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Subcommittee on Power Upgrades

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

November 16, 2005

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This transcript has not been reviewed, corrected and edited and it may contain inaccuracies.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON POWER UPRATES

+ + + + +

WEDNESDAY,

NOVEMBER 16, 2005

+ + + + +

The meeting came to order at 8:28 a.m. at the  
Quality Inn and Suites, in Brattleboro, Vermont. Dr.  
Richard Denning, Chairman, presiding.

PRESENT:

RICHARD DENNING, Ph. D., CHAIRMAN

MARIO BONACA, Ph. D., MEMBER

THOMAS KRESS, MEMBER

VICTOR RANSOM, Ph. D., MEMBER

JOHN SIEBER, MEMBER

GRAHAM WALLIS, Ph. D., MEMBER

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## 1       ALSO PRESENT:

2               GEORGE APOSTOLAKIS

3               SANJOY BANERJEE

4               RALPH CARUSO

5               LARRY DOERFLEIN

6               RICK ENNIS

7               BRIAN HOBBS

8               SARAH HOFMANN

9               CORNELIUS HOLDEN

10              GRAHAM LEITCH

11              RICHARD LOBEL

12              JEFF JACOBSON

13              DAVID O'BRIEN

14              MARK PALIONIS

15              MARK RUBIN

16              BILL SHERMAN

17              BETH SIENEL

18              BRUCE SLIFER

19              ASHOK THADANI

20              CHRIS WAMSER

21

22

23

24

25

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

(8:28 a.m.)

CHAIRMAN DENNING: The meeting will now come to order. This is a continuation of the meeting that began yesterday of the Advisory Committee on Reactor Safeguards, Subcommittee on Power Upgrades. I am Dr. Richard Denning, Chairman of the Subcommittee. The committee members in attendance today are Dr. Graham Wallis, Dr. Tom Kress, Dr. Victor Ransom, Mr. Jack Sieber, Dr. George Apostolakis, and Dr. Mario Bonaca. ACRS consultants in attendance are Dr. Sanjoy Banerjee, Mr. Graham Leitch.

The purpose of this meeting is to discuss the extended power upgrade application for the Vermont Yankee Nuclear Power Station. The subcommittee will hear presentations by and hold discussions with representatives of the NRC Staff and the Vermont Yankee Licensee, Entergy Nuclear Northeast, and also from the Vermont Department of Public Service regarding these matters.

The subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the Full Committee. Ralph Caruso is the Designated Federal Official for this meeting.

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1           The rules for participation in today's  
2 meeting have been announced as part of the notice of  
3 this meeting previously published in the "Federal  
4 Register" on November, 2004. A transcript of the  
5 meeting is being kept and will be made available as  
6 stated in the "Federal Register" notice. It is  
7 requested that speakers first identify themselves and  
8 speak with sufficient clarity and volume so that they  
9 can be readily heard. We request that members of the  
10 audience refrain from talking so that the  
11 presentations can be heard by everyone who is here  
12 today. We all want this meeting to be as productive  
13 as possible, so I would encourage everyone who is here  
14 today to listen carefully to all of the presenters and  
15 speakers.

16           We have received several requests from  
17 members of the public to make oral statements at this  
18 meeting. In addition, to accommodate members of the  
19 public who were not able to contact the ACRS Staff in  
20 advance, we've set up a sign-up list at the table at  
21 the entrance to the room for this afternoon's public  
22 comment session. As yesterday, we will take speakers  
23 one at a time from the list until the close of the  
24 business at 5:30 p.m. If time does not allow us to  
25 hear all of the people who wish to speak, they can

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1 submit written comments to the ACRS at the NRC's  
2 Washington, D.C. address, or by email to Mr. Caruso at  
3 the address on the agenda.

4 This is the first of two ACRS Subcommittee  
5 meetings that will consider the Vermont Yankee Power  
6 Uprate request. On November 29 and 30, the  
7 Subcommittee will meet at NRC Headquarters in  
8 Rockville, Maryland to hear presentations regarding  
9 other technical subjects, including some that involve  
10 proprietary information. That meeting will also be  
11 open to the public, except for those portions during  
12 which proprietary information will be discussed. The  
13 Full ACRS is scheduled to consider this application on  
14 December 7, 2005 in Rockville, Maryland, and that  
15 meeting will also be open to the public. I understand  
16 that the press release that announced today's meeting  
17 also stated that the Full Committee meeting would be  
18 held on December 8<sup>th</sup>, but please note that that  
19 meeting has been moved up one day to accommodate the  
20 meeting of the ACRS with the Commissioners.

21 We will now continue with the meeting, and  
22 I call upon Mr. Bill Sherman to begin. Thank you.

23 MR. SHERMAN: Thank you, Dr. Denning,  
24 members of the committee, consultants, and staff. I'm  
25 Bill Sherman. I'm the State Nuclear Engineer for the

1 State of Vermont located in the Vermont Department of  
2 Public Service. I would first like to introduce  
3 Commissioner David O'Brien, Commissioner of the  
4 Department of Public Service, to say a few words.

5 COMMISSIONER O'BRIEN: Good morning,  
6 gentlemen. I actually want to be very, very brief.  
7 I want to make sure that we save the time for Mr.  
8 Sherman's presentation, and certainly for whatever  
9 questions you might have of him. I simply just want  
10 to express our appreciation and our gratitude for you  
11 to come here to Vermont, and to Brattleboro to conduct  
12 this meeting at, I guess, our suggestion, but I think  
13 in your own good judgment, and to hear from the public  
14 yesterday. I understand the meeting went quite long  
15 yesterday, and you gave people a lot of chance to  
16 offer their concerns, or their comments, or pose  
17 questions and that sort of thing, and we tried our  
18 level best to do that here, state representing the  
19 public and the State of Vermont. I chair what's  
20 called the Vermont State Nuclear Advisory Panel.  
21 We've held numerous meetings in this part of the  
22 state, and sometimes with NRC Staff providing  
23 information to the public, so I very much appreciate  
24 you taking that time and that effort.

25 I think we feel very good about what Bill

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1 will be presenting to you this morning. We've put a  
2 lot of effort into our role in terms of looking at the  
3 safety of this facility. It's very, very important to  
4 us. This is a very important facility to us from a  
5 power standpoint, that that cannot be understated how  
6 important this facility is to the State of Vermont  
7 from a power supply standpoint, and from an economic  
8 standpoint. We simply are in pursuit of what we hope  
9 is a safe operation of that plant, and I think that,  
10 again, may sound simplistic to say, but that's an  
11 important part of your role, certainly. So I look  
12 forward to hearing your questions today and the other  
13 presentations, and I just want to say that on behalf  
14 of Governor Douglas and the State of Vermont, we very  
15 much appreciate you taking the time out of your busy  
16 lives to come here and conduct this hearing in  
17 Vermont. Thanks.

18 MR. SHERMAN: I would also like to  
19 introduce who are with us today; Sarah Hofmann, who is  
20 the Vermont Director of Public Advocacy, and Mr.  
21 Anthony Royceman, who is also an attorney, working  
22 for us and the state.

23 We appreciate very much the opportunity to  
24 speak today on containment over-pressure, and  
25 especially we appreciate adjusting the agenda so that

1 we could speak in this first slot this morning. We  
2 presented on the subject to the Thermal Hydraulic  
3 Subcommittee in July of this year, and to the Full  
4 Committee in September on a generic issue related to  
5 the same subject, and Regulatory Guide 1.82. In  
6 Vermont, we have high confidence in this committee and  
7 its deliberations to help us consider and assist us in  
8 resolving our concerns on this issue.

9 I'm not going to say so much about the  
10 technical aspects of containment over-pressure because  
11 I trust that the slides and presentation from the  
12 licensee and the staff will say more, and I know the  
13 committee is familiar with the issue.

14 In Vermont, we question the desirability  
15 of using containment pressure to demonstrate the  
16 adequacy of emergency cooling pumps. When we started  
17 out the power uprate review, we wrote a letter to the  
18 staff in December of 2003 because it appeared to us  
19 that the staff wasn't following its own guidance in  
20 Regulatory Guide 1.82 Revision 3. As we passed on, we  
21 found that we did not have answers to our questions,  
22 and so we initiated an Atomic Safety and Licensing  
23 Board proceeding which is ongoing. We continue to  
24 have questions, although we feel that this process is  
25 assisting us to get the answers to our questions.

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1           What I will do in my presentation is first  
2     identify and summarize the letter that the committee  
3     wrote in September. Following that, I will identify  
4     some aspects of Vermont Yankee's application as it  
5     relates to the letter. Then I will summarize Dr.  
6     Sheron's presentation that he made to the Full  
7     Committee in October, the licensee's response to that.  
8     I will identify some comments that we have on the  
9     licensee's response to Dr. Sheron's proposal, and then  
10    comment at the end of the presentation about the  
11    overall method of that proposal and the probabilistic  
12    safety assessment method to look at this problem. And  
13    I wanted to go first, wanted to have the state go  
14    first so that we would have the opportunity for both  
15    the licensee and the staff to, perhaps, answer some of  
16    the questions and issues that we propose.

17           I would be remiss if I tried to propound  
18    that we were experts in probabilistic safety  
19    assessments; we're not. We've reviewed their  
20    material, we have some comments. They may be able to  
21    provide comments that resolve the questions and  
22    concerns we have.

23           In the letter of September 20<sup>th</sup> of this  
24    year, the committee stated that, "For containment  
25    over-pressure there should be no practical



1 alternatives that can eliminate the need for such  
2 credit." They indicated it would be useful for  
3 positive means of indication of containment integrity  
4 that the time intervals for such credit should be  
5 limited to a few hours commensurate with the  
6 demonstrated capability of equipment to perform its  
7 intended functions during this time period.

8 I'm showing now what is Vermont Yankee's  
9 proposal. This is part of their submittal. I don't  
10 believe this particular slide or figure was included  
11 in the Safety Evaluation Report, but a table with  
12 essentially the same information was in the SER.

13 This shows that they need containment  
14 over-pressure for the period shown here for both the  
15 containment spray pump and the residual heat removal  
16 pump. It shows that they calculate containment  
17 pressure to be over what they need. It requests step  
18 increases and decreases of containment pressure as  
19 credit.

20 I took the liberty of putting the time  
21 scale on the bottom here, and only because when time  
22 is shown in seconds, it's not as easy to see. It  
23 shows easier in hours, although we all know, we can  
24 all do the math. They're asking for credit for the  
25 RHR pumps for up to 56 hours.

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1 MEMBER WALLIS: While we're looking at  
2 this figure, this over-pressure available, that is  
3 presumably a conservative estimate. It's actually  
4 higher than that. Is that what I understand, or is  
5 that a best estimate curve? Which is it?

6 MR. SHERMAN: No, Dr. Wallis, or the  
7 answer; yes, Dr. Wallis, that is a conservatively  
8 calculated pressure, where all of the assumptions  
9 that go into it have been either minimized or  
10 maximized to give the lowest pressure possible. And  
11 in the State of Vermont, we accept that. We don't  
12 question that that's a conservative calculation. And  
13 for containment integrity for the pressure retention,  
14 the maximum pressure curve is, I think, up in the high  
15 20s or 30s.

16 So as I was saying, they're asking for  
17 over-pressure credit for the HRH pumps for  
18 approximately 56 hours. Just looking on the curve, it  
19 looks like 40-41 hours of credit necessary for the  
20 containment spray pump.

21 Now in terms of the first item in your  
22 letter of September, practical alternatives, we found  
23 in our review that the staff, I don't believe, has  
24 even yet formally inquired about practical  
25 alternatives. I don't think there was a request for

1 additional information, RAI, related to practical  
2 alternatives. And it wasn't until just last month  
3 that Entergy volunteered some information in  
4 Supplement 38 regarding practical alternatives, I  
5 think as a result of your letter in September.

6 What they said was that they had not  
7 completed looking at alternatives, that changes would  
8 be quite substantial, that a new pump design would be  
9 required. In their supplement they provided a list of  
10 design implications that would result from  
11 implementing a practical alternative. They indicated  
12 that effectively it would double the length of a  
13 refueling outage, or in the alternative, it might be  
14 necessary to implement over several refueling outages.

15 From our point of view, it appears that  
16 Entergy's objections to alternatives appear to  
17 translate into costs. We believe, and actually we  
18 think that the law says that safety issues should not  
19 be cost-driven. And we also think that there is  
20 significant economic value to Entergy in the proposed  
21 uprate.

22 MEMBER WALLIS: So there's no estimate of  
23 the cost of this at all yet. Is that right?

24 MR. SHERMAN: No estimate of the cost of  
25 what?

MEMBER WALLIS: Of any of these alternatives.

MR. SHERMAN: We are not aware of the estimate of the cost of any of these alternatives.

Commenting on the other items in the ACRS letter, in terms of positive indication of containment integrity, the letter itself notes inerting, although we're not sure that inerting is an effective indicator of containment integrity because the inert system at Vermont Yankee is a feed and bleed system, which means that they are constantly feeding Nitrogen, and they're constantly bleeding Nitrogen. And the very fact that it's inerted by itself doesn't indicate that you have containment integrity.

However, the drywell is maintained at a positive pressure, 1.7 psi above the suppression pool. We do believe that that's an indication that the drywell maintains pressure.

MEMBER KRESS: Do you have an idea what the amount of the feed and bleed there is; that would be an indicator.

MR. SHERMAN: The licensee could answer that. But through our review, here's what I think. I believe that for the drywell maintained at positive pressure but with a feed and a bleed system, they can

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1 indicate whether they get a significant additional  
2 leakage, and that the leakage of the drywell in the  
3 feed and bleed system is much less than would defeat  
4 containment pressure. I'm not sure that they have  
5 that indication with the Torus because the Torus is  
6 essentially at atmospheric pressure, and I'm not sure  
7 that they get a positive indication of Torus pressure.  
8 And then the last item that was in the September  
9 letter, demonstrated capability for the time period,  
10 to the best of my knowledge, the containment Type A  
11 tests were run for 24 hours, and they're asking for  
12 credit for up to 56 hours. And also, as all of the  
13 committee members and consultants know, the  
14 containments haven't been Type A tested for 10 years,  
15 and many plants, including Vermont Yankee, have  
16 permission to extend that to 15 years.

17 So my summary, comparing or taking the  
18 Vermont Yankee's request and the September 20 letter,  
19 there are practical alternatives. I don't believe  
20 that there's a full positive indication of containment  
21 integrity because of the Torus, and I don't think  
22 containment integrity has been demonstrated for the c  
23 credited time period. But moving from the letter to  
24 Dr. Sheron's proposal, Dr. Sheron proposed a risk-  
25 based approach, Reg Guide 1.174, in lieu of

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1 implementing practical alternatives.

2 In the State of Vermont, we believe that  
3 this approach may have promise. However, through our  
4 review, Entergy's supplements, which haven't been  
5 reviewed by the staff officially yet, we are not sure  
6 that they accomplish the purpose and hopefully by my  
7 comments and the process that we're going through,  
8 we'll flesh out whether or not they do. Our first  
9 view is that they don't, and I'll explain why.

10 Entergy's risk evaluation --

11 MEMBER WALLIS: Excuse me. Did you get  
12 this inch thick PSA report that we have? Do you have  
13 that?

14 MR. SHERMAN: Yes.

15 MEMBER WALLIS: Is that what you're  
16 referring to here?

17 MR. SHERMAN: Yes. On October 21<sup>st</sup> they  
18 submitted Supplement 38.

19 MEMBER WALLIS: Revision Zero - okay.

20 MR. SHERMAN: And on October 26<sup>th</sup>, the  
21 larger report - both of them are here. The first  
22 submittal on October 21<sup>st</sup> was essentially an  
23 evaluation of the five elements of Reg Guide 1.174.  
24 I haven't got a slide which lists them. I know that  
25 subsequent presentations will have.

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1           Then five days later they submitted the  
2   more full PSA. Actually, it's this. Included within  
3   that was a new top event, primary containment  
4   integrity. Their methodology was essentially to  
5   determine the core damage frequency difference between  
6   containment pressure available and not available.  
7   First, I'd like to --

8           MEMBER WALLIS: Maybe they should answer  
9   this. When you said does this mean difference between  
10   having the pumps work and having the pumps not work?  
11   What is the consequence of not having the pressure  
12   available?

13          MR. SHERMAN: The consequence of not  
14   having the pressure available if they took credit for  
15   containment pressure, containment over-pressure, the  
16   consequences of not having containment pressure  
17   available is that the pumps would not work.

18          MEMBER WALLIS: Would not work at all.  
19   It's not as if they partially work, as they probably  
20   would.

21          MR. SHERMAN: Well, I think we all believe  
22   that they would partially work. And I'm going to say  
23   something more about that, touch on that in just a  
24   minute.

25          MEMBER WALLIS: Yes, because some of these

1 PSA assumptions are not realistic; they're sort of  
2 yes/no-type answers.

3 MR. SHERMAN: I believe that, but I would  
4 bootstrap that to say the PSA methodology has some  
5 limitations on what you can make it do. First, I'm  
6 going to comment on two of the five Regulatory Guide  
7 1.174 elements before talking about comments on the  
8 PSA. The first element that I want to mention is the  
9 proposed change is consistent with defense-in-depth  
10 philosophy.

11 I think the staff, maybe the licensee  
12 also, will talk a fair amount of why the proposal may  
13 be consistent with defense-in-depth philosophy, and I  
14 think that you, the committee, should look at that,  
15 see what they have to say. From the top view, the  
16 proposed change makes fuel cladding barrier dependent  
17 on the containment barrier which to us in Vermont is  
18 a significant modification of the defense-in-depth  
19 philosophy, but it's important that we listen to all  
20 of the comments in that area.

21 The other item is of lesser significance  
22 to us, the impact of the proposed change should be  
23 monitored. I've already mentioned this earlier in the  
24 presentation. Entergy claims credit for the 1.7  
25 differential pressure. That's a valid monitor of the

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drywell, but I'm not convinced or sure that it's a valid monitor of the Torus, and in the penetrations to the Torus.

Now I'm going to go and mention seven comments that I have on the submittal that was provided on October 26<sup>th</sup>. I'm going to caveat those comments, again, we are not PSA experts, but we're trying to make the best of what we had in our review. Our first comment is that the model claims to consider only the time when the hard piped vent is used to prevent over-pressure. What this refers to is an implementation of a hardened vent, and the operator opening that vent to relieve containment pressure, and then not closing it and losing containment pressure.

In our view, if this statement were true, it's way too limiting. And I should mention that the licensee answered an RAI early in the review, stating that the only aspect it knew about containment over-pressure and the challenge was this hardened vent and its use. We think the problem is broader than that, that one has to look at the possibility of numbers of isolation failures, but the licensee mentioned that the model that was run didn't really just do that, it did more, so it may be a matter of what the words say in the supplement versus what the licensee really did.

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1 But the words say that it's only the time when the  
2 hard pipe vent is used, and to us that's too limiting.

3 The next item in the fault tree for their  
4 new top event - they look at leakage paths both from  
5 the drywell and the Torus of two inches and greater.  
6 They only look at selective pathways, actually only  
7 those pathways which are purge and vent drain  
8 pathways. I am not convinced that they've included in  
9 their analysis all of the pathways that they might  
10 look at that might result in leakage. I think they  
11 make an assumption that if it's a closed system,  
12 there's no leakage. I think we'd accept that, unless  
13 there was an opening of that system through the LOCA  
14 or the accident itself. So again, we just had the  
15 question of whether they've included all of the  
16 leakage pathways in their evaluation.

17 Further to that item, Comment 3, it  
18 appeared to us that they included leakage pathways two  
19 inches and above, but they did not have a block or a  
20 split fraction or leakage pathways two inches and  
21 below, or below two inches, small bow piping. They  
22 did determine and they published in their supplements  
23 that a leak, a half-inch leak would defeat - I think  
24 it was .4 something - but approximately, a half-inch  
25 leak would defeat over-pressure, so it looks to us

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1 like there should be some consideration of small bore  
2 piping. Again, maybe through detailed review - it's  
3 not there, but it looks to us like there should be  
4 something there.

5 This one is technical and I almost feel  
6 like I have to talk to Dr. Apostolakis just directly  
7 on this. The case reported uses an initial small leak  
8 criteria, the base case, double the value of the  
9 leakage that would defeat over-pressure. It seems to  
10 us like it would have been more accurate to use the  
11 small leak criteria equal to the value for over-  
12 pressure. And there's a little bit counter-intuitive  
13 here. If you use a smaller leak criteria in your base  
14 case, then the core damage frequencies are higher  
15 because it is easier, it is more probable to have a  
16 smaller leak than a larger initial leak. So the fact  
17 that they used a larger initial leak as the initial  
18 condition creates a higher or lower - lower CDF, and  
19 I'll leave that comment there because it's down in the  
20 bushes, but with scrutiny I think it could be  
21 understood.

22 MEMBER WALLIS: Do they explain why they  
23 do this?

24 MR. SHERMAN: Well, they actually did a  
25 parametric study where they did a number of -- in the

1 supplement they did a number of cases, and showed  
2 results for those cases; although, they didn't give  
3 Delta CDFs for those. And I'm not sure if the Delta  
4 CDF for the leakage case equivalent to the half an  
5 inch break doesn't bring you up around ten to the  
6 minus six, which is the cut-off criteria for 1.174,  
7 but I presume the licensee will say more about this  
8 this morning.

9 Comment 5 - the main steam isolation valve  
10 leakage pathway was not considered in their base case.  
11 I believe that's because they assumed it would be a  
12 closed pathway, although they have implemented within  
13 the last year or so something that is called alternate  
14 leakage treatment pathway, ALT. And in this pathway,  
15 they - within 30 minutes following an accident, a LOCA  
16 - they open a pathway from the downstream of the  
17 outboard MSIV. They open a pathway to the condenser,  
18 and this is for the alternate source term methodology  
19 that they use. And, therefore, the MSIV leakage has  
20 an effective open pathway, and ought to be considered,  
21 in my view.

22 And then number six, I believe that when  
23 they do that, they should take care to use their own  
24 MSIV leakage history. Their MSIV leakage history is  
25 not very good, but then I know that the industry's is

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1 not very good either, and I'm not sure who gets the  
2 benefit of my comment here.

3 MEMBER WALLIS: It's a half-inch hole or  
4 bigger?

5 MR. SHERMAN: No, their MSIV histories,  
6 the leakage that they found have not resulted in the  
7 leakage rate equivalent to a half-inch hole. But what  
8 this would lead to, Dr. Wallis, is a split fraction or  
9 a probability, the probability that the hole would be  
10 larger or smaller.

11 MEMBER SIEBER: They still meet Part 100?

12 MR. SHERMAN: Yes, there's no question  
13 about the dose criteria and the meeting of Part 100,  
14 and we don't question that.

15 MEMBER SIEBER: Okay.

16 MR. SHERMAN: My last comment, I imagine  
17 this is a bugaboo for all who are in the PSA area, and  
18 that is the fact that seismic in the PSA area is not  
19 done through probabilistic methods, but only through  
20 deterministic evaluations. And I'm not sure how the  
21 committee should look at the seismic interaction of  
22 this particular question, but here's the problem.

