those conditions there is no possibility of  
17 steam leaking back.

18 Another recommendation related to this point is that  
19 the steam generator water level is normally above the  
20 discharge end of the auxiliary nozzle.

21 Inside the steam generator, attached to the  
22 auxiliary nozzle, is a piece of pipe three or so feet  
23 long, which is inclined upward.

24 The water level, during a normal operation, is above  
25 the top of that internal extension, so that if back

1 leakage should occur, hot water would leak back and not  
2 steam.

3 Another feature related to whether or not or how  
4 much steam leaks back is the leakage of the check valves  
5 concerned.

6 I would summarize what I have said so far that there  
7 are steps, procedures, in place which greatly reduce the  
8 opportunity for steam to leak back into the bypass piping.

9 In addition -- well, let's assume, however, that  
10 some steam -- that steam does leak back, despite those  
11 features.

12 The purpose of the thermocouples is to detect such  
13 back leakage, and if that should occur, a procedure is  
14 provided to safely flush that steam back into the steam  
15 generator.

16 A (WITNESS PLENIEWICZ) If I could correct one thing.

17 Bob mentioned thermocouples, and they are  
18 temperature sensors for which they will be articulus, not  
19 thermocouples.

20 It's a small point. He said thermocouple. He meant  
21 temperature.

22 The type of temperature sensors will be RTD's.

23 Q Mr. Pleniewicz, have those RTD's been known to fail?

24 A (WITNESS PLENIEWICZ) There have been cases of RTD's  
25 failing, yes.

1 I don't know if you -- I can't tell you now the  
2 particular brand; only the failures that there have been,  
3 not the statistics on them.

4 Q Mr. Pleniewicz, in your opinion, would it be possible for  
5 a water hammer occurrence to occur at the Byron plant even  
6 if all these recommendations were carried out?

7 A (WITNESS PLENIEWICZ) If all the recommendations are  
8 carried out, no.

9 Q If they are carried out and operator error occurs in that,  
10 will the water hammer possibility be eliminated?

11 MR. COPELAND: Objection.

12 Can we have a clear statement as to what kind of  
13 operator error we are talking about here?

14 JUDGE SMITH: Relevant operator error, would  
15 that be satisfactory?

16 (WITNESS PLENIEWICZ): Do you want me to answer  
17 it?

18 JUDGE SMITH: Yes, please.

19 A (WITNESS PLENIEWICZ) The reason I answered how I did is  
20 one of -- the second Westinghouse recommendation is that  
21 when back leakage is detected, that we slowly refill the  
22 piping at a rate of 15 gallons per minute.

23 So that is why I said when we follow all of those  
24 four Westinghouse recommendations, water hammer would not  
25 occur.

1 BY MS. CHAVEZ:

2 Q Mr. Pleniewicz, do you also in your testimony state that  
3 Commonwealth Edison will determine, during hot functional  
4 testing, whether or not it is possible to refill it at the  
5 recommended rate?

6 A (WITNESS PLENIEWICZ) I would like -- you know, give me a  
7 chance to see the exact words I said.

8 Q Yes.

9 A (WITNESS PLENIEWICZ) Yes. I said in the testimony during  
10 hot functional testing we will test the ability of the  
11 tempering flow system to achieve the low flow rate  
12 recommended by Westinghouse for refilling the bypass  
13 piping.

14 Q Mr. Pleniewicz, do you know how often the check valves at  
15 the Byron plant will be inspected during the operational  
16 stage?

17 A (WITNESS PLENIEWICZ) Do you mean, by operational stage --

18 Q When the plant is in operation.

19 A (WITNESS PLENIEWICZ) Can I -- I think I know what you are  
20 getting at, but I am not sure I can answer it the way the  
21 question is asked.

22 We will check these valves when we are shut down for  
23 maintenance as one type of check.

24 During these refueling outages, one of the two  
25 six-inch valves will be checked, two of the eight



1 four-inch check valves will be inspected.

2 If problems are indicated with either type of valve,  
3 then the remaining valves of that type will be checked,  
4 inspected.

5 JUDGE SMITH: Mr. Pleniewicz, wouldn't the  
6 valves be more or less continuously checked?

7 A (WITNESS PLENIEWICZ) (Continuing.) That was my next --  
8 that was my next part --

9 JUDGE SMITH: I see.

10 A (WITNESS PLENIEWICZ) (Continuing.) -- that, during  
11 normal operation, we do have those temperature sensors;  
12 and if flow is interrupted through that auxiliary nozzle,  
13 then the temperature sensors will be monitored, which are  
14 also an indication of back leakage. So it's a two-part  
15 answer.

16 BY MS. CHAVEZ:

17 Q Mr. Pleniewicz, do you feel that the hot functional  
18 testing and prior checks on the system will be enough to  
19 guarantee that the recommendations can be carried out and  
20 the system will operate without water hammer occurring?

21 A (WITNESS PLENIEWICZ) The checks that we are presently  
22 doing and the hot functional testing that we will do  
23 should demonstrate that we can carry out the Westinghouse  
24 recommendations, yes.

25 Q Mr. Carlson, would it have been possible for the water

1 hammer at the KRSKO event to have ruptured the pipe if it  
2 had been larger in magnitude?

