

# UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

**Title:** BRIEFING ON HIGH PRIORITY AEOD ISSUES  
--PUBLIC MEETING--

**Location:** Washington, D.C.

**Date:** Thursday, March 31, 1988

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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BRIEFING ON HIGH PRIORITY AEOD ISSUES

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PUBLIC MEETING

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Nuclear Regulatory Commission  
Room 1130  
1717 H Street, N.W.  
Washington, D.C.  
March 31, 1988

The Commission met in open session, pursuant to notice, at 2:04 p.m., the Honorable LANDO W. ZECH, JR., Chairman of the Commission, presiding.

Commissioners Present:

LANDO W. ZECH, Chairman  
THOMAS M. ROBERTS, Commissioner  
FREDERICK M. BERNTHAL, Commissioner  
KENNETH ROGERS, Commissioner  
KENNETH M. CARR, Commissioner

1 Staff and presenters seated at table:

2

3 S. CHILK - SECY

4 G. SJOBLOM

5 T. NOVAK

6 E. JORDAN

7 V. STELLO - EDO

8 W. MINNERS

9 E. ROSSI

10 W. PARLER - OGC

11

12 Audience Speakers:

13

14 E. BROWN

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

2 CHAIRMAN ZECH: Good afternoon, ladies and  
3 gentlemen. On the 10th of September last year, we were  
4 briefed by the Office of Analysis and Evaluation of  
5 Operational Data, AEOD, concerning their activities and  
6 how the results of their studies are integrated into the  
7 regulatory process.

8 We also heard about actions that AEOD was taking  
9 to enhance the integration of AEOD products into the  
10 regulatory process.

11 Today's information briefing by the Executive  
12 Director for Operations of AEOD is intended to update the  
13 Commission concerning the AEOD activities since our last  
14 briefing, and to inform the Commission of agency actions  
15 and high priority AEOD recommendations.

16 During the briefing today, I'd like the staff to  
17 include some discussion of the results of their efforts to  
18 enhance the integration of AEOD products into the  
19 regulatory process. This is what we emphasized the last  
20 time, and we want to talk about that today, not just the  
21 status report of what AEOD is doing.

22 I'd also appreciate a brief description of how  
23 the staff is handling what we discussed last time as  
24 lower priority AEOD suggestions as opposed to  
25 recommendations.

1 I understand the copies of the slides that we are  
2 going to use today are available in the back of the room.

3 Do any of my fellow Commissioners have any  
4 comments before we begin?

5 [No response.]

6 CHAIRMAN ZECH: If not, then Mr. Stello would you  
7 proceed, please.

8 MR. STELLO: Thank you, Mr. Chairman. We're  
9 prepared to give you both the status report as well as to  
10 answer the specific question following the recommendations  
11 of AEOD through the process.

12 There's one additional issue that's going to be  
13 in the briefing that I think is first time that I believe  
14 is an important part of our responsibilities and that's to  
15 examine data to determine to what extent and to what  
16 degree we are accomplishing the very purpose for which we  
17 exist, which is the safety of operating plants.

18 We have been looking at the data and have pulled  
19 together some data which in my view start to demonstrate  
20 that the process is working, and based on performance, we  
21 see trends that in our view clearly suggest the plants  
22 indeed are safer. I think we would be disappointed if  
23 that were not the case.

24 I think this is a particular area we've not spent  
25 enough time looking at and one through which I believe is

1 perhaps the most important performance indicator in that  
2 it gives, if you will, a report card on the agency, how  
3 well we're doing and are not, and we are going to be  
4 prepared to answer all the questions that relate to that.

5 I think we want to present you at least with some  
6 data that starts to show that the process is working and  
7 plants indeed are getting safer. And with that I hope we  
8 will be able to some day be able to present the data in a  
9 comprehensive way that shows the overall performance of  
10 plants that are improving because I think the link between  
11 safety, reliability, availability and capacity are very,  
12 very strongly coupled and tied together, and in that  
13 context, I think as we develop more and more data and  
14 understanding, hopefully we'll develop the kind of  
15 indicators that show that.

16 I'll ask Mr. Jordan to start the briefing and to  
17 begin with introducing the others at the table with your  
18 permission.

19 CHAIRMAN ZECH: All right. Thank you very much.  
20 Mr. Jordan, you may proceed.

21 MR. JORDAN: Thank you. Tom Novak is here as  
22 Director of the Division of Safety Studies from AEOD and  
23 he'll be giving a large part of the presentation for AEOD.

24 Ernie Rossi is here as Director of the Division  
25 of Operational Events Assessment to respond to issues

1 regarding NRR and to explain the NRR activities related to  
2 those most significant of our recommendations; and Warren  
3 Minners from Research is here, Deputy Director, Division  
4 of Reactor and Plant Systems.

5           Glen Sjoblom is the Deputy Director of Division  
6 of Fuel Cycle/Medical, Academic and Commercial Use and  
7 he's sitting back here. So the questions related to NMSS,  
8 he'll be prepared to answer those and we have staff  
9 support if we get into details that these people can't  
10 handle.

11           In the previous meeting in September, the  
12 Commission asked AEOD how we handle suggestions and also  
13 asked the Program Offices how suggestions were handled.  
14 Those questions were responded to in the SECY 88-12 for  
15 AEOD and 88-13 for the Program Offices respectively all on  
16 January 13 of this year.

17           And I would just briefly summarize and say with  
18 regards to AEOD, the suggestions that are contained in  
19 engineering studies or other documents are reviewed by the  
20 Division Director, the Director of Safety Studies, and so  
21 he then may upgrade or downgrade the suggestions and those  
22 documents are issued under his signature.

23           There is a process of review within the office so  
24 that as the study is maturing, presentations are given by  
25 the staff and there's an interaction along the way. But I

1 wanted to clarify how suggestions within the office are  
2 handled.

3           Recommendations are issued under my signature to  
4 the other program offices. And not trying to speak for  
5 the other offices, but to summarize the responses, the  
6 other offices each have procedures for responding to  
7 recommendations that AEOD provides, and those procedures  
8 we feel are coherent and functional.

9           NRR has within their procedures a process for  
10 reviewing suggestions. They did not respond to AEOD but  
11 they track suggestions, assign them to individuals and  
12 follow-up on them. And that's a relatively recent  
13 procedural change, a formalization.

14           And so there is a second chance on suggestions  
15 that AEOD provides. There was also a question asked about  
16 prioritization of generic issues and we deferred that to the  
17 subsequent meeting to the Commission by Research, so I  
18 think that issue was covered.

19           In terms of the enhancements that we discussed in  
20 September, we will mention examples within the priority  
21 issues as we go along, but I would like to make a few  
22 comments about that.

23           AEOD has assumed an advocacy role in the  
24 follow-up of these higher priority issues, and I think  
25 probably one of our strongest methods is by sending the

1 AEOD expert in the given area such as an air system  
2 problem to assist the region in an inspection where they  
3 have a plant with an air system problem to work with NRR  
4 when there is an air system problem.

5           So that when the study has been developed, we  
6 don't just terminate our interest, we provide the expert  
7 and then he feeds it back into the system.

8           We've also had those SARC feedback efforts with  
9 industry as well so that we communicate through INPO or  
10 other organizations through meetings with the industry  
11 directly and by transmitting the studies themselves  
12 targeted to the utilities within a given population group,  
13 such as new plants.

14           And certainly it's because of our view that until  
15 the plant has physically changed, that is the training is  
16 changed for the people, the procedures are changed, or the  
17 equipment is in some way altered, that is modified,  
18 replaced, there's not really a change in the plant safety.  
19 So our goal is to get it all the way to the plant.

20           The areas that I plan to cover -- could I have  
21 the first slide, please.

22           [Slide.]

23           MR. JORDAN: -- will briefly touch on the  
24 organization of resources and the sources of experience.  
25 The trends in operating experience, that's the good news

1 slides in this package, Tom will go through the reports  
2 that we have issued recently and then discuss I think the  
3 meaty part which is the priority issues, the status of  
4 those and interact with both Warren and with Ernie. And  
5 then we'll describe to you ongoing studies that we have.

6           Could I have the next slide, please.

7           [Slide.]

8           MR. JORDAN: The only point with the  
9 organizational slide is to identify the recommendations,  
10 and suggestions that may generally come out of four  
11 branches: The Diagnostic Evaluation Branch, the  
12 Operations Analysis Branch, Trends in Patterns, and the  
13 non-Reactor Assessment staff.

14           So that constitutes the portion of AEOD that's  
15 involved in analysis/evaluation of operational data. Next  
16 slide, please.

17           [Slide.]

18           MR. JORDAN: The programs within each of those  
19 branches that then contributes those recommendations and  
20 suggestions are first in the Diagnostic Branch, the  
21 diagnostic evaluations themselves and the incident  
22 investigation team inspections.

23           And the example for the diagnostic evaluation  
24 would be the Dresden diagnostic review that was done and  
25 the recommendations that were then transmitted to the

1 Program Office and for the Region to use in further review  
2 of the Dresden Station.

3 In the Trends in Patterns Analysis Branch, the  
4 products there are lessons learned from trends in pattern  
5 for instance, like the new plant studies.

6 The Operations Analysis Branch, that's generally  
7 where the case studies, engineering evaluations and  
8 special reports are performed. And I would identify the  
9 air systems study, the decay heat removal study as being  
10 typical examples.

11 In the non-Reactor Assessment, case studies and  
12 engineering evaluations such as in misadministrations and  
13 the radiography review.

14 [Slide.]

15 MR. JORDAN: The resources that are applied to  
16 these areas, a staff of about 44 are applied, distributed  
17 about half of those -- half of the total resource I should  
18 say, contractor and staff in the operational data  
19 analysis, about a quarter in the data collection and  
20 dissemination, and the next large fraction is the  
21 diagnostic with the performance indicators and incident  
22 investigation following behind.

23 Next slide, please.

24 [Slide.]

25 MR. JORDAN: The sources of operating experience,

1 you've seen a similar presentation. The object is that  
2 there is an awful lot of material and material that is  
3 sifted carefully and resifted.

4 For instance, the telephone notifications,  
5 licensee event reports, and Regional data reports, many of  
6 those are on the same event. They're not additive but  
7 those are different events.

8 The foreign events of course are unique and we  
9 examine those, have a responsibility for the Agency, for  
10 reviewing those.

11 We're doing more in the way of reviewing  
12 inspection reports to try to pull out of those issues that  
13 we may not get from the normal events. And we're also  
14 doing more in the way of AIT reports and the NPRDS data.

15 And I probably should have added that there is  
16 direct on-site follow-up through participation in AITs or  
17 in special studies. Next slide, please.

18 [Slide.]

19 MR. JORDAN: And this is the good news section.  
20 We're looking at in addition to individual plant  
21 performance through the performance indicators the same  
22 sorts of data but on an overall, an average basis for  
23 industry.

24 We look at it by functional areas and we do see  
25 some positive trends that we would like to communicate to

1 you. These trends we believe are in fact indicating  
2 improvements in overall plant safety and we feel that the  
3 basis for these improvements is the combination of the  
4 industry programs, the trip reduction program, the INPO  
5 monitoring reviews, and the NRC inspection and monitoring  
6 programs. The next slide, please.

7 [Slide.]

8 MR. JORDAN: We have two sets of trend slides and  
9 I'll only talk about the first set. And the point between  
10 the two sets is the first set is all plants for the years  
11 1984 through '87. That is what we termed as new plants,  
12 and the shutdown plants are grouped within this all plants  
13 list.

14 The next set excludes the shutdown plants and the  
15 point is that it does not affect the trend itself, it  
16 affects the slopes a bit but not significantly. So it's  
17 sufficient to merely look at all plants.

18 We clearly see that the automatic scrams are  
19 declining; safety system actuations are declining, that is  
20 the rates of those which is an improvement; significant  
21 events have reduced; safety system failures, there is a  
22 change in our screening criteria for 1987 and a change in  
23 the systems involved so that this one is not as clear but  
24 we've extracted the change -- the larger part of the  
25 change in 1987 and it does appear there is an improvement.

1 [Slide.]

2 MR. JORDAN: Perhaps the point disappointment is  
3 for forced outage rate, there is not a positive change.  
4 That's one that I caused you to switch a couple of pages,  
5 to your Page 10. And that one is affected by taking out  
6 the shutdown plants so that it's flat. Not an improving  
7 trend, but a flat trend.

8 The equipment forced outages is essentially flat,  
9 radiation exposure is clearly improving, and then the last  
10 one which is not one of our performance indicators is the  
11 accident sequence precursor. This is a relative measure  
12 and it is looking at the set of precursor data that was  
13 extracted by a contractor, and over a consistent basis  
14 does show an improvement.