23 The problem is seismic can create the  
24 event, seismic can result in either a half-inch  
25 opening being created through the containment or small

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1 bore piping because of the particular seismic  
2 methodologies that the architect/engineer used for  
3 small bore piping. And this is something that one  
4 needs to think about if one is going to look at the  
5 containment over-pressure issue through probabilistic  
6 methods.

7 MEMBER SIEBER: As far as seismic analysis  
8 that this plant was built back in the time frame when  
9 templates were used to determine where supports were.

10 MR. SHERMAN: Yes.

11 MEMBER SIEBER: I take it there's been no  
12 subsequent re-analysis of the small bore piping, and  
13 the adequacy of supports?

14 MR. SHERMAN: I can't answer that. The  
15 licensee would be able to answer that, but I can  
16 answer that this plant has submitted an IPEEE  
17 evaluation and the IPEEE, basically they used Squib  
18 methods of doing walkdowns and looking at all the  
19 cases. So analysis, I'm not sure, Mr. Sieber, but in  
20 terms of review and consideration, I know they've done  
21 it, but in a deterministic manner.

22 MEMBER SIEBER: Okay.

23 DR. APOSTOLAKIS: You said that seismic  
24 analyses are not done probabilistically. They could  
25 be done. There are methodologies out there to do it,

1 but they are a little bit expensive. My understanding  
2 is that in this plant they implemented a bounding  
3 analysis, which determines whether the equipment can  
4 survive a reference earthquake, which is not a  
5 probabilistic analysis, but that was accepted by the  
6 NRC. These methodologies have been approved, but your  
7 point that they perhaps should be doing a complete  
8 probabilistic analysis may be well taken. They may  
9 need to do that.

10 MR. SHERMAN: Actually, Dr. Apostolakis,  
11 my concern is more focused, and that is that I don't  
12 question the seismic adequacy of the plant. I only  
13 develop a question when the consideration of  
14 qualifying containment over-pressure through 1.174  
15 techniques comes into play. Then I say well, the  
16 broad calculation doesn't really answer the question  
17 at hand. And what I conclude, and this is a possible  
18 conclusion, a possible conclusion is that PSA  
19 techniques are not an adequate method to resolve this  
20 issue.

21 DR. APOSTOLAKIS: That's why, as you well  
22 know, that the regulatory guide proposes an integrated  
23 decision making process, because they appreciate  
24 deficiencies. But this touches on an issue that I  
25 think is very important in power uprates, what we have

1 seen so far. I mean, the rule is that you do this  
2 deterministically. Okay. And the licensee's usually  
3 submit a risk assessment as a supplement, and the  
4 requirements are not very stringent.

5 It seems to me that if you go to  
6 Regulatory Guide 1.174, the requirements now change,  
7 because now the PRA has to be fairly complete, has to  
8 be scrutinized, and it's a different ball game. And  
9 I'm not sure that this has happened. I remain to be  
10 convinced, but I'm not sure it has happened, so we  
11 don't just take the regulatory guide and just do an  
12 analysis, and then say okay, you can look at it when  
13 you do your deterministic analysis and have a better  
14 feel if things are going well.

15 Now it's a different thing, now it's risk-  
16 informed. Okay. And by the way, I mean, the analysis  
17 involving earthquakes, there is a very interesting  
18 document on the NRC website that refers to GSI 193,  
19 where there is a detailed event tree, several event  
20 trees starting with a seismic event, and they address  
21 the issue of large LOCA, and they refer to Mark 1  
22 containments. And again, I didn't see any reference  
23 to that, and I think that's very enlightening to look  
24 at the event trees that the staff has developed there,  
25 and the timing of the pumps coming on line and so on,

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1 GSI 193.

2 MR. SHERMAN: Thank you. What I have just  
3 done is identified comments on the PSA that was  
4 submitted. And now I'd like to take ten slides and  
5 identify why I think that the licensee only provided  
6 part of the problem, and what I think the whole  
7 problem should look like.

8 The method that the licensee used was to  
9 show the CDF difference between containment over-  
10 pressure, with containment pressure available and  
11 containment pressure not available. But what I think  
12 that we would like to have seen or see is an  
13 evaluation that shows the CDF difference between NPSH  
14 failure of cooling pumps with no use of containment  
15 pressure over-pressure, and NPSH failure of cooling  
16 pumps with the use of containment over-pressure.

17 Now that's a different problem, which I'll  
18 try and explain. Let me get to one more slide.

19 DR. APOSTOLAKIS: Let me interrupt you for  
20 a second.

21 MR. SHERMAN: Yes.

22 DR. APOSTOLAKIS: I thought you were going  
23 to say that what you would like to see is a complete  
24 probabalistic evaluation within 1.174 for the EPU  
25 itself. This is really the issue. Right? And that

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1 would include what you want to see, and also what the  
2 licensee has done. In other words, here we have a  
3 situation where we're asking for a power uprate. The  
4 licensee does some risk assessment, but not within  
5 1.174, and then they pick one element of that and they  
6 say we'll go to 1.174. And my question is why don't  
7 they go to 1.174 using the complete EPU? I mean, do  
8 the CDF before and after, including NPSH and  
9 everything. That would seem to me to be the way to do  
10 it.

11 MEMBER KRESS: And, George, I would add to  
12 that that since this is basically a late containment  
13 failure issue, that I would make that an additional  
14 constraint in 1.174, which it doesn't actually show up  
15 there.

16 DR. APOSTOLAKIS: You wouldn't just look  
17 at LERF, you would go beyond. Yes. But this is an  
18 interesting situation. In the past, we have talked  
19 about bundling of changes. This, I think, is the  
20 reverse. We have the big thing, and then we pick one  
21 element, and we do a complete 1.174 analysis. That's  
22 something that I think will be of interest to the  
23 committee. I'm sorry for interrupting, Mr. Sherman.

24 MR. SHERMAN: No, not at all. And I think  
25 of your comment very interesting. I, of course, would

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1 let both the staff and the licensee respond to that.  
2 We are more focused in our's, but the full would be  
3 the best.

4 DR. APOSTOLAKIS: Rest assured I will  
5 raise the questions when the staff is up there. But  
6 another thing that is very interesting since we're on  
7 the subject, if you look at the Delta CDF for the EPU  
8 that they submitted in the early application, and then  
9 the Delta CDF they calculated in the latest thing,  
10 it's higher. That's a very strange result, isn't it?  
11 I mean, the Delta CDF for the complete change is lower  
12 than the Delta CDF for looking at only a particular  
13 piece of it. And it's almost double, and I find that  
14 very strange.

15 MEMBER WALLIS: Well, it must be that the  
16 piece of it wasn't included in the original proposal.

17 DR. APOSTOLAKIS: I think that's the  
18 reason. And then the question is, of course, what  
19 else is not included. Please.

20 MR. SHERMAN: Thank you. The way that we  
21 looked at it, going back to the previous slide,  
22 instead of only the containment pressure available or  
23 not available, we think that for this particular  
24 problem it's the question of whether NPSH failure  
25 using containment over-pressure, and NPSH failure not

1 using it would show at least what the probability that  
2 Dr. Sheron was speaking about.

3 The difference in the method is this; if  
4 we did what we are suggesting, you would capture the  
5 loss of the NPSH margin given up by crediting over-  
6 pressure. It is not only whether the over-pressure is  
7 there from containment integrity, but it is whether or  
8 not you needed that margin because of other  
9 uncertainties, which I'll identify on the next slide.  
10 So what we would propose is to assume in one case that  
11 the practical alternative was implemented, and that  
12 is, therefore, you had the full containment over-  
13 pressure margin, and then compare that with the case  
14 where over-pressure was credited on the step method  
15 that I showed on the earlier slide.

16 What we would see is not a new top event  
17 that is primary containment integrity, but a new top  
18 event that says pump fails due to inadequate NPSH.

19 MEMBER WALLIS: I have a philosophical  
20 problem with something here. I mean, crediting is  
21 something that is done by the agency. It's a  
22 regulatory thing. I thought PRAs, PSAs were supposed  
23 to be realistic descriptions of what happens. How can  
24 something sort of arbitrarily credited or not credited  
25 by an agency have an effect on reality?

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1 DR. APOSTOLAKIS: The NRC can do that.

2 MEMBER WALLIS: No, but I have a  
3 philosophical problem with that.

4 MR. SHERMAN: We actually think, Dr.  
5 Wallis, that both can be accommodated, because in the  
6 probabalistic methodology, you can determine the  
7 probability of the event occurring in the first place,  
8 the probability of the temperature being so high as to  
9 require containment over-pressure.

10 As a matter of fact, we think that  
11 something along the line of a top event similar to the  
12 slide that I have up now would flush out the answer,  
13 and that is a pump fails due to inadequate NPSH, and  
14 then finding ways to assign the probabilities for the  
15 items in the boxes, which I'll mention a little bit  
16 further in, and finding ways to implement gates that  
17 only apply things when the over-pressure is needed. I  
18 think this might answer the question.

19 MEMBER KRESS: A comment on Dr. Wallis'  
20 philosophical problem. Given certain amount of credit  
21 for over-pressure, what one wants to ask in the PRA  
22 is, given that credit, what's the conditional  
23 probability that you won't have it. And that can be  
24 addressed in a PRA.

25 DR. APOSTOLAKIS: Yes. PRAs are always

1 done with certain boundary conditions, so you can view  
2 that as a boundary.

3 MEMBER WALLIS: Yes, but the action of an  
4 agency in crediting or not crediting something doesn't  
5 change physical reality.

6 DR. APOSTOLAKIS: No.

7 MR. HOLDEN: We're going to have to move  
8 forward quickly with the rest of this presentation.

9 MR. SHERMAN: And we'll get through as  
10 quickly as we can. What I'm going to mention now is  
11 items related to almost each of the boxes I have on  
12 here, but I'll be fairly quick. The first box is,  
13 there is some probability that the NPSHR required is  
14 not significant. The Staff SAR discusses at length  
15 that the licensee is using a reduced NPSHR, an NPSHR  
16 somewhere between NPSH head minus three, and head  
17 minus six, a situation that is in cavitation.

18 To the best of my knowledge, this reduced  
19 NPSHR is based on a Brown's Ferry pump test that  
20 included ten minutes of running in severe cavitation,  
21 25 minutes in less severe cavitation. Also, on the  
22 pump acceptance tests, which were short duration  
23 tests, and on engineering judgment.

24 I note that Regulatory Guide 182, Section  
25 2113, Rev 3, the current revision, states: "Pumps in

1 cavitation should have performance tests at least as  
2 long as the pumps operate in cavitation." And in my  
3 view in this situation, we're talking about 56 hours  
4 or up to 56 hours. I think that it's unfortunate  
5 wording in Reg Guide 182, and along with the other  
6 changes that will eventually be proposed. Probably,  
7 this will need to get adjusted. Nevertheless, the  
8 issue is have the pumps been tested for the operation  
9 that is proposed? And my only point here is that  
10 there is some non-trivial probability the NPSHR used  
11 is not sufficient. I don't know whether it's one in  
12 a hundred, one in five hundred, one in a thousand, but  
13 there's some split fraction probability that could be  
14 placed in this event tree.

15 My next item is debris head loss. That's  
16 another item that we have in that event tree, and the  
17 item that I would identify, in particular, is the  
18 Vermont Yankee paint chip assumption. The licensee  
19 assumes that all unqualified paint fails, all  
20 unqualified failed paint is transported to the Torus,  
21 and no paint chips are deposited on the strainers.  
22 They base this on an Alden Lab test, which was a  
23 single test rig that's pretty different than this  
24 conflagration that's going to occur in the Torus if we  
25 had the whole situation.

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1 I think if I were the engineer on the  
2 project, I would have assumed some low value of paint  
3 chip deposition, 10 percent or so, but they assumed  
4 zero. This, to me, is enough to tell me - I'm going  
5 to flip back on my slides - that the second box,  
6 number 3, debris head loss more than expected, there  
7 is some probability that it will be more than  
8 expected. And there needs to be some calculations  
9 done to understand what the probability that more than  
10 inspected eats into too much NPSH, and too much of the  
11 over-pressure margin.

12 I have little to say about this -  
13 containment fails to hold pressure. That's the one  
14 block that the licensee has done.

15 MEMBER WALLIS: I guess we have to ask the  
16 applicant - the no chips deposited on the Torus, is  
17 that because they don't get there on the strainer at  
18 all, because they go through the strainer because  
19 they're so small?

20 MR. SHERMAN: They assume that --

21 MEMBER WALLIS: I assume they never get  
22 there, but if they get there, they might go right  
23 through anyway.

24 MR. SHERMAN: I believe their testing was  
25 reasonable, in that their testing showed that the

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1 chips were heavy enough to fall to the bottom, and not  
2 get caught on the strainer, not get sucked into the  
3 strainer. But in the real accident situation in the  
4 Torus, there is some probabilistic distribution that  
5 that's not quite what's going to happen based on their  
6 one test.

7 The containment fails to hold pressure -  
8 that's the one item that the licensee did, and I've  
9 already identified our comments and questions on the  
10 way that they did that. Two other items, insufficient  
11 developed pressure, and some temperature higher than  
12 predicted - these values have already been calculated  
13 conservatively, so I would imagine these probabilities  
14 would be very low. However, there is some probability  
15 that even these conservative calculations are - if  
16 you're going to assign a probabalistic distribution,  
17 that they're not zero.

18 Finally, operator fails to retain  
19 sufficient pressure. Operators are trained to reduce  
20 containment pressure. The operators follow a fairly -  
21 not a complicated, but also not a trivial nomogram in  
22 their EOPs, and there is a probability that the  
23 operator will fail to retain sufficient over-pressure.

24 So finally, as conclusion, if we apply the  
25 letter that was written in September, it appears to us

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1 that over-pressure credit shouldn't be granted based  
2 on my earlier comments. If we apply Dr. Sheron's  
3 proposal, first, the 1.174 element of defense-in-depth  
4 concept and the modification of that concept is  
5 troublesome. Secondly, we believe Entergy analyzed  
6 part of the problem, but not the whole problem. If  
7 they analyzed the whole problem, it would shed light  
8 on what the risk of over-pressure credit was. And  
9 that's all I have for my proposal. Thank you very  
10 much.

11 MR. HOLDEN: Thank you very much. If  
12 anybody has any questions for Mr. Sherman.

13 MEMBER WALLIS: I think you were very  
14 helpful to us. Thank you.

15 MR. SHERMAN: Thank you, Dr. Wallis.

16 MEMBER BONACA: I have just one comment on  
17 the defense-in-depth, I believe the EPGs, at least  
18 for some BWR already include consideration of flooding  
19 the drywell under LOCA conditions to cool the core.  
20 I'm not sure what they are for Vermont Yankee, but the  
21 linkage may exist already to the EPGs. I just wanted  
22 to point out, that's something we certainly should  
23 explore.

24 MR. SHERMAN: Fine. And again, I believe  
25 that the staff will have significant additional

1 comments about that.

2 MR. HOLDEN: Again, thank you very much.

3 MR. SHERMAN: Thank you.

4 MR. HOLDEN: Mr. Hobbs, are you ready?

5 MR. HOBBS: Yes. Good morning. I am  
6 Brian Hobbs, Entergy's Supervisor of Engineering  
7 Analyses for the Vermont Yankee Power Uprate project.  
8 I'd like to introduce Mr. Bruce Slifer on my right,  
9 who is the task owner and lead analyst for our  
10 containment and other fission products barrier  
11 analyses for the power uprate project. This morning  
12 I'll be providing an overview of the analyses  
13 associated with Entergy's request to credit  
14 containment accident pressure, also known as  
15 containment over-pressure included in the Vermont  
16 Yankee Power Uprate license amendment request.

17 Just a general statement about the State  
18 of Vermont presentation that you just heard. The  
19 State's items to consider in their presentation are  
20 almost all related to today's plant operation, so I  
21 will be discussing in my presentation the fact that  
22 issues such as strainer debris loading, containment  
23 integrity, containment leak rate testing are all  
24 issues for today, and regardless of whether we were  
25 requesting containment over-pressure to ensure

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1 adequacy of ECCS pumps net positive suction head, the  
2 items for consideration by the State would apply  
3 today, such as MSIV leakage - is it adequate? And  
4 I'll be answering that we meet the regulatory  
5 requirements, and we meet the conditions of our  
6 license relative to MSIV leak rate testing, so that's  
7 just a general comment.

8 The containment over-pressure credit is  
9 requested for application to the deterministic design  
10 basis analysis, loss of coolant accident, and ATWS  
11 events. And I'm going to be talking first about the  
12 deterministic design basis analysis today, and then  
13 about the probabilistic safety assessment we performed  
14 relative to crediting over-pressure, so we're going to  
15 be switching back and forth between the real world and  
16 the risk world; although, if you consider the design  
17 basis accident the real world, it's the deterministic  
18 analysis.

19 MEMBER WALLIS: You're saying the risk  
20 world is unreal?

21 MR. HOBBS: I'm sorry?

22 MEMBER WALLIS: You said the real world  
23 and the risk world. Is there something unreal about  
24 the risk analysis?

25 MR. HOBBS: Well, I'm not a risk

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1 specialist, and at times it appears to me to be an  
2 unreal world, but I'm sure it actually may be more  
3 realistic in some senses.

4 MEMBER WALLIS: Well, if it's not  
5 realistic, I don't want to hear about it.

6 MR. HOBBS: Okay. The topics I'll be  
7 presenting in this overview include background  
8 information on regulatory and industry precedence for  
9 crediting over-pressure, Entergy's basis for  
10 requesting over-pressure credit for the deterministic  
11 analysis, specifics of the over-pressure credit  
12 requested, and then details of the evaluation  
13 performed to assess the risk of crediting containment  
14 over-pressure. And the staff is going to be following  
15 this presentation, so I'm not going to get into a  
16 whole lot of detail relative to the deterministic  
17 analysis, just give you some background information.

18 Containment over-pressure credit has been  
19 granted by the NRC for 25 nuclear plants to meet long-  
20 term containment cooling requirements. This includes  
21 four boiling water reactor plants granted over-  
22 pressure credit in conjunction with an extended power  
23 uprate, and those are Duane Arnold, Brunswick I and  
24 II, Dresden II and III, and Quad-Cities I and II.

25 Regulatory Guide 1.82 titled "Water

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1 Sources for Long-Term Recirculation Cooling Following  
2 a Loss of Coolant Accident", defines the basis for  
3 crediting over-pressure.

4 MEMBER WALLIS: Again, this is not yet a  
5 regulatory guide, this is a draft.

6 MR. HOBBS: Regulatory Guide 1.82 Rev 3.

7 MEMBER WALLIS: Is that the real one or is  
8 that the new draft?

9 MR. HOBBS: Rev 3 is the real one.

10 MEMBER WALLIS: Okay. I'm sorry. Then I  
11 know what you're talking about. Thank you.

12 MR. HOBBS: Vermont Yankee conforms to the  
13 aspects of Regulatory Guide 1.82 Rev 3 that pertain to  
14 crediting over-pressure. This table lists the boiling  
15 water reactors with Mark 1 containments similar to the  
16 Vermont Yankee design that currently credit over-  
17 pressure in their licensing basis. The extended power  
18 uprate plants on this list include Duane Arnold,  
19 Dresden and Quad-Cities, not listed here is the  
20 Brunswick plant, although it does have a Mark 1  
21 containment, and it did request credit for over-  
22 pressure as part of its extend power uprate license  
23 amendment request, and did receive that credit.

24 During the design basis loss of coolant  
25 accident, the Vermont Yankee's low pressure ECCS

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1 pumps, which are the residual heat removal and core  
2 spray pumps take suction from the suppression pool and  
3 supply water to the reactor in order to maintain fuel  
4 temperature less than the maximum allowable.  
5 Suppression pool temperature and pressure increase as  
6 a result of the postulated large reactor coolant  
7 piping break.

8 The Vermont Yankee primary containment is  
9 designed to automatically isolate in order to prevent  
10 the release of radioactive material. Isolation of the  
11 containment also bottles up the energy released from  
12 the hypothesized reactor piping break. It is this  
13 accident pressure that we are requesting credit for.  
14 And accident pressure is not a new condition resulting  
15 from power uprate, it's available in the current  
16 postulated Vermont Yankee design basis accident  
17 analysis. Power uprates does increase decay heat  
18 which results in a design basis analysis peak  
19 suppression pool temperature that's approximately 12  
20 degrees greater than the current licensed thermal  
21 power peak, which reaches full power uprate at peak of  
22 195 degrees Fahrenheit.

23 MEMBER WALLIS: Is this a very  
24 conservative-type analysis, or is this a realistic  
25 one? What's the real temperature likely to be?

1 MR. HOBBS: I'll be showing a slide  
2 momentarily here that contains best estimate results.

3 MEMBER WALLIS: So this contains  
4 significant conservatism?

5 MR. HOBBS: This contains the maximum  
6 allowable values for the --

7 MEMBER WALLIS: Because the heat has to go  
8 somewhere, presumably conservatism assumes that it's  
9 not taken out by some mechanisms which actually occur  
10 or something?

11 MR. HOBBS: Correct. At the temperature  
12 reached by the power uprate as far as suppression pool  
13 temperature goes, the available net positive suction  
14 head is less than required; hence, the need to credit  
15 containment over-pressure.

16 MR. LEITCH: You do not have a problem  
17 with requiring containment over-pressure for the  
18 current power level. Is that correct?

19 MR. HOBBS: We do not credit containment  
20 over-pressure for the current licensed thermal power.

21 MR. LEITCH: And this increase in  
22 suppression pool temperature of 12 degrees is what  
23 generates the issue of inadequate NPSH. That's the  
24 only impact is the 12 degrees?

25 MR. HOBBS: Yes.

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1 MR. LEITCH: So the 12 degrees maximum  
2 suppression pool temperature is enough to tip the  
3 scales from not needing containment over-pressure to  
4 needing containment over-pressure.

5 MR. HOBBS: That's correct.

6 MR. LEITCH: Okay. Thank you.

7 MR. HOBBS: The licensing basis change  
8 request crediting a portion of the over-pressure that  
9 is available in the suppression pool to ensure  
10 adequate pump net positive suction head. This slide  
11 you saw just a few moments ago, and it contains the  
12 requested over-pressure credit versus time for the  
13 Vermont Yankee large break LOCA.

14 MEMBER WALLIS: Now this 1.5 percent  
15 weight containment leakage, is that a rate per day or  
16 something?

17 MR. HOBBS: Weight percent per day, yes.

18 MEMBER WALLIS: It doesn't say. It says  
19 per day, doesn't mean anything to me, so that's per  
20 day.

21 MR. HOBBS: Per day.

22 MEMBER WALLIS: And what is that based on?

23 MR. HOBBS: The allowable containment  
24 leakage rate in our license is 0.8 weight percent per  
25 day. That is for the primary containment. That does

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1 not include MSIV leakage. This value of 1.5 percent  
2 weight percent per day incorporates both the  
3 integrated containment leak rate test allowable limit,  
4 and the maximum MSIV leakage rate limit.

5 MEMBER WALLIS: So it might then be  
6 important for you to monitor this leakage rate more  
7 than you have in the past in order to assure that  
8 these calculations are correct?