3 MR. COPELAND: Objection. It calls for  
4 speculation by the witness.

5 JUDGE SMITH: Well, does the question make  
6 technical sense and can you answer it with technical  
7 sense?

8 A (WITNESS CARLSON) Yes, I think it is conceivable that the  
9 pipe could rupture.

10 JUDGE SMITH: If a larger event?

11 A (WITNESS CARLSON) (Continuing.) Yes.

12 BOARD EXAMINATION

13 BY JUDGE COLE:

14 Q How could the event have been larger, sir?

15 A (WITNESS CARLSON) Well, the bubble collapse event is, as  
16 I think Mr. Serkiz indicated, a complicated phenomenon  
17 involving things like the water temperature, how fast it  
18 is introduced, how much steam is present, pressure  
19 conditions.

20 I think you could expect a spectrum of pressure  
21 magnitudes as a consequence of a bubble collapse event.

22 I don't know what is the largest conceivable pulse  
23 for the conditions that occurred at KRSKO, so it's  
24 conceivable, I suppose, that it could be greater than what  
25 actually occurred.

1 Q So you have no knowledge of where the actual KRSKO event  
2 would fall within the spectrum of possible bubble collapse  
3 water hammer events involving that particular plant  
4 system?

5 A (WITNESS CARLSON) Well, I would certainly think that it  
6 was the upper end of that range of pulse magnitudes,  
7 pressure increase magnitudes.

8 Q What makes you say that, sir?

9 A (WITNESS CARLSON) Because of the extent of the damage.

10 JUDGE COLE: All right. Thank you.

11 BY MS. CHAVEZ:

12 Q Mr. Carlson, do you feel that a KRSKO water hammer event,  
13 which had not resulted in any deformation of the piping,  
14 could have resulted in fatigue stresses?

15 A (WITNESS CARLSON) I really don't feel that fatigue  
16 considerations are of concern with respect to the piping.

17 As we indicated before -- as I indicated before,  
18 they are a concern in the preheater because of the nature  
19 of the structure, but I don't see that they are a concern  
20 in the piping.

21 Q Mr. Carlson, isn't water hammer in the piping system --  
22 doesn't it generally result in fatigue --

23 MR. COPELAND: Objection. Asked and answered,  
24 your Honor.

25 BY MS. CHAVEZ:

1 Q -- in the feedwater piping?

2 JUDGE SMITH: Sustained.

3 MS. CHAVEZ: Okay. Your Honor, I have no  
4 further questions for the witness.

5 JUDGE SMITH: Mr. Goldberg.

6 MR. GOLDBERG: No questions.

7 JUDGE COLE: Just a couple of questions,  
8 gentlemen.

9 BOARD EXAMINATION

10 BY JUDGE COLE:

11 Q Mr. Carlson, on Page 2 and on Page 7 of your testimony,  
12 you refer to an acceptable level of likelihood of  
13 occurrence of the KRSKO-type water hammer event.

14 What do you mean by "acceptable," sir?

15 A (WITNESS CARLSON) As I indicated during -- well, I didn't  
16 indicate, but what I would respond is that I don't have a  
17 probability value to give you.

18 My response would be that if the recommendations  
19 that Westinghouse has made on this subject are  
20 implemented, the KRSKO-type bubble collapse event should  
21 not occur.

22 Q All right, sir.

23 And that's what you mean by using the term  
24 "acceptable"?

25 A (WITNESS CARLSON) That's correct.

1 Q Okay. Thank you, sir.

2 On Page 7 of your testimony, again, Mr. Carlson --

3 A (WITNESS CARLSON) What page? Pardon me.

4 Q Page 7, Question 7, in the latter part of your answer to  
5 Question 7, which is, "What is the purpose of the  
6 feedwater bypass system, you state that -- in the latter  
7 part of that answer, you say, "In those circumstances  
8 where it is necessary to introduce cold water into the  
9 steam generator, the feedwater bypass system operates to  
10 direct the cold water to the upper auxiliary nozzle."

11 My question, sir, is: Why there? What are the  
12 advantages of introducing it there?

13 A (WITNESS CARLSON) The advantage of introducing the cold  
14 water there is that it would not result in a bubble  
15 collapse water hammer in the preheater.

16 Q Okay. So it was solely the preheater that was of concern  
17 there then?

18 A (WITNESS CARLSON) That's true.

19 Q All right, sir.

20 Mr. Pleniewicz, Page 3 of your testimony --

21 MR. GALLO: Dr. Cole, Pleniewicz.

22 JUDGE COLE: Pleniewicz. Silent I. Pardon me,  
23 Mr. Pleniewicz.

24 BY JUDGE COLE:

25 Q It's a question for information, Mr. Pleniewicz.

1           It's not clear to me the reason for removing the  
2 valve that you refer to in your response to Question 6,  
3 the check valve.

4           What is the reason for removing that valve?

5       A   (WITNESS PLENIEWICZ) The reason for removing that check  
6 valve was for acoustical water hammer considerations.

7           Being a fast-acting type check valve, that with --  
8 you know, if it slammed shut, it would give acoustical  
9 water hammer type problems.

10       Q   It had nothing to do with bubble collapse water hammer?

11       A   (WITNESS PLENIEWICZ) No, sir.

12       Q   All right. In response to Question 7 -- or in Question 7  
13 itself, "Are you familiar with the recommendations made by  
14 Westinghouse Electric Corporation in regard to prevention  
15 of a KRSKO-type water hammer event," and in answer to that  
16 you replied, "Yes."