15 COMMISSIONER CARR: Well, that explains the  
16 language, that would be what it is if we hadn't changed  
17 the recording of the requirements?

18 MR. JORDAN: The black is if we hadn't changed  
19 the reporting requirement and the hatch is the result of  
20 having added requirements.

21 Now I'd have to say that one is fussier though.  
22 We have done some changes with the data system, and I  
23 showed an article out of the Post to Vic Stello just  
24 before the meeting that was critical of the FAA's  
25 statistics on safety, and I certainly would not want this

1 agency to get in the same kind of flap.

2           So we have a consistent basis for all of these  
3 characteristics except for the safety system failures  
4 during these years, and in order to track this data we  
5 will have to continue with the same basis, the same  
6 definitions to see how the trends continue.

7           COMMISSIONER BERNTHAL: I just point out that  
8 since 1984, the number of operating plants in this country  
9 has oh probably gone up from around 70 to 105 or so today.  
10 Of course the general public doesn't realize that, so  
11 unless you've improved proportionally at least, you still  
12 don't look any better than you did four years ago.

13           In other words, you've got to keep improving as  
14 the number of plants goes up because I don't think the  
15 public pays much attention.

16           COMMISSIONER ROBERTS: These are averages?

17           MR. JORDAN: Yes, sir, these are average. These  
18 are average numbers.

19           COMMISSIONER BERNTHAL: Oh, these are all per  
20 plant.

21           MR. STELLO: Per plant.

22           MR. JORDAN: Average per plant.

23           COMMISSIONER BERNTHAL: I know it, but that's  
24 okay. I'm saying if you add up every plant you're still  
25 ending up with the same picture to the public: You have

1 the same number of significant events because you've got  
2 more plants.

3 CHAIRMAN ZECH: No, that isn't the way I read it.  
4 But perhaps it should be explained.

5 COMMISSIONER BERNTHAL: That's the average per  
6 plant because you've got more plants.

7 MR. JORDAN: I understand.

8 CHAIRMAN ZECH: But the trend is what we're  
9 looking at I think, and the trend shows that significant  
10 events for example have decreased.

11 MR. JORDAN: Per plant.

12 CHAIRMAN ZECH: Per plant.

13 COMMISSIONER BERNTHAL: Per plant, but we've got  
14 more plants.

15 MR. NOVAK: I think Commissioner Bernthal's point  
16 is, for example in 1984 you may have had 500 reactor  
17 trips, in 1987 you had 500 reactor trips. We see that as  
18 a declining trend per plant but the public would say you  
19 still have as many trips out there today as you had in  
20 1984. That's a perception problem, I agree.

21 COMMISSIONER BERNTHAL: Because they don't know  
22 how many plants we got.

23 CHAIRMAN ZECH: Well, it certainly needs some  
24 more explanation, perhaps, but the conclusion you draw is  
25 that it's an improving condition of operation.

1           COMMISSIONER BERNTHAL:  On a plant by plant  
2 basis.

3           CHAIRMAN ZECH:  On a plant by plant basis.

4           COMMISSIONER BERNTHAL:  That's right.

5           MR. JORDAN:  And the staff has been cautious not  
6 to come to you with questionable trends.  We feel this is  
7 a real trend.

8           CHAIRMAN ZECH:  Sure.

9           COMMISSIONER BERNTHAL:  No, it's commendable.  I  
10 draw the analogy to the airline industry.  If we had the  
11 same accident rate today as we did in the 60s, nobody  
12 would fly airplanes because we got so many more flights.  
13 That's really what the analogy is.

14           MR. JORDAN:  All right, sir.  Then with that, I  
15 would go into the next portion of the presentation and ask  
16 Tom Novak to pick up on your Slide 11.

17           MR. NOVAK:  Okay.  May I have Slide 11.

18           [Slide.]

19           MR. NOVAK:  Thank you.  The first four items I'm  
20 going to discuss separately later on in the presentation,  
21 they are the priority issues.

22           What I thought I would do is just pick two more  
23 and give you a feeling for the breath and the type of  
24 studies that we are doing.

25           For example, there is one midway down,

1 operational experience feedback on main feedwater flow  
2 control and bypass valves and valve operators.

3 I bring this one up because we did this study  
4 using NPRDS data. It was the first comprehensive review  
5 of trying to understand balance of plant performance,  
6 what's contributing to the initiating transients coming  
7 from balance of plant.

8 We looked and we say that feedwater control  
9 valves and bypass valves were major contributors. Now  
10 that kind of background we got from the LER database, but  
11 what was going on with those components we felt we could  
12 better learn by going into ALIDS.

13 We've spent quite a bit of time developing that  
14 study. It's going to end up as being what I would call a  
15 good practice document. It's going to show that  
16 maintenance and not necessarily model design of flow  
17 control valves is the predominant cause for failures.

18 It also told us a lot about the NPRD database  
19 where it needs to be improved, the weaknesses. It's  
20 really the only way you can use it. And so this kind of  
21 study now we plan to share with all licensees, provide  
22 this so that they can see what we consider to be good  
23 practices with regard to maintenance that motor operate  
24 valves and bypass valves.

25 We have a similar study underway on feedwater

1 pumps just so that we can put that whole balance of plant  
2 study together under NPRDS.

3 COMMISSIONER BERNTHAL: I'm sorry. Did somebody  
4 comment on the forced outage rate? I thought I did hear a  
5 comment.

6 MR. JORDAN: Yes, sir. That there is not a  
7 perceptible change.

8 COMMISSIONER BERNTHAL: Yes, it certainly hasn't  
9 gotten any better. Is that because of DQ work and other  
10 things that -- no, that's forced outage.

11 MR. JORDAN: I don't have an explanation.

12 COMMISSIONER CARR: Poor maintenance.

13 COMMISSIONER BERNTHAL: It's catching up.

14 MR. STELLO: No, I think the overall maintenance  
15 of the plants has not been done as well and you are not  
16 seeing the improvement in doing better maintenance,  
17 although the numbers do show a very, very small downward  
18 trend, not enough to make a difference.

19 CHAIRMAN ZECH: Well, it certainly shows we  
20 should emphasize maintenance.

21 MR. STELLO: Yes.

22 MR. JORDAN: Yes.

23 CHAIRMAN ZECH: Yes.

24 MR. JORDAN: I think that's the right thing. The  
25 equipment forced outages and the forced outage rate which

1 is slightly different, neither show a positive improvement  
2 and the equipment forced outages for per 1000 critical  
3 hours is a maintenance indicator so to speak.

4 And so I guess I must say I'm a bit surprised  
5 that with the other indicators showing improvements which  
6 are related to maintenance, that the actual availability  
7 or forced outage rate hasn't also responded as yet.

8 CHAIRMAN ZECH: Well, it tells you one other  
9 thing, that there's room for more improvement.

10 MR. JORDAN: Yes, sir.

11 MR. STELLO: And I would think that there might  
12 be one other point that most of the indicators that show  
13 the trends are the important safety systems for which we  
14 pay a great deal of attention to, and you can see the  
15 improvement there where a great deal of the outages are a  
16 balance of plan for which we have not --

17 CHAIRMAN ZECH: That's a good point.

18 MR. STELLO: I think we are beginning to and it  
19 will just take time.

20 CHAIRMAN ZECH: To focus more on balance of plan.

21 MR. STELLO: That's right.

22 CHAIRMAN ZECH: Which is the maintenance and  
23 other things, but certainly as you point out that the  
24 trends are generally an improving condition, but there are  
25 a couple, forced outages is one of them, which indicates

1 there's more room for improvement and certainly  
2 maintenance perhaps is a contributing factor there.

3 MR. STELLO: I think it's a key.

4 CHAIRMAN ZECH: Yes.

5 COMMISSIONER BERNTHAL: What would the Japanese  
6 numbers be there?

7 MR. JORDAN: Their forced outage rate --

8 MR. STELLO: One indicator is the average plant  
9 availability capacity. Japan this year I think is 76  
10 percent and ours is about 56.

11 COMMISSIONER BERNTHAL: Well, I think by capacity  
12 it's 76, availability for that -- well, okay. You got to  
13 be careful with those.

14 MR. STELLO: Same either way. About 20  
15 percentage points different.

16 COMMISSIONER BERNTHAL: Outside the mandatory  
17 shutdown would really be the question.

18 COMMISSIONER CARR: I'd predict their force  
19 outage rate is flat, too.

20 COMMISSIONER BERNTHAL: Yes, but I think it's  
21 probably flatter by 2 percent.

22 COMMISSIONER CARR: It's flat at a higher place.

23 COMMISSIONER BERNTHAL: It's probably flat at  
24 about 2 percent.

25 MR. STELLO: I don't know what the number is, but

1 I suspect it's substantially lower.

2 CHAIRMAN ZECH: All right. Let's proceed.

3 MR. NOVAK: Okay. Let me just point out one more  
4 before I move off this slide. The fourth one, which is  
5 the depressurization of reactor coolant systems at PWR.

6 What prompted us to look at this was an event at  
7 Salem in August of 1986 which was predominantly an event  
8 having to do with the electrical system; however, our  
9 staff, when they looked at it, saw some configurations  
10 with regard to the ability to depressurize.

11 What we did then was look very carefully at the  
12 circumstances involved with the operation of that plant  
13 because had the event been triggered from a loss of  
14 off-site power or a steam generator tube and the ability  
15 to depressurize which is necessary following those events,  
16 we saw a configuration at the plant at that time which  
17 would have made it very difficult for the operators to  
18 depressurize non-safety related equipment out of service.

19 So that study then came up with suggestions to  
20 NRR and I'll ask Dr. Rossi to follow-up on that.

21 But our bottom line was we felt that there was a  
22 message there for better operations of the Salem plant  
23 with regard to systems necessary for pressure control and  
24 so forth.

25 MR. ROSSI: Yes, we took that suggestion from the

1 AEOD engineering evaluation and we combined it with  
2 another event that demonstrated the importance of  
3 maintaining the capability to control or depressurize the  
4 reactor coolant system in emergencies, and we issued  
5 Information Notice No. 8760 on depressurization of reactor  
6 coolant systems in pressurized water reactors, and that  
7 was issued in December of 1987 and is indeed an example of  
8 where we took an AEOD suggestion and then worked with AEOD  
9 to expand it into a lesson that could be sent to the  
10 industry via an information notice.

11 MR. NOVAK: May I have the next slide, please.

12 [Slide.]

13 CHAIRMAN ZECH: Let me make just one comment  
14 before you go off this slide on your NUREG 1275, Volume II  
15 which I think was a very excellent effort on the part of  
16 AEOD on operating experience feedback report air systems  
17 problems, and we all know that air systems is something  
18 that has caused problems in the past but probably has not  
19 had the emphasis that it should have had. I think this is  
20 a valuable report and I hope it too is being worked into  
21 the regulatory system.

22 Could anybody comment on that?

23 MR. NOVAK: And we will when we get to it.

24 MR. JORDAN: At length.

25 CHAIRMAN ZECH: All right. Good.

1 MR. NOVAK: Let me have the fourth study slide.

2 [Slide.]

3 MR. NOVAK: Again here is a variety of studies.

4 Let me just pick one again and talk about it briefly. The  
5 fifth item down, pressurizer code safety valve  
6 reliability.

7 I bring this up only to show the kind of spread.  
8 We look at all of the licensing event reports and what we  
9 see is that pressurizer code safeties are lifting both  
10 above and below their nominal set points, but outside of  
11 the range.

12 That was a concern to us because some of them are  
13 lifting as far as 20 percent above their set point. And  
14 what we did then was continue to watch that recognizing  
15 that there are things regarding set point drift and  
16 leakage and misadjustment of ring settings.

17 The bottom line is this is a study from which we  
18 expect now to grow. We think there's more work to be done  
19 here. We've shared this information with Dresser and  
20 Weily. We think it's a valuable piece of work.

21 It may be that the reality is that's the way  
22 pressurizer safety valves are going to operate and so  
23 safety analysis and other documents have to recognize that  
24 the variability in the ways these valves behave is  
25 different than what was originally described in the final

1 safety analysis reports.

2 So that was all I wanted to mention on that one.

3 Okay, may I have the next slide.

4 [Slide.]

5 MR. NOVAK: This is only intended to show the  
6 variety of reports that we've issued since January of '87.  
7 I don't plan to bring anything specifically out on this  
8 one. They're standard reports that come out. May I have  
9 the next slide.

10 [Slide.]

11 MR. NOVAK: What we want to talk about now are  
12 our priority issues and there are four specific ones. And  
13 I'd like to make one point that perhaps is worth just  
14 touching on.