9 MR. HOBBS: These leakage rates that are  
10 in our license today apply to containment integrity  
11 for today, so for radiological release purposes, we  
12 need to meet the --

13 MEMBER WALLIS: No, I'm trying to get at  
14 the question of allowable on license and what's real.  
15 You have to actually measure these things on some sort  
16 of a regular basis to satisfy yourself that the MSIV  
17 leakage is what you predict.

18 MR. HOBBS: Yes, and we measure those --

19 MEMBER WALLIS: And if you're more  
20 dependent on it, you might have to measure it more  
21 often.

22 MR. HOBBS: Agreed, yes. And there is an  
23 additional dependency that I'll be talking about here  
24 that we're creating, but there is a dependency today,  
25 also, relative to allowable leakage limits.

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1 MEMBER KRESS: You measure it how often  
2 now?

3 MR. HOBBS: We measure integrated leak  
4 rate testing every ten years, although we do have an  
5 exemption that's been approved to extend the current  
6 leak rate test to an additional five years. MSIVs are  
7 leak rate tested every cycle.

8 CHAIRMAN DENNING: Tell me with regards to  
9 this inerting question and its additional ability to  
10 give you information on what the leakage is from the  
11 containment - what can you really infer with regards  
12 to drywell leakage, and can you infer anything with  
13 regard to Torus leaking?

14 MR. HOBBS: And, Dr. Denning, I'll be  
15 talking about one of the elements of Reg Guide 1.174,  
16 which is monitoring of the proposed licensing basis  
17 change shortly here, but there is a strategy for  
18 monitoring leakage from the drywell, and I'll also be  
19 talking about how we propose to ensure that we don't  
20 exceed the integrated containment leak rate allowable  
21 limit for the Torus, as well. So I'll be getting to  
22 that shortly.

23 Now the lowest line on this curve here is  
24 the core spray required over-pressure for this event  
25 at EPU conditions. The next lowest line is the

1 residual heat removal pump over-pressure required.  
2 The highest line is the available over-pressure  
3 assuming the 1.5 weight percent per day containment  
4 leakage, and also assuming that containment sprays are  
5 being operated continuously during this event, so  
6 those are the most conservative assumptions relative  
7 to available over-pressure.

8 So the middle line here is the credited  
9 over-pressure that's being requested, and that's a  
10 step curve that shows how much over-pressure credit we  
11 need. The peak is 6.1 PSIG, and the duration is 56  
12 hours.

13 MEMBER WALLIS: Well, it would seem to me  
14 that any curve between the diamonds and the triangles  
15 would suffice.

16 MR. HOBBS: That is true.

17 MEMBER WALLIS: Why do you have this  
18 particular one?

19 MR. HOBBS: Well, the reason we have it  
20 midway between is to establish and maintain sufficient  
21 margin.

22 MEMBER WALLIS: Well, how do you know  
23 what's sufficient margin without some probabalistic or  
24 some other kind of analysis? Is this just a word you  
25 throw out, or does it mean something, "sufficient

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1 margin"? Is there some requirement in the law that  
2 says it has to be 1 psi or something?

3 MR. HOBBS: There is no quantitative  
4 basis.

5 MEMBER WALLIS: So it's just some sort of  
6 engineering guess that you have enough margin if you  
7 make it 1 psi more than you need?

8 MR. HOBBS: Well, we didn't want to be on  
9 the ragged edge of margin for the deterministic  
10 analysis, so that's why we --

11 MEMBER WALLIS: You might as well have  
12 asked for the upper curve.

13 MR. HOBBS: Yes, but then we didn't want  
14 to go and attempt to recapture all the over-pressure  
15 available, so this is how much we need.

16 MEMBER WALLIS: You need the diamonds.  
17 You don't need anything above that really.

18 MR. HOBBS: Right.

19 MEMBER WALLIS: Presumably, since I  
20 understand NPSH margin of zero is acceptable to the  
21 agency, seemed to me in part of the SER, they were  
22 allowing zero margin.

23 CHAIRMAN DENNING: And if we can  
24 understand a little better the upper curve, the sprays  
25 are operating. That means that the drywell, that at

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1 least where the sprays are operating - where are the  
2 sprays operating?

3 MR. HOBBS: The sprays are operating in  
4 both the drywell and the suppression pool.

5 CHAIRMAN DENNING: And that means that the  
6 partial pressure of the vapor is whatever the pool  
7 temperature is, the saturation value for whatever the  
8 pool temperature is. Is that basically what the  
9 partial pressure of the steam is or vapor?

10 MR. HOBBS: Let me turn to Bruce Slifer  
11 over here to the microphone.

12 MR. SLIFER: Well, the calculation of the  
13 pressure inside the containment would consider the  
14 actual conditions in the airspace, so when the sprays  
15 are operating, the temperature would actually be  
16 closer to the spray temperature rather than the  
17 suppression pool temperature. So the --

18 CHAIRMAN DENNING: I'm sorry. The sprays  
19 are not pulling from the suppression pool.

20 MR. SLIFER: They're pulling from the  
21 suppression pool, but they're going through the heat  
22 exchanger and being cooled off.

23 CHAIRMAN DENNING: Okay. So it's whatever  
24 -- so you have to take into account that heat  
25 exchange.

1 MR. SLIFER: That's correct.

2 CHAIRMAN DENNING: I'm sorry. Okay. It's  
3 not as simple as I thought. Continue.

4 MR. HOBBS: The over-pressure credit  
5 request is based on the Vermont Yankee pump curves,  
6 which are formulated from specific performance tests  
7 for Vermont Yankee ECCS pumps. This is the same basis  
8 being used for current licensed thermal power. We are  
9 aware of the Brown's Ferry pump tests at reduced net  
10 positive suction head, but do not credit margin from  
11 these tests in our analyses.

12 MEMBER WALLIS: So these specific tests  
13 that you had, they ran with reduced NPSH for 56 hours?

14 MR. HOBBS: The specific tests for our  
15 ECCS pumps ran for a duration less than 56 hours, but  
16 they were the original pump tests performed --

17 MEMBER WALLIS: How much less? Four hours  
18 or something like that my colleague said. Is the test  
19 report four hours, so four hours seems somewhat less  
20 than 56.

21 MR. HOBBS: The original tests were done  
22 by the pump vendor, and they were done just to  
23 demonstrate that -- determine what the minimum NPSH  
24 required was. Done in accordance with standard test  
25 procedures for pumps in that era. These tests were

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1 performed in 1969 and 1970. The purpose of these  
2 tests was to establish the minimum required value. It  
3 wasn't for the purpose of establishing a duration of  
4 a time allowable to operate at those conditions.

5 MEMBER WALLIS: It says, "up to four  
6 hours", I think, here. Expected modes of operation -  
7 that doesn't say that's how they were tested. It says  
8 "expected hours of operation for less than four  
9 hours."

10 MEMBER SIEBER: Well, at the time that  
11 Vermont Yankee was built, it didn't need over-pressure  
12 credit, so you would test the pumps in those modes for  
13 a long enough period of time to demonstrate that they  
14 would work. When you come to a new situation where  
15 you take credit for over-pressure protection, you're  
16 basically still operating in the same regime. The  
17 temperature is hotter, which reduces NPSH. On the  
18 other hand, you have an over-pressure which  
19 compensates for that, so question as to whether that's  
20 adequate or not, or has any relationship to the amount  
21 of time that the credit is needed doesn't appear to be  
22 relevant, at least in my reading of the test report.

23 MR. HOBBS: We actually went back to the  
24 pump vendor in 1997 or 1998, and asked them to  
25 determine what the acceptable durations of operation



1 were at those minimum values. They performed an  
2 evaluation for us at that time, and at the minimum  
3 values that were tested, they said we could operate up  
4 to seven hours at those conditions. And then they  
5 said after that period of time, they provided a ramp  
6 up to some upper level, which was approximately four  
7 feet higher in NPSH, which would be acceptable for a  
8 long-term operation up to 8,000 hours, when they did  
9 an evaluation based on an evaluation of impeller  
10 lifetime characteristics.

11 MEMBER WALLIS: It's the impeller lifetime  
12 that matters, it's not the bearings or anything like  
13 that, or the seals? That thing is shaking  
14 considerably.

15 MEMBER SIEBER: It's the bubbles --

16 MEMBER WALLIS: It's only the impeller  
17 that matters.

18 MEMBER SIEBER: It's the bubbles  
19 collapsing on the impeller that --

20 MR. HOBBS: Right. It would be the effect  
21 of the cavitation --

22 MEMBER WALLIS: So the shaking of the pump  
23 has no effect at all.

24 MEMBER SIEBER: Well, it does, but it's a  
25 secondary effect.

1 MEMBER RANSOM: Those required values were  
2 a 3 percent drop in head due to cavitation?

3 MR. HOBBS: Actually, the minimum value  
4 for the HRH pump is closer to 6 percent head drop. At  
5 the time these pumps were tested, they were not living  
6 to a standard which was based on a head drop. These  
7 tests were done according to the manner that meets the  
8 requirements of the customer. The customer at that  
9 time was General Electric. They were the purchasers  
10 of those pumps. They specified the conditions that  
11 they would --

12 MEMBER RANSOM: But the long times of  
13 operation you just quoted were 6 percent drop in head  
14 then.

15 MR. HOBBS: Yes, they were.

16 MR. LEITCH: I have a question about the  
17 curve that's on the screen right now. You expect, I  
18 take it, the operator to more or less follow this  
19 stepped curve. And I guess the claim that's made is  
20 that there's no change required to your emergency  
21 operating procedures, but it seems to me that there  
22 would be a change if we expect the operator to follow  
23 this new requirement to follow that step curve.

24 MEMBER SIEBER: Well, the operator doesn't  
25 follow the step curve. He has to be above the minimum

1 NPSH line there, which puts an additional burden on  
2 the operator.

3 MR. WAMSER: If I can address the  
4 question.

5 MR. HOBBS: Yes, I'd like to have Chris  
6 Wamser, our Operations Superintendent, address that.

7 MR. WAMSER: Good morning again. Chris  
8 Wamser, Operations Manager. The guidance for  
9 maintaining net positive suction head for both the  
10 residual heat removal pumps and the core spray pumps  
11 is already in place, and has been in place in our  
12 emergency operating procedures. This step or  
13 staircase look on this graph that we have up on the  
14 slide is a simplified guide that is provided in the  
15 EOPs. It is previously existing because the EOPs are  
16 essentially written for design basis and beyond design  
17 basis-type accidents, so that guidance exists already.  
18 And we have trained on this, and we will continue to  
19 train on this, so this is not new information for  
20 operators. This is not a new change to the EOPs.  
21 There is no change to the EOPs as a result of this.

22 MR. LEITCH: Well, the general EOP  
23 practices are unchanged, but are the numerical values  
24 changed in line with this curve?

25 MR. WAMSER: Not for this, no. The

1 existing curves encompass this.

2 MR. LEITCH: Okay.

3 MEMBER WALLIS: The curve is the same, but  
4 he has to at certain times now maintain 6 psi, whereas  
5 before he may only have had to -- didn't have to  
6 maintain anything. Something has changed about what  
7 he has--

8 MR. WAMSER: The existing guidance looks  
9 at the parameters of pump flow, Torus damage here, et  
10 cetera.

11 MEMBER WALLIS: Right. So it's the same  
12 guidance, but what he tells you is changed.

13 MR. WAMSER: Well, prior to taking action  
14 to depressurize or lower containment pressure, the  
15 operators are responsible for determining what the net  
16 positive suction head is required for the pumps under  
17 the conditions that exist at that time.

18 MEMBER WALLIS: How does he know how much  
19 junk is on the screen when he's determining this NPSH?

20 MR. WAMSER: He does not -- that is not a  
21 variable that he is asked to --

22 MEMBER WALLIS: So how does he know what  
23 NPSH he needs? Does he have some other measurement  
24 that --

25 MEMBER SIEBER: He can tell if the pump is

1       cavitated.

2               MEMBER WALLIS: He can tell the pump is  
3       cavitated.

4               MR. WAMSER: We do have indications, we  
5       have a separate procedure for ECCS pump cavitation,  
6       but within the EOPs, the existing curves for  
7       containment pressure and system flow exist and are  
8       conservative to ensure that an individual would not  
9       reduce containment pressure below that which is  
10      required for --

11              MEMBER WALLIS: This is assuming a  
12      conservative screen blockage then, presumably.

13              CHAIRMAN DENNING: Let me understand  
14      something here about what the operator actually does.  
15      He would never do anything intentionally here to  
16      reduce the pressure below what we see as the blue  
17      curve, would he? There's no -- I realize that there  
18      is some requirement for reduction below some level,  
19      but I think we're assuming here that that blue curve  
20      is really taking into account any actions he might  
21      take. He's never going to take an action -- I mean,  
22      he's never going to intentionally take an action that  
23      would ever reduce the pressure below the blue curve,  
24      would he?

25              MR. WAMSER: If the blue curve is the

1 upper curve, that's true.

2 CHAIRMAN DENNING: Yeah, the blue curve.  
3 Well, I meant the upper curve. So he's not taking  
4 actions --

5 MEMBER SIEBER: To follow the steps.

6 CHAIRMAN DENNING: -- to follow the steps,  
7 or in any way reduce some of the assumptions that  
8 underlie here, which is that the non-condensable gases  
9 are not escaping this containment faster than the 1.5  
10 weight percent by some intentional action. Okay?

11 MEMBER SIEBER: Let me ask a question  
12 while you're up there.

13 CHAIRMAN DENNING: He's doing very little.  
14 He does reduce the pressure, if necessary, because of  
15 other reasons, but he's not -- there's very little he  
16 can do in this case in reality.

17 DR. APOSTOLAKIS: Then what is the change  
18 in the EOP that this gentleman --

19 CHAIRMAN DENNING: There is not one.  
20 Actually, they're saying there is no change.

21 MR. WAMSER: That was my point. This is  
22 not -- there is no change to the EOPs as a result of  
23 this. There's no additional or new training that  
24 needs to be provided to operators as a result of this.  
25 The guidance has existed, and I just want to make sure

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1 that was clearly addressed, that the operator's  
2 implementation of the Emergency Operating Procedures  
3 is not changing as a result of this.

4 CHAIRMAN DENNING: You know, we're going  
5 to have to move more quickly than we normally do.

6 MEMBER WALLIS: I think we need to  
7 challenge this. I mean, if some of the things that  
8 Bill Sherman talked about, like breaks in pipes  
9 actually are occurring and your leakage is bigger than  
10 predicted here, the operator may well have to do  
11 something. You may get below that top blue curve in  
12 the event of a pipe break that bends the containment  
13 more than predicted.

14 MR. HOBBS: And I'll be talking here  
15 momentarily --

16 MEMBER WALLIS: You will talk about that?

17 MR. HOBBS: -- Dr. Wallis, about if we  
18 assume the single failure in the deterministic  
19 analysis was containment, we would not need  
20 containment over-pressure.

21 MEMBER WALLIS: So you don't need it  
22 anyway, so after it's all done --

23 MR. HOBBS: If the single failure is  
24 containment, we don't need containment over-pressure.  
25 Okay. Moving along here, at the NRC's request,

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1 Entergy developed a risk-informed evaluation of  
2 crediting over-pressure in accordance with Reg Guide  
3 1.174, which is an approach for using probabalistic  
4 risk assessment and risk-informed decisions on plant-  
5 specific changes to licensing basis. The reg guide  
6 specifies areas or elements for consideration when  
7 assessing risk, which is shown here. I'll be  
8 discussing how these elements were considered in the  
9 next few slides.

10 Relative to the first element, Vermont  
11 Yankee continues to meet current regulations which are  
12 the design basis analysis requirements when crediting  
13 over-pressure to ensure adequate ECCS pump net  
14 positive suction head. The proposed crediting of  
15 over-pressure is consistent with and does not  
16 significantly degrade the defense-in-depth philosophy,  
17 as specified in the second reg guide element. The  
18 same methods will be applied at power uprates as are  
19 used at current licensed thermal power for prevention  
20 and mitigation of accidents.

21 MEMBER WALLIS: Are you going to address  
22 the question of independence of areas?

23 MR. HOBBS: Yes. The defense-in-depth  
24 safety philosophy avoids over-reliance on any one  
25 component or system. This ensures that we take into



1 account the inherent uncertainty associated with  
2 equipment and human performance. Vermont Yankee  
3 relies on multiple means to accomplish safety  
4 functions, and prevent the release of radioactive  
5 materials, none of which are affected by over-  
6 pressure.

7 MEMBER SIEBER: Let me just get this  
8 clear. If you end up with assess the containment  
9 leakage, what you're saying is that will not cause the  
10 clad to fail. And what does --

11 MR. HOBBS: Well, in the deterministic  
12 analysis, if we were to assume an additional single  
13 failure of containment, then we would have core  
14 damage. In other words, if we lost containment  
15 integrity which caused us to lose net positive suction  
16 head adequacy for ECCS pumps, we would have core  
17 damage. But that would be two single failures,  
18 because we would not only fail on our heat exchanger,  
19 we'd be failing containment, as well, so that's  
20 deterministic.

21 Now in the PRA world, we looked at this,  
22 and we looked at what the effect was on core damage  
23 frequency and large area release frequency as a result  
24 of crediting over-pressure, and we determined that was  
25 very small. So I guess in the deterministic world, we

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1 have to pick our single failures and decide which one  
2 is most conservative.

3 MEMBER SIEBER: On the other hand, it's  
4 possible, not likely but possible, for you to have a  
5 containment failure which you don't detect, enough  
6 leakage that you can't really pick it up in the normal  
7 day-to-day operation.

8 MR. HOBBS: A passive containment failure  
9 that occurs between testing of the containment  
10 leakage.

11 MEMBER SIEBER: You've got a 15-year span  
12 that you're talking about.

13 MR. HOBBS: Right. And we'll be talking  
14 about the fact that we test our containment  
15 penetrations individually. We test more than 50  
16 percent of those every cycle, so rather than the  
17 integrated leak rate test, we test the individual  
18 containment penetrations on a regular basis. So we  
19 have high confidence in containment integrity.

20 The regulations require incorporation of  
21 the worst case single failure for the design basis  
22 analysis, which for Vermont Yankee is failure of an  
23 HRH heat exchanger. If the single failure was assumed  
24 to be loss of containment integrity, rather than the  
25 HRH heat exchanger, there would be no need for over-

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1 pressure credit, because we would have adequate  
2 suppression pool cooling, keeping the temperature well  
3 below that where we would have adequate net positive  
4 suction head.

5 MEMBER WALLIS: So why do you need to  
6 apply for it. It would seem to me just appeal to the  
7 single failure criterion and you're home free. Why do  
8 you need to apply for this over-pressure credit?

9 MR. HOBBS: Because the single failure we  
10 currently apply, which is the loss of the HRH heat  
11 exchanger, is the most limiting relative to the design  
12 basis accident for peak cladding temperature.

13 MEMBER WALLIS: Yes. But then you're  
14 saying that additionally you have to apply for  
15 containment credit, so that the containment credit is  
16 somehow on top of the single failure?

17 MR. HOBBS: Yes.

18 MEMBER WALLIS: So it's a bit -- it  
19 depends on how you read the regulations, perhaps? No,  
20 the staff is quite clear.

21 MR. HOBBS: Okay.

22 MEMBER WALLIS: Well, go ahead.

23 MR. HOBBS: The staff will be, I'm sure,  
24 able to address that.

25 DR. BANERJEE: Let me just ask a question.

1 If you had a containment single failure, that water  
2 gets cool enough that you don't get this 12 degree  
3 rise?

4 MR. HOBBS: Yes. And I have a table that  
5 will show you here momentarily what the temperature  
6 peak is for that case.

7 DR. BANERJEE: But it depends on the size  
8 of the failure, right or not?

9 MR. HOBBS: The size of containment  
10 failure?

11 DR. BANERJEE: Yes.

12 MR. HOBBS: It can be an infinite size.

13 DR. BANERJEE: It can be very small. Then  
14 what happens in that case?

15 MR. HOBBS: That is true. We also did a  
16 sensitivity that showed you would need 27 times the  
17 allowable leakage rate to lose containment over-  
18 pressure for the deterministic analysis. And that  
19 would be a hole size that would be detectible, if it  
20 were in the drywell.

21 DR. BANERJEE: Now we heard some  
22 discussion that a half-inch hole would actually give  
23 you --

24 MR. HOBBS: That equates to the 27 times  
25 the allowable leakage rate.

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1 DR. BANERJEE: Now if you've got a half-  
2 inch hole, how much would your water cool? Would it  
3 cool at all?

4 MR. HOBBS: It would be the same  
5 temperature.

6 DR. BANERJEE: The same temperature,  
7 right?

8 MR. HOBBS: Right.

9 DR. BANERJEE: So if you got a single  
10 failure which was a half-inch hole, you would lose  
11 over-pressure, and the water wouldn't cool?

12 MR. HOBBS: Well, if the half-inch hole  
13 were the single failure, in the deterministic analysis  
14 we said we have both RHR heat exchangers available,  
15 which means we have one single failure, not two.

16 DR. BANERJEE: Right.

17 MR. HOBBS: Then we would cool the pool  
18 sufficiently so that we didn't require over-pressure,  
19 if that half-inch hole were our single failure.

20 DR. BANERJEE: So you only need that over-  
21 pressure if one of the RHR heat exchangers is not  
22 working.

23 M R . H O B B S : Y e s .

24

25 DR. BANERJEE: Okay.

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1 MR. HOBBS: Okay. And back to the  
2 question of independence relative to defense-in-depth.  
3 We do acknowledge the fact that the dependence on the  
4 core integrity becomes reliant on containment  
5 integrity here, but that's the case today. We have  
6 dependence today between the containment and  
7 functioning of the emergency core cooling system, and  
8 I can specify two examples of that. One is the fact  
9 that the primary containment holds the water that  
10 serves to recirculate for core cooling during an  
11 accident. If we lost primary containment and lost the  
12 source of water for recirculation, then we would have  
13 no emergency core cooling success. So we have a  
14 dependency today between containment integrity and  
15 ECCS functionality. Another example is environment  
16 qualification. If we lost containment integrity today  
17 which resulted in exceeding the EQ qualification of  
18 some of the equipment that makes the ECCS system work,  
19 some of the logic equipment, et cetera, then we could  
20 have a failure of the ECCS system, as well. So we're  
21 crediting a new dependency, which is for the over-  
22 pressure credit between containment integrity and ECCS  
23 functionality, but we have some dependencies today.

24 MEMBER SIEBER: The ones you cite are  
25 pretty gross compared to the refined, relatively small

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1 loss of containment integrity that would result in the  
2 situation we're discussing.

3 MR. HOBBS: Right.

4 MEMBER SIEBER: It takes a pretty big  
5 insult to override the EQ qualifications.

6 MR. HOBBS: Okay. These are some of the  
7 conservative design basis assumptions that we talk  
8 about here, and we have some cases for sensitivities  
9 on these, but essentially, we assume all these worst  
10 case conditions in our design basis accident.

11 Realistically, as we've mentioned here,  
12 containment over-pressure would not be required except  
13 for the fact that the regulations require assumption  
14 of all worst case inputs.

15 MEMBER WALLIS: Now you make this  
16 assertion, is there some analysis we can see that we  
17 can examine, to see how you've reached this  
18 conclusion? Are you going to tell us that?