17           Where are those recommendations stated, sir; do you  
18 know?

19       A   (WITNESS PLENIEWICZ) Yes, sir. In my -- in the following  
20 questions and answers, we discuss the four Westinghouse  
21 recommendations, you know, one at a time.

22           For example --

23       Q   You discuss them there; but where are they stated? What  
24 is your source of information?

25       A   (WITNESS PLENIEWICZ) Our source of information right now

1 is through Mr. Carlson's testimony.

2 It would be on Page 16 of his, sir.

3 Q Okay. That's your source of information, then, for that,  
4 sir?

5 A (WITNESS PLENIEWICZ) Yes, sir.

6 Q With respect to the tempering flow in the bypass line, at  
7 all power operations from zero power to 100 percent power,  
8 there is a flow in the bypass line; is that your  
9 testimony, sir?

10 I believe it's in both of your testimonies.

11 A (WITNESS PLENIEWICZ) Yes, sir. We just -- I tried to  
12 say, in response to a question that was, I think, on my  
13 testimony, it was -- the heatup and the hot standby  
14 conditions would be times when this flow may be  
15 interrupted.

16 Q All right, sir.

17 And would it not be these conditions that would be  
18 when you would be most susceptible to bubble collapse  
19 water hammer?

20 A (WITNESS PLENIEWICZ) The -- yes. The flow is -- keeping  
21 the flow through the auxiliary nozzle, is, indeed, a means  
22 of preventing steam -- one of the means of preventing  
23 steam from back leaking into the piping.

24 Q So the KRSKO-type -- the KRSKO event occurred during hot  
25 functional testing.

1                   How are you going to avoid having that kind of an  
2                   event during your hot functional testing?

3       A       (WITNESS PLENIEWICZ) Well, the first step -- well, I  
4                   won't say -- yes, I guess it is.

5                   The first step is that we are checking the -- we are  
6                   testing these check valves to see that they are in good  
7                   condition; and that process is complete for the four-inch  
8                   check valves and will be done on the six-inch check valves  
9                   prior to the hot functionals.

10                  The second major element in it will be to place  
11                  these temperature sensors on that auxiliary nozzle, so  
12                  that we can monitor the temperature of that piping when  
13                  flow is interrupted, to detect conditions where, you know,  
14                  we are susceptible to the bubble collapse water hammer.

15       A       (WITNESS CARLSON) May I add another element to that; and  
16                   that is the fact that the water leveler in the steam  
17                   generator will be normally above the discharge of the  
18                   internal extension.

19       A       (WITNESS PLENIEWICZ) Yes.

20       A       (WITNESS CARLSON) So if there is back leakage, it would  
21                   be hot water rather than steam.

22       Q       This would be the case during most of the hot functional  
23                   testing or all of the hot functional testing?

24       A       (WITNESS PLENIEWICZ) I do not know when the water level  
25                   will be lower than that level.



1 JUDGE COLE: All right, sir.

2 Thank you.

3 JUDGE CALLIHAN: I have a couple of questions.

4 Let me direct them to you collectively, except as  
5 noted, perhaps.

6 BOARD EXAMINATION

7 BY JUDGE CALLIHAN:

8 Q Mr. Carlson, would you agree that the bulge occurred  
9 between Pipe Hangers 114 and 116, just to add a bit to the  
10 earlier response?

11 A (WITNESS CARLSON) Yes, yes.

12 Q What is the safety significance of, well, the Yugoslav  
13 event, to start with, or as it occurred, the Yugoslav  
14 event were it to have ruptured the pipe or a similar water  
15 hammer occurrence that might have been expected at Byron  
16 had changes not been incurred?

17 That's rather a severe compound question I realize,  
18 so let's break it down.

19 If there had been in operations an occurrence like  
20 the KRSKO event, what would have been the safety  
21 significance?

22 A (WITNESS CARLSON) Well, if -- you are assuming now a  
23 rupture?

24 Q No. I am taking it step by step. I am taking the KRSKO  
25 event as it happened.

1 A (WITNESS CARLSON) Okay. As it happened where the line  
2 was bulged and the hangers damaged, there was no impact on  
3 operation or safety.

4 Q In the event that there had been a rupture, which, I  
5 believe, you earlier indicated might possibly have  
6 occurred, what would have been the safety significance?

7 A (WITNESS CARLSON) If there had been a rupture in the  
8 bypass line, that would result in a blow of the steam  
9 generator through the auxiliary nozzle; and that  
10 occurrence is enveloped by the fault condition of a steam  
11 line break, steam line break.

12 Q And are there remedial measures immediately put into  
13 effect?

14 A Well, the auxiliary feedwater system will still operate  
15 and provide cooling water to at least two effective steam  
16 generators.

17 Q Would your remarks have been applicable or will they be  
18 applicable to Byron if an occurrence similar to the  
19 Yugoslav occurred there, and this presumes, of course,  
20 that the recommendations of Westinghouse are not followed?

21 A (WITNESS CARLSON) Yes, they would.

22 Q However, as you have said, you have confidence in the  
23 recommendations of Westinghouse precluding such an event.