15 When we looked at operating trends, there was one  
16 trend there which looked at accident sequence precursors.  
17 Those are events that we have seen that we feel are  
18 significant events.

19 I had our people go back and look at what  
20 contributed to those events, what things failed. And it's  
21 interesting that when you look at motor operated valves  
22 and air systems and loss of decay heat, in half of those  
23 events these systems in one way or another didn't perform  
24 their intended function.

25 So that sort of supports our view that these are

1 important priority issues because they go hand in hand  
2 with what we have been studying under the accident  
3 sequence precursor program.

4 May I have the next slide on newly licensed  
5 plants.

6 [Slide.]

7 MR. NOVAK: I'm going to move quickly through  
8 this one. We were here, we did express what we've done on  
9 new plants. There was a question to be sure that our  
10 message got out to industry.

11 We did it in two ways. Actually we sent on the  
12 order of several hundreds copies of the NUREG report to  
13 plant managers, to nuclear plant managers, vice presidents  
14 of nuclear plant, to owners' groups, to vendors, to  
15 architects, engineers.

16 So we gave it a very wide distribution and then  
17 in addition to that, Mr. Jordan under his signature,  
18 directed specific copies to each plant getting ready for  
19 their start-up program, also plants that were in extended  
20 shutdown.

21 So clearly everybody has that document and they  
22 have it more than one time so we are very pleased with  
23 that.

24 As we mentioned earlier, we did meet with INPO to  
25 go through a workshop and we felt that was a good exchange

1 of information and we shared that with the Commission.

2 I have one back-up slide I'd just like to show  
3 you for a minute. May I see back-up Slide 8, please.

4 [Slide.]

5 MR. NOVAK: What I wanted to show is just to give  
6 you a quick feeling, I don't expect you to -- thanks  
7 George, but it's the wrong way -- he works for me, but I  
8 don't care.

9 If you looked at the solid lines, upper bound and  
10 lower bound, those were the bands that we talked about  
11 when we did the initial study.

12 So we've taken all of the older plants out and  
13 now here is the new population of plants coming through  
14 since this study was done. A few of them were in there,  
15 but they were just starting out.

16 And so you see, this is what all of the plants  
17 since this report are doing in terms of start ups. I  
18 think of interest is the ones that tend to come up. That  
19 was plant Vogel. We supported NRR in Region II in some  
20 meetings on their start-up program, and we think those  
21 types of events was what was responsible for turning that  
22 curve over somewhere between one or 2,000 cumulative  
23 critical hours.

24 The other plant right after Vogel was Beaver  
25 Valley. We had the same sort of meetings there.

1           But generally I would say there are more plants  
2 moving towards the preferred mode of operation. We don't  
3 have as many bumping up against the upper limit.

4           But that's just an idea of where we are in terms  
5 of the new plants coming on line. South Texas 1 is on  
6 there, we'll be watching it. Braidwood is on there,  
7 Braidwood 2 will be coming on.

8           So we're going to be seeing just what they are.  
9 That's just to give you the broadest feeling for the  
10 performance of that --

11           COMMISSIONER BERNTHAL: I'm sorry. What's does  
12 the upper and lower bound representing?

13           MR. NOVAK: What that was, when we did the  
14 original new plant study, the worse performer was  
15 represented by the upper bound --

16           COMMISSIONER BERNTHAL: Worse and best.

17           MR. NOVAK: -- and the best performer was on the  
18 lower. And all that's saying, are we doing any better  
19 today. I would say, yes, but we've still got some work to  
20 do.

21           May I have the next slide on motor operated  
22 valves.

23           [Slide.]

24           MR. NOVAK: What I'd like to just mention on this  
25 of course, this is an area where back in 1982 we did a

1 case study related to motor operated valves.

2           The bottom line of these studies are that these  
3 things take a lot of attention, detail, and there's just  
4 no shortcut and I think Dr. Brown who's in the audience  
5 here has spent several years -- he's our expert on it and  
6 every time I've had an opportunity to be briefed on it, I  
7 get a clear impression that this -- it takes a lot of  
8 teamwork to make these systems work properly. Engineers  
9 and maintenance people have to do it together. You can't  
10 put the responsibility on one side of the house.

11           CHAIRMAN ZECH: The engineers and who?

12           MR. NOVAK: Maintenance personnel.

13           CHAIRMAN ZECH: How about the designers?

14           MR. NOVAK: As well. And we're working with --  
15 in fact right now EPRI is working on what they call an  
16 applications guide which really is what you're saying.  
17 How do two pieces go together.

18           CHAIRMAN ZECH: You got to start from the  
19 beginning.

20           MR. NOVAK: Yes.

21           CHAIRMAN ZECH: Do the designers get the feedback  
22 from the engineers and the operators on the problems we've  
23 had with these water operated valves?

24           MR. NOVAK: I'm not as confident of that. I'll  
25 ask Dr. Brown, but I think that's one of the problems we

1 see.

2 CHAIRMAN ZECH: Is Dr. Brown here?

3 MR. NOVAK: Earl, would you mind stepping up.

4 CHAIRMAN ZECH: And would you please identify  
5 yourself for the reporter.

6 DR. BROWN: Yes. I'm Earl Brown with AOED.

7 CHAIRMAN ZECH: Thank you.

8 DR. BROWN: The operating experience does not get  
9 back as much to the designer or the operator of the  
10 equipment as it should.

11 I think the groups that Tom mentioned, though,  
12 with the effort going on now with NUMAR-EPRI, they are  
13 working together. So I think there's room for progress.

14 CHAIRMAN ZECH: All right. Fine. Well, I'd like  
15 you to follow through on that if you would, Tom, because  
16 you know this is not just in this one area but I've found  
17 in some of our power plants even, the design people don't  
18 necessarily always get the feedback from the engineers,  
19 the engineers don't always get the feedback from the  
20 craftsmen, and the others who are putting the  
21 modifications in the plant. And if you don't close the  
22 loop, you're not going to make any improvements. You're  
23 just going to keep Band-Aiding things. If we don't close  
24 the loop, we're not going to improve in my judgment.

25 So there's got to be a feedback system. A

1 feedback system is important from water operated valves as  
2 well as for many other evolutions we do in these power  
3 plants.

4           The designers, the engineers, the  
5 constructionists, the people who install the work, the  
6 craftsmen, and others, there simply must be a feedback  
7 system. So that's my point.

8           I think in this motor operated valve, it's kind  
9 of obvious that perhaps that can be improved.

10           MR. JORDAN: Maybe I can step in there. Just  
11 before we had this meeting, we attended a very quick  
12 briefing by the NUMARC and the EPRI folks on the program  
13 they're going through now, and after this meeting we're  
14 going to go get a full briefing --

15           CHAIRMAN ZECH: Good.

16           MR. JORDAN: -- on their activities. And I was  
17 impressed. The representatives that are there include not  
18 only the maintenance engineers from the plants, but  
19 representatives from LIVITARK itself, from MOVATS, from  
20 the industrial groups that are supporting very strongly  
21 this overall activity.

22           So in this case the designers -- that count now  
23 are involved -- the problem of course has been that the  
24 designers were less interested than the  
25 architect-engineering firms that in fact are no longer

1 involved in this particular loop unless they're contracted  
2 back to provide support.

3           But I think the important thing is the  
4 applications guide will become then an instrument for  
5 posterity that will be available for any subsequent design  
6 efforts, that they can see what size valve, what type  
7 operator, and what combinations in fact are viable.

8           So the efforts are ongoing in that direction.

9           CHAIRMAN ZECH: Okay. Well, I'd just frankly  
10 like you to think of it as a closed circle --

11          MR. JORDAN: Yes, sir, we do.

12          CHAIRMAN ZECH: -- not as an open circle. And  
13 even though the designers have finished their effort and  
14 contractors finished and they're all gone and now it's up  
15 to the engineers and the construction people and so forth,  
16 in my view, somewhere or another we should keep them in  
17 the loop so that if you need them to come back to  
18 something you should do it. You shouldn't just throw it  
19 back to the engineers and have them engineer around a  
20 design that maybe isn't the best.

21           So all I'm saying is in the logic process, I'd  
22 like to think there's a closed loop in this design,  
23 construction, craftsmen circle and we keep going back  
24 again. Especially in areas like water operated valves,  
25 air systems, other things where we know we have problems.

1 It's just a concept I think is worth keeping in mind.

2 MR. JORDAN: Yes, sir.

3 CHAIRMAN ZECH: And I would ask you to at least  
4 keep that in mind. Okay.

5 MR. NOVAK: Let me just touch on a couple of more  
6 points on this slide. You see a point there regarding  
7 training courses that the staff is in part providing for  
8 NRC employees. I'd just like to give you some information  
9 on that.

10 There have been six courses offered. We've had a  
11 total of 71 NRC employees attend this course on  
12 maintenance training. It's a three day course, and it's  
13 intended just to give us the best information we can on  
14 motor operated valves.

15 Before the end of September, there'll still be  
16 another six courses, so by the end of this fiscal year,  
17 we'll have over 140 staff people trained in this area and  
18 I think that's another positive feature.

19 One other point I'd like to make. There's a  
20 point down here where the scope of this effort has been  
21 extended to include hydraulic lockup of MOVs.

22 I think this is a just an indications of the  
23 subtlety through which problems can come.

24 Here's a situation where the lubricant, the  
25 grease migrates from gearbox into what's called the spring

1 package. And you've just got -- now when the valve is  
2 caused to operate, the springs have got to compress and  
3 the grease is there and it becomes a spring constant.

4           So those are the kinds of problems that you have  
5 to recognize and they are subtle; that's why we have Dr.  
6 Brown working on it just about full time. May I have the  
7 next slide, please.

8           [Slide.]

9           MR. NOVAK: Now this is the discussion that we  
10 wanted to have with regard to the air system study.

11           I think the bottom line that we have seen for  
12 several years with regard to air system studies is the  
13 vulnerability of safety related equipment to common mode  
14 failures. The air system can go across the plant and can  
15 take out a number of key systems.

16           We did a study back in the early 80s. It was  
17 reviewed and really it has been an uphill fight I think in  
18 terms of convincing ourselves that the air system study  
19 deserves the priority that it now has.

20           I think the earlier look at air systems was that  
21 it wasn't that significant a contributor. It was really  
22 due to the perseverance of the individuals working on this  
23 case study that continued to look at the data and put it  
24 in front of our people to do risk assessments that said  
25 there are more events. They are significant and it ought

1 to be looked at.

2           So it has been a fight going up. It's there now.  
3 Vic has initiated distribution of the case study to every  
4 licensee, it's in their hands, and it's being now actively  
5 worked on by NRR.

6           We've got a number of things that we've  
7 recommended. Let me see -- back up slide -- I've got a  
8 slide here. Back up Slide No. 10, please.

9           [Slide.]

10          MR. NOVAK: And I'll ask Ernie again to walk us  
11 through what NRR is doing. I'll just put the slide up to  
12 show you the bottom line with regard to this particular  
13 study.

14          MR. ROSSI: Well, as you probably know, air  
15 systems are generally non-safety related systems that  
16 serve safety related valves, and the design basis is for  
17 the safety related valves to fail in the proper position  
18 if you lose air unless an air accumulator is provided.

19          Now as a result of the AEOD study, NRR issued  
20 Information Notice 8728 in June. That notified licensees  
21 of the AEOD report and it also highlighted several  
22 specific problems that came out of that report that air  
23 system problems could end up causing.

24          In December, we issued an Information Notice  
25 Supplement that transmitted NUREG 1275 which was an

1 updated version of the AEOD report on air systems to the  
2 industry.

3           The concerns with instrument air systems has been  
4 designated a high priority issue, and we currently have  
5 short- and long-term actions underway.

6           In the short-term, we're in a process of  
7 developing a generic letter incorporating the primary AEOD  
8 recommendations on instrument air systems to send out to  
9 the industry.

10           That letter will do such things as confirm -- ask  
11 utilities to confirm the adequacy of their instrument air  
12 quality, confirm the adequacy of any accumulator designs  
13 that are used to operate safety related valves, confirm  
14 the adequacy of maintenance practices and procedures, and  
15 training for handling loss of instrument air; and verify  
16 the valve designs for what the failure position is if you  
17 should loose air.

18           We expect to have that generic letter to the CRGR  
19 in April and issued in May.

20           In the long-term, Research is coordinating  
21 further staff review of instrument air system design  
22 requirements under generic issue 43, and any necessary new  
23 requirements that they develop would be recommended if the  
24 supporting regulatory analysis showed the need for that.  
25 And that resolution is scheduled for the end of 1988.