19 MR. HOBBS: Yes, I'm going to tell you  
20 right now.

21 MEMBER WALLIS: We can't look at analysis  
22 now, but you're going to give us enough material, we  
23 can verify that your realistic analysis is okay?

24 MR. HOBBS: Yes.

25 MEMBER WALLIS: And we get it pretty soon,

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1 so we can actually look at it before we have to make  
2 any decision?

3 MR. HOBBS: We can do that. Okay. This  
4 table shows that over-pressure credit is only needed  
5 for the worst case design basis assumptions, which are  
6 presented in case one. This reflects the maximum  
7 conservatism in this design basis event. If the  
8 required single failure was the primary containment,  
9 then case two would be the result. And this shows  
10 there would be no need for over-pressure credit since  
11 both our HRH heat exchangers would be available, and  
12 peak pool temperature would be substantially lower.  
13 For cases three, four, and five, where surface water  
14 temperature or initial suppression pool temperature,  
15 or other input assumptions are not assumed to be at  
16 their maximum allowable value, suppression pool  
17 temperature does not increase to the point where over-  
18 pressure is required to ensure adequate net positive  
19 suction head. Therefore, a more realistic analysis  
20 would not result in the need to request over-pressure  
21 credit.

22 MEMBER WALLIS: You use this word  
23 "nominal" again. What does that mean? Does it mean  
24 what is most likely or something, or what?

25 MR. HOBBS: Let me ask Bruce Slifer to

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1 chime in on that.

2 MR. SLIFER: When we say "nominal", what  
3 we're talking about are things like 100 percent  
4 reactor power, instead of 102 percent power --

5 MEMBER WALLIS: More realistic is the word  
6 you should use. Nominal I have trouble with, because  
7 that can mean something defined in a regulation or  
8 something, sort of a people-defined thing rather than  
9 a real thing. You mean a realistic, is that what you  
10 mean?

11 MR. SLIFER: Okay.

12 CHAIRMAN DENNING: So this initial pool  
13 temperature in the first case, for example, is that  
14 something that is experienced in normal operation, in  
15 the variability you see, what is the maximum pool  
16 temperature that you really see?

17 MR. SLIFER: As I say, in response to an  
18 accident?

19 CHAIRMAN DENNING: No, this - I assume  
20 this is initial pool temperature.

21 MR. SLIFER: Oh, correct. Well, the  
22 variation tends to be somewhat seasonal. In the  
23 wintertime the temperatures are lower, in the  
24 summertime higher. I don't think we've ever gotten to  
25 90 degrees during normal operation. There could be

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1 times when you test the HPCI and RCI systems where it  
2 goes up, and the tech spec allows it to go about 90  
3 degrees occasionally, but then you have a certain  
4 period of time to get it back down below the limit.

5 CHAIRMAN DENNING: But it could be that it  
6 just went through some --

7 MR. SLIFER: We've estimated looking at  
8 plant records that the probability of it being at that  
9 level would be less than one day out of the year or  
10 something like that.

11 CHAIRMAN DENNING: I don't know if there's  
12 a common cause relationship between these if you went  
13 into LOCA and whatever transient you went through to  
14 give you a higher core temperature.

15 MR. SLIFER: Well, just taking a look at  
16 the data we have available to us.

17 CHAIRMAN DENNING: Okay. I was just  
18 trying to get a feeling for that.

19 MEMBER WALLIS: But normally, it's around  
20 70 degrees or something like that?

21 MR. SLIFER: It basically is room  
22 temperature, whatever the actual temperature is, that  
23 tends to be the temperature of the Torus. The surface  
24 water temperature, which is a more important factor,  
25 is, of course, dependent on the river temperature.

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1 And in Vermont, the river temperature is around 32  
2 degrees --

3 MEMBER WALLIS: If it gets to 90 degrees,  
4 I'd be very surprised.

5 DR. APOSTOLAKIS: Why is this slide titled  
6 "Risk Assessment"? I never understand -- what is the  
7 risk here?

8 MR. HOBBS: The risk assessment is coming  
9 up, Dr. Apostolakis. And this is element two of the  
10 Reg Guide 1.174, which talks about defense-in-depth.  
11 So I guess this is a risk-informed approach to  
12 deterministic analysis.

13 DR. APOSTOLAKIS: So the message of this  
14 slide is that defense-in-depth is not compromised. Is  
15 that what it is?

16 MR. HOBBS: It is not compromised. Right.  
17 It's maintained.

18 DR. APOSTOLAKIS: Because? Maybe you've  
19 said it, but because what? Because case one is the  
20 only case where we need containment over-pressure?  
21 And then what?

22 MR. HOBBS: I'll be talking here shortly  
23 about our exact defense-in-depth --

24 DR. APOSTOLAKIS: Okay.

25 CHAIRMAN DENNING: And the point at which

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1 you go between needing no credit to some credit is  
2 someplace in-between 185 and 195. Can you tell us  
3 what that number is?

4 MR. HOBBS: It's actually 185.

5 CHAIRMAN DENNING: 185 is the threshold.  
6 Continue.

7 MR. HOBBS: Okay.

8 MEMBER SIEBER: And that's where you'd be  
9 without EPU.

10 MR. HOBBS: Okay. Crediting over-pressure  
11 applies in existing condition in containment, and does  
12 not result in additional challenges or new types of  
13 challenges that would increase the probability of a  
14 fission product barrier failure. No new accident  
15 initiators will result from crediting containment  
16 over-pressure.

17 There are also no changes to the plant or  
18 changes in plant procedures in order to credit  
19 containment over-pressure; and, therefore, no increase  
20 in the failure probability as a result of those types  
21 of changes. Although adequate net positive suction  
22 head has been analyzed as being dependent on  
23 containment integrity, the probability of the worst  
24 case design basis event conditions occurring  
25 simultaneous with a lose of containment integrity is

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1 very small. Okay.

2 Crediting containment over-pressure does  
3 not degrade the current Vermont Yankee operator  
4 philosophy and practice of ensuring adequate pump net  
5 positive suction head, as Mr. Wamser discussed.  
6 Operator actions continue to mitigate fission product  
7 barrier challenges through training and following  
8 procedures.

9 Relative to the AST implementation, the  
10 ALT path, which was mentioned earlier this morning, is  
11 a pathway that's already open, and the operators  
12 confirm that on a loss of power or loss of air, that  
13 that path remains open. That does not affect MSIV  
14 leakage. It's basically a pathway to ensure you have  
15 adequate play down of elemental iodines and other  
16 fission products in accordance with the alternative  
17 source term regulation, so this does not increase any  
18 leakage from containment.

19 The over-pressure credit request preserves  
20 adequate margin for the deterministic analysis, which  
21 is the third element of Reg Guide 1.174. The  
22 currently --

23 MEMBER WALLIS: We had a discussion  
24 yesterday about what you mean by "adequate margin".

25 MR. HOBBS: Right.

1 MEMBER WALLIS: Does this mean simply  
2 meeting the regulations or meeting the regulations  
3 with some bit to spare, what you call margin.

4 MR. HOBBS: That second statement is --

5 MEMBER WALLIS: It's the bit to spare  
6 you're talking about.

7 MR. HOBBS: Bit to spare, right.

8 MEMBER WALLIS: But your margins have gone  
9 down.

10 MR. HOBBS: As a result of --

11 MEMBER WALLIS: How did you decide that  
12 it's not adequate?

13 MR. HOBBS: Well, based on engineering  
14 judgment, and benchmarking, and --

15 MEMBER WALLIS: Your engineering judgment  
16 might be different from mine.

17 MR. HOBBS: Might be different, right.  
18 And ultimately, we rely on the regulators to tell us -  
19 -

20 MEMBER WALLIS: Are you going to tell us  
21 more about this in two weeks time, what you mean by  
22 margin and why it's okay?

23 MR. HOBBS: Yes.

24 MEMBER WALLIS: Okay. You don't need to  
25 go into it now.

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1 MR. HOBBS: Okay. And as previously  
2 described, the deterministic analysis contains  
3 substantial margin, as well. Okay. Moving on to the  
4 risk assessment.

5 Entergy performed a risk assessment to  
6 determine the impact on core damage frequency in large  
7 early release frequency as a result of crediting over-  
8 pressure EPU conditions. This risk assessment was  
9 based on more realistic input assumptions compared to  
10 the design basis accident analysis. The impact of  
11 other EPU design changes were previously addressed in  
12 a separate risk assessment documented in the license  
13 amendment request. This assessment for over-pressure  
14 estimated the risk of establishing a dependency  
15 between over-pressure, which is a function of  
16 containment integrity, and success of low pressure  
17 ECCS pumps for cooling the core. And the results show  
18 a very small change in core damage frequency of 5.78  
19 E to the minus 7, and large early release frequency of  
20 4.5 E to the minus 8 as a result of crediting over-  
21 pressure.

22 MEMBER WALLIS: Now you say it's very  
23 small because it's less than E minus six.

24 MR. HOBBS: That's correct.

25 MEMBER WALLIS: So if it were twice as

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1 big, it would actually be above E minus six. So you  
2 must have a pretty good PRA with that accuracy.

3 MR. HOBBS: Yes.

4 DR. APOSTOLAKIS: The issue that came up  
5 earlier in your October 26<sup>th</sup> submission, where you  
6 look only at containment over-pressure, you get this  
7 number of 5.8 or you report 5.78 here, ten to the  
8 minus seven. However, in the SER that I read, the  
9 staff quotes 310 to the minus seven per reactor year  
10 as part of your earlier submission that looked at the  
11 whole EPU. So if I do a risk assessment on the whole,  
12 I get a number that's lower than if I do a risk  
13 assessment on a piece of it, which is kind of  
14 confusing to me. I mean, this analysis of containment  
15 over-pressure is one part of the risk assessment for  
16 the EPU itself, so that it's one contributor, so how  
17 can one contributor be higher than the --

18 MEMBER WALLIS: I think it's because it's  
19 an artificial contributor, assuming something which  
20 isn't realistic. This goes back to the --

21 DR. APOSTOLAKIS: No, this is supposed to  
22 be a realistic analysis.

23 CHAIRMAN DENNING: But, of course, there  
24 could be pluses and minuses, George.

25 DR. APOSTOLAKIS: Huh?

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1 CHAIRMAN DENNING: It can be pluses and  
2 minuses.

3 DR. APOSTOLAKIS: Is that a reason? This  
4 is much more detailed --

5 CHAIRMAN DENNING: I don't know if that's  
6 the reason, but it could be a reason.

7 MR. PALIONIS: I'd like to address that,  
8 if I could.

9 CHAIRMAN DENNING: Okay.

10 MR. PALIONIS: Yes. Mark Palionis, PSA  
11 Engineer for Vermont Yankee. You're quite correct,  
12 the original EPU submittal has a risk assessment  
13 associated with it. And as you've already discussed,  
14 realistically we did not expect, we don't expect to  
15 have to depend upon containment over-pressure. So for  
16 our thermal hydraulic analysis in support of our PRA,  
17 where we used realistic assumptions, we never need  
18 containment over-pressure. We don't need to credit  
19 containment over-pressure, so for this submittal we  
20 were requested to assess the risk associated with the  
21 assumption, artificial assumption that containment  
22 over-pressure is required. As far as we're concerned,  
23 it's artificial, because you have to max out all of  
24 your parameters if they're max possible, in order to  
25 get to a condition where you would require that

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1 containment over-pressure. So what we did was look at  
2 Delta CDF between what would be required, what the CDF  
3 would be if containment over-pressure is required for  
4 the low pressure ECCS success, versus the CDF where  
5 containment over-pressure is not required to support  
6 low pressure ECCS success.

7 MEMBER WALLIS: That's a funny kind of  
8 risk analysis.

9 CHAIRMAN DENNING: It's a variation in  
10 success criteria.

11 MR. PALIONIS: I would characterize it  
12 more a sensitivity study than --

13 DR. APOSTOLAKIS: So your number is the  
14 earlier one of 310 to the minus seven. That is a more  
15 realistic number.

16 MR. PALIONIS: That's a more realistic  
17 number, yes. Yes, indeed.

18 CHAIRMAN DENNING: Thank you. Continue.

19 DR. APOSTOLAKIS: Well, again, I looked at  
20 -- I mean, it appears that the timing here is  
21 important. I mean, in your PRA you sort of dismiss  
22 the seismic issue. You say we did a bounding analysis  
23 using an accepted method, and the numbers came out  
24 okay with respect to the reference earthquake of .3g  
25 I think. Now I don't know how relevant this is, but

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1 if I look at the GSI 193, there is a detailed analysis  
2 of a large LOCA with time in there of when the pumps  
3 come into the picture. And in the case of what they  
4 call a fast LOCA, they find some sequence there that  
5 can cause common cause failure so the pumps and so on  
6 - although, its frequency is still low. It's on the  
7 order of a few ten to the minus six.

8 I didn't see any of that in your PRA. Is  
9 it because you don't have a seismic probabilistic risk  
10 assessment, so you are not able to do it? Is it  
11 because you dismiss it, and the analysis that is on  
12 the website of the NRC under GSI 193 is irrelevant to  
13 you? There should be some sort of discussion, because  
14 that analysis refers specifically to Mark 1  
15 containments. Maybe the probability is still low. I  
16 am not saying that this would upset really what you  
17 have done, but I found it a little odd that the  
18 regulator has a whole analysis there that starts with  
19 a seismic event, loss of off-site power as a result of  
20 the seismic event, the diesels come on, then they give  
21 you details, they give a curve of the probability of  
22 failure of the pumps as a function of time, and all  
23 LPCI pumps fail because they come into the picture six  
24 seconds into the accident. Then there is a  
25 conditional probability of losing all containment

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1 spray pumps, which is .24. So, I mean, we're talking  
2 about serious stuff there; although, the thing that  
3 makes the frequency of the sequence low is the  
4 occurrence of the seismic event. But shouldn't there  
5 be some reference to that here? I mean, dismissing  
6 it, perhaps, as irrelevant, or saying that it doesn't  
7 -- I find it odd that we have all this detailed  
8 analysis on the one hand, and then a submittal that --

9 MEMBER WALLIS: Trying to mix  
10 deterministic and risk informed.

11 DR. APOSTOLAKIS: No, this is risk now.  
12 This is just risk.

13 MEMBER WALLIS: No, this is the problem of  
14 mixing them and then the application is not fully  
15 risk-informed application.

16 CHAIRMAN DENNING: It is definitely not a  
17 risk-informed application.

18 DR. APOSTOLAKIS: Well, not when you  
19 invoke 1.174. I disagree with that.

20 CHAIRMAN DENNING: You mean it's not risk-  
21 informed?

22 DR. APOSTOLAKIS: Then it becomes risk-  
23 informed.

24 CHAIRMAN DENNING: If you look at RS-001 -

25 -

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1 DR. APOSTOLAKIS: Remember, you can't pick  
2 and choose. Either you're risk-informed or you're  
3 not. The moment you invoke 1.174, it seems to me  
4 you're risk-informed.

5 MEMBER KRESS: I'd like to comment on  
6 invoking 1.174 for containment over-pressure credit.  
7 1.174 is for a change in the licensing basis. The  
8 plant is the same, when regulatory gives credit --  
9 they're not changing the licensing basis. 1.174 is  
10 irrelevant for that condition. But what you should be  
11 saying is just what you said - a change in the power  
12 is a change to the licensing basis. You need to look  
13 at 1.174 with respect to that. And then if your  
14 Deltas don't meet the criteria, then you might say  
15 well, maybe we need to do something about containment  
16 over-pressure. That might be a way to get the Delta  
17 down if we stick in a pump or something, but I just  
18 don't see the connection between crediting over-  
19 pressure and 1.174.

20 DR. APOSTOLAKIS: That's right. I fully  
21 agree with that. I think it should be done on the real  
22 change in the licensing basis, which they claim is the  
23 first analysis that they submitted, which gives a  
24 Delta CDF of 310 to the minus seven.

25 MEMBER KRESS: Yes, but then again, I've

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1 got to throw in my complaint about 1.174, that CDF and  
2 LERF are insufficient metrics.

3 DR. APOSTOLAKIS: Well, that original  
4 analysis was probably submitted as a supplement to the  
5 deterministic analysis, which was the real thing. But  
6 when you invoke 1.174, it's a different story. Then  
7 you scrutinize the risk assessment much more, and I  
8 don't know whether that was done or whether the PRA  
9 will change if we do that. We have the staff  
10 presenting, I believe, after these gentlemen, so maybe  
11 these questions will be addressed by them.

12 CHAIRMAN DENNING: George, we are going to  
13 have to address this issue. It's a very important  
14 issue. We can't address it in the detail that's  
15 needed at this meeting, just because of --

16 DR. APOSTOLAKIS: Which issue is this?

17 CHAIRMAN DENNING: What's that?

18 DR. APOSTOLAKIS: Which issue are you  
19 referring to?

20 CHAIRMAN DENNING: The one you're talking  
21 about, 1.174 and its relationship, because if you look  
22 at RS-001, which is staff guidance, for a non-risk-  
23 informed application, which this is, there are still  
24 requirements on PRA that have the nature of 1.174 in  
25 them. And we have to look at that and see if there's

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1 some generic issue here that we want to address that  
2 has some applicability to this particular plant, and  
3 its relationship to a credit on containment over-  
4 pressure.

5 DR. APOSTOLAKIS: I'm not sure, Rich, how  
6 stringent those requirements are. I remember from  
7 past safety evaluation reports from the staff, they  
8 would say things like the human error probability  
9 probably goes up by a little bit. We are not very  
10 sure, but after all, this is not a risk-informed  
11 application, so we're not going to pursue the issue.  
12 So the requirements are not the same. I mean, if you  
13 go through 1.174, it's a different story.

14 I'm not saying, again, that things will  
15 change dramatically, but we have to make sure we  
16 follow our own rules.

17 CHAIRMAN DENNING: Well, I think, Jack,  
18 the principal issue that I have at the moment is that  
19 we have things that we have to hear here today, and  
20 we're going to have to move forward. And if we wind  
21 up with insufficient time even on the next meeting,  
22 and we need more time, we're going to have to take  
23 more time. But as it turns out, today we have some  
24 constraints, and I'd say the absolute constraint that  
25 we have to meet is that we have a responsibility to

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1 the public this afternoon, that we don't go into their  
2 time frame of comment. And it's just that we're going  
3 to have to move on, because we've got major questions  
4 of the regulatory staff that are going to follow this  
5 on this particular issue.

6 MEMBER WALLIS: Well, they're hearing it  
7 now so they're going to be prepared.

8 CHAIRMAN DENNING: So they will be  
9 prepared.

10 MEMBER SIEBER: Well, it's premature to  
11 discuss any of this because the staff, to my  
12 knowledge, hasn't written an SER on it. And until  
13 they do, I think that's when we need to --

14 DR. APOSTOLAKIS: No, they have an SER.  
15 They don't have an SER on the latest submittal.

16 MEMBER SIEBER: And without that, we take  
17 the place of the staff, which we should not do.

18 DR. APOSTOLAKIS: No, but we are getting  
19 some useful answers though, Dr. Denning, so we're  
20 getting actually very good answers.

21 MEMBER SIEBER: Why don't we move on?

22 CHAIRMAN DENNING: Yes, and we'll move on.

23 MR. HOBBS: Okay. So the actions  
24 associated with our performance of the sensitivity  
25 assessment of risk included changing the Level 1 PSA

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1 model to incorporate containment leakage probability,  
2 and this included creation of a new fault tree top  
3 event designated as primary containment integrity.  
4 Secondly, we revised the appropriate Level I event  
5 trees, which include LOCAs, floods, ATWS and  
6 transients to reflect the impact of over-pressure on  
7 ECCS pump NPSH. Then we performed an uncertainty  
8 evaluation, and finally ran the PSA model to determine  
9 the impact on risk of crediting over-pressure. And  
10 one response to your question yesterday, Dr. Kress,  
11 which was asking about the late containment failure.  
12 As you noted earlier today, Reg Guide 1.174 specifies  
13 reporting the change in CDF and LERF, and we did not  
14 look at late release frequencies since that was not  
15 part of the reg guide.

16 MEMBER KRESS: If you considered in your  
17 PRA, though, that the reason that NPSH failed was lack  
18 of containment pressure because of a failure of  
19 containment, did you then say that's an early  
20 containment failure? Was that clear?

21 MR. HOBBS: Yes.

22 MEMBER KRESS: So that's considered an  
23 early containment failure.

24 MR. HOBBS: Yes. And relative to the  
25 State's desire for a different type of modeling, we

1 believe that our approach to the sensitivity  
2 assessment was very similar to what the State had  
3 requested or thought was appropriate there, because if  
4 we lost containment integrity, we lost NPSH for ECCS  
5 pumps, and essentially the ECCS pumps failed, so it  
6 was guaranteed failure on loss of containment  
7 integrity. Same outcome.

8 Okay. Moving on to Reg Guide 1.174  
9 Element Five, the ability to monitor the success of  
10 the proposed change using performance measurement  
11 strategies - the integrity of the Vermont Yankee  
12 containment is currently monitored through leak rate  
13 testing, in-service inspection, surveillances, and on-  
14 line operator indications. The maximum allowable  
15 containment leakage rate is specified in the Vermont  
16 Yankee technical specifications, and it's abbreviated  
17 here as LSFA, but that's 0.8 weight percent per day  
18 leakage. And relative to the integrated leak rate  
19 test sufficiency, our integrated leak rate test is  
20 performed at a peak containment pressure of 44 psig  
21 for 24-hours. This meets the regulatory requirements  
22 for integrated leak rate testing, and we are confident  
23 it would identify any containment integrity challenges  
24 that would result from performance of a longer test.  
25 And the duration for over-pressure credit we're asking

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1 for, which is 56 hours, relates to a peak pressure of  
2 6.1 psi credit. So basically, the 24-hour integrated  
3 leak rate test of 44 pounds we believe is sufficient  
4 to identify any leakage that would affect the over-  
5 pressure credit request and duration.

6 MEMBER WALLIS: Are you going to tell us  
7 when we meet again how accurately you can measure this  
8 containment leakage?

9 MR. HOBBS: How accurately we measure  
10 containment leakage?

11 MEMBER WALLIS: Are you going to tell us  
12 that when we meet again?

13 MR. HOBBS: Yes.

14 MEMBER WALLIS: Because I'm not sure how  
15 well you can do it.

16 CHAIRMAN DENNING: I think there are two  
17 issues here. One is with the leak rate test, the  
18 other is how well you can --

19 MEMBER WALLIS: How well you can monitor -  
20 -

21 CHAIRMAN DENNING: -- from the on-line  
22 information you have.

23 MR. HOBBS: Right. Two separate  
24 techniques for the monitoring.

25 MEMBER WALLIS: When the weather is

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1 fluctuating tremendously and things like that.

2 MR. HOBBS: Right. So we'll have some  
3 uncertainty information about the integrated leak rate  
4 test.

5 MEMBER WALLIS: All right. And you'll  
6 tell us that.

7 MR. HOBBS: Yes. We evaluated the maximum  
8 containment leakage rate that could be tolerated  
9 without a loss of containment over-pressure and  
10 determined that value using the worst case design  
11 basis analysis input assumptions was 27 times the  
12 allowable tech spec limit. The as-found Vermont  
13 Yankee primary containment leakage rate has always  
14 been quantifiable, and has never approached this  
15 tolerable leakage rate. Therefore, the test result  
16 suggests that containment leakage at a rate 27 times  
17 greater than allowable is unlikely.