24 What is the status of the changes and what is the  
25 status of Byron 1 at the moment as regards these

1           modifications and your testing and so forth?

2       A     (WITNESS PLENIEWICZ) With regards to the modifications,  
3           these check valves are in process of being relocated,  
4           six-inch check valves.

5           Testing, we are approximately a month away from hot  
6           functionals.

7           For example, one of the tests being run as of this  
8           time is the pre-op test on the aux feedwater system  
9           itself.

10       Q     So you yet have an opportunity to explore the design  
11           changes which Westinghouse has made, and I say is that  
12           true?

13       A     (WITNESS PLENIEWICZ) I am just sorting that question out  
14           in my mind. The --

15       Q     Let me restate it.

16           I think you said your hot functional testing had not  
17           yet begun.

18       A     (WITNESS PLENIEWICZ) No, sir. That's true.

19       Q     Are the Westinghouse recommendations, which I understood  
20           you to say that you are at the moment putting into effect --  
21           are those changes of significance to or sufficiently  
22           significantly different from the original design that you  
23           have any concern about their effect on normal operation  
24           and, if so, will you have an opportunity to explore those  
25           effects during your hot functional testing?

1 A (WITNESS PLENIEWICZ) I don't consider them significant  
2 changes to how we would operate the system.

3 We, for example, will interrupt flow deliberately  
4 during the hot functionals and use this temperature -- use  
5 these temperature sensors to see that we don't have back  
6 leakage.

7 JUDGE CALLIHAN: Thank you very much.

8 BOARD EXAMINATION

9 BY JUDGE SMITH:

10 Q I wonder if you could give me a clarification.

11 As I understood, Dr. Callihan's questions and your  
12 answers were if an auxiliary feed line broke, that event  
13 would be enveloped by the loss of -- by a break of main  
14 feedwater --

15 JUDGE COLE: Main steam line.

16 BY JUDGE SMITH:

17 Q -- main steam line.

18 A (WITNESS CARLSON) You are addressing that to me?

19 Q Yes, I am.

20 A (WITNESS CARLSON) I believe we are referring to a break  
21 in the bypass line.

22 Q In the bypass line, okay.

23 A (WITNESS CARLSON) What I said was that that break is  
24 covered by the evaluation of a steam line break.

25 I might point out that the auxiliary nozzle and its

1 external extension are in the upper part of the steam  
2 generator.

3 JUDGE SMITH: Mr. Copeland.

4 MR. COPELAND: I --

5 JUDGE SMITH: Excuse me. Do you have any  
6 additional cross examination based upon the Board's  
7 questions?

8 MS. CHAVEZ: No.

9 JUDGE SMITH: All right. Mr. Copeland.

10 REDIRECT EXAMINATION

11 BY MR. COPELAND:

12 Q Mr. Carlson, are you familiar with the Quadrex report,  
13 also titled NUREG/C R-3090, entitled "Evaluation of Water  
14 Hammer Potential in Preheat Steam Generators," which was  
15 submitted into evidence last Friday as Board Exhibit No.  
16 2?

17 A (WITNESS CARLSON) Yes, I am.

18 Q Do you have a copy in front of you?

19 A (WITNESS CARLSON) Yes, I do.

20 Q I would refer you to Page -- excuse me.

21 I would refer you to Figure 2-6, which is found on  
22 Page 2-9.

23 Are there any errors that should be noted on that  
24 figure?

25 A (WITNESS CARLSON) Yes. The vertical length of piping on

1 the right margin of the page, which is indicated as 52.5  
2 feet long, is really about 20 feet long.

3 This is an error that I made in transcribing data  
4 from the KRSKO bypass piping drawings.

5 That number also appears on Page 2-11, the second  
6 line. Instead of 52.5 feet, it should read 20 feet.

7 It's actually six meters, which is the value given  
8 in my testimony.

9 JUDGE CALLIHAN: Mr. Carlson, I am sorry. What  
10 is the correct value?

11 (WITNESS CARLSON): The correct value is six  
12 meters or approximately 20 feet.

13 JUDGE CALLIHAN: Thank you very much.

14 BY MR. COPELAND:

15 Q I would now refer you to Page 3-9 of that same report,  
16 Board Exhibit No. 2, and there is a discussion there of  
17 the Byron Nuclear Station.

18 Are there any corrections that you think should be  
19 made to that explanation?

20 A (WITNESS CARLSON) In the first paragraph, under 3.2.3,  
21 the statement is made in the second line, "Byron has a  
22 check valve installed in the feed line near the auxiliary  
23 nozzle."

24 That check valve is going to be replaced -- is going  
25 to be removed. Pardon me.

1 Q Is this the check valve which has been brought to the  
2 attention of the Court before?

3 A (WITNESS CARLSON) Yes.

4 Q Are there any other problems?

5 A (WITNESS CARLSON) In the third paragraph, reference is  
6 made to, in the first line of the third -- pardon me.

7 The third paragraph of Section 3.2.3, first line,  
8 the statement is made, "The presence of the check valve in  
9 each auxiliary feedwater pump suction line."

10 For purposes of bubble collapse water hammer, that  
11 valve is not effective in preventing back leakage, because  
12 it is located upstream of the pump mini-flow line.