1           CHAIRMAN ZECH: All right. Thank you.

2           MR. NOVAK: May I have the next slide on loss of  
3 decay heat removal.

4           [Slide.]

5           MR. NOVAK: Now this study was done primarily to  
6 look at situations in the shutdown mode. Decay heat  
7 removal has been an unresolved safety issue, but the hard  
8 -- what's been worked there is in the event of an  
9 accident, what's the reliability and the ability of the  
10 decay heat removal system to handle post-accident  
11 situations, which is a valid problem.

12           What we looked at in this study was, if for some  
13 reason you have to shutdown the plant other than an  
14 accident situation, what's the likelihood that you might  
15 run into problems while you're in a shutdown mode because  
16 you've lost decay heat removal?

17           We've seen a number of events where plants have  
18 gone into alignments where the only method of removing  
19 decay heat is the one they're currently using and it  
20 failed. So you get air binding or something in a pump,  
21 and then you're sitting there without any other source of  
22 decay heat removal until you can restore the availability  
23 of that system. And we've seen events where actually the  
24 cooling temperatures have reached boiling and you've had  
25 actual boiling in the reactor while you're trying to

1 recover the decay heat removal system. So we see this as  
2 a significant area.

3           What also supports this is a recent study done by  
4 the Nuclear Safety Analysis Center where they did a PRA  
5 study looking at shutdown conditions for the Zion Station.  
6 And roughly they come up with the same answers that we do,  
7 that the potential for serious events can be as well in  
8 the shutdown mode as well as in operation because there's  
9 just that tendency to put yourself in a less favorable  
10 situation than you need to.

11           So this study is really aimed at making sure that  
12 people look at containment integrity when they're in  
13 refueling modes, look at the configurations that they  
14 have, plan their shutdowns so that they have a back up for  
15 any situation that occurs. Don't get yourself out  
16 strictly where you're operating on a single trend without  
17 a back up.

18           Now this is another one where I'll ask Ernie now  
19 to follow through on what NRR is doing with respect to the  
20 recommendations that we did in the case study.

21           MR. ROSSI: About 40 percent of the loss of  
22 residual all heat removal events occur while in mid-loop  
23 operation.

24           Following an event in April of 1987, we issued an  
25 information notice. That event occurred at Diablo Canyon.

1           And then later after that information notice we  
2 went out with a generic letter to obtain information from  
3 the utilities on training and procedures and supporting  
4 analyses for basically mid-loop operation.

5           Currently we are in a process of preparing a  
6 bulletin to go out and that bulletin would dwell on things  
7 like reducing event initiators during mid-loop operation,  
8 improving mitigation of loss of RHR if it should occur by  
9 making sure that everyone has adequate procedures, and it  
10 would look at instrumentation available during mid-loop  
11 operation.

12           COMMISSIONER CARR: I don't understand the term  
13 "mid-loop". How about giving me a tutorial.

14           MR. NOVAK: When you want to do steam generator  
15 tube inspections, you will drain down the primary system  
16 to a certain level. That's what we refer to as mid-loop  
17 operation. Something less than having the vessle  
18 completely filled.

19           COMMISSIONER CARR: Okay.

20           MR. NOVAK: Are you finished, Ernie?

21           MR. ROSSI: I'm finished.

22           MR. NOVAK: May I see the next slide now on  
23 on-going studies.

24           [Slide.]

25           MR. NOVAK: I'd like to spent a lot time on

1 service water system performance in light water. That's a  
2 case study and I'd just like to walk you through that one  
3 very quickly. May I see back up Slide D-12, please.

4 [Slide.]

5 MR. NOVAK: What I'd like to do is take a minute  
6 and walk you through our process, how do these studies  
7 evolve.

8 Certainly what's key is a continuing review of  
9 our operating data. What Ed Jordan mentioned, all of  
10 those LERs, the bulletins, inspection reports and so  
11 forth, that constitutes it.

12 We watch service water systems, we saw a high  
13 repeat rate and I'll get to the numbers in a minute, but  
14 also we look at what has been done, what have we said to  
15 industry with regard to taking care of service water  
16 systems.

17 So we went back and looked at all of the  
18 bulletins, generic letters. We looked at MPRDS, what did  
19 we see failing from that system. And then we looked at  
20 what INPO has put out.

21 So we've had a lot of written material on taking  
22 care of service water systems. It really hasn't done the  
23 job that we think it has, so it prompted us to continue to  
24 look, and we did a number of site visits.

25 Now when we went back into the licensing event

1 reports, we did a search and we found it interesting here  
2 that almost 1,000 events, with some degradation in service  
3 water system, occurred between that 7 year period. That's  
4 a substantial number of events.

5 Well, then we took another cut and we looked more  
6 closely at them to see which of those 1,000 actually had  
7 failures or significant degradations and we found almost  
8 300 there.

9 And then we narrowed them down to some 30 events  
10 where we really poured over, what is going on with regard  
11 to service water systems in plants today? And from that  
12 is coming our case study. May I have the next slide on  
13 D-13, please.

14 [Slide.]

15 MR. NOVAK: Okay. What did we find? Of those  
16 276 situation where either the system was declared  
17 inoperable or there was significant degradation, you can  
18 see that more than 50 percent is due to fouling.  
19 Something else is in that line other than water and it's  
20 blocking the flow. And it's nothing that would be  
21 surprising, sediment, vial fouling most recently in  
22 Catawba, a number of clamps found their way into the  
23 system, and the other is just the corrosion and other  
24 things that find their way into it.

25 We also found places in the design where a single

1 failure could fail the whole system. It isn't single  
2 failure proof. That could be some of the older plants  
3 with some of the configurations.

4           Flooding occurs. Pump rooms are flooded and it  
5 takes out the electrical system. So it showed us that  
6 there was a large number of things causing system  
7 failures. May I have the next slide. Back up slide --

8           COMMISSIONER CARR: Before you leave that one,  
9 what kind of failures did seismic deficiencies cause?

10           MR. NOVAK: Good question. They may have gone in  
11 and said that system is not seismically qualified.

12 Something is wrong with a hanger they declared inoperable.

13           COMMISSIONER CARR: Oh, okay.

14           MR. NOVAK: They had to report it.

15           COMMISSIONER CARR: It wasn't an earthquake.

16           MR. NOVAK: No, it wasn't an earthquake. Now,  
17 may I have the next slide, please, George.

18           [Slide.]

19           MR. NOVAK: This is kind of where I see us coming  
20 out. We're going to put this review out now for peer  
21 review. We will take our case study and we will provide  
22 it to NRR, we will provide it to EPRI, we will provide it  
23 to industry groups for the factual correctness. Are those  
24 276 events and 30 events exactly the way we understand  
25 them? We're not asking them to comment on our

1 recommendation, but make sure we have our facts correct.  
2 That will be done.

3           We see basically that there are numerous causes  
4 of system failures. No surprises from the previous slide.  
5 We believe this thing is going to come as being a  
6 situation where we would say the risks would put it into a  
7 high priority category.

8           We've done some preliminary work, and we tested  
9 against NUREG 0933 or the severe accident policy, it would  
10 say do something about it.

11           The bottom numbers are really just our numbers.  
12 1.5 times 10 to minus 2. If you go back to our data, we  
13 find ten events where the system has completely failed  
14 over 600 years and that's a number like 1.5 times 10 to  
15 minus 2.

16           System degradation frequency is nothing more than  
17 those 276 events over 600 reactor years again. 100  
18 reactor years roughly over 6 years.

19           So the numbers aren't fancy, but it does say then  
20 that you're talking about core melt frequencies roughly in  
21 the range of 10 to minus 3 to 10 to minus 5.

22           We're going to stop here and we would forward our  
23 work now over to Research and they will take the next cut  
24 at not just fine tuning but looking more carefully at what  
25 we consider the risks.

1           But this is the kind of thing we think now  
2 prompts us to say something should be done in the area of  
3 service water systems.

4           MR. MINNERS: I'd note on that, Tom, that there  
5 is a generic issue on service water system fouling which  
6 is working its way through the resolution process.

7           MR. NOVAK: I planned on only bringing up one  
8 more point here just to give you -- may I go back now to  
9 Slide 20, please.

10           [Slide.]

11           MR. NOVAK: The other way around, please, George.  
12 Thank you. Let me just touch base for a minute on some of  
13 the trends in patterns studies, again give you a breath of  
14 what we are doing.

15           We are just in the process again of completing it  
16 but I'll call the case study on our review of Tech Spec  
17 violations and I wanted to spend a minute just to show you  
18 what we think we're learning from the review of Tech  
19 Specs. George, may I see the back up slide on Tech Spec  
20 violations.

21           [Slide.]

22           MR. NOVAK: Now what we've done is we've looked,  
23 and since the licensing of that report system requires any  
24 violation to be reported, we have gone back and looked at  
25 1984, '85 and '86 to see the kinds of violations and the

1 frequency, to get an understanding of just how often are  
2 operations violating Tech Specs and how significant are  
3 they.

4 I think this is an excellent study to support the  
5 Tech Spec improvement program and as you'll see on the  
6 bottom line there, our bottom line supports theirs in the  
7 sense that fire protection and those things that were in  
8 Tech Specs are low priority in terms of significance and  
9 can be moved out of the Tech Specs.

10 But what we did see is basically that there was  
11 an increase in the number of violations average per plant.  
12 There are more violations per year. Not a major change,  
13 but what we see are individual plants kind of spiking.  
14 They'll go through a period of six months to a year and  
15 they have a rash of violations. That's when the Region  
16 and NRR will look more carefully at it.

17 But even if you take them out and take the new  
18 plants out, the remaining plants, the mature plants still  
19 have a slight increase. We'll be looking at that and  
20 talking to NRR with regard to what it means.

21 But I think this is again instructive in terms  
22 of -- I also will look at this to see if we ought to be  
23 looking at our reporting requirements.

24 In other words, in 1984 this rule on reporting  
25 went into effect, and this is an appropriate way to look

1 at the need for any changes in the reporting requirements,  
2 additions as well as deletions. We've seen things that we  
3 don't need to be looking at as carefully.

4 So that was just again to give you the breath of  
5 the kind of work that we have. That completes my study  
6 unless there is any specific questions.

7 MR. STELLO: We're through, Mr. Chairman.

8 CHAIRMAN ZECH: All right. Thank you. Questions  
9 my fellow Commissioners? Commissioner Roberts?

10 COMMISSIONER ROBERTS: I'll ask a non-fact  
11 question and one you can't answer. But, Vic said that  
12 plants are operating more safely. Why?

13 MR. STELLO: I said --

14 COMMISSIONER ROBERTS: Is it the regulators or is  
15 it the private sector or operator?

16 MR. STELLO: You mean who is producing that  
17 change?

18 COMMISSIONER ROBERTS: Yes.

19 MR. STELLO: Both. I think INPO is having an  
20 effect, I think the industry itself is changing, and I  
21 believe that the regulatory process and the kinds of  
22 things that we have done in the last several years has  
23 produced change.

24 So together the regulatory process, the industry  
25 and what they are doing I think is getting overall

1 performance.

2           We emphasize, because that's our business, those  
3 parameters that we think are more direct measures to  
4 safety, and I think you can see that the efforts and  
5 attention going into them suggest that the trends are  
6 clearly there, and I think they are clearly there.

7           I think it's just more than that. I think I  
8 would observe that in meetings with licensees over --  
9 well, that have expanded over the 22 years that I have  
10 been in this business, I think I sense a significant  
11 change in the attitudes.

12           At the top level management of the company they  
13 are responsive, they are starting to develop the kinds of  
14 attributes that culture and policy and philosophy of  
15 operation -- that is process producing change.

16           I think I see it in everything. I see it in the  
17 daily reports that we see. You don't see as many or as  
18 significant issues being raised. I think it's an overall  
19 change throughout the industry that's positive.

20           COMMISSIONER ROBERTS: Well, I read your brief  
21 article, there. I don't know whether that's true or not.  
22 I just saw that. Don't ever get this agency in a  
23 situation that's alleged there from your FAA thing  
24 changing the rules of the game from year to year. I know  
25 that goes without saying.

1 MR. STELLO: Yes.

2 COMMISSIONER ROBERTS: Okay. That's all I have.

3 CHAIRMAN ZECH: All right. Thank you.

4 Commissioner Bernthal.

5 COMMISSIONER BERNTHAL: I really don't have any  
6 questions. On the last point you raised, however, Tech  
7 Spec violations. Are you sure we aren't getting better  
8 reporting over that period of time?