18 Drywell pressure is maintained 1.7 psi  
19 above suppression pool pressure as a result of the  
20 fact that Vermont Yankee containment is inerted with  
21 Nitrogen, and the Torus is continuously vented. Now  
22 if this pressure drops below 1.7 psi differential, a  
23 control room alarm will alert the operators. And if  
24 this condition cannot be met, the plant must be placed  
25 in a cold shutdown within 24 hours. So this would

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1 preclude any significant time operating with drywell  
2 leakage great enough to cause a loss of containment  
3 over-pressure.

4 Detectible drywell leakage is essentially  
5 one-fifth of the tolerable containment leakage that  
6 would allow maintenance of containment over-pressure,  
7 so we would detect this 1.7 psi differential change at  
8 a level of about one-fifth the rate of leakage that  
9 would cause a loss of containment over-pressure. So,  
10 therefore, we believe drywell leakage would be  
11 detected at a rate substantially less than the  
12 tolerable leakage rate, and result in a shutdown of  
13 the plant within 24 hours if we had a significant  
14 drywell leak. And finally, the Vermont Yankee  
15 containment - Nitrogen consumption is monitored and  
16 significant changes would be identified and  
17 investigated.

18 In conclusion, in order to get the staff  
19 up here to discuss their review, the request to credit  
20 containment over-pressure meets regulatory  
21 requirements, results in a very small change in risk,  
22 and realistically would not be required.

23 CHAIRMAN DENNING: Any quick questions?  
24 Good. Thank you very much.

25 MR. HOBBS: Thank you.

1 CHAIRMAN DENNING: Let's proceed then with  
2 Mr. Lobel.

3 MEMBER WALLIS: No break? I think we need  
4 a break.

5 DR. APOSTOLAKIS: We need a break, Rich.

6 CHAIRMAN DENNING: Okay. We need a break  
7 and we will take a break. That means that we will be  
8 back by that clock on the wall at quarter of 11.

9 (Whereupon, the proceedings in the  
10 foregoing matter went off the record at 10:24 a.m. and  
11 went back on the record at 10:42 a.m.)

12 CHAIRMAN DENNING: Please be seated.  
13 We're now going to continue with the NRR's part of  
14 containment overpressure.

15 Because of some time constraints, at  
16 11:30, regardless of where we are in that  
17 presentation, we are going to do the engineering  
18 inspection and complete the engineering inspection  
19 part by 12:30, and then come back to containment  
20 overpressure in the early afternoon.

21 Please, let's proceed.

22 MEMBER WALLIS: Do we have a handout for  
23 this one?

24 CHAIRMAN DENNING: Yes. It's from  
25 yesterday.

1 MEMBER WALLIS: It's from yesterday?

2 CHAIRMAN DENNING: It's from yesterday.

3 MEMBER WALLIS: I don't have it.

4 CHAIRMAN DENNING: You don't have it?

5 MEMBER WALLIS: I don't think I have  
6 anything from yesterday. Thank you.

7 MEMBER BONACA: Mr. Chairman? Mr.  
8 Chairman, I would like to ask a question for  
9 clarification.

10 CHAIRMAN DENNING: Yes.

11 MEMBER BONACA: For clarification, from  
12 the presentation we had from the previous engineer,  
13 the message I got is that the need for NPSH credit  
14 comes in the situation where the analysis assumes a  
15 single failure from RHR heat exchanger, plus also  
16 assumes the failure of the containment to provide  
17 isolation. Am I correct?

18 MR. LOBEL: No. The need for containment  
19 overpressure is due to, first of all, the higher power  
20 from the extended power uprate, and the single -- and  
21 the worst single failure, which is failure of RHR heat  
22 exchanger outlet valve. And if you have those two  
23 conditions, then you need to take credit for  
24 containment overpressure -- containment accident  
25 pressure in the deterministic analysis.

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1 MEMBER BONACA: Well, the record has to be  
2 cleared, I think, because it's confusing --

3 MR. LOBEL: Okay.

4 MEMBER BONACA: -- in the principal  
5 intention, because I can quote a slide presented by  
6 the licensee. I mean, you know, that --

7 MR. LOBEL: Well, I didn't coordinate --

8 MEMBER BONACA: I understand that.

9 MR. LOBEL: -- my slides with the  
10 licensee's or --

11 MEMBER BONACA: Oh, no, no, no. I  
12 understand that.

13 MR. LOBEL: -- the state's, so --

14 MEMBER BONACA: I'm not placing it onto  
15 you, but I --

16 MR. LOBEL: I'm going to repeat some of  
17 the same information, and so we'll have a chance to go  
18 over it again. And if I'm not clear, please ask and  
19 we'll --

20 MEMBER BONACA: Because, I mean, he  
21 pointed out that their basic analysis -- the limiting  
22 analysis in which they're assuming the failure of the  
23 RHR heat exchanger will not need credit for NPSH if --  
24 okay -- even with the power uprate. That's what the  
25 statement was.

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1 MR. LOBEL: With the power uprate, the  
2 worst single failure that the licensee assumed was  
3 failure of an RHR heat exchanger outlet valve. And  
4 what they were saying is -- and the staff agrees -- is  
5 that if I don't take that as the single failure, if my  
6 single failure is failure of a containment penetration  
7 or in some other way I fail the containment so that I  
8 lose containment accident pressure, then that's --  
9 I've taken my single failure, and now I can assume  
10 that I have two trains of RHR --

11 MEMBER BONACA: Okay.

12 MR. LOBEL: -- cooling the suppression  
13 pool. And if that's the case, then I don't need  
14 containment --

15 MEMBER BONACA: Okay.

16 MR. LOBEL: -- accident pressure credit,  
17 because my suppression pool temperature will be low  
18 enough that I'll have adequate available NPSH.

19 MEMBER WALLIS: So I think you're agreeing  
20 with the licensee, aren't you?

21 MR. LOBEL: Yes.

22 MEMBER BONACA: Okay.

23 MR. LOBEL: Okay. I'm starting on  
24 slide 5-1. My name is Richard Lobel. I am a Senior  
25 Reactor Systems Engineer in the Office of Nuclear

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1 Reactor Regulation.

2 Slide 5-2. The purpose of my presentation  
3 is to discuss the NRC staff review of the Vermont  
4 Yankee proposal to credit containment accident  
5 pressure in determining available net positive suction  
6 head, or NPSH. Vermont Yankee hasn't previously  
7 credited containment accident pressure for this  
8 purpose.

9 Next slide, 5-3. The licensee is  
10 proposing to credit a fraction of the calculated  
11 containment accident pressure in determining available  
12 NPSH of the RHR and core spray pumps. There is no  
13 regulation prohibiting credit for containment accident  
14 pressure for this purpose.

15 MEMBER WALLIS: Is there any regulation  
16 allowing it?

17 MR. LOBEL: Well --

18 MEMBER WALLIS: Or is it just silent?

19 MR. LOBEL: No, there's no regulation that  
20 addresses it specifically, but GDC 35, for example,  
21 requires abundant ECCS flow. 10 CFR 50.46 and  
22 Appendix K talk about criteria that have to be met,  
23 that aren't going to be met if you don't have the pump  
24 flow that's credited in the accident analysis.

25 So, no, there isn't any regulation that

1 really addresses it at all.

2 MEMBER WALLIS: I'm just wondering, if  
3 there's nothing that prohibits it, why isn't it  
4 disallowed? Why all this fuss?

5 MR. LOBEL: Well, it goes to philosophy  
6 that goes back to the early days of licensing plants.  
7 Early on, some plants -- some plants of the Vermont  
8 Yankee vintage, it turned out during their licensing  
9 credit was given for containment accident pressure.

10 And then, the staff wrote Regulatory  
11 Guide 1.1, which essentially said that isn't such a  
12 good idea, and so let's not --

13 MEMBER WALLIS: But that's just a Reg.  
14 Guide, though. That's not --

15 MR. LOBEL: Right.

16 MEMBER WALLIS: -- a regulation.

17 MR. LOBEL: Right. And so later on when  
18 other things happened, there was Bulletin 96-03 that  
19 addressed BWR strainer blockage from debris. Some  
20 plants needed credit for it then.

21 There was a Generic Letter 97-04 that was  
22 issued by the NRC, I believe in October of 1997, that  
23 talked about -- that asked questions about the use of  
24 containment pressure, because the staff had found from  
25 LERs and inspections and other things that some

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1 licensees were crediting it without getting prior  
2 staff review and approval. And some licensees'  
3 analyses, NPSH analyses, were incorrect.

4 So the staff issued Generic Letter 97-04  
5 about the same time as Bulletin 96-03, and the two  
6 reviews kind of got meshed together for BWRs. And in  
7 some of those cases when licensees went back and  
8 looked again at their NPSH calculations, some  
9 licensees found that they needed to take credit for  
10 containment accident pressure.

11 MEMBER WALLIS: Could you put it into  
12 simple words for the public? Why the NRC, first of  
13 all, thought it should sort of be allowed, and then  
14 said, "Well, that's not a very good idea, we better  
15 not allow it," and then said, "We'd better allow it,  
16 with some conditions perhaps," but then you always  
17 allowed it.

18 And now, you know, has anything really  
19 changed? Could you put it in simple words, so that  
20 the people that are really concerned about this issue  
21 can be sort of reassured that it really is not that  
22 big an issue or something? I mean, why is it that  
23 these regulations have sort of changed in some way  
24 about this matter?

25 MR. LOBEL: It was felt -- I'm not sure I

1 can put it in simple words. I'm not sure that the  
2 thought process was that simple. But, essentially and  
3 obviously, it would be better if credit was not taken  
4 for containment accident pressure, because then there  
5 would be an extra margin in the analysis. But that's  
6 not a reason why it can't be given.

7 And as I'm going to get to in some detail  
8 in my presentation, these analyses have a lot of  
9 conservatism in them, and the fact that an analysis  
10 may have been done in a very conservative way  
11 initially doesn't mean that it -- it couldn't be done  
12 in a less conservative way, but still adequately  
13 conservative later on with more consideration and when  
14 there was -- I've never found another word besides  
15 "need."

16 But it has always been the staff position  
17 -- and I'm going to get to that, too -- that -- that  
18 the analyses are done in a safe way using conservative  
19 assumptions. And, therefore, we have never really  
20 gone back to licensees and asked them for  
21 alternatives.

22 So the staff position has been pretty much  
23 what I'm going to state later now, that if the  
24 analysis is done in a safe -- in a conservative way,  
25 adequately conservative way, then the staff has felt

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1 that it was acceptable to give credit for containment  
2 pressure.

3 MEMBER WALLIS: But all analyses in  
4 engineering having to do with reactor safety are  
5 either conservative or they are realistic with  
6 uncertainty. That's -- they all are, so it's -- so  
7 they're posing a condition that everybody always  
8 meets. It doesn't really --

9 MR. LOBEL: There's a difference between  
10 doing an analysis in a conservative way. For  
11 instance, a stress analysis where you put in a margin  
12 of safety, and an analysis where you take practically  
13 every variable and you add some conservatism to that  
14 variable, and you add conservatives that may not even  
15 be physically real --

16 MEMBER WALLIS: I don't know what this  
17 thing is -- realistic conservatism. What has changed  
18 is you're now more realistic about the conservatism?  
19 Is that what it is?

20 MR. LOBEL: Well, the analysis that  
21 Vermont Yankee has done isn't more realistically  
22 conservative. It's conservative. And what I was  
23 going to show is that, if I take away just some of  
24 those conservatisms, I don't need containment -- I  
25 don't need containment accident pressure credit, but

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1 I still have a good deal of conservatism left in the  
2 calculation.

3 CHAIRMAN DENNING: You never use the terms  
4 "defense in depth," in all of this discussion. And in  
5 a lot of -- but a lot of the discussion around this is  
6 hinged around defense in depth and the tying of two  
7 barriers together. What's your comment on that?

8 MR. LOBEL: Well, like I'll show later in  
9 the presentation, it's tied back to -- if I'm talking  
10 about it deterministically, it's tied back to  
11 conservatism. If I did the analysis a little less  
12 conservatively, I wouldn't need credit for containment  
13 pressure. A realistic analysis shows that I don't  
14 need credit for containment pressure.

15 So in the case of Vermont Yankee -- and  
16 I'm not saying in general, I'm here talking just about  
17 Vermont Yankee -- I think there is defense in depth,  
18 because if I do the analysis in a more realistic way,  
19 I don't have to tie the barriers together.

20 MEMBER WALLIS: So, really, you should  
21 change the way you do things, it seems to me.

22 MR. LOBEL: Well, we started --

23 MEMBER WALLIS: Instead of saying we're  
24 going to do something very artificial, and then we're  
25 going to give credit for something we don't need, it

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1 would make much more sense to say, "You don't really  
2 need it. Therefore, this is no issue."

3 MR. LOBEL: I agree.

4 MEMBER WALLIS: That would satisfy me much  
5 more than this sort of artificially conservative, and  
6 then giving it --

7 MR. LOBEL: I don't think --

8 MEMBER WALLIS: -- you know --

9 CHAIRMAN DENNING: You don't have to  
10 respond to that, because it's such a global  
11 recommendation. I think --

12 MR. LOBEL: Okay.

13 CHAIRMAN DENNING: I think you probably  
14 ought to move on.

15 MR. LOBEL: Okay.

16 MR. BANERJEE: I have a question of  
17 clarification. You told Dr. Bonaca that if you lost  
18 the containment -- let's say there was a hole in the  
19 containment.

20 MR. LOBEL: If I take --

21 MR. BANERJEE: If that's just in the --

22 MR. LOBEL: -- if I'm making deterministic  
23 rules --

24 MR. BANERJEE: Yes, yes.

25 MR. LOBEL: -- and that's my single

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1 failure.

2 MR. BANERJEE: Then, there is no way that  
3 the pumps would cavitate, and they would pump fine,  
4 because the --

5 MR. LOBEL: Because the suppression pool  
6 temperature would be lower, because I've taken my  
7 single failure.

8 MR. BANERJEE: Right.

9 MR. LOBEL: And I can take credit for both  
10 trains of RHR and --

11 MR. BANERJEE: So, effectively, there is  
12 defense in depth, because --

13 MR. LOBEL: Right.

14 MR. BANERJEE: -- it doesn't -- one  
15 failure doesn't lead to the other.

16 MR. LOBEL: Right. That's what I was  
17 trying to say.

18 MR. BANERJEE: Right. Now, what  
19 assumptions did you make about the strainer, then?  
20 Did you assume a debris bed and some sort of pressure  
21 losses there, or what did you --

22 MR. LOBEL: That's included. Vermont  
23 Yankee -- well, it's not my assumptions. It's what  
24 Vermont Yankee assumed in the analysis, and what  
25 Vermont Yankee did essentially was they used the

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1 analysis that was done when they installed the larger  
2 strainers as part of the resolution of Bulletin 96-03,  
3 which for people in the audience who aren't familiar,  
4 Bulletin 96-03 asks licensees to address clogging of  
5 ECCS pump strainers by debris caused by a pipe break.

6 MR. BANERJEE: So how much pressure loss  
7 was there across the strainer?

8 MR. LOBEL: For Vermont Yankee, it's very  
9 low. I think the debris head loss is in the order of  
10 .3 feet, and there's another .3 feet from the clean  
11 strainer.

12 MR. BANERJEE: So the calculation had --  
13 you're going to talk about this pressure loss  
14 calculation?

15 MR. LOBEL: I wasn't going to. I can --

16 MR. BANERJEE: I'd like to hear about how  
17 you did it, so -- how it went up.

18 MR. LOBEL: Well --

19 MR. BANERJEE: Maybe in the next --

20 MR. LOBEL: I didn't do it. Maybe the  
21 licensee ought to address it. I mean, I can talk in  
22 general about it, and I can tell you that we -- we,  
23 the staff, wrote a letter to Vermont Yankee, I think  
24 in 1999. I'm not sure about that, but it was around  
25 that time, saying that we agreed with their approach.

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1 MR. BANERJEE: So we can take it up later,  
2 right?

3 MR. LOBEL: If you want.

4 MR. BANERJEE: Could we deal with this in  
5 some detail in the next meeting, the 29th and the  
6 30th?

7 MR. LOBEL: Yes, if the committee wants  
8 to.

9 CHAIRMAN DENNING: What we'll do is after  
10 this meeting we will identify all those things that we  
11 want to do at that next meeting, which are beyond  
12 possibility I know already.

13 MEMBER WALLIS: And it will take four  
14 days, right?

15 (Laughter.)

16 MR. LOBEL: It might be helpful if we  
17 provided you with a list of the documents, or gave you  
18 the documents, and then if you felt that you still  
19 needed to discuss it at the meeting, we could do that.

20 MR. BANERJEE: Yes, that definitely would  
21 be --

22 MR. LOBEL: We'll do that.

23 MEMBER WALLIS: But do it quickly. We  
24 have no time. Thanksgiving is coming up, and, you  
25 know, we're looking to work every day between now and

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1 Thanksgiving.

2 CHAIRMAN DENNING: You can continue.

3 MR. LOBEL: Okay.

4 MEMBER BONACA: Yes. Just one thing that  
5 I want to, you know, raise. You were asking the  
6 question, Sanjoy, the case that's show, is on slide 11  
7 -- is the case of a single failure RHR, her exchanger  
8 has failed, and that's the only case where they need  
9 back pressure.

10 To deny back pressure means that you're  
11 assuming that your containment is not isolating. So,  
12 effectively, it results in the assumptions of two  
13 failures. I mean, one is the RHR, and the other one  
14 is the containment that you are not giving credit for.

15 So I'm talking about the fact that  
16 effectively that is what it corresponds to in the  
17 deterministic analysis. All the other scenarios are  
18 shown that they do not need containment of a pressure.

19 CHAIRMAN DENNING: Yes.

20 MEMBER BONACA: And it's important for the  
21 record, because before I brought out the issue and it  
22 wasn't the case. It is the case, and -- and so I'll  
23 have additional questions later on about the risk  
24 analysis, whether or not it assumed the same condition  
25 or the RHR, too, but --

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1 MR. LOBEL: Okay. The licensee --

2 MEMBER WALLIS: I'm sorry. I have a note  
3 here that the public needs to understand what you mean  
4 by "take credit."

5 MR. LOBEL: Okay. The licensee does a  
6 calculation of what we call "available NPSH." It's  
7 essentially the pressure at the suction to the pump,  
8 which forces the liquid, the water, into the pump.  
9 That value has to be above a certain value in order  
10 for the pump to operate properly, to give the flow  
11 that's assumed in the safety analyses.

12 In order to calculate that value, there  
13 are certain positive quantities and certain negative  
14 quantities. Some licensees just take credit for the  
15 height of water, say the height of water in the  
16 suppression pool, and that's the only pressure that's  
17 forcing water into the pump.

18 If the licensee finds that that's not  
19 sufficient, really, the only other place -- without  
20 changes to the system -- that the licensee can get  
21 more pressure is to take credit for the pressure over  
22 the water, in the atmosphere above the water.

23 And if the licensee isn't taking credit  
24 for that pressure, he assumes the pressure is zero, or  
25 the pressure is 14.7 psia. If the licensee does take

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1 credit for it, that means that the licensee is  
2 assuming some or all of the pressure that's available  
3 above the water is used in the calculation of the  
4 available NPSH.

5 MEMBER BONACA: Thank you.

6 MR. LOBEL: Did that -- is that clear?

7 CHAIRMAN DENNING: That was perfect.

8 MR. LOBEL: Okay.

9 CHAIRMAN DENNING: Whether it was clear is  
10 another issue.

11 (Laughter.)

12 No, actually --

13 (Laughter.)

14 MR. LOBEL: 5-4. Okay. NRC position,  
15 slide 5-4. The NRC allows credit for containment  
16 accident pressure when a conservative analysis has  
17 demonstrated that this amount of pressure will be  
18 available for the postulated design basis accident.  
19 That is, a calculation is done that minimizes this  
20 pressure over the water.

21 And also, when examined from a broader  
22 perspective, including design basis accidents, the  
23 level of risk is acceptable.

24 MEMBER KRESS: Is that an "and" or an  
25 "or"?

1 MR. LOBEL: I'm sorry. Did I say "or"?

2 MEMBER KRESS: Are you supposed to have  
3 both of these?

4 MR. LOBEL: Both.

5 MEMBER KRESS: And what do you mean by  
6 "level of risk"?

7 MR. LOBEL: I'm sorry. What?

8 MEMBER KRESS: By "level of risk," do you  
9 mean CDF and LERF?

10 MR. LOBEL: Yes... Yes.

11 MEMBER KRESS: Probably should say level  
12 of CDF and LERF.

13 MEMBER WALLIS: What is the vintage of  
14 this position?

15 MR. LOBEL: I'm sorry?

16 MEMBER WALLIS: What is the vintage of  
17 this position?

18 MR. LOBEL: Well --

19 MEMBER WALLIS: When did it get  
20 established?

21 MR. LOBEL: Actually, it's pretty much  
22 what has always been done.

23 MEMBER WALLIS: But you haven't written it  
24 down, right?

25 MR. LOBEL: But it was written down about

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1 the time that we were revising Reg. Guide 1.82 to put  
2 in the NPSH guidance which became --

3 MEMBER WALLIS: That is quite recent,  
4 isn't it?

5 MR. LOBEL: -- Revision 3.

6 MEMBER WALLIS: This is a clarification of  
7 the position in the last year maybe?

8 MR. LOBEL: It's more a documentation of  
9 a position that we've been using.

10 MEMBER WALLIS: But it hasn't been written  
11 down until --

12 MR. LOBEL: It wasn't written -- it hasn't  
13 been written down.

14 MEMBER WALLIS: -- this new draft Reg.  
15 Guide, is that it? Or has it been there before?

16 MR. LOBEL: I don't think that -- if I  
17 remember right, this isn't written in Reg. Guide 1.82,  
18 Revision 3.

19 MEMBER WALLIS: But it is in the new  
20 draft, is that right?

21 MR. LOBEL: It will be. We're going to  
22 make a lot of revisions to that before we come back to  
23 the committee in February. We're scheduled to come  
24 back to you in February and --

25 MEMBER WALLIS: When does it become a

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1 hardened position, if it's in the draft now?

2 MR. LOBEL: Well, I suppose if it -- if we  
3 put it in the Reg. Guide, the Reg. Guide will go out  
4 for public comment, and the public and other parties  
5 -- the stakeholders will have a chance to comment on  
6 that, and --

7 MEMBER WALLIS: It might not be the  
8 position next year.

9 MR. LOBEL: Well, it might not be, but I  
10 think something along these lines would be the  
11 position.

12 MEMBER KRESS: I take it that that  
13 position requires a full scope PRA with uncertainty.

14 MR. LOBEL: I think where we are now is  
15 that it would -- we would ask licensees to do a Reg.  
16 Guide 1.174 analysis to satisfy the second part of the  
17 position.