13 To, perhaps, go one step further here, the Byron  
14 system will have at least two check valves preventing or  
15 limiting back flow in any path available, starting at the  
16 auxiliary nozzle.

17 Q Mr. Pleniewicz, are you familiar with the discussion of  
18 the Byron Nuclear Station as found in this Quadrex report,  
19 Board Exhibit No. 2?

20 A (WITNESS PLENIEWICZ) Yes, I am.

21 Q Do you note any problems with the explanation found there?

22 A (WITNESS PLENIEWICZ) Well, in addition to the ones Mr.  
23 Carlson discussed, the second paragraph, the first and  
24 second sentence, leads one to believe that the plant is  
25 started up using the auxiliary feedwater pumps; and that's

1 not true at Byron.

2 At Byron we would be using the startup feedwater  
3 pump and the bypass piping.

4 BOARD EXAMINATION

5 BY JUDGE CALLIHAN:

6 Q What wording would you recommend changing, please --

7 A (WITNESS PLENIEWICZ) Okay. In --

8 Q -- and what page are we on?

9 A (WITNESS PLENIEWICZ) On Page 3-9.

10 Q Thank you.

11 A (WITNESS PLENIEWICZ) In the Byron design, feedwater  
12 enters the auxiliary nozzle during startup to prevent  
13 introducing cold water to the steam generator preheat  
14 section, so I guess I would delete that from the AFW line.

15 I would delete the entire second sentence, because --

16 MR. GOLDBERG: Judge, this is a rather awkward  
17 line of questions and answers.

18 First of all, it's outside the scope of the cross,  
19 but I am not going to object to that ground, but we are  
20 talking about reading a document that neither of these  
21 individuals commented on.

22 If they want to comment on it, fine.

23 Notwithstanding the fact that it's outside of the scope of  
24 the cross, we can do that.

25 JUDGE SMITH: That was an area I wanted



1 clarified, because the first so-called correction, if you  
2 will note, it was explained that that error was made as a  
3 result of the information supplied, so that, I think, was  
4 probably appropriate; but I would like to have it  
5 clarified as to what we should do with these so-called  
6 corrections; if there is any basis to actually correct the  
7 exhibit or if we should take it as these witnesses'  
8 rebuttal, so to speak.

9 BOARD EXAMINATION

10 BY JUDGE SMITH:

11 Q Can you explain the errors, the other two errors, the  
12 statements that you perceive to be errors?

13 A (WITNESS PLENIEWICZ) Concerning the auxiliary feedwater  
14 pump being used during low power?

15 Q Yes. That's the last one.

16 A (WITNESS PLENIEWICZ) I think that's a typical design that  
17 is used probably in most plants, but not true of Byron.

18 Q So the author truly intended to make that statement, and  
19 so there is no basis for us to change that statement in  
20 this exhibit, but we should listen to your explanation of  
21 what the actual Byron situation is.

22 How about the second change?

23 A (WITNESS PLENIEWICZ) The capacity of the aux feedwater  
24 line?

25 Q That was by Mr. Carlson, the second change, on Page 3-9.

1 A (WITNESS CARLSON) This is in regard to the check valve  
2 suction line?

3 MR. COPELAND: I believe he is referring to the  
4 one in the first paragraph.

5 JUDGE SMITH: Well, I even have a more basic  
6 difficulty. I don't know where this document even came  
7 from. It just happened to appear up here on our bench one  
8 morning, and I don't have a copy of it.

9 MR. GOLDBERG: Judge, I can help you where it  
10 originated.

11 I provided copies to the Board and parties.

12 As Mr. Serkiz testified last week, it was prepared  
13 under the -- under contract to the NRC.

14 JUDGE SMITH: Yes. I mean physically how it  
15 came into our possession.

16 MR. GOLDBERG: I provided copies physically by  
17 correspondence to the Board and parties.

18 JUDGE SMITH: Early, early, before that.

19 MR. GOLDBERG: Yes. It predated the  
20 transmission of the written testimony.

21 JUDGE SMITH: As a consequence, I was not able  
22 to follow the changes being made.

23 BY JUDGE SMITH:

24 Q The only thing I know is that Mr. Carlson, after he  
25 corrected the dimensions of the upriser, if that's what it

1 is, you offered another change where we should delete some  
2 aspect of this document; and my question is this:

3 Is that, too, based upon incorrect information you  
4 provided or is it simply information that you disagree  
5 with?

6 A (WITNESS CARLSON) Well, I think I -- with respect to the  
7 first item directly under Byron Nuclear Station,  
8 originally Byron did have a check valve in the bypass line  
9 close to the steam generator.

10 However, that -- and that is what this statement  
11 indicates.

12 Q Okay. So the statement was accurately made?

13 A (WITNESS CARLSON) Right, right.

14 JUDGE SMITH: Mr. Copeland-

15 REIDRECT EXAMINATION

16 (Continued)

17 BY MR. COPELAND:

18 Q Mr. Carlson, would you like to explain the reason for the --

19 MR. GALLO: May I be heard just a moment, Judge?

20 JUDGE SMITH: Certainly.

21 MR. GALLO: The witness -- also, consistent with  
22 your line of organization here, the witness has also  
23 indicated that there is another valve that doesn't serve  
24 its purpose.

25 It might be the suggestion that the witness is

1 making that it's an error, but consistent with the  
2 chronology that you are laying out, he needs to address that  
3 change as well for a clear record.