9 MR. NOVAK: I think Ed and I talked. We think  
10 from both sides, I think we're doing a better job of  
11 watching and I think the industry has also been more  
12 sensitive to what constitutes a basis.

13 COMMISSIONER BERNTHAL: Yes, that's what I  
14 wonder. I wouldn't want to suggest that not everything  
15 got reported four or five years ago, but --

16 MR. STELLO: I think there's just more care.

17 COMMISSIONER BERNTHAL: Yes.

18 MR. STELLO: There is more attention to the  
19 detail and I think that's the key to the overall  
20 improvement, I think that's a key to the overall  
21 reporting. They're finding more because they're looking  
22 harder.

23 COMMISSIONER BERNTHAL: Yes, that's what I'm  
24 saying.

25 MR. JORDAN: There may be an analogy in looking

1 at individual plant performance. We see plants that go  
2 into a very detailed improvement program and immediately  
3 show more events and an apparent decline before they  
4 actually show an improvement and it's because of caring in  
5 reporting and finding their own problems.

6 COMMISSIONER BERNTHAL: Well, I just want to  
7 commend you again for a job that you continued to do and  
8 you and your people are I think making a real contribution  
9 here.

10 It's not always as exciting to be working with  
11 statistics and numbers and figures, it depends on what you  
12 do with them and I think some of the numbers you're  
13 gathering are already leading to significant regulatory  
14 action.

15 And I might say in the same vein that I think  
16 your people are doing an equally estimable job in the area  
17 of medical misadministration. There has been some very  
18 valuable data that have been coming to us in that area,  
19 too, that are now very important in fact in view of the  
20 measures that we're considering. So keep it up.

21 MR. JORDAN: Thank you. We enjoy it.

22 CHAIRMAN ZECH: Commissioner Carr?

23 COMMISSIONER CARR: Yes, I'd like to add two  
24 cents on that issue. I think it's a very valuable and  
25 required service that you're doing. We're the only outfit

1 probably that can do it, we're the only ones that seize  
2 reports all across the industry and no single utility  
3 would be able to do that because they don't have enough  
4 database. I'm not sure how good our database is, I wish  
5 it were better, but I think the more we do this kind of  
6 thing, the better the database gets because they see what  
7 comes out of the reports.

8           So I think it's vital, I think it's necessary,  
9 and I think it's a very good adjunct to our regulatory  
10 responsibilities, so keep up the good work.

11           CHAIRMAN ZECH: Thank you. Commissioner Rogers?

12           COMMISSIONER ROGERS: No, nothing to add.

13           CHAIRMAN ZECH: Just a couple of points. In a  
14 letter that we received -- we received a policy issue  
15 information letter on January 13 from AEOD, SECY 88-12, in  
16 the last page of that, in the summary, I noticed that --  
17 and the subject is AEOD decision process on issuing  
18 suggestions or recommendations following completion of  
19 technical studies.

20           Summarizing the last -- in the summary of the  
21 last page, it says this: "Specifically, emphasis has been  
22 placed on identifying the root causes of deficiencies  
23 observed in operational events. The adequacy of  
24 corrective actions implemented or planned, the need for  
25 actions, and more importantly, whether or not the

1 perceived safety significance of the issue involved should  
2 result in a suggestion of a recommendation for action.  
3 Only issues with high safety significance would warrant an  
4 AEOD recommendation."

5 I would only comment that I hope that you're -- I  
6 agree with my colleagues, that AEOD is making a valuable  
7 contribution. And I would hope that threshold is not too  
8 high because I do think -- and I know you can't do  
9 everything, but I do feel that some of the things you've  
10 talked about here today, if they're only examples, air  
11 systems and motor operated valves, there are areas --  
12 these are very important areas that do need, in my view,  
13 our regulatory attention. And it seems to me there might  
14 be other areas. I hope your threshold for making  
15 recommendations is not too high.

16 How would you feel about it, Mr. Jordan?

17 MR. JORDAN: Well, my earlier experience with the  
18 NRC was as an inspector, and I sort of felt when I was  
19 dealing with the licensee that I had a silver bullet each  
20 day and that if I used it wisely, I could effect a change.

21 And I think that's the point, that I want to try  
22 to effect a change. I don't want to just dig up a lot of  
23 dirt. And so it's the follow through that we feel is  
24 important.

25 The threshold can indeed be set differently. I'm

1 pleased with the system that NRR has for examining our  
2 suggestions in an organized manner and in fact pulling up  
3 some of them and acting upon them where we couldn't find a  
4 basis to make a recommendation that we would in fact  
5 track.

6           So there is a feedback process that I think is  
7 appropriate.

8           MR. STELLO: Mr. Chairman, I would like to make  
9 sure it is clear --

10           CHAIRMAN ZECH: Yes, go ahead.

11           MR. STELLO: -- that whether it is a suggestion  
12 or a recommendation, it's immaterial to the fact that NRR  
13 is obligated to look at each of them and determine whether  
14 action is required from the plants, independent of our Reg  
15 classified. And that's done, as you've heard.

16           CHAIRMAN ZECH: Right. I appreciate that and  
17 that's a very important point. Last time we also talked  
18 about enhancing integration in the regulatory process and  
19 you've given us a paper on that and I guess I'm interested  
20 again in closing the loop not only in the  
21 design-engineering-craftsmen-type business in the plants,  
22 but also in our own system.

23           AEOD, in my view, is indeed contributing a very  
24 valuable service. I know you can't look at everything  
25 with the same degree of attention that you can at certain

1 things that maybe don't rise to the same threshold, but it  
2 is important, I think, that as the EDO points out, that  
3 the NRR people do look at what you have and that we do  
4 continue to integrate our system and close the loop, so to  
5 speak, because I think that's the only way we can gain  
6 from the valuable recommendations that are coming out of  
7 the AEOD.

8 I do think you are providing a very valuable  
9 service and I know we're still kind of growing into this  
10 organization, but it's my view in this day and age when we  
11 are focusing more of our attention on operational plants,  
12 operational safety, that this is a very appropriate thing  
13 to do, and I just want to make sure that the loop gets  
14 closed and NRR does keep involved and it does continue to  
15 get supported.

16 I would agree with EDO's comments, too, as far as  
17 an improving situation is concerned. Many of you heard my  
18 comments yesterday at Congress along the same lines.

19 I do believe also that trends are all going in  
20 the improving direction in the commercial nuclear power  
21 plants. That doesn't mean there isn't room for continued  
22 improvement, we know that there is. We've mentioned it  
23 here and we continue to be mindful of that.

24 But it should be encouraging, I think, to note  
25 that it does look like from the indications you've given

1 here today, too, that there is an improving trend and I  
2 agree with EDO, too, when he indicates that he thinks that  
3 perhaps there has been a change in attitude and I think a  
4 maturing process as I see it in the utilities to recognize  
5 that it is in their own best interest to focus on safety,  
6 as well as reliability, as well as economics, and I think  
7 the INPO organization as we've mentioned, too, has make a  
8 contribution in that area.

9           So I'm encouraged by what's going on, but by the  
10 same token we can see the things we've talked about here  
11 today, there are areas that we can continue to make  
12 improvement on and those are the things that I think AEOD  
13 should be particularly supported in by all the other parts  
14 of our agency.

15           It's not just gathering statistics and data  
16 that's important, it's your analysis that's important, and  
17 it's your passing that to the other parts of our  
18 organization that can be -- that can integrate it into  
19 their regulatory process and work with the utilities and  
20 with the industry to close the loop all the way around.

21           So I think it's very important that we recognize  
22 that you're not just often one side of our organization,  
23 you're an integral part of it, and I think you're  
24 beginning to make an impact on regulatory safety and I  
25 think that's exactly what we have in mind when AEOD was

1 really first started.

2           So I think your organization is maturing now to  
3 the point where I hope the rest of our staff and I would  
4 commend the EDO for his continuing support of your  
5 organization and make sure that Research helps when  
6 necessary as would NRR or the other branches of our agency  
7 that is also involved.

8           But I would just like to also commend you for  
9 what you're doing with my colleagues and say that I think  
10 we'll look forward to another report from you.

11           I think the next report, I would certainly  
12 suggest that you focus perhaps even a little bit more  
13 emphasis on how your recommendations are being integrated  
14 into NRR and what specific regulatory actions your  
15 recommending or we've taken to show that the AEOD work is  
16 is being followed through and we're closing the loop.

17           So I would hope that we could perhaps in the next  
18 session with AEOD focus -- just take another step to see  
19 where some of those recommendations perhaps are being  
20 placed in our regulatory program.

21           I think it's a very commendable effort and I  
22 commend EDO and you and all of you here today for the  
23 effort that you're providing this agency. You're  
24 definitely in my judgment making a significant  
25 contribution to improved operations and I think as we all

1 know, with our focus on operating plants these days. That  
2 that's a proper emphasis for us to be taking.

3 Are there any other final comments, my fellow  
4 Commissioners?

5 COMMISSIONER CARR: I might caution you, don't  
6 overlook those plants that complacency might be their  
7 problem.

8 MR. JORDAN: Yes, sir.

9 CHAIRMAN ZECH: That's a good point.

10 COMMISSIONER BERNTHAL: Do you have a complacency  
11 indicator?

12 MR. JORDAN: Perhaps.

13 CHAIRMAN ZECH: No, but it is a good point. It's  
14 a very good point and just because we're improving, it has  
15 got to be emphasized that in my judgment, there's plenty  
16 of room to improve more, and we should definitely not be  
17 complacent about even the fact that we're improving and  
18 the plants have been improving, the utilities are  
19 improving.

20 I think it's extremely important for us to be  
21 mindful of our responsibilities and there's plenty of room  
22 for improvement and we should encourage that at every  
23 opportunity.

24 COMMISSIONER ROGERS: It really connected a  
25 little bit with that. Just to urge you to be looking at

1 the human factors' aspects of these analyses, because it's  
2 easy to get. Relatively easy to get data on hardware.  
3 It's a little harder to get data on people performance,  
4 and I think creative analysis there is very valuable as  
5 well and it certainly does relate to some of these other  
6 things that we are just touching upon, but it's easy to  
7 focus more on the things that are very directly measurable  
8 and quatifiable, but somehow we know that the problems  
9 come from the people very often, and of course you can see  
10 that in some ways through general trends, but any other  
11 things that you can discover through the data that comes  
12 to you, I think would be very helpful, and any new  
13 indicators that might suggest themselves.

14 CHAIRMAN ZECH: I think that's a very important  
15 point. I also had that down in my notes. I didn't  
16 mention it but I'm glad Commissioner Rogers brought it  
17 out.

18 Human factors is something that we haven't  
19 perhaps talked about at the table for a little while. I  
20 think it's something we can emphasize more. I know it has  
21 been an area that we've tried to integrate into our whole  
22 organization, but I really think that we should perhaps  
23 take another look at the human factors emphasis we're  
24 placing on our agency and perhaps we want to enhance that  
25 effort.

1           And it might be something that AEOD could take a  
2 look at and perhaps the next session with us or before, if  
3 you want to write us a paper on it, give us your views as  
4 you see the events and the operational data unfolding,  
5 perhaps you can make a recommendation with EDO as to  
6 whether you think an enhanced human factors program with  
7 our emphasis on operational factors would be appropriate.  
8 I think that's something that the Commission would  
9 appreciate receiving your recommendation on.

10           MR. JORDAN: All right, sir.

11           CHAIRMAN ZECH: All right. Is there anything  
12 else?

13           [No response.]

14           CHAIRMAN ZECH: If not, thank you very much. We  
15 stand adjourned.

16           [Whereupon, at 3:18 p.m., the briefing was  
17 adjourned.]

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CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: HIGH PRIORITY AEOD ISSUES

PLACE OF MEETING: Washington, D.C.

DATE OF MEETING: Thursday, March 31, 1988

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcript is a true and accurate record of the foregoing events.



MARIO A. RODRIGUEZ

Ann Riley & Associates, Ltd.