18 MEMBER KRESS: Which really calls for a  
19 full scope PRA with uncertainty.

20 MR. APOSTOLAKIS: Well, not Level 3,  
21 right?

22 MEMBER KRESS: No, it never called for  
23 Level 3, which is unfortunate.

24 MEMBER WALLIS: So, then, you get my  
25 philosophical difficulty. How can a PRA reflect some

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1 regulation? It's got to reflect reality.

2 MR. LOBEL: Well, there's two parts to  
3 this. One point, the licensee still has to do the  
4 deterministic analysis, and the deterministic analysis  
5 looks at the design basis accidents and a few of the  
6 non-design basis accidents like Appendix R fire and  
7 station blackout and ATWS.

8 But like it says, then the broader  
9 perspective, looking at everything else that could  
10 possibly happen, would be the risk part of it. So it  
11 really covers both.

12 MR. APOSTOLAKIS: But when you refer to  
13 risk, you are referring to the EPU itself, right? The  
14 result of the increase in power, that's where the risk  
15 assessment will be done --

16 MR. LOBEL: Well, this position --

17 MR. APOSTOLAKIS: -- not just the  
18 regulatory part.

19 MR. LOBEL: This position doesn't talk  
20 about EPU. There are other things that could require  
21 the use of containment overpressure also.

22 MR. APOSTOLAKIS: So it's the level of  
23 risk of the reactor as is.

24 MR. RUBIN: Good morning. This is Mark  
25 Rubin from the staff. We have a couple issues being

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1 treated slightly differently where risk -- the word  
2 "risk" is being used. As far as taking credit for  
3 overpressure in the proposed Rev. 4 to Reg. Guide  
4 1.82, guidance from NRC senior management, is to  
5 require that that be a risk-informed submittal, and be  
6 defended and compared against the acceptance  
7 guidelines in Reg. Guide 1.174.

8 With respect to the EPU as a whole, that  
9 is not a risk-informed submittal, but licensees have  
10 voluntarily included quite a bit of risk information.  
11 And from that perspective, we assess the risk from an  
12 adequate protection perspective rather than explicitly  
13 from the 1.174 acceptance guidelines, even though in  
14 reality we use the guidelines as our starting point.

15 CHAIRMAN DENNING: Thank you. Let's --

16 MR. LOBEL: Let me try to go on.

17 CHAIRMAN DENNING: Yes.

18 MR. LOBEL: Okay. Slide 5-5. The  
19 licensee credits containment accident pressure for two  
20 postulated accidents -- the loss of coolant accident  
21 and the ATWS, anticipated transient without scram.

22 Next slide, 5-6.

23 The first part of an NPSH calculation is  
24 calculating the containment conditions, and many of  
25 the conservatisms -- many of the conservative

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1 assumptions are in this portion of the calculation.

2 The Vermont Yankee calculation --  
3 containment calculation for LOCA and ATWS events is  
4 done with a GE Super Hex computer code. This code has  
5 been used for containment licensing calculations for  
6 many years.

7 The staff wrote a letter to GE in July of  
8 1993 stating that Super Hex was acceptable for  
9 licensing calculations in general, and it had earlier  
10 been accepted for power uprate analyses. And Super  
11 Hex has been used for all BWR extended power uprates.

12 The staff has previously performed  
13 independent calculations for comparison with Super Hex  
14 and obtained good agreement, and we did the same thing  
15 for the Vermont Yankee calculation. And the results  
16 are shown on the next slide for the suppression pool  
17 temperature, which is the key parameter for NPSH  
18 calculations.

19 MEMBER WALLIS: Could I suggest that you  
20 have a slide which extends out to 200,000 seconds like  
21 the licensee's overpressure requested credit diagram?  
22 That would -- you know, because this is all just for  
23 short time. They're requesting it out to 200,000  
24 seconds. It would help if your diagram went that far.

25 MR. LOBEL: This calculation was done to

1 cover the point of peak suppression pool temperature.

2 MEMBER WALLIS: Just the peak, but, in  
3 fact, the length of time is also an issue I think.

4 MR. LOBEL: Well, yes. I guess -- I guess  
5 I, as the reviewer, didn't consider that to be that  
6 important. And partly because -- mainly because of  
7 the conservatisms that are in the calculation. If I  
8 take away, again, a few of those conservatisms, I cut  
9 the time that I need credit to a much shorter time.

10 So the point of interest in our  
11 calculation was checking the suppression pool  
12 temperature at the time where it was --

13 MEMBER KRESS: This is just decay heat  
14 going into a fixed amount of water?

15 MR. LOBEL: Right.

16 MEMBER KRESS: It's a pretty simple  
17 calculation. I could do --

18 MR. LOBEL: It's a very simple  
19 calculation, and a lot of the input came from the  
20 licensee. So that's a good point. I don't want to  
21 overdo what we did. We did use a different computer  
22 code. We did -- so that gives some assurance, and  
23 that's probably the main point -- that both codes can  
24 do the same calculation and get practically the same  
25 values.

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1 MR. APOSTOLAKIS: So the peak temperature,  
2 according to this, is at about 20,000 seconds? Is  
3 that what we get from this?

4 MR. LOBEL: Yes, I believe so. I don't  
5 remember exactly the time.

6 MR. APOSTOLAKIS: No. I mean, not  
7 exactly, but --

8 MR. LOBEL: 25-, I think it was.

9 MR. APOSTOLAKIS: Yes. Yes.

10 MR. LOBEL: Yes.

11 MR. APOSTOLAKIS: Whether it turns around.

12 MEMBER KRESS: Why is there a peak? Why  
13 does it turn over?

14 MR. LOBEL: Because there's a balance.  
15 You're still adding energy to the suppression pool,  
16 and you're taking away that energy with the RHR heat  
17 exchanger.

18 MEMBER KRESS: Oh. You do have the RHR in  
19 there.

20 MR. LOBEL: Right.

21 MEMBER KRESS: Okay.

22 MR. LOBEL: And the RHR heat exchanger  
23 isn't sized for this situation. It's sized for  
24 shutdown. So it takes some time before the RHR heat  
25 exchanger starts to overtake the energy that you're

1 adding to the pool.

2 MEMBER WALLIS: And another suggestion --  
3 this curve is for one RHR heat exchanger.

4 MR. LOBEL: Right.

5 MEMBER WALLIS: If you put two on, then  
6 you could show what you get for temperature then,  
7 which is more realistic.

8 MR. LOBEL: We tried to do that, but we  
9 didn't have enough information to do that calculation  
10 without going back to the licensee. And since this  
11 was the design basis case, we just did this case. But  
12 the licensee before talked about the value they got  
13 with two, and I'm going to talk about that some more  
14 -- with two heat exchangers.

15 MR. THADANI: Okay. Rich, before you go  
16 on, the two accident sequences you talk about are LOCA  
17 and ATWS. And you were saying analyses were  
18 conservative. I don't seem to recall ATWS analyses  
19 being done in a conservative way.

20 MR. LOBEL: You're right. ATWS analyses  
21 don't have to be done in a conservative way, but the  
22 licensee did put some conservatism into the  
23 calculation. And off hand, I can't think of what they  
24 are, but -- but the licensee, I think in a July 2,  
25 2004, letter, gave us some tables with a list of their

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1 assumptions for the different analyses.

2 And if you look at those, you can see that  
3 some of the assumptions that they used were  
4 conservative, and they didn't -- you're right, they  
5 didn't have to do that.

6 MEMBER KRESS: Is this the ATWS curve or  
7 the LOCA curve?

8 MR. LOBEL: This is a LOCA. This is the  
9 large break LOCA.

10 MEMBER WALLIS: We need to discuss ATWS  
11 with you or somebody in detail next time we need with  
12 the staff. Perhaps not here, but we do.

13 CHAIRMAN DENNING: Okay.

14 MR. LOBEL: Okay. As you can see, the  
15 agreement is good. We just talked a little bit about  
16 that.

17 Slide 5-8. In addition to those two  
18 events -- LOCA and ATWS -- the licensee originally  
19 proposed containment accident pressure for Appendix R  
20 fire and station blackout events. The licensee later  
21 changed their analysis to eliminate the need to credit  
22 containment accident pressure, and they did that by  
23 crediting a second service water pump in each train of  
24 service water, and the service water is what cools the  
25 RHR heat exchanger. So they essentially added more

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1 flow through the RHR heat exchanger.

2 The licensee used the GOTHIC 7 computer  
3 code to calculate the containment conditions for the  
4 Appendix R fire event and the station blackout.  
5 GOTHIC is developed for EPRI. It's subject to  
6 Appendix B and Part 21. The staff uses GOTHIC in  
7 reviews for sensitivity studies.

8 The code is very widely used in the  
9 industry. The staff asked the licensee some questions  
10 about the use of GOTHIC. There is an NSER that we put  
11 out, which essentially provides guidance on the use of  
12 GOTHIC after a pretty detailed review of the licensing  
13 basis containment models, and the licensee said that  
14 they used it in accordance with that SER.

15 Also, the licensee complies with Generic  
16 Letter 83-11, and 83-11 Supplement 1, which are  
17 guidance documents for utilities that want to use  
18 large, complex computer codes that have been usually  
19 approved by the staff. And the point of the Generic  
20 Letters is the codes may be okay, and they've been  
21 benchmarked and found acceptable, but we want to be  
22 assured that the licensee has the capability to use  
23 those codes properly.

24 And the licensee responded to a question  
25 describing how they complied with the Generic Letter

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1 that we found acceptable.

2 MEMBER RANSOM: Is the ATWS case worse  
3 than the large break LOCA?

4 MR. LOBEL: No. The large break LOCA is  
5 the most limiting event.

6 The next slide, 5-9, gets into what the  
7 state was talking about before -- required NPSH. As  
8 you know, there are two types of net positive suction  
9 head, NPSH, the available that I discussed a little  
10 before and the required NPSH, which is a function of  
11 a pump design. And it's determined by testing the  
12 pump.

13 The licensee's NPSH calculations use a  
14 required NPSH that's different from the usual  
15 definition in the Hydraulics Institute standards. The  
16 standard approach, as shown on this figure, for  
17 determining required NPSH of the pump -- the figure is  
18 a plot of the head increase generated by the pump as  
19 the vertical axis, and it's called the total head.

20 So, again, this is the energy that the  
21 pump is producing. So this is the desired product of  
22 the pump.

23 MEMBER WALLIS: What is the pressure it's  
24 producing?

25 MR. LOBEL: Hmm?

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1 MEMBER WALLIS: What is the pressure it's  
2 producing?

3 MR. LOBEL: Pressure, right. Well, the  
4 centrifugal pumps --

5 MEMBER WALLIS: Energy is something else.  
6 It's the pressure.

7 MR. LOBEL: -- centrifugal pumps, you talk  
8 in terms of head. The --

9 CHAIRMAN DENNING: Okay.

10 MR. LOBEL: I'm sorry. Maybe I missed the  
11 question.

12 MEMBER WALLIS: No. This is pressure  
13 after delivery of Q2.

14 MR. LOBEL: Okay. Yes. Okay. So the  
15 figure shows the head generated by the pump as a  
16 function of the available NPSH. And what's done in  
17 the testing is the flow rate is set to a constant  
18 value, and the NPSH -- the available NPSH is lowered  
19 until you get to a point where the -- where the head  
20 experiences a drop of three percent.

21 The drop in heads caused by cavitation in  
22 the pump, the value of NPSH at which this three  
23 percent drop in head occurs, is the usual definition  
24 of a required NPSH. In an actual system, such as a  
25 core spray pump in a BWR, the usual criterion for

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1 acceptable operation is that the available NPSH be  
2 equal or greater than the required NPSH to avoid  
3 excessive cavitation.

4 The licensee uses values of NPSH in some  
5 analyses which correspond to a head loss greater than  
6 three percent. The maximum value is approximately six  
7 percent. So the intensity of the cavitation is  
8 increasing as the required NPSH drops.

9 MEMBER WALLIS: Now, the back pressure on  
10 this is very small, isn't it? The back pressure from  
11 the -- from the -- because, really, you have to -- do  
12 you have to tie this in with the impedance of the  
13 delivery system, because there's a feedback. If you  
14 lose head, you change the flow because of the  
15 characteristics of pressure flow of where it's going.  
16 So you need to have a load --

17 MR. LOBEL: And this is done --

18 MEMBER WALLIS: -- curve or something on  
19 here.

20 MR. LOBEL: This is done in a test loop.

21 MEMBER WALLIS: All right.

22 MR. LOBEL: And so the available NPSH is  
23 calculated for that test loop.

24 MEMBER WALLIS: But, in reality, if you  
25 have, say, a pump in your basement from a low -- a

1 well or something, and it begins to do this, you can  
2 get to the point where the flow falls off the cliff  
3 and goes to zero, and the pump just heats up.

4 MR. LOBEL: Right.

5 MEMBER WALLIS: Because it's a stability  
6 question, not just a question of NPSH.

7 MR. LOBEL: Well, the idea is that -- that  
8 you don't let the pump get to that --

9 MEMBER WALLIS: Yes.

10 MR. LOBEL: -- to that point.

11 MEMBER WALLIS: You don't let it get to  
12 that point.

13 MR. LOBEL: And the usual drop of three  
14 percent is done so that you're on the very top of the  
15 knee of the curve. You aren't getting to the point  
16 where the flow and the head have dropped off to  
17 essentially nothing.

18 MEMBER WALLIS: But if you drew the head  
19 flow characteristics of the load it's pumping to on  
20 top of this, you'd get a stability criteria, which  
21 might or might not correspond to three percent. It  
22 would be an intersection of two curves, whether  
23 they're tangential or not --

24 MR. LOBEL: Right.

25 MEMBER WALLIS: -- which, really, you

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1 should do. I mean, this is more --

2 MR. LOBEL: Right.

3 MEMBER WALLIS: -- I would like to see it.

4 It's a much more rational way of explaining why the  
5 pump doesn't work. There's nothing magical about  
6 three percent.

7 MR. LOBEL: There's nothing --

8 MEMBER WALLIS: But anyway --

9 MR. LOBEL: -- magical about it. It's  
10 chosen because at a level of three percent there is  
11 assurance for low and moderate energy pumps that the  
12 pump won't experience any damage. And also, it's  
13 about the level where you can actually measure a head  
14 drop. Anything less than that it gets harder to  
15 measure the drop in head.

16 Well, the licensee uses curves developed  
17 by the pump vendor, which permit operation at lower  
18 values of required NPSH for limited amounts of time.  
19 The Vermont Yankee RHR pumps are permitted to operate  
20 with a loss of head of approximately six percent for  
21 seven hours.

22 Then, the value of required NPSH ramps up  
23 to close to the three percent head loss value at 100  
24 hours, and then stays constant from 100 hours to  
25 essentially 8,000 hours. They call it the value of

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1 the 8,000-hour value of required NPSH, which is about  
2 333 days.

3 MR. APOSTOLAKIS: Would you explain the  
4 figure a little better? What are Q1 and Q3? And  
5 what's the meaning of --

6 MR. LOBEL: It's just different flows.

7 MR. APOSTOLAKIS: So Q1 is --

8 MR. LOBEL: It's different values of  
9 volumetric flow.

10 MR. APOSTOLAKIS: And the arrows, what do  
11 the arrows mean?

12 MR. LOBEL: The arrows are pointing to the  
13 value of head where you've had a drop of three percent  
14 from the horizontal line. So that would be -- that  
15 would be the required NPSH value. You would lower the  
16 available NPSH to the point where you started to get  
17 cavitation at a three percent head drop. That would  
18 be the value of required NPSH the way things are  
19 normally done.

20 MR. BANERJEE: Let me just ask you -- so  
21 for different -- if you have a pump characteristic,  
22 clearly the head varies with the flow rate.

23 MR. LOBEL: Right.

24 MR. BANERJEE: So the NPSH varies with the  
25 flow rate as well.

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1 MR. LOBEL: The required NPSH does, right.

2 MR. BANERJEE: It varies, so --

3 MR. LOBEL: Right.

4 MR. BANERJEE: -- I guess --

5 MR. LOBEL: And you can see that in the  
6 figure. You can see that when you vary the flow  
7 rate --

8 MR. BANERJEE: Right. So Q1 is smaller  
9 than Q2 is smaller than Q3.

10 MR. LOBEL: Right.

11 MR. BANERJEE: On this, right? So you  
12 have a cubic curve or something, which gives you head  
13 versus flow. How does the NPSH vary? Is it just in  
14 proportion to this, or is there --

15 MR. LOBEL: The required NPSH increases  
16 with the flow.

17 MR. BANERJEE: Right.

18 MR. LOBEL: Which is one of the  
19 conservatisms that's included in these calculations.  
20 As the flow increases, the required NPSH increases.

21 MR. BANERJEE: So there's a curve of NPSH  
22 versus flow.

23 MR. LOBEL: Right.

24 MR. BANERJEE: Okay. So when you say this  
25 NPSH is required, it's for a particular flow.

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1 MR. LOBEL: Right.

2 MR. BANERJEE: So how do you know exactly  
3 what that flow is? You have to do a calculation,  
4 right, for that flow?

5 MR. LOBEL: Well, this is where you would  
6 get the -- the required NPSH as a function of flow,  
7 from this kind of test. The available NPSH you get  
8 from whatever system the pump is in, and that's going  
9 to vary with flow because the resistance is going to  
10 -- the flow resistance is going to change the flow.

11 MR. BANERJEE: Yes. So as your flow goes  
12 up, the NPSH required goes up.

13 MR. LOBEL: Right.

14 MR. BANERJEE: So at a high flow you need  
15 a much higher NPSH.

16 MR. LOBEL: Right.

17 MR. BANERJEE: So when you say this NPSH  
18 is required for this system, that's based on a  
19 particular flow, right?

20 MR. LOBEL: Well, I'm not saying it's  
21 required for a system. Required NPSH is the term of  
22 art that's used for the -- as a characteristic of the  
23 pump.

24 MR. BANERJEE: But at what flow?

25 MR. LOBEL: Well, it's going to vary with

1 flow. As you can see, on this simple curve, it's --

2 MR. BANERJEE: Yes. I can see it will  
3 vary with flow, but what is the flow that you use to  
4 say that NPSH is required?

5 MR. LOBEL: Well, I'm going to get to  
6 that.

7 MR. BANERJEE: How do you do that?

8 MR. LOBEL: I'm going to get to that a  
9 little later.

10 MEMBER WALLIS: You see, that's where you  
11 have to do what I was saying. If the operator  
12 throttles this thing --

13 MR. LOBEL: Right.

14 MEMBER WALLIS: -- it changes the NPSH,  
15 because --

16 MR. LOBEL: Absolutely.

17 MEMBER WALLIS: -- it depends on the  
18 pressure drop characteristics of whatever it's bumping  
19 into.

20 MR. LOBEL: Of the system, right.

21 MEMBER WALLIS: Which you can change by  
22 throttling and all that sort of thing.

23 MR. LOBEL: Right.

24 MEMBER WALLIS: It's not a simple thing  
25 like just looking at one curve and three percent.

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1 CHAIRMAN DENNING: Let's continue on, and  
2 then you can --

3 MR. LOBEL: Okay. All this is supposed to  
4 show is how I get required NPSH.

5 MEMBER SIEBER: Let me ask you a quick  
6 question. In the Hydraulics Institute standard, it  
7 talks about basically three grades of -- three types  
8 of pumps -- low energy, high suction energy, and very  
9 high suction energy. These pumps are in the high  
10 suction energy category.

11 MR. LOBEL: The licensee stated in  
12 response to a question that -- they called it  
13 moderate, and it's -- it's -- I believe it's -- maybe  
14 they can help, but I believe it's above low, but not  
15 a whole lot above low.

16 MEMBER SIEBER: Well, the standard only  
17 has three.

18 MR. LOBEL: Right, right. So it would be  
19 high, but --

20 MEMBER SIEBER: In the cavitation  
21 characteristics, they're distinctly different from one  
22 to the other.

23 MR. LOBEL: Right. But these pumps would  
24 still be in the suction energy range, where you  
25 wouldn't expect a lot of damage. You wouldn't expect

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1 damage from operating the pump in cavitation for a  
2 length of time.

3 MEMBER SIEBER: At about -- even at six  
4 percent below the --

5 MR. LOBEL: Right.

6 MEMBER SIEBER: -- the flow level.

7 MR. LOBEL: Right. And --

8 MEMBER SIEBER: Well, the standard says  
9 that, so --

10 MR. LOBEL: Yes. And that's consistent --  
11 their six percent is consistent with other industry  
12 experience for safety-related nuclear pumps. Okay.

13 MEMBER SIEBER: And these are vertical  
14 shaft --

15 MR. LOBEL: Yes, single stage.

16 MEMBER SIEBER: -- down in the well

17 MR. LOBEL: I believe they're single  
18 stage, right.

19 MEMBER SIEBER: Okay. Thanks.

20 MR. LOBEL: Right. Okay. Slide 5-10.  
21 Let me go through this a little faster.

22 MEMBER WALLIS: This is probably  
23 oversimplistic -- I mean, the required NPSH -- because  
24 if the operator throttles, he can get into an  
25 operation mode where it's still -- the pump still

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1 works. He just gets less water. And the question is:  
2 is that out of -- NPSH isn't only part of the whole  
3 question. You can't just have a magical required  
4 NPSH. You have --

5 MR. LOBEL: And I was --

6 MEMBER WALLIS: -- the pressure in the  
7 vessel and everything.

8 MR. LOBEL: And I was going to talk about  
9 that under conservatism later. But you're right, if  
10 I lower the pump flow, I lower the flow resistance,  
11 the available NPSH goes -- goes up, and the required  
12 NPSH goes down. So I've increased the margin between  
13 the available and the required.

14 MEMBER WALLIS: Both things help you,  
15 right?

16 MR. LOBEL: Right. Right. Okay. One of  
17 the positions in Reg. Guide 1.82, Revision 3, is that  
18 the prototypical pump test should be performed, and  
19 there should be a post-test examination of the pump to  
20 show acceptable results, if the licensee is crediting  
21 required NPSH of more than the three percent value.  
22 It's not that clear in the Reg. Guide. That's another  
23 thing that's going to get fixed.

24 MEMBER WALLIS: Well, let me say, as a  
25 Vermont, they used to have a lower head -- a spring.

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1 Any Vermont who has a spring down below his house  
2 knows that when the level gets low he might get  
3 cavitation in his pump, and the cure is to go down and  
4 throttle it, and you just get a little less water and  
5 you can still survive for a while that way.

6 MR. LOBEL: Right. And --

7 MEMBER WALLIS: You know, even -- I think  
8 even some members of the public here would understand  
9 what you're talking about on that basis.

10 MR. LOBEL: And the assumption that's made  
11 in these conservative analyses is the pumps are either  
12 in runout or at design flow. So you would expect the  
13 operator to throttle the pumps, even without signs of  
14 cavitation, if he had that condition.

15 MEMBER RANSOM: Do you know if the system  
16 models include the pump characteristic cavitation  
17 factored into the pump characteristic?

18 MR. LOBEL: I can't answer that question.  
19 I don't know.

20 MEMBER SIEBER: I think when you set the  
21 pump characteristics, the operating points for the  
22 pump, there is some amount of cavitation assumed.

23 MEMBER RANSOM: But, in general, you put  
24 in the full pump characteristic -- you know, head  
25 versus flow at different speeds --

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1 MEMBER SIEBER: Yes.