4 JUDGE SMITH: Okay, fine. Yes.

5 (WITNESS CARLSON): In the third paragraph under  
6 Byron Nuclear Station, a statement is made -- reference is  
7 made to a check valve in each AFW pump suction line.

8 My point is that check valve is not effective, does  
9 not play a part in preventing back leakage, since it is  
10 upstream of the pump mini-flow line.

11 BOARD EXAMINATION

12 BY JUDGE SMITH:

13 Q Now, can you explain how the statement, as it exists, got  
14 in there? Do you have any idea?

15 A (WITNESS CARLSON) Well, there is a valve there.

16 My point is that it's not effective. It appears as  
17 if the author is taking credit for that valve; and I am  
18 saying that it's not effective in preventing back leakage.

19 JUDGE SMITH: Okay.

20 BY MR. COPELAND:

21 Q Mr. Pleniewicz, were you in the hearing room last Friday  
22 when Mr. Serkiz was giving his testimony?

23 A (WITNESS PLENIEWICZ) Yes, I was.

24 Q At that time did you hear him state that the Byron steam  
25 generator feedwater systems in the -- in the Byron Station

1 will be determined during preoperational testing as noted  
2 in Section 10.4.7 of the Byron SER, the purpose of -- and  
3 he was stating that the purpose of these tests was to  
4 determined the susceptibility of the Byron steam  
5 generators to a KRSKO type water hammer event.

6 Do you recall him saying that?

7 A (WITNESS PLENIEWICZ) Yes, I do.

8 JUDGE CALLIHAN: Can you give us a transcript  
9 page reference, Mr. Copeland?

10 MR. COPELAND: Transcript Page 1,005.

11 JUDGE CALLIHAN: Thank you.

12 BY MR. COPELAND:

13 Q Are you familiar with Section 10.4.7 of the Byron SER?

14 A (WITNESS PLENIEWICZ) Yes, I am.

15 Q Does the testing which is addressed in that section of the  
16 Byron SER include -- excuse me -- specifically include  
17 testing for a KRSKO type water hammer events in the  
18 feedwater systems at Byron?

19 A (WITNESS PLENIEWICZ) No, it doesn't.

20 Q What type of testing is being referred to there?

21 A (WITNESS PLENIEWICZ) It's being the type of tests there  
22 is for water hammer in the preheater section of the steam  
23 generator.

24 Q Is the testing which you have committed to doing above and  
25 beyond then what is stated in the 10.4.7 of the SER?

1 A (WITNESS PLENIEWICZ) Yes, it is.

2 Q Mr. Carlson, Judge Cole asked you if -- what you meant by  
3 an acceptable level.

4 In response to his question that if the -- what was  
5 meant by acceptable level in your statement that the  
6 Westinghouse recommendations are followed?

7 Do you mean to state that there is no possibility of  
8 a water hammer occurring if the Westinghouse  
9 recommendations are followed?

10 A (WITNESS CARLSON) No. What I mean is what I have stated,  
11 that the likelihood will be reduced to an acceptable  
12 level; and, as I further stated, because of -- assuming  
13 that the recommendations are implemented, water hammer  
14 such as occurred at KRSKO should not occur; but I am not  
15 able to say that it is completely impossible.

16 Q Can you tell us the basis of your opinion?

17 A (WITNESS CARLSON) I indicated earlier the recommendations  
18 that have been made and how they relate to the possibility  
19 of bubble collapse water hammer.

20 There are two steps here, if you will.

21 One is those recommendations related to whether or  
22 not steam can or will leak back into the bypass line, and  
23 they are, No. 1, that during normal operation there is  
24 always flow through the auxiliary nozzle into the steam  
25 generator preventing back leakage.

1           No. 2, normally, the water level in the steam  
2 generator is above the discharge end of the internal  
3 extension, so if there is leakage it would be hot water  
4 and not steam.

5           No. 3, we recommend that the check valves be  
6 maintained to minimize back leakage.

7           In addition to those steps, if I could amplify on  
8 one of them, Mr. Pleniewicz in his testimony indicates  
9 that if flow through the auxiliary nozzle is interrupted,  
10 his operators are instructed to check the temperature  
11 sensor data, to verify whether or not steam has leaked  
12 back; and if it has, then to flush it out according to  
13 established procedure.

14           In conclusion, we have -- assuming that steam does  
15 leak back, we have temperature sensor -- will have  
16 temperature sensors on the bypass line to prevent back  
17 leakage and then we have a procedure by which that steam  
18 can be safely flushed back into the steam generator.

19           MR. COPELAND: No further questions, your Honor.

20           JUDGE SMITH: Is there anything further of  
21 either of these witnesses?

22                   (No response.)

23           JUDGE SMITH: Thank you, gentlemen. You are  
24 excused.

25                   (Witnesses excused.)



1 JUDGE SMITH: Just one moment, please.

2 The issue came up as to the documents that Ms. -- I  
3 am sorry. My mind is a blank. What is your name?

4 MR. CHAVEZ: Chavez.

5 JUDGE SMITH: -- yes, Chavez, gave us as cross  
6 examination documents, and the witness hasn't seen them  
7 and it developed that neither had any other party except  
8 for the Board, so I regard that as the same basic area as  
9 cross examination plans and they should have an  
10 opportunity to look at the documents you gave us.