## OUTLINE

- ° INTRODUCTION
  - ORGANIZATION AND RESOURCES
  - SOURCES OF REACTOR-PLANT OPERATING EXPERIENCE
  
- ° OPERATING EXPERIENCE TRENDS
  
- ° AEOD REPORTS ISSUED IN 1987
  
- ° AEOD PRIORITY ISSUES
  - STARTUP EXPERIENCE AT NEWLY LICENSED PLANTS
  - STATUS OF MOTOR OPERATED VALVE PROGRAM
  - KEY EVENTS RELATED TO AIR SYSTEM FAILURES
  - LOSS OF DECAY HEAT REMOVAL WITH PARTIALLY DRAINED RCS
  
- ° ONGOING ISSUES

**OFFICE FOR ANALYSIS AND EVALUATION OF OPERATIONAL DATA**  
Director Edward Jordan  
Deputy Director Jack Heltemes

**DIVISION OF OPERATIONAL ASSESSMENT**  
Director R. Lee Spessard

**DIVISION OF SAFETY PROGRAMS**  
Director Thomas M. Nevak

**INCIDENT RESPONSE BRANCH**  
Gary Zech

**DIAGNOSTIC EVALUATION AND INCIDENT INVESTIGATION BRANCH**  
Stu Rubin

**TECHNICAL TRAINING CENTER**  
Ken Raglin

**REACTOR OPERATION ANALYSIS BRANCH**  
Jack Rosenthal

**TRENDS AND PATTERNS BRANCH**  
Mark Williams

**NONREACTOR ASSESSMENT STAFF**  
Kathleen Stock

2

MAJOR AEOD REPORTS ON NUCLEAR OPERATIONS

° DIAGNOSTIC EVALUATION AND INCIDENT INVESTIGATION BRANCH

DIAGNOSTIC EVALUATIONS - EDO FOLLOWUP ACTIONS  
INCIDENT INVESTIGATION TEAMS - EDO FOLLOWUP ACTIONS

° TRENDS AND PATTERNS ANALYSIS BRANCH

TRENDS AND PATTERNS REPORTS - LESSONS LEARNED  
SPECIAL STUDIES - FOLLOWUP ACTIONS

° REACTOR OPERATIONS ANALYSIS BRANCH

CASE STUDIES - RECOMMENDATIONS  
ENGINEERING EVALUATIONS - SUGGESTIONS  
SPECIAL REPORTS - RECOMMENDATIONS

° NON REACTOR ASSESSMENT STAFF

CASE STUDIES - RECOMMENDATIONS  
ENGINEERING EVALUATION - SUGGESTIONS

RESOURCES APPLIED TO OPERATING EXPERIENCE AND EVALUATION

	<u>TECHNICAL STAFF</u>		
	<u>STAFF</u>	<u>CONTRACTOR</u>	<u>PERCENT OF TOTAL</u>
OPERATIONAL DATA ANALYSIS	25	\$2.1M	52
DATA COLLECTION & DISSEMINATION	6	\$1.8M	24
PERFORMANCE INDICATORS	4	\$230K	8
INCIDENT INVESTIGATION	2.5	\$50K	4
DIAGNOSTIC INSPECTION	<u>6.5</u>	<u>\$300K</u>	<u>12</u>
	44	\$4.5M	100

SOURCES OF OPERATING EXPERIENCE

° ROUTINE SOURCES

- TELEPHONE NOTIFICATIONS (50.72) 4000/YR
- LICENSE EVENT REPORTS (50.73) 3500/YR
- REGIONAL DAILY REPORTS 3000/YR
- FOREIGN EVENTS (BILATERAL + IRS) 1500/YR
- INSPECTION REPORTS 500/YR

° OTHER SOURCES

- IIT, AIT REPORTS
- NPRDS
- 50.55(e) AND PART 21 REPORTS
- INPO AND OTHER INDUSTRY REPORTS

## OVERVIEW OF INDUSTRY TRENDS IN OPERATIONAL EXPERIENCE

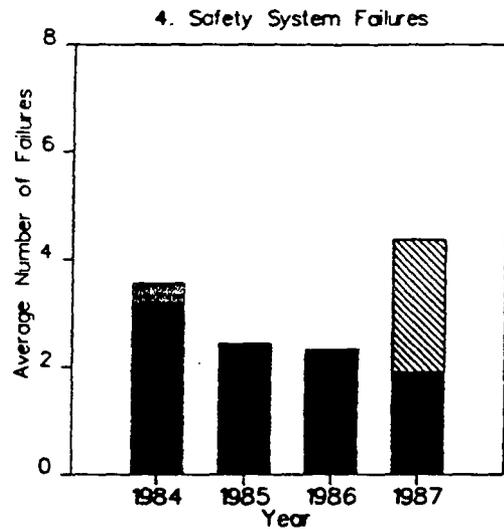
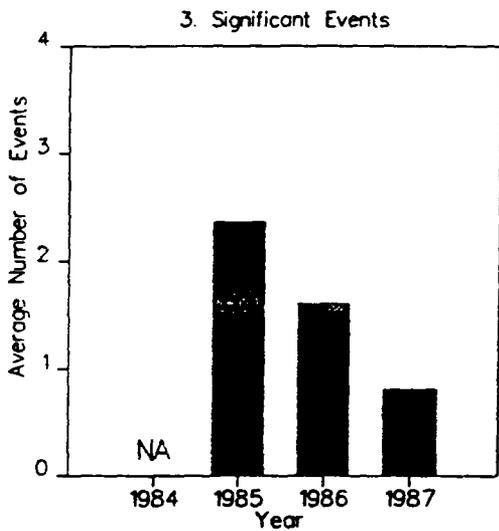
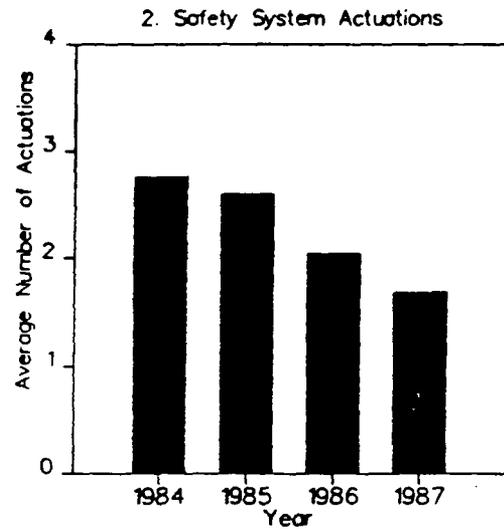
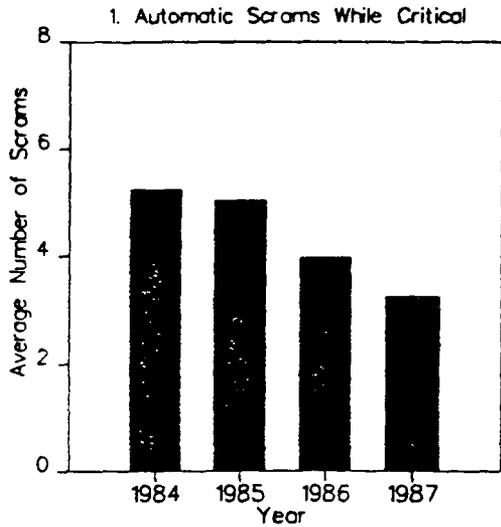
- ° TRENDS IN OPERATIONAL EXPERIENCE PROVIDE AN ASPECT OF OVERALL ASSESSMENT OF PLANT SAFETY

INDUSTRY TRENDS BASED ON PERFORMANCE INDICATOR PROGRAM AND ACCIDENT SEQUENCE PRECURSOR PROGRAM SHOW OVERALL IMPROVEMENT

- ° PROGRAMS IN PLACE TO MONITOR INDIVIDUAL PLANT PERFORMANCE
- ° INDUSTRY TRIP REDUCTION PROGRAMS, INPO MONITORING AND GOALS, AND NRC MONITORING ALL CONTRIBUTING

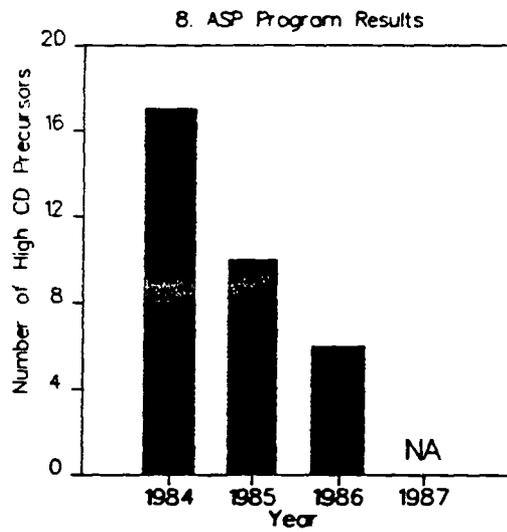
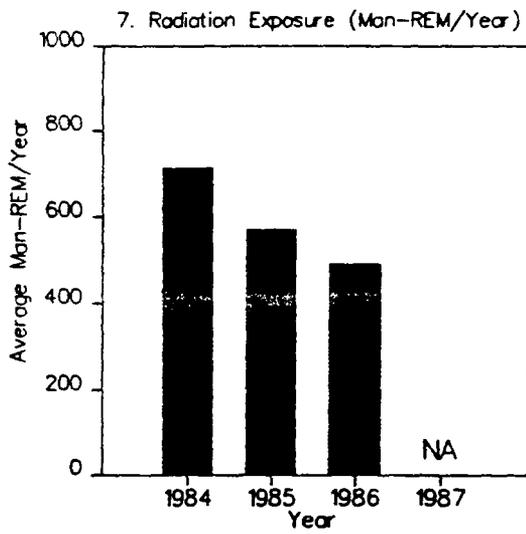
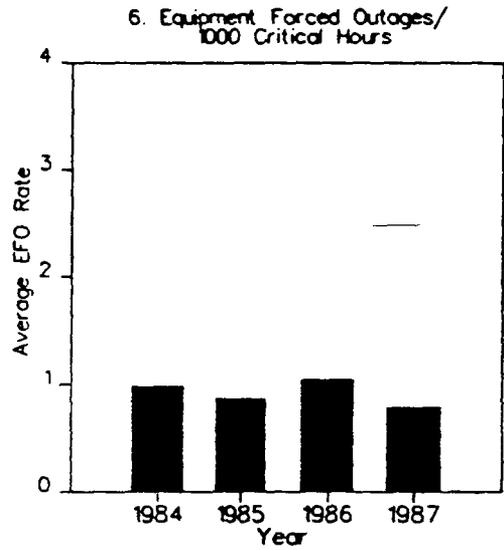
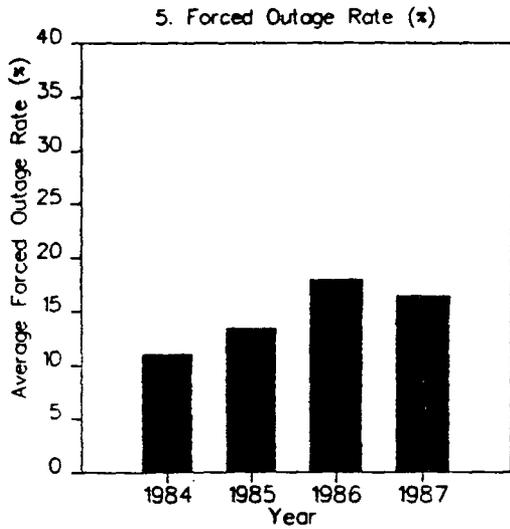
# Industry Trends in Operating Experience

All Plants 1984 to 1987



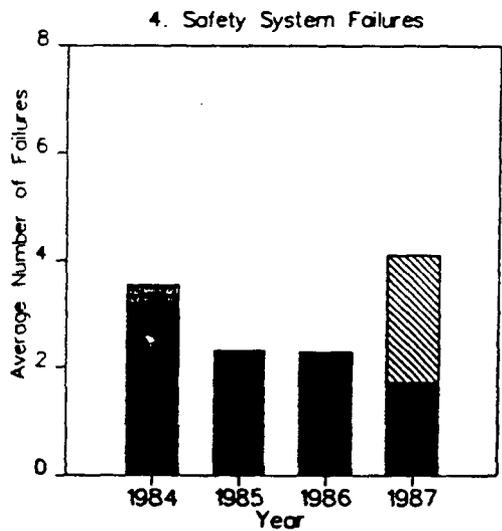
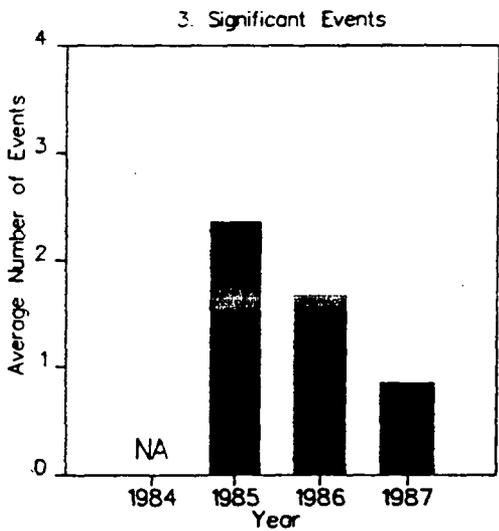
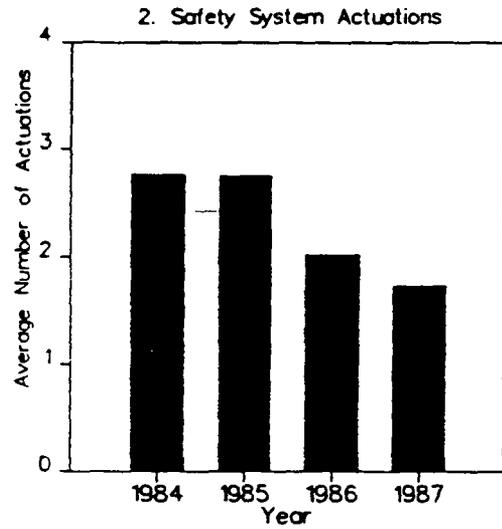
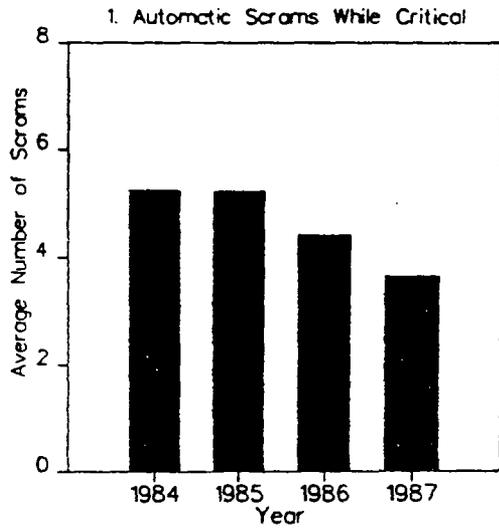
# Industry Trends in Operating Experience