2 MEMBER RANSOM: -- and usually they put a  
3 cavitation model on it using suction-specific speed as  
4 the parameter.

5 MR. LOBEL: Well, I don't think -- I don't  
6 think -- if the licensee would like to address that or  
7 if you can do that later.

8 MEMBER RANSOM: If you do the  
9 calculations, then you could share what level of  
10 cavitation a given calculation --

11 MR. LOBEL: Well, I think the usual  
12 assumption that's done in the safety analyses is you  
13 have whatever flow you need. And then, if -- and that  
14 assumes adequate required NPSH.

15 MEMBER RANSOM: No cavitation.

16 MR. LOBEL: No cavitation. And then, you  
17 do these NPSH calculations to assure that you're going  
18 to have that level of available NPSH, required NPSH,  
19 so they are really two separate calculations.

20 MR. BANERJEE: So is it possible to  
21 throttle these pumps back if the flow is too high?

22 MR. LOBEL: Yes. Yes.

23 MR. BANERJEE: So you can do that.

24 MR. LOBEL: Right. The operator can do  
25 that.

1 MR. BANERJEE: If it starts shaking or  
2 something, you can go and do something about it.

3 MR. LOBEL: If the operator has  
4 indications of cavitation -- and like was said  
5 earlier, he has curves in the emergency operating  
6 procedures of suppression pool temperature, pump flow  
7 with containment accident pressure as a parameter.  
8 And that's how he would -- he would make sure that he  
9 has adequate NPSH.

10 MEMBER WALLIS: And the cost of the LOCA  
11 if you have -- if you throttle back enough on your  
12 core spray, and then you start to affect the  
13 containment pressure, because you're not cooling  
14 things so well. And then, you've got too high a  
15 pressure rather than too low a pressure. Everything  
16 is tied together in this.

17 MR. LOBEL: Right.

18 MEMBER WALLIS: Which is why a realistic  
19 PRA, coupled with realistic thermal hydraulics, would  
20 make a lot of sense, instead of all of this  
21 artificially -- doing things here and there.

22 CHAIRMAN DENNING: Regrettably, we're  
23 going to have to interrupt this presentation at this  
24 point, and we'll come back after lunch with this  
25 presentation. And we're now going to move to



1 engineering inspection, and we have to complete that  
2 in the next hour.

3 So, please, would the engineering  
4 inspection people -- oh, I'm sorry. And we don't  
5 believe that we really need a presentation by Entergy.  
6 At this point, we're going to move directly on to the  
7 staff's presentation.

8 If you're ready, please go ahead.

9 MR. DOERFLEIN: We're on slide 7-1. Good  
10 morning. My name is Larry Doerflein, and I'm an  
11 Engineering branch chief in the NRC Region I office.  
12 I'm here today with Jeff Jacobson and Rick Ennis to  
13 discuss the 2004 Vermont Yankee engineering team  
14 inspection.

15 Jeff was the inspection team leader, and  
16 Rick is the project manager for Vermont Yankee.

17 We intend to cover four topics during our  
18 presentation. I'll briefly discuss the inspection  
19 background, or basically why we did the inspection we  
20 did. Jeff will discuss the details of the inspection  
21 and the results. That will be followed by a  
22 discussion of what inspection followup we have done  
23 since the team inspection, and Rick will discuss the  
24 impact of the inspection findings on EPU amendment  
25 review.

1 At this point, I'll ask if there's any  
2 questions before I continue.

3 MR. APOSTOLAKIS: Do you feel the need for  
4 asking us whether we have questions?

5 (Laughter.)

6 MR. DOERFLEIN: I'm new to this.

7 (Laughter.)

8 Next slide.

9 I'll start by noting that the biennial  
10 safety system design and performance capability  
11 inspection was scheduled for August of 2004. That was  
12 scheduled about 18 months in advance and is our  
13 baseline design team inspection, which uses about 475  
14 inspection hours to review one or two systems.

15 I mention it because it set the timing of  
16 whatever inspection we would do, and this was one of  
17 the options we initially considered staying with, even  
18 as various stakeholders began requesting a special  
19 inspection prior to approval of EPU amendment  
20 requests.

21 In particular, in March 2004, the Vermont  
22 Public Service Board, PSB, asked the NRC to conduct an  
23 independent safety assessment of Vermont Yankee.  
24 Specifically, the PSB requested the inspection be  
25 performed by experts independent of any recent

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1 regulatory oversight of Vermont Yankee. The  
2 assessment included review of two safety systems and  
3 two non-safety systems affected by the uprate, and  
4 that the inspection results be reviewed by the ACRS.

5 I think I would like to point out at this  
6 point that the PSB did not specifically request an  
7 inspection the size and scope of what was done at  
8 Maine Yankee. In their request, they indicated that  
9 they had received testimony that they thought what  
10 they were asking to review the four systems could be  
11 done by four people in four weeks, which equates to  
12 about 640 inspection hours. I give that as a  
13 comparison, and you'll see what we actually did do.

14 CHAIRMAN DENNING: In the Maine Yankee,  
15 how many inspection hours was that?

16 MR. DOERFLEIN: I don't have a total. It  
17 was thousands, probably close to 2,000.

18 CHAIRMAN DENNING: Thanks.

19 MR. DOERFLEIN: Nonetheless, as a result  
20 of the PSB request and other stakeholder comments, we  
21 did discuss the option of performing an inspection at  
22 Vermont Yankee similar to the Maine Yankee independent  
23 safety assessment. However, we determined that the  
24 conditions at the two plants were different, and that  
25 this option was not warranted.

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1 Specifically, at Maine Yankee there were  
2 allegations of the licensee misrepresenting a computer  
3 analysis in a 1989 license amendment request, as well  
4 as an Inspector General investigation regarding  
5 deficiencies in other past licensing actions. This  
6 caused the NRC to have significant concerns with Maine  
7 Yankee's conformance to their license requirements.

8 In addition, the Governor at the time  
9 requested a special review of Maine Yankee, and the  
10 problems at Millstone were starting to surface  
11 regarding compliance with the design requirements.  
12 And with all of this -- all of this led Sherman  
13 Jackson to call for the independent safety assessment  
14 at Maine Yankee.

15 This was a customized inspection, the size  
16 and scope of which were determined by the  
17 circumstances. In contrast, there was not a similar  
18 situation at Vermont Yankee. This was based on a  
19 couple of factors, one of which was the fact that the  
20 plant had received significant engineering inspection  
21 since 1996. Most notably, it was one of the four  
22 plants in Region I to receive an architect-engineer  
23 team inspection in August of 1997.

24 In 1998, there was an engineering team  
25 inspection to follow up on the issues from the AE team

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1 inspection, as well as look at configuration  
2 management. In 1998, there was also a baseline core  
3 engineering team inspection.

4 Under the current reactor oversight  
5 program, there have been two safety system design and  
6 performance capability team inspections -- one in 2000  
7 and one in 2002 -- as well as two plant modification  
8 inspections. So there has been a lot of inspection.

9 Some of the other factors that we  
10 considered dealt with the fact that there were not  
11 integrity issues at VY that we saw at Maine Yankee  
12 that led us to lose confidence in Maine Yankee. And  
13 at VY we were actually in a formal process.

14 We are reviewing an amendment request,  
15 which is going to take thousands of hours of staff  
16 review to determine whether this plant was ready for  
17 proceeding to EPU conditions. So we thought, based on  
18 that, a Maine Yankee type inspection was not required.

19 Another option considered, and ultimately  
20 chosen, was to perform the new inspection procedure  
21 being developed to enhance our engineering inspection.  
22 The new procedure incorporated the best practices of  
23 existing and past engineering inspection procedures.

24 The new procedure was under development  
25 since late 2003, and we determined it would be

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1 appropriate to implement the inspection procedure at  
2 Vermont Yankee as part of an agency pilot program.

3 Basically, it gave us much more inspection  
4 activity, considered margin reductions that could be  
5 caused by power uprates, and was within our process,  
6 without getting --

7 MEMBER WALLIS: Can I ask a question about  
8 this?

9 MR. DOERFLEIN: Sure.

10 MEMBER WALLIS: We had a lot of questions  
11 from the public yesterday about the extent of the  
12 inspection. They seem to have the impression that it  
13 only inspected a very small percent of what might have  
14 been inspected. Maybe you could explain this and why  
15 the amount inspected was a reasonable fraction of what  
16 could have been inspected, why this was adequate, and  
17 so on, because this was a main issue -- a major issue  
18 yesterday.

19 MR. DOERFLEIN: That is actually part of  
20 Jeff's presentation.

21 MEMBER WALLIS: So we will hear that?

22 MR. DOERFLEIN: Yes.

23 MEMBER WALLIS: Okay. Thank you.

24 MR. DOERFLEIN: Without getting into  
25 Jeff's presentation, the new procedure called for an

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1 inspection and components across multiple systems,  
2 about 50 percent more inspection time, and the use of  
3 more contractor support. And, again, at Vermont  
4 Yankee, we actually doubled the estimated inspection  
5 time.

6 In staffing the Vermont Yankee inspection,  
7 the NRC established specific criteria to ensure  
8 independence of the team. These criteria applied to  
9 NRC contractors as well as the inspectors.

10 We believe this, combined with the fact  
11 that we would look at components of multiple system,  
12 including some impacted by the power uprate, address  
13 the PSB's concerns.

14 Lastly, I want to point out that the  
15 Vermont State Nuclear Engineer did participate in all  
16 team activities, and this is something that we  
17 promised not only the PSB but others that we would do.

18 That concludes my background discussion.  
19 And unless there's any other questions, I'll turn it  
20 over to Jeff.

21 MR. APOSTOLAKIS: What exactly was the  
22 nature of his participation? Was he just an observer  
23 or --

24 MR. DOERFLEIN: He was an observer. He  
25 participated in all team discussions. He could answer

1 it himself.

2 MR. SHERMAN: I did participate. And I  
3 had no direct inspection responsibilities, but I was  
4 able to be with the team, ask questions of the  
5 licensee on various issues, and actually was able to  
6 participate much like a full member of the team.

7 CHAIRMAN DENNING: And that was Bill  
8 Sherman.

9 MR. APOSTOLAKIS: But you did not  
10 participate in the decision of how much to inspect.

11 MR. SHERMAN: That is correct. I did  
12 observe how that process was done, and I also had some  
13 input through the fact that the state was concerned  
14 about various items related to power uprate, which in  
15 the process we saw that they were included in the  
16 scope.

17 MR. APOSTOLAKIS: Thank you.

18 MR. DOERFLEIN: Any other questions?  
19 Jeff?

20 MR. JACOBSON: Good morning. As Larry  
21 said, my name is Jeff Jacobson. Was the team leader  
22 for the Vermont Yankee engineering inspection. What  
23 I'm going to try to cover this morning is a little bit  
24 about the background of the inspection and the scope,  
25 and I'll focus on some of the questions that have been

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1 raised regarding the amount of things that were looked  
2 at, and so forth.

3 I'll talk a little bit about the methods  
4 that we used during our inspection. And then, lastly,  
5 I'll cover each of the inspection findings that were  
6 identified by the team. Following my presentation,  
7 Larry and Rick will talk about what was done after the  
8 inspection with respect to each of the inspection  
9 findings.

10 My responsibility, essentially, ended upon  
11 the completion of the inspection. It's up to the  
12 region and the NRR tech staff to follow up on the  
13 issues that were raised with regard to how they impact  
14 current operability in the power uprate.

15 Next slide.

16 We believe the inspection that we did was  
17 responsive to the Public Service Board's request to  
18 conduct an independent assessment.

19 MEMBER WALLIS: The real thing is: did  
20 they think it was responsive?

21 MR. JACOBSON: Well, they'll have to speak  
22 to that.

23 MEMBER WALLIS: Can they speak to it now,  
24 or do they want to speak to it later? Did this  
25 respond to what you were looking for?

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1 MS. HOFMANN: Sarah Hofmann from the  
2 Department of Public Service. We're the Department,  
3 not the Board, so I won't speak for the Board. But  
4 the Board is actually interested. They wanted to make  
5 sure that ACRS saw this inspection report and have not  
6 ruled on whether it met the requirements of what they  
7 asked for. The Department believes it did.

8 MEMBER WALLIS: Okay.

9 MR. JACOBSON: The inspection that we did  
10 at Vermont Yankee was part of a pilot program that was  
11 begun just prior to the Vermont Yankee inspection to  
12 improve the effectiveness that we do -- in which we do  
13 engineering inspections. It was an initiative that  
14 came out of Commission that directed us to take a look  
15 at how we were doing engineering inspections and try  
16 to identify ways to improve their effectiveness.

17 And it largely resulted out of some of the  
18 concerns that came out of the Davis-Besse plant and  
19 some other facilities that had undergone lengthy  
20 shutdowns as a result of engineering issues. So we  
21 were asked to look at our approach and see if we could  
22 do these inspections more effectively.

23 I was the project lead for that initiative  
24 to look at these inspections, and we had developed a  
25 draft inspection procedure just prior to the issues

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1 that came up with Vermont Yankee. And we decided that  
2 the Vermont Yankee facility would be a good first test  
3 of this new draft inspection procedure.

4 We wound up doing one of the inspections  
5 in each of the regions, and then we did an assessment.  
6 And I'll talk a little bit more about where we're  
7 going with that in a few minutes.

8 As Larry said, the inspection that we did  
9 involved about 900 hours of direct inspection versus  
10 475 hours which we would have spent had we done the  
11 normal engineering team inspections that --

12 MEMBER WALLIS: Is this because there were  
13 twice as many people, or you did twice as much work?

14 MR. JACOBSON: Well, it was more -- it was  
15 more people and more time.

16 MEMBER WALLIS: And more time. So the  
17 normal inspection is -- it was eight or nine people  
18 with this inspection?

19 MR. JACOBSON: We added an additional week  
20 to the inspection, and then we also had additional  
21 people beyond what would have been done had we done  
22 the normal team inspection.

23 Next slide.

24 I was the team leader. We also had four  
25 regional inspectors and three highly qualified

1 independent contractors. And we specifically chose  
2 the team members and the contractors based upon past  
3 performance and their ability to have identified  
4 findings at other inspection sites. So we really  
5 tried to staff this team with some of the best people  
6 that were available to us, both from an NRC inspection  
7 perspective as well as a contractor perspective.

8 As Larry said, all of the team members  
9 were independent of any recent oversight  
10 responsibilities at Vermont Yankee.

11 MEMBER WALLIS: The public was very  
12 concerned about independent inspection. It would seem  
13 to me that it would be very difficult to pick anybody  
14 who is not familiar with these plants and didn't know  
15 inspection procedures who could do the work. So you  
16 are sort of restricted to picking people who are  
17 knowledgeable. You can't just go out and pick some  
18 engineer off the street to inspect these things. So  
19 the --

20 MR. JACOBSON: Well, the --

21 MEMBER WALLIS: -- independence has got to  
22 be within a very small community of people.

23 MR. JACOBSON: Well, there's various  
24 levels of independence. We chose a level that, like  
25 you said, was a balance between people that were

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1 capable enough to do a decent inspection, but, again,  
2 did not have recent oversight activities at Vermont  
3 Yankee.

4 I was not in Region I. I was in NRR, so  
5 I didn't have any responsibilities with Vermont  
6 Yankee, had never done an inspection at Vermont  
7 Yankee. So that's an example. If somebody -- the  
8 contractors had not done inspection activities at  
9 Vermont Yankee, and the regional inspectors had not  
10 done any recent engineering inspections.

11 So there is -- we tried to get the best  
12 balance we could between true independence and  
13 capability to do an effective inspection.

14 MR. APOSTOLAKIS: Do these contractors  
15 work for you usually, or are they also working for the  
16 industry?

17 MR. JACOBSON: The contractors that we  
18 use, we have a contract with Beckman and Associates  
19 that provides us --

20 MR. APOSTOLAKIS: Okay.

21 MR. JACOBSON: -- contractors. They are  
22 free to take jobs for utilities. But for this  
23 particular job, we added additional conflict of  
24 interest requirements beyond those that are normally  
25 in place that prohibited them from having -- doing

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1 previous work at the utility, at Vermont Yankee, and  
2 also applies to future work that they may have to do.

3 So we normally have conflict of interest  
4 requirements. For this particular inspection, we  
5 added on this, just to address this question of  
6 independence.

7 The inspection focused on components and  
8 operator actions that represented the most risk and  
9 also had the lowest relative safety margins. So the  
10 idea behind this inspection concept was to not just  
11 look at things that are important from a risk  
12 perspective, but to also consider where the most  
13 vulnerabilities exist with respect to the design.

14 MR. APOSTOLAKIS: I'm a little confused  
15 about the operator actions, because I heard this  
16 morning that the operators don't need to do anything.  
17 Is that -- what are the operator actions that are of  
18 relevance here?

19 MR. JACOBSON: Well, there's various  
20 different accident scenarios that are part of the  
21 design basis.

22 MR. APOSTOLAKIS: Oh.

23 MR. JACOBSON: Some require more operator  
24 access than --

25 MR. APOSTOLAKIS: Oh. So it's not -- I

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1 mean, maybe I misunderstood a statement earlier this  
2 morning. Maybe they meant there were no additional --

3 MEMBER WALLIS: No. This is a much  
4 broader inspection than --

5 MR. APOSTOLAKIS: I understand. There  
6 were no additional operator actions as a result of the  
7 EPU.

8 MR. JACOBSON: Right.

9 MR. APOSTOLAKIS: But there are clearly  
10 operator actions required at the -- okay.

11 MR. JACOBSON: I think the statement this  
12 morning was directly related to the design basis  
13 accident with regard to containment overpressure. And  
14 in that regard, they were saying there was no  
15 additional operator. But they were still required to  
16 maintain --

17 MR. APOSTOLAKIS: Right.

18 MR. JACOBSON: -- the pressure within  
19 those curves.

20 MR. APOSTOLAKIS: So can you give me an  
21 example or two of operator actions that you looked at?

22 MR. JACOBSON: I'm going to give you an  
23 example, because one of the findings we had was  
24 directly related to that.

25 MR. APOSTOLAKIS: Okay.

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1 MR. JACOBSON: The way we did this  
2 inspection is the first phase of it is really to  
3 figure out where the low margin/high-risk areas are.  
4 And then, once those are identified, the remainder of  
5 the inspection is focused in on those areas. So it's  
6 really a two-phased inspection.

7 And when we talk about margin, I wanted to  
8 expand upon that a little bit, because it's not just  
9 design margin or calculation of margin, but it  
10 includes other factors such as physical degradation,  
11 which is based on our visual walkdowns of the plant.

12 It includes looking at past maintenance  
13 histories for particular components, such that if  
14 there was a history that there had been a lot of  
15 failures with a certain component, that would  
16 certainly cause us to put it into more low margin area  
17 than a component that is -- had no problems in the  
18 past.

19 MR. APOSTOLAKIS: Has Vermont Yankee asked  
20 for license extension?

21 MR. ENNIS: This is Rick Ennis. They have  
22 provided a letter that said they're planning on  
23 submitting it in January.

24 MR. APOSTOLAKIS: Right.

25 MR. JACOBSON: And we particularly looked



1 at the areas of the plant where the margin would be  
2 reduced as a result of the power uprate, and that  
3 comes into play very much so with regard to some of  
4 the operator actions. We'll talk a little bit more  
5 about that.

6 MEMBER KRESS: How did you decide what  
7 were high-risk components?

8 MR. JACOBSON: We used the licensee's PRA.  
9 We also used our own SPAR models, used risk  
10 achievement worth profiles, and so forth.

11 MEMBER WALLIS: Are you going to go into  
12 all of your findings, or just a few?

13 MR. JACOBSON: We have eight findings, and  
14 I'm going to briefly touch on them all.

15 MEMBER WALLIS: I'm particularly  
16 interested in this one about the 21.3 minutes.

17 MR. JACOBSON: The operator time.

18 MEMBER WALLIS: Because I think some of  
19 the other ones are less -- less relevant perhaps.

20 MR. JACOBSON: I'll try to focus on that  
21 one.

22 We looked at 45 components, operator  
23 actions, and operating experience samples. So that  
24 inspection is broken up between components, operator  
25 actions, and then we also looked at generic-type

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1 issues that had been communicated to the licensee in  
2 the past. And we reviewed their disposition of those  
3 issues.

4 For example, periodic testing of motor-  
5 operated valves was a generic issue that we looked at,  
6 an issue that we had a finding on. I'll talk a little  
7 bit about that.

8 The components that we reviewed were not  
9 limited to any one specific system, but just the way  
10 it came out they tended to be grouped more or less in  
11 several important systems that are important from a  
12 risk perspective and are also the systems that are  
13 impacted most by the power uprate.

14 And those include the onsite and offsite  
15 electrical systems, the reactor core isolation cooling  
16 system, the residual heat removal system, the safety  
17 relief valves, reactor feedwater and condensate  
18 system, as well as other risk-significant systems.

19 In doing our inspection, we looked for  
20 visual signs of degradation, installation errors,  
21 interference issues, environmental concerns. We  
22 reviewed the applicable design and licensing basis  
23 documentation, evaluated assumptions that went into  
24 each of the design calculations that we looked at,  
25 system interfaces, different failure modes that could

1 occur.

2 We looked at the component history,  
3 including maintenance, corrective action, and testing  
4 records, associated operating procedures, and we tried  
5 to focus on the functionality of the equipment.

6 We also evaluated certain operator  
7 timelines and compared those to real-time operator  
8 actions. So we actually took some design basis  
9 operator actions and walked through the plant with the  
10 operators and had them demonstrate to us that they  
11 could perform the actions in the time that was  
12 credited in the calculations.

13 The Vermont Yankee inspection was a little  
14 unique, because we were really looking at the plant  
15 with respect to two design bases -- the one that was  
16 in existence at the time with 100 percent power level.  
17 But we also looked at, would the equipment be adequate  
18 for the extended power uprate conditions, even though  
19 those conditions weren't in place at the time.

20 So, in many cases, we looked at two  
21 different sets of calculations for the same components  
22 and actions. And in some cases, they are very close.  
23 In other cases, the power uprate has more of an  
24 impact.

25 We also assessed the design control

1 process that was used for Vermont Yankee in doing the  
2 power uprate. So for some of the components we  
3 actually walked through the design control process  
4 back to the actual vendor that did the work, and then  
5 how the licensee scoped it in, and so forth, to assure  
6 ourselves that there was control of the process  
7 throughout the different parties that are involved in  
8 actually scoping and implementing the power uprate  
9 analysis.

10 The inspection identified eight findings  
11 of very low risk significance, which are colored green  
12 based on our reactor oversight process. The findings  
13 did not result in any immediate system inoperability,  
14 nor would they have resulted in system inoperability,  
15 had we done this inspection once the power uprate had  
16 actually taken place.

17 We also did not believe that the findings  
18 were indicative of any programmatic breakdown.

19 MEMBER WALLIS: Well, you said that it  
20 wouldn't result in any failure to perform, whatever  
21 the terms were you used. But you had this business of  
22 the inadequate -- you hadn't done any coping analysis,  
23 so how do you know that things would have worked if  
24 they hadn't actually looked at it for this electrical  
25 issue? I mean, you say that there's no -- there's no

1 problem. But if you hadn't done anything, how do you  
2 know it's okay?

3 MR. JACOBSON: Well, at the time we  
4 identified it, we didn't know, but before the end of  
5 the inspection we made them -- or we didn't make them,  
6 but we -- we brought the issue to their attention that  
7 there was not an adequate coping analysis. And we did  
8 a draft coping analysis before we actually left the  
9 site, which gave us comfort.

10 MEMBER WALLIS: So they did things after  
11 you were there, which reassured you, but to state that  
12 you found it, it was not quite so good.

13 MR. JACOBSON: Right. They did things  
14 while we were there and after we were there to address  
15 some of the issues.

16 We looked at the extent of condition,  
17 which is an art term, in three areas for some of the  
18 findings to make sure that the findings were not  
19 indicative of bigger concern. So some findings were  
20 clearly isolated cases. Others could have been  
21 indicative of broader concerns. And in those cases we  
22 pulled a string and reviewed additional samples to  
23 make sure that there was not a bigger programmatic  
24 concern associated with those findings.

25 To talk a little bit about the inspection

1 approach that we used and how it was different than  
2 things we had done in the past -- in the past, our  
3 inspections have always focused on one or two safety  
4 systems.

5 We would pick the most risk-significant  
6 systems and then we would inspect just about  
7 everything in that system to prove that that system  
8 was functional, whereas in this approach we really try  
9 to focus throughout the plant on where we believe the  
10 plant is most vulnerable and where the lowest margin  
11 areas are.

12 And when we finished our pilot  
13 inspections, we really -- we did an assessment. We  
14 brought all the people that were involved in the  
15 pilots, the regional people, the contractors, and we  
16 really decided that this new approach was, in fact,  
17 more effective than the inspection approaches that we  
18 had done in the past. And we --

19 MEMBER WALLIS: Again, this is important  
20 for the public. I mean, yesterday we heard about  
21 there's great need for a vertical slice inspection.

22 MR. JACOBSON: Right.

23 MEMBER WALLIS: And you have done an  
24 inspection which you believe is more effective than  
25 doing that.

1 MR. JACOBSON: That's why I wanted to  
2 focus on this. It's not just engineering judgment.  
3 We looked at other factors such as the risk  
4 significance of the aggregation of the findings that  
5 came out of these pilots, the number of findings per  
6 inspection hour that was spent during these  
7 inspections.

8 In all cases, we determined that the pilot  
9 inspections were more effective than the previous  
10 baseline inspections. And, in fact, one of the pilot  
11 inspections at the Kewaunee facility actually resulted  
12 in that plant shutting down due to some of the issues  
13 that were raised until they could rectify the issues  
14 that were identified by the inspection.

15 And that situation had not occurred in the  
16 previous four years where we had done engineering  
17 inspections throughout the country. So we really have  
18 a lot of faith in this new approach, and we plan on  
19 implementing it nationwide starting the first of next  
20 year. So it is going to take the place of what we had  
21 previously done.

22 I'm going to talk briefly now about each  
23 of the eight inspection findings. I'm assuming that  
24 you've had a chance to read the inspection report, so  
25 I'm not going to go into a lot of detail about each

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1 one. But if anyone has any questions, I'll try to  
2 elaborate on it.

3 The first finding, which is probably the  
4 issue we spent the most amount of time on, involved  
5 questions concerning the capability of the Vernon  
6 hydroelectric station to supply power to Vermont  
7 Yankee in the event of a regional blackout. The  
8 inspection team identified that Entergy had not  
9 provided assurance that the Vernon station could be  
10 brought back online within the time assumed in its  
11 coping analysis.

12 The issue was very complicated because  
13 these -- if this situation occurs, there's a lot of  
14 different players that have to coordinate their  
15 actions in order to supply power back to Vermont  
16 Yankee.

17 So it's not limited just to the Vermont  
18 Yankee licensee, but you've got the people that  
19 operate the Vernon station, you've also got the  
20 regional grid operator who controls the switchyard at  
21 the Vernon station, and all of those people need to  
22 coordinate in a proper way to make sure that the  
23 actions that are credited in Vermont Yankee's station  
24 blackout analysis can actually occur.

25 MR. LEITCH: Is this -- the Vernon station

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1 is not continuously manned, correct?

2 MR. JACOBSON: The Vernon station is not  
3 now. At one time it was continuously manned, so the  
4 conditions actually changed over the years. Now it is  
5 not continuously manned, and if the regional --

6 MR. LEITCH: So an assumption is made for  
7 the reaction time of the operators to get there, and  
8 that's a -- an assumption that is also based on bad  
9 weather conditions, and so forth?

10 MR. JACOBSON: I'm going to let Rick talk  
11 about the corrective actions that have been --

12 MR. LEITCH: Okay.

13 MR. JACOBSON: -- taken as a result. But  
14 at the time of the inspection, that was not factored  
15 in at all, and that was why we had so much concern  
16 about that issue is that --

17 MR. LEITCH: Did you look at the material  
18 condition of the Vernon plant? Is that -- was that at  
19 all a factor in your inspection?

20 MR. JACOBSON: We didn't visually inspect  
21 the Vernon plant. However, we did look at test  
22 procedures and some records associated with its  
23 operation, and it -- based on our review of those  
24 records, it's been a very reliable operating facility.  
25 It pretty much runs all the time.

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1 MEMBER WALLIS: But the man in charge of  
2 it is in Wilder, which is quite a long way away.

3 MR. JACOBSON: We actually visited the  
4 Wilder site. That's one thing we did is we took a  
5 trip to Wilder and interviewed the operator at the  
6 Wilder station that controls that plant. But it does  
7 require them to dispatch individuals to the Vernon  
8 station. They can't restart --

9 MEMBER WALLIS: Right.

10 MR. JACOBSON: -- the Vernon station for  
11 a while.

12 MEMBER WALLIS: I think all of the  
13 discussion about whether they can get there in a  
14 snowstorm is in the SER. It's not in your inspection  
15 report.

16 MR. JACOBSON: No.

17 MEMBER WALLIS: Well, at least you've  
18 raised the issue.

19 MR. JACOBSON: Right.

20 MEMBER WALLIS: Right.

21 MR. JACOBSON: The second finding involved  
22 the adequacy of the procedures used by the Vermont  
23 Yankee operators to monitor one of the normal offsite  
24 power lines into the station. The procedures did not  
25 contain adequate -- contain appropriate acceptance

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1 criteria, nor did they reference an appropriate  
2 methodology for determining the lowest acceptable  
3 offsite voltage for which the offsite power line could  
4 still be considered operable.

5 This was an alternate offsite source that  
6 the operators are allowed to credit for tech specs,  
7 though our concern was they didn't have adequate  
8 guidance to determine whether that offsite source  
9 really would be capable of fulfilling its functions  
10 under certain conditions.

11 MR. LEITCH: This is the 115 KV Keene  
12 line?

13 MR. JACOBSON: Yes.

14 MR. LEITCH: Did you get any sense for  
15 whether the operators knew what to do, that this was  
16 just a lack of a procedural documentation of the  
17 requirements?

18 MR. JACOBSON: I don't think I can answer  
19 that question.

20 MR. LEITCH: Okay. Okay.

21 MR. JACOBSON: The third finding concerned  
22 the lack of an acceptable degraded voltage analysis.  
23 A degraded voltage analysis is performed to ensure  
24 that all safety-related equipment can function under  
25 the lowest specified voltage for which the offsite or

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1 onsite power systems are considered operable.

2 We did do some rough calculations -- the  
3 team did some rough calculations while were onsite  
4 just to ensure ourselves that we thought that the  
5 calculations would come out favorable once they were  
6 done, and we determined that -- we didn't determine  
7 any operability questions as a result of the  
8 calculations that we did.

9 MEMBER WALLIS: Do you follow up on this  
10 and make sure that the licensee does the calculations?

11 MR. JACOBSON: Larry is going to talk --

12 MEMBER WALLIS: He's going to talk about  
13 that.

14 MR. JACOBSON: -- about the follow up.

15 MR. DOERFLEIN: But the quick answer is,  
16 yes, we have.

17 MR. JACOBSON: Yes. The fourth finding  
18 concerned a pressure control valve in the reactor core  
19 isolation cooling system, which was improperly  
20 installed and not independent of the instrument air  
21 system.

22 The team identified that the loss of the  
23 non-safety-related instrument air system would cause  
24 this valve to go fully open and would overpressure  
25 portions of the reactor core isolation cooling system.

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1 MR. LEITCH: Did you look at the extent of  
2 condition there? In other words, were there other --  
3 it sounds like this valve was installed perhaps after  
4 the original design. Was there any followup to see  
5 whether there was any similar valves that depended on  
6 instrument air?

7 MR. JACOBSON: Yes. That was one of the  
8 three findings that we thought could be indicative of  
9 a broader concern, so we did review other valves to  
10 make sure that they were not dependent on instrument  
11 air. And we didn't find any additional examples.

12 MR. LEITCH: Okay. Thanks.

13 MR. JACOBSON: The fifth finding concerned  
14 Entergy's failure to correct another condition  
15 associated with the same pressure control valve. The  
16 team identified that this valve was designed to  
17 operate automatically but had not operated properly  
18 and had required manual operation since its original  
19 installation.

20 So this valve I believe was an original --  
21 part of the original design. They had problems during  
22 original testing where it never operated properly and  
23 had never corrected the problem for many years.

24 The sixth finding involved the use of an  
25 incorrect and non-conservative input for the

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1 condensate storage tank temperature into the plant's  
2 transient analysis. Entergy used a value of 90  
3 degrees Fahrenheit when the actual tank temperature  
4 could be as high as 120 degrees Fahrenheit.

5 And this is another one where we looked at  
6 extent of condition, because the concern was if  
7 they're not using proper assumptions in their accident  
8 calculations, it could impact other important  
9 calculations such as containment overpressure  
10 calculations, and so forth. So --

11 MEMBER WALLIS: This is where your NPSH  
12 was reduced to zero.

13 MR. JACOBSON: Right. This actually --

14 MEMBER WALLIS: And then, you decided that  
15 was okay.

16 MR. JACOBSON: Because there's no  
17 requirement for margin. Our team did not pass  
18 judgment on whether credit should be given for  
19 containment overpressure. That was not part of our  
20 inspection.

21 MEMBER WALLIS: Can I ask you about  
22 something that you seem to have skipped over? It  
23 wasn't the finding. The vacuum breaker system --  
24 vacuum breaker system from reactor building to Torus?

25 MR. JACOBSON: I believe that was one of

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1 the components that we looked at.

2 MEMBER WALLIS: That has to work, doesn't  
3 it? I mean, it's a leak part, isn't it? It doesn't  
4 work?

5 MR. JACOBSON: I believe so, yes.

6 MEMBER WALLIS: And how reliable are these  
7 vacuum breakers? Don't they sometimes give trouble?

8 MR. JACOBSON: I can't answer -- the  
9 licensee possibly can --

10 MEMBER WALLIS: But you did inspect that,  
11 because it's in your report here.

12 MR. JACOBSON: Would you like the licensee  
13 to answer that, or --

14 MEMBER WALLIS: You're talking about  
15 leaks. What's the assurance that the vacuum breaker  
16 will not leak?

17 CHAIRMAN DENNING: Can the plant address  
18 that?

19 MEMBER WALLIS: Maybe that's something  
20 we'll talk about in the future, right? We'll talk  
21 about that in the future.

22 MR. JACOBSON: Go on?

23 CHAIRMAN DENNING: Go on.

24 MR. JACOBSON: The seventh finding  
25 concerned the plant's safe shutdown analysis, and this

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1 is the issue that you asked me to elaborate on. The  
2 seventh finding concerned the plant's safe shutdown  
3 analysis, which is performed to ensure that the  
4 facility can be safely shut down should a fire make  
5 the control room uninhabitable.

6 The team identified that the time it would  
7 take for Operations to place the reactor core  
8 isolation cooling system into service from the  
9 alternate control panel would exceed that contained in  
10 the safe shutdown analysis.

11 In addition, the team identified that  
12 Entergy's proposed power uprate would further reduce  
13 the time available to perform these steps, and that at  
14 the power uprated levels the ability to place the  
15 reactor core isolation cooling system into service  
16 before the reactor water level reached the top of the  
17 active fuel was questionable.

18 So this is a case where the power uprate  
19 reduced the margin -- in other words, reduced the time  
20 available to operators to put the reactor core  
21 isolation cooling system into place due to increased  
22 decay heat that --

23 MEMBER WALLIS: So how is this handled?  
24 Maybe the -- when you're dealing with an EPU where  
25 you've got -- the time available is almost exactly the

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1 same as the time that it takes them to do the job.

2 MR. JACOBSON: I think Larry and Rick are  
3 going to answer what they've done, but they --

4 MEMBER WALLIS: It's because --

5 MR. JACOBSON: -- they've taken corrective  
6 actions to --

7 MEMBER WALLIS: Did they change that time  
8 in some way?

9 MR. JACOBSON: Yes. They've changed the  
10 time it actually takes them.

11 MEMBER WALLIS: So how much margin do you  
12 need? If it's estimated to take 21 minutes to do  
13 something, presumably that's 21 plus or minus five or  
14 something. And if you've only got 21 minutes  
15 available, the probability of not doing it would seem  
16 to be not -- zero. I mean, quite -- something you  
17 have to worry about.

18 MR. JACOBSON: Well, that's why we were  
19 worried about it.

20 MEMBER WALLIS: So how big a margin do you  
21 need in this sort of case?

22 MR. JACOBSON: Well, I think on any of  
23 these cases there is no requirements for a margin in  
24 excess of the design basis conditions. And it would  
25 apply to this as well as any other calculations.

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1 MEMBER WALLIS: But I can't believe that  
2 you can predict how long it takes someone to do  
3 something in 21 minutes with great accuracy. It must  
4 be quite a span, depending on the athleticism of the  
5 people and their smartness and their experience and  
6 everything.

7 MR. JACOBSON: I think when we look at  
8 that, we look at their basis for demonstrating what  
9 they believe is the time it would take. And, for  
10 instance, if they ran five crews through and the time  
11 span ranged from 15 to 18 minutes, you know, that  
12 would be a factor. In this case, we identified it as  
13 a problem.

14 MEMBER WALLIS: It's not --

15 MR. JACOBSON: Because it was too close to  
16 call, and they've addressed that -- and I think what  
17 Rick is going to tell you is they've reduced the  
18 timeframe considerably such that they now have a lot  
19 of margin. But --

20 MEMBER WALLIS: So when they did their  
21 PRA, did they use the newer vision or the old one?

22 MR. JACOBSON: I don't believe the PRA  
23 looks at margin in terms of --

24 MEMBER WALLIS: They must look at --

25 MR. JACOBSON: -- the ability to complete

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1 certain functions.

2 MEMBER WALLIS: It must look at the  
3 probability of them being successful. That's the  
4 whole -- that's the whole game.

5 MR. JACOBSON: But it looks at probability  
6 of an operator completing an action, but I don't  
7 believe it considers how much margin is available.

8 MEMBER WALLIS: Oh. You mean it says that  
9 if he's allowed 21 minutes, and he's got 21.1 minutes,  
10 then it's successful? Is that what the PRA says? I  
11 mean, how do you decide that it's successful in the  
12 PRA? I guess we'll pursue this again some day.

13 CHAIRMAN DENNING: Yes. Well, we're going  
14 to hear a little bit more anyway about what the --  
15 what the -- how it was corrected.

16 MEMBER WALLIS: Yes. But I think we also  
17 need to know what effect it has on the EPU PRA, right?

18 CHAIRMAN DENNING: Right.

19 MR. APOSTOLAKIS: Is there going to be a  
20 discussion of this later?

21 CHAIRMAN DENNING: There is a discussion  
22 of the finding, but there's not additional discussion  
23 of the question that you've raised with regard to PRA.

24 MR. JACOBSON: Let's continue, because we  
25 have very serious findings that --

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1 MEMBER WALLIS: I'm sorry. But, yes, we  
2 seem to be raising issues which --

3 MR. JACOBSON: -- we have to bring --

4 MEMBER WALLIS: -- might be important, I  
5 hope.

6 CHAIRMAN DENNING: Yes. Absolutely. We  
7 have to identify these important issues. I absolutely  
8 agree, Graham.

9 MR. LEITCH: I understand that the root of  
10 this problem was that there was some steps added to  
11 the procedure. And there was perhaps a failure to  
12 communicate between Operations and Engineering as to  
13 what those steps were.

14 I guess, once again, I'm concerned about  
15 the generic implications of that. Did you look at any  
16 other places? Did you find any other places where  
17 there were problems resulting from that lack of  
18 communication?

19 MR. JACOBSON: This was another one of the  
20 findings that we looked at from extent of condition  
21 concerns, and we didn't find any additional issues.  
22 I had the same concern, that if they had added steps  
23 to this one, you know, that could be a programmatic  
24 problem, where there's a lack of design control with  
25 these operator timelines. So --

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1 MR. LEITCH: But you found no other  
2 evidence of --

3 MR. JACOBSON: We found no other examples.

4 MR. LEITCH: Okay.

5 CHAIRMAN DENNING: Continue.

6 MR. JACOBSON: The last -- the eighth  
7 finding, the last finding, concerned the acceptability  
8 of portions of Entergy's program for testing motor-  
9 operated valves. The team identified that in some  
10 cases testing was performed without establishing  
11 appropriate acceptance criteria, and that in some  
12 instances a test methodology was used that had not  
13 been properly validated.

14 There was also an unresolved item  
15 identified by the team that concerned the facility's  
16 ungrounded 480-volt electrical system, and the  
17 potential that a certain type of ground fault could  
18 propagate and damage safety-related equipment.

19 For each of the issues identified by the  
20 team, Entergy performed an immediate assessment of its  
21 impact on operability. In some cases, they had to do  
22 additional calculations. For example, with the RCIC  
23 control valve that was overpressurized, they did some  
24 extensive work during the inspection to show that that  
25 system would hold together even though it was

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1 significantly over pressure, and that it wouldn't be  
2 an immediate operability concern.

3 Once entered into the corrective action  
4 program, the licensee is required by our procedures,  
5 or our regulations and their own procedures, to do an  
6 evaluation of both the individual issue and the  
7 potential extent of condition and significance of each  
8 of the issues. And we actually followed up on each of  
9 these issues, and Larry is going to talk a little bit  
10 more about that in detail.

11 I think that's pretty much all I had on  
12 the inspection. As I said, Larry is going to -- Larry  
13 and Rick are going to talk a little bit more about our  
14 followup, and I'll take any additional questions on  
15 the inspection approach now, if anyone has them.

16 CHAIRMAN DENNING: Any questions on that?  
17 Okay.

18 MEMBER SIEBER: Could you give us just a  
19 little more detail on the ungrounded 480-volt  
20 situation? How did you find it? Why is it  
21 ungrounded? Is it a design issue or a grounding  
22 connection come -- is missing or something?

23 MR. JACOBSON: Yes. The ungrounded 480-  
24 volt issue -- there's actually other plants that also  
25 have ungrounded 480-volt systems. It's an original

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1 design consideration, and there is pros and cons of an  
2 ungrounded system.

3 MEMBER SIEBER: Right. It's usually  
4 grounded someplace, but not more than one place.

5 MR. JACOBSON: Well, in this case, it's an  
6 ungrounded system.

7 MEMBER SIEBER: So it is not grounded any  
8 place.

9 MR. JACOBSON: Right. So there's a  
10 concern -- there's an actual phenomena that could  
11 occur that if you were to get an arcing ground on that  
12 system --

13 MEMBER WALLIS: Right.

14 MR. JACOBSON: -- that the voltages could  
15 essentially accumulate due to the capacitants in the  
16 system, such that they would exceed the voltage  
17 ratings of the connected motors. We have essentially  
18 done an extensive analysis of this issue in NRR after  
19 the inspection. Rick is going to talk about how that  
20 was closed out.

21 MEMBER SIEBER: Okay.

22 MR. JACOBSON: But I believe it has been  
23 determined to be acceptable as is. Essentially, you  
24 have to weigh the risk of such a ground against the  
25 benefits that the ungrounded system provide.

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1 MEMBER SIEBER: It has to be an arcing  
2 ground?

3 MR. JACOBSON: It has to be a certain type  
4 of arcing ground that would cause this to occur, which  
5 is pretty unlikely.

6 MEMBER SIEBER: Okay.

7 CHAIRMAN DENNING: Thank you. Larry,  
8 would you go ahead, then?

9 MR. DOERFLEIN: Sure. As Jeff said,  
10 Region I did do inspection followup on all of the  
11 findings from the engineering team. We did this as  
12 part of our normal baseline process, so they were  
13 scattered throughout the year. For instance, we  
14 looked at one of the issues during one of our routine  
15 baseline inspections. We didn't -- we just didn't  
16 send another team to go follow up on all this stuff.

17 Our inspection followup consisted of  
18 verification that Entergy took appropriate corrective  
19 actions to address the deficiency and performed an  
20 extent of condition review. In March, we completed  
21 the followup inspection for the RCIC startup timeline  
22 issue and the procedure for assessing operability of  
23 offsite power.

24 Regarding RCIC, we found that Entergy made  
25 appropriate procedure revisions and conducted training

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1 to correct the problem. In addition, we found that  
2 their extent of condition review was comprehensive.

3 I would like to add that our followup  
4 inspection included a procedure walkdown with the  
5 operators and verified the system could be started in  
6 about 14 minutes.

7 If you're interested in the specific  
8 issue, steps had been added to the procedure, but they  
9 were safety steps, OSHA-required safety steps -- don  
10 face masks, don aprons, don gloves -- things that  
11 probably were added that nobody gave a thought to  
12 until -- it just makes the procedure take longer.

13 MEMBER WALLIS: Yes. When the reactors  
14 are -- the reactors are at risk, you don't want to  
15 fiddle around with a lot of detailed --

16 MR. DOERFLEIN: Well, not only that, but,  
17 as I understand it, the OSHA requirements were for  
18 open cabinets. Some of these -- some of these were  
19 just pushing buttons on closed cabinets. So they  
20 revised the procedure to -- they still passed it  
21 through their Safety Committee obviously, but a  
22 revised procedure to take out the extra steps.

23 Plus another contributing cause, I think,  
24 was all of these things are practiced in the regual  
25 program. Some are done in classroom, some are done in

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1 the field. This happened to be done in the classroom,  
2 so a little familiarity issue. But once they fixed  
3 the procedure and trained the operators, it -- they  
4 could get it done in 14 minutes.

5 Regarding the offsite power issue, that  
6 was -- this is the procedures. That was a pretty  
7 narrow issue. We found that Entergy made adequate  
8 procedure revisions and trained the operators on the  
9 changes. The inspection results for both of those  
10 issues are documented in Inspection 2005-02.

11 In August, we completed the followup  
12 inspection for the degraded relay setpoint  
13 calculations and the storage temperature issues. For  
14 the degraded relay setpoint issue we found that  
15 Entergy had appropriately revised their electrical  
16 calculations and determined that the safety-related  
17 equipment would remain operable with a minimum voltage  
18 of 3,660 volts AC at safety buses 3 and 4.

19 Regarding the CST temperature issue, we  