11 Now, the only aspect of any of them, as far as I can  
12 see, that we looked at where the parts pointed to, but it  
13 was a rather sizeable stack. You should have at least  
14 that opportunity.

15 Do you have enough to give them? You can take mine  
16 back.

17 MS. CHAVEZ: I can furnish them with copies  
18 tomorrow.

19 JUDGE SMITH: Why don't you just take mine back,  
20 because we will -- I will have no further use of mine.  
21 Any aspect that we will consider is only that which is in  
22 the record.

23 I am not real sure those are exactly the same. If  
24 it's incomplete, would you please state.

25 MR. SAVAGE: Your Honor, may I be heard?



1 JUDGE SMITH: Mr. Savage.

2 MR. SAVAGE: We will give you a report on  
3 DAARE/SAFE's motion to amend and consolidate Contention 3.  
4 I don't know if you want to hear it now or later on.

5 JUDGE SMITH: I think it's a good time.

6 Is the next group of witnesses available?

7 MR. MILLER: Yes, your Honor. We would propose  
8 to begin our ALARA evidentiary presentation with Mr.  
9 Rescek's testimony; but, perhaps, we ought to see whether  
10 we can't make any progress on this emergency planning  
11 matter.

12 JUDGE SMITH: This seems to be a good time.

13 I don't have all the papers that we may need, but  
14 proceed.

15 MR. SAVAGE: Representatives from both  
16 Intervenor and of Applicant and of the state emergency  
17 planners met this morning in Chicago and for several hours  
18 tried to come to a compromise on the motion but the  
19 negotiations proved unfruitful.

20 I have a suggestion to resolve the dispute.

21 I wanted to invoke the Board's power to help us  
22 settle this. I don't know exactly how to do it other than  
23 to ask you right now whether the Board would consider  
24 helping us settle the issue short of deciding the motion.

25 JUDGE SMITH: Well, we won't help you settle it

1           except in the sense that we will help all parties settle  
2           it.

3                   MR. SAVAGE:   What I was referring to, your  
4           Honor, is a power designated of the Presiding Officer in  
5           2.718, conference before or during the hearing for  
6           settlement, simplification of the proceedings or any other  
7           purposes.

8                   JUDGE SMITH:   Yes, I will entertain a motion to  
9           do that.   As a matter of fact, we have consistently made  
10          the offer that we would try to help in the settlement  
11          negotiations.

12                   MR. SAVAGE:   How would we do that?   Would we do  
13          this now or would we set a time aside this evening or  
14          tomorrow?

15                   JUDGE SMITH:   If you want us to actually preside  
16          over offers and counteroffers and rejections, I think we  
17          would have to, with the agreement of all the parties,  
18          considering the scheduling of witnesses and everything  
19          else, have to agree when would be a suitable time.

20                   MR. SAVAGE:   I have mentioned this to Applicant  
21          but I don't know what their feeling is about proceeding  
22          this way, Mr. Miller.

23                   MR. MILLER:   We have no objection to the Board  
24          hearing this now, assuming that it would not, obviously,  
25          be prejudice of any rights we would have, in the event

1 settlement was not effectuated, that we would assert  
2 before the Board with respect to acceptance or rejection  
3 of the contention. I assume that is implicit in 2.178.

4 JUDGE SMITH: Your concern is you might make  
5 statements in the course of settlement of the negotiations  
6 to which we would actually bind you in the actual  
7 litigation of the case.

8 MR. MILLER: Yes, sir, and also, obviously, I  
9 just want it understood and on the record that comments  
10 made in the course of any participation before the Board  
11 with respect to settlement of this dispute between the  
12 parties are in the nature of settlement discussions and  
13 it's kind of unusual, although we do it before courts  
14 where we are having a non-jury trial all the time,  
15 statements made before you are not to be regarded as  
16 binding on any party, should we later litigate the issue.

17 JUDGE SMITH: There are several approaches we  
18 can take to that.

19 First, you would have to have confidence in the  
20 ability of the Board to listen to remarks made during  
21 settlement and then disregard them in the litigation or  
22 decision; but this is not an unusual thing in litigations.  
23 We recognize that in the spirit of settlement and for the  
24 purpose of settlement parties are willing to go beyond,  
25 yielding, I mean they are willing to yield points which

1       they do not feel that they are legally obligated to do and  
2       which they don't believe the facts require them to do it,  
3       but in the spirit of settlement and looking for settlement  
4       they are willing to do it; so we would not take settlement  
5       offers or settlement proposals as being a statement of the  
6       party's legal positions or factual positions. At least,  
7       we would be sensitive to the spirit of my remarks that I  
8       am making.

9               Settlement is encouraged by the federal rules and by  
10       Nuclear Regulatory Commission rules to bolster that  
11       encouragement, to foster settlement negotiations, parties  
12       are urged to give up rights, to give up litigative  
13       positions that they could, perhaps, successfully win  
14       during litigation or feel they could. They are encouraged  
15       to give that up.

16              The willingness to give it up in settlement  
17       negotiations cannot then be carried back into the hearing  
18       against them and there is a specific rule.

19              The problem is you have to have confidence in the  
20       Board to listen to these remarks and then disregard them.

21              We can approach it in another way, too. We could  
22       have either an off the record settlement conference or a  
23       settlement conference on the record but not as a part of  
24       the formal record of this proceeding. You might consider  
25       that if that's a matter of concern.

1 I saw you conferring.

2 MR. MILLER: I am sorry. I beg your pardon.

3 JUDGE SMITH: What I have suggested is if you  
4 are concerned about settlement negotiations being  
5 prejudicial to the parties, you might consider that we  
6 would have such a conference off the record or in an on  
7 the record -- I mean with a transcript of the negotiations  
8 but not as a part of the evidentiary record, that is a  
9 separately-numbered conference, not a part of the  
10 evidentiary record or the formal record of the proceeding,  
11 if that is a concern.

12 MR. SAVAGE: I am amenable to either approach,  
13 your Honor. I don't see that it's necessary to make a  
14 separate record of the conference, but if Miller would so  
15 desire --

16 MR. MILLER: I would agree to do it off the  
17 record, Judge Smith.

18 JUDGE SMITH: You would prefer off the record?

19 MR. MILLER: Yes.

20 MR. SAVAGE: So would I.

21 JUDGE SMITH: Well, if nobody objects, would the  
22 Staff object to that approach?

23 MR. GOLDBERG: No, Judge, but I might add we  
24 were not privy to the meetings held this morning nor have  
25 I had an opportunity to confer with counsel about their

1 recommendation, but we have no objection to a settlement  
2 conference, either on or off the record, just in the  
3 spirit that you indicated the conference would be held.

4 JUDGE SMITH: Is there any reason why it should  
5 be in camera, that is, non-public?

6 MR. SAVAGE: I don't see a reason, your Honor,  
7 but, again, if Mr. Miller would rather have it that way --

8 MR. MILLER: I really think, Judge Smith, any  
9 settlement negotiation that I have ever participated in  
10 has been confidential. I would prefer to keep it that  
11 way.

12 JUDGE SMITH: That is very, very traditional,  
13 that the parties are able to go into a private room,  
14 discuss with the Judge in settlement and have those  
15 remarks never leave that room; and they are wiped out of  
16 the mind of the Judicial Officer.

17 MR. SAVAGE: That is fine with me, your Honor.

18 JUDGE SMITH: Now, if we can find such a room.  
19 I think we can.

20 (Laughter.)

21 JUDGE SMITH: Now, the problem is when.

22 MR. MILLER: I would like to propose right now.  
23 We have a significant evidentiary burden if we are going  
24 to go forward with all or any part of new contention on  
25 schedule that is even remotely close to that which has

1           been previously agreed upon.

2           We have been negotiating now for almost a week and I  
3           would like very much to either bring it to closure or to  
4           find out that we do not have an agreement, get a ruling  
5           from the Board and proceed in accordance with that ruling.

6           MR. SAVAGE: It's fine with us to proceed now,  
7           your Honor. In fact, I would like to do so, also.

8           So if it's convenient for the Board, let's adjourn  
9           to a private room and see what we can come to.

10          MR. MILLER: One possibility is to request that  
11          people who are not affiliated with party or necessary for  
12          the conference excuse themselves from this courtroom and  
13          proceed on that basis.

14          JUDGE SMITH: It would be very helpful if all  
15          persons who were not affiliated with the parties were to  
16          allow the parties the opportunity to have settlement  
17          negotiations in confidence. This is a traditional thing  
18          that is normally done in a particular conference room,  
19          which we don't have available to us.

20          Is there any member of the public or press who  
21          objects to this procedure?

22                   (No response.)

23          JUDGE SMITH: Then after we adjourn, we will  
24          then ask non-participating people to leave; but before we  
25          do, it's obvious we won't get to the witnesses tonight.



1 MR. MILLER: Fine.

2 JUDGE SMITH: Before we do leave, is there any  
3 business relating to the main proceeding that we should  
4 attend to?

5 (No response.)

6 JUDGE SMITH: All right. We will adjourn until  
7 tomorrow morning at 9:00 A. M., and in the event that this  
8 goes longer than we have to -- I mean than we have time  
9 for tonight, it's a possibility we may resume the  
10 settlement conference tomorrow at 9:00 o'clock. The way  
11 things are the evidentiary hearing in this proceeding will  
12 begin tomorrow morning again at 9:00 A. M. in this room.

13  
14  
15 (Whereupon at 5:37 P. M.,  
16 the hearing in the above-entitled  
17 matter was recessed, to reconvene  
18 at 9:00 A. M. on Tuesday, March 8,  
19 1983.)  
20  
21  
22  
23  
24  
25



NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

ATOMIC SAFETY AND LICENSING BOARD

in the matter of: COMMONWEALTH EDISON COMPANY (Byron Nuclear  
Power Station, Units 1 & 2)

Date of Proceeding: March 7 , 1983

Docket Number: 50-454-OL and 50-455-OL

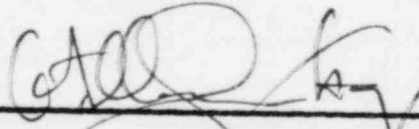
Place of Proceeding: ROCKFORD, ILLINOIS

were held as herein appears, and that this is the original transcript  
thereof for the file of the Commission.

m

G. Allen Sonntag

Official Reporter (Typed)



Official Reporter (Signature)