All Plants 1984 to 1987



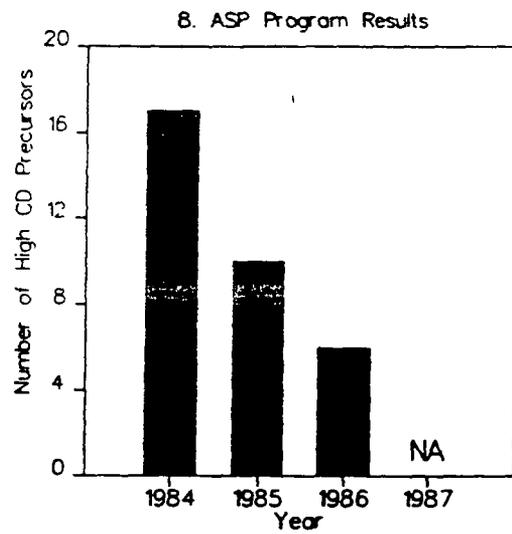
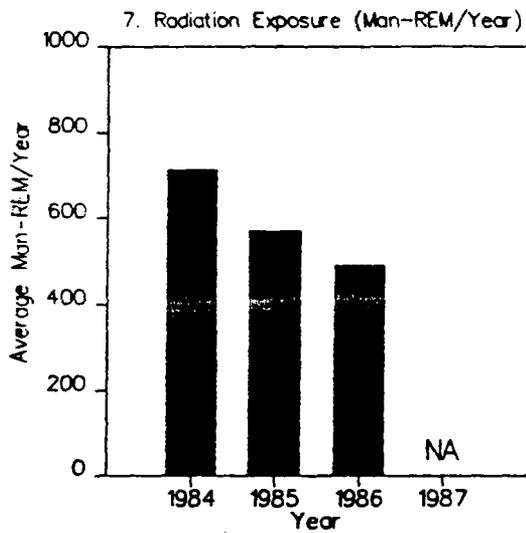
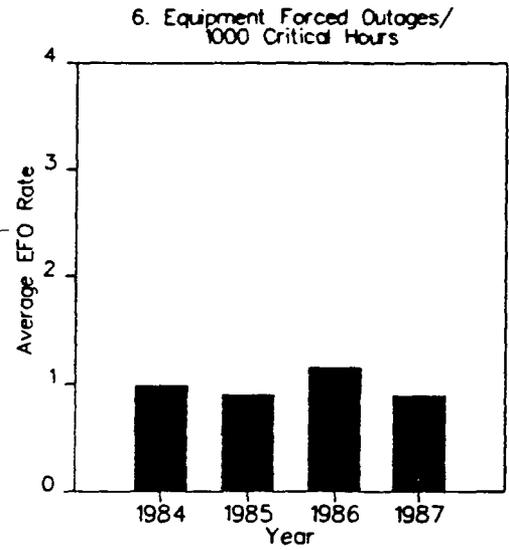
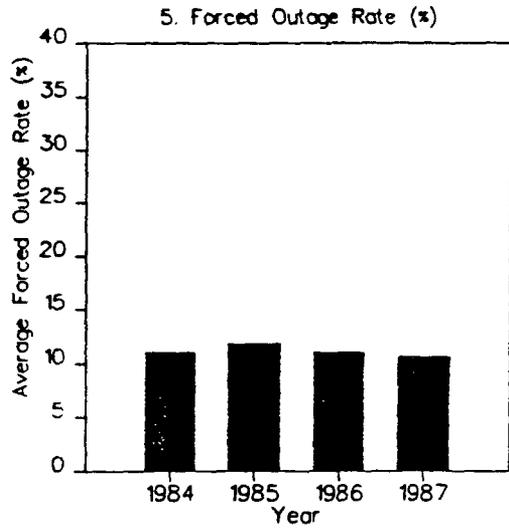
# Industry Trends in Operating Experience

Excluding Plants Shutdown 1984 to 1987



# Industry Trends in Operating Experience

Excluding Plants Shutdown 1984 to 1987



## COMPREHENSIVE STUDIES SINCE JANUARY 1987

- ° AIR SYSTEM PROBLEMS AT LWRS
- ° LOSS OF DECAY HEAT REMOVAL FUNCTION AT PRESSURIZED WATER REACTORS WITH PARTIALLY DRAINED REACTOR COOLANT SYSTEMS
- ° MOV FAILURE DUE TO HYDRAULIC LOCKUP FROM EXCESSIVE GREASE IN SPRING PACK
- ° OPERATING EXPERIENCE FEEDBACK REPORT - NEW PLANTS
- ° RECENT NEW PLANT OPERATIONAL EXPERIENCE
- ° OPERATIONAL EXPERIENCE FEEDBACK ON MAIN FEEDWATER FLOW CONTROL AND BYPASS VALVES AND VALVE OPERATORS
- ° POTENTIAL CONTAINMENT AIRLOCK WINDOW FAILURE DUE TO RADIATION
- ° LOSS OF OFFSITE POWER DUE TO UNNEEDED ACTUATION OF STARTUP TRANSFORMER PROTECTIVE DIFFERENTIAL RELAY
- ° DISCHARGE OF PRIMARY COOLANT OUTSIDE OF CONTAINMENT AT PWRs WHILE ON RHP COOLING
- ° RWCU SYSTEM AUTOMATIC ISOLATION AND SAFETY CONSIDERATIONS
- ° INADEQUATE MECHANICAL BLOCKING OF VALVES
- ° DESIGN AND CONSTRUCTION PROBLEMS AT OPERATING NUCLEAR PLANTS
- ° DEPRESSURIZATION OF REACTOR COOLANT SYSTEMS AT PWRs
- ° AUXILIARY FEEDWATER PUMP TRIPS CAUSED BY LOW SUCTION PRESSURE
- ° INADEQUATE NPSH IN LOW PRESSURE SAFETY SYSTEMS IN PWRs
- ° RADIATION OVEREXPOSURE EVENTS INVOLVING INDUSTRIAL FIELD RADIOGRAPHY

## BRIEF STUDIES SINCE JANUARY 1987

- ° PERRY NUCLEAR POWER PLANT UNIT 1 - UNEXPECTED MSIV CLOSURE AND REOPENING
- ° COMPRESSION FITTING FAILURES
- ° LEAKING PULSATION DAMPENER LEADS TO LOSS OF CHARGING SYSTEM
- ° POTENTIAL FOR LOSS OF EMERGENCY FEEDWATER DUE TO PUMP RUNOUT DURING CERTAIN TRANSIENTS
- ° PRESSURIZER CODE SAFETY VALVE RELIABILITY
- ° OCCURRENCE OF EVENTS INVOLVING WRONG UNIT/WRONG TRAIN/WRONG COMPONENT - UPDATE THROUGH 1986
- ° RECENT EVENTS INVOLVING TURBINE RUNBACKS AT PWRS
- ° UNDETECTED LOSS OF REACTOR WATER
- ° PROBLEMS WITH HIGH PRESSURE SAFETY INJECTION SYSTEMS IN WESTINGHOUSE PWRS
- ° HEATING, VENTILATING AND AIR CONDITIONING SYSTEM PROBLEMS
- ° REVIEW OF DATA ON TELETERAPY MISADMINISTRATIONS REPORTED TO THE STATE OF NEW YORK THAT WERE THE SUBJECT OF PNO-1-87-74A
- ° UNPLANNED CRITICALITY EVENTS AT U.S. POWER REACTORS SIMILAR TO THAT AT OSKARSHAMN UNIT 3 ON 07/30/87
- ° MISPOSITIONING OF "REVERSE ACTING" VALVE CONTROLLERS

ROUTINE REPORTS SINCE JANUARY 1987

4 PI REPORTS

- ° 5 AO QUARTERLY REPORTS TO CONGRESS
- ° —56 IRS REPORTS TO NEA
- ° ABOUT 45 LER QUALITY REPORTS TO REGIONS AND NRR
- ° 6 POWER REACTOR EVENTS REPORTS
- ° 12 MONTHLY LER COMPILATION REPORTS
- ° ABOUT 18 COMMISSIONER SITE VISIT BRIEFING PACKAGES
- ° REPORT OF MEDICAL MISADMINISTRATIONS REPORTED TO NRC DURING 1986
- ° COMMISSION PAPER ON NPRDS EVALUATION
- ° AEOD ANNUAL REPORT FOR 1986
- ° REPORT ON NONREACTOR EVENTS DURING 1986
- ° UPDATE REPORT THROUGH 1986 OF EVENTS INVOLVING WRONG UNIT/WRONG TRAIN/WRONG COMPONENT

## AECD PRIORITY ISSUES

### ISSUES

- ° STARTUP EXPERIENCE AT NEWLY LICENSED PLANTS
- ° MOTOR OPERATED VALVE PERFORMANCE
- ° KEY EVENTS RELATED TO AIR SYSTEM FAILURES
- ° LOSS OF DECAY HEAT REMOVAL WITH PARTIALLY DRAINED PCS

## STARTUP EXPERIENCE AT NEWLY LICENSED PLANTS

- LARGE NUMBER OF SCRAMS NOTED DURING AEOD REVIEWS FOR NEWLY LICENSED PLANTS
- ENGINEERING EVALUATION ON NEW PLANT PERFORMANCE ISSUED JULY 1986
- NUREG-1275 "OPERATING EXPERIENCE FEEDBACK REPORT - NEW PLANTS" - JULY 1987
- COMMISSION BRIEFED AUGUST 1987
- LESSONS COMMUNICATED TO INDUSTRY
  - REPORT SENT TO ALL PLANTS APPROACHING STARTUP AND PLANTS IN EXTENDED SHUTDOWN SEPTEMBER 1987 FOR INFORMATION AND USE
  - INPO/NRC MEETING WITH SENIOR PLANT MANAGERS DECEMBER 1987
- NEW PLANTS GENERALLY CONTINUE WITHIN NUREG-1275 PERFORMANCE ENVELOPE

## MOTOR OPERATED VALVE PERFORMANCE

- INITIAL AEOD CONCERNS DOCUMENTED IN INITIAL CASE STUDY - 1982
- DAVIS-BESSE IIT - AUGUST 1985
  - BULLETIN 85-03 ISSUED ON TESTING OF CERTAIN MOV'S
  - GENERIC MOV STUDY REQUESTED BY EDO
- AEOD CASE STUDY ON MOV PERFORMANCE - DECEMBER 1986
- EDO REQUESTS NUMARC TO INITIATE MOV CORRECTIVE ACTION PROGRAM
- MEETING FORMS BASIS FOR INDUSTRY INVOLVEMENT AND ACTION PLAN TO ADDRESS MOV PROBLEMS - SEPTEMBER 1987
- SCOPE EXTENDED TO INCLUDE HYDRAULIC LOCKUP OF MOV'S - JANUARY 1988
- INPO HOLDS INDUSTRY MOV WORKSHOPS AND INCORPORATES MOV EVALUATION IN PLANT REVIEWS
- EPRI - NMAC ADVISORY GROUP TO DEVELOP MOTORIZED VALVE REPAIR GUIDE (DUE APRIL 1988) AND APPLICATION GUIDE (DUE SEPTEMBER 1988)
- NRC PARTICIPATION IN INPO EVALUATION
- NEED FOR REGULATORY ACTION CONTINUES UNDER REVIEW

## KEY EVENTS RELATED TO AIR SYSTEM FAILURES

- ° AEOD CONCERNS OVER ADEQUACY OF INSTRUMENT AIR DATA DEVELOPED OVER TIME STARTING IN 1982
- ° AEOD CASE STUDY ISSUED MARCH 1987 (C701) —
- ° INFORMATION NOTICE 87-28 ISSUED JUNE 1987
- ° AEOD CASE STUDY UPDATED AND ISSUED TO ALL PLANTS - DECEMBER 1987 (NUREG-1275, VOL. 2)
- ° NRR PREPARING GENERIC LETTER ADDRESSING 4 OF 5 AEOD RECOMMENDATIONS
- ° GENERIC ISSUE (GI-43) - DRAFT REG. GUIDE TO INCLUDE FIFTH RECOMMENDATION EXPECTED IN DECEMBER 1988
- ° AEOD CONTINUES TO MONITOR OPERATING EXPERIENCE

## LOSS OF DECAY HEAT REMOVAL WITH PARTIALLY DRAINED RCS

- ° EPRI/NSAC ISSUES TECHNICAL STUDY ON LOSS OF DHR EVENTS
- ° AEOD INITIATES STUDY IN VIEW OF CONTINUED HISTORY OF DHR EVENTS
- ° CASE STUDY ISSUED DECEMBER 1985
- ° INFORMATION NOTICE 86-101 ISSUED, "LOSS OF DHR DUE TO LOSS OF FLUID LEVELS IN RCS"
- ° RECOMMENDATIONS STUDIED BY NPR AND NEW GI INITIATED (GI 99)
- ° SPECIAL AEOD STUDY ISSUED MAY 1987 WITH ADDITIONAL SPECIFIC RECOMMENDATIONS
- ° RENEWED EMPHASIS FOLLOWING DIABLO CANYON EVENT OF APRIL 10, 1987
- ° INFORMATION NOTICE 87-23, ISSUED, "LOSS OF DHR DURING LOW RCS LEVEL OPERATION"
- ° EPRI-DHR WORKSHOP JUNE 1987
- ° GENERIC LETTER (87-12) ISSUED JULY 1987, "LOSS OF RHR WHILE RCS PARTIALLY FILLED," REQUESTED SPECIFICS ON DHR OPERATIONS
- ° BROOKHAVEN NATIONAL LABORATORY STUDY (DRAFT MARCH 1988) SUPPORTS AEOD STUDY RECOMMENDATIONS
- ° NRR COMPLETED REVIEW OF LICENSEE RESPONSES AND PREPARATION OF BULLETIN IS IN PROGRESS
- ° AEOD CONTINUES TO MONITOR OPERATING EXPERIENCE FOR EFFECTIVENESS OF LICENSEE ACTION

## ONGOING STUDIES

### CASE STUDY

- SERVICE WATER SYSTEM PERFORMANCE AT LWRs

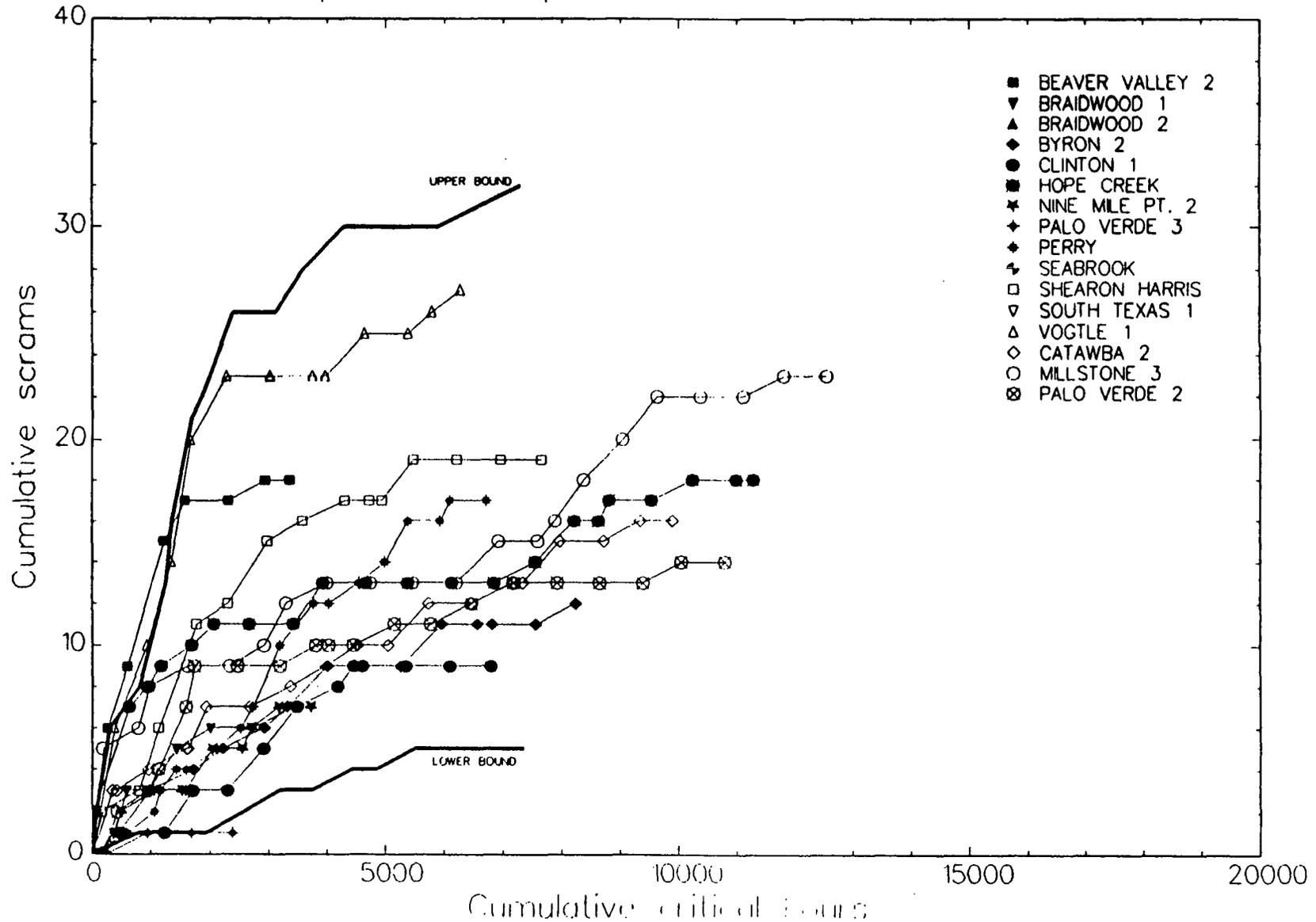
### ENGINEERING EVALUATIONS

- BOPIC ACID CORROSION OF FERRITIC STEEL COMPONENTS AT THE PRIMARY SYSTEM BOUNDARY
- WATER DAMAGE TO SAFETY-RELATED EQUIPMENT AND ELECTRICAL CONDUITS
- DESIGN AND OTHER DEFICIENCIES IN CONTROL ROOM EMERGENCY VENTILATION SYSTEMS
- IMPROPER APPLICATION OF GREASE, SOLVENTS, AND SEALANTS
- MAINTENANCE PROBLEMS CAUSING EXTENDED UNAVAILABILITY OF EQUIPMENT
- SIGNIFICANT CONTAINMENT LEAKAGE EVENTS
- PROBLEMS WITH SHARED SYSTEMS AT MULTI-UNIT SITES
- PRUDENCE OF OPERATION WITH EQUIPMENT OUT OF SERVICE IN SHUTDOWN MODES
- REACTOR SCRAMS CAUSED BY A LOSS OF FEEDWATER AND COMPLICATED BY A FAILURE OF THE HPCI OR RCIC SYSTEM
- SAFETY AND SAFETY/RELIEF VALVE RELIABILITY
- PUMP CAVITATION AT LOW FLOW CONDITIONS

### TRENDS AND PATTERNS STUDIES

- OPERATIONAL EXPERIENCE FEEDBACK REPORT - PROGRESS IN SCRAM REDUCTION
- OPERATIONAL EXPERIENCE FEEDBACK REPORT - TECHNICAL SPECIFICATIONS
- OPERATIONAL EXPERIENCE FEEDBACK REPORT - UNPLANNED ESF ACTUATIONS
- INSIGHTS FROM ACCIDENT SEQUENCE PRECURSORS
- TRENDS AND PATTERNS OF MAIN FEEDWATER PUMP FAILURES
- TRENDS AND PATTERNS OF MSIV FAILURES

# Composite Unplanned Reactor Scrams



## SERVICE WATER SYSTEM FAILURES AND DEGRADATIONS

### SCOPE AND APPROACH

- ° REVIEW OPERATING DATA
- ° BULLETINS, INs, GENERIC LETTERS, AOs, NPRDS, INPO SOERS, SERs, VENDOR REPORTS
- ° SITE VISITS: TURKEY POINT, DIABLO CANYON, CALVERT CLIFFS, AND CATAWRA
- ° JANUARY 1980 - DECEMBER 1987 -- 980 EVENTS INVOLVING SERVICE WATER SYSTEMS
  - 276 EVENTS WITH SYSTEM FAILURES OR SIGNIFICANT DEGRADATIONS
  - 30 EVENTS FOR IN-DEPTH DESCRIPTION AND ANALYSIS

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AEOD PERIODIC REPORT TO THE COMMISSION  
ANALYSIS & TRENDS

MARCH 31, 1988

CAUSES OF SYSTEM FAILURES AND SIGNIFICANT DEGRADATIONS

<u>CAUSE</u>	<u>NUMBER OF EVENTS</u>	<u>PERCENTAGE</u>
FOULING DUE TO		
- SEDIMENT DEPOSITION	26	9
- BIOFOULING	28	10
- OTHER	80	39
SINGLE FAILURES AND DESIGN DEFICIENCIES	18	7
FLOODING	12	4
MULTIPLE EQUIPMENT FAILURES	10	4
PERSONNEL & PROCEDURAL ERRORS	46	17
SEISMIC DEFICIENCIES	<u>29</u>	<u>10</u>
TOTAL	276	100%

### QUALITATIVE DISCUSSION

- NUMEROUS CAUSES OF SYSTEM FAILURES AND DEGRADATIONS
- ADVERSE IMPACT ON MANY SAFETY-RELATED SYSTEMS AND COMPONENTS
- NUMEROUS NRC AND INDUSTRY ACTIONS
- HIGH PRIORITY

### QUANTITATIVE DISCUSSION

- $1.5 \times 10^{-2}$  /RY SYSTEM FAILURE FREQUENCY
- $4.0 \times 10^{-1}$  /RY SYSTEM DEGRADATION FREQUENCY
- APPROXIMATELY  $10^{-3}$  -  $10^{-5}$  /RY CORE MELT FREQUENCY DUE TO SERVICE WATER SYSTEM FAILURES

TRENDS & PATTERNS ANALYSIS OF  
TECHNICAL SPECIFICATION (TS)-RELATED EVENTS

MAJOR FINDINGS

- ° THE NUMBER OF TS-RELATED EVENTS, WHICH WAS DRIVEN BY TS VIOLATIONS, INCREASED SIGNIFICANTLY FROM 1984 TO 1985, AND THEN MODERATED SLIGHTLY FROM 1985 TO 1986.
- ° WE OBSERVED AN INCREASING TREND IN THE NUMBER OF TS VIOLATIONS ATTRIBUTABLE TO THREE SOURCES:
  - (1) RELATIVELY HIGH VIOLATION RATES EXPERIENCED BY A SMALL GROUP OF MATURE PLANTS WITH REPETITIOUS EVENTS
  - (2) A SLOWLY INCREASING AVERAGE VIOLATION RATE FOR THE REST OF THE MATURE PLANTS
  - (3) A CLEAR CONTRIBUTION FROM NEWLY LICENSED PLANTS
- ° THE RESULTS OF OUR ANALYSIS OF 1985 AND 1986 TS VIOLATIONS SUPPORTED THE TSIP CONCLUSIONS REGARDING THE SIGNIFICANCE OF VIOLATIONS INVOLVING FIRE PROTECTION SYSTEMS.

B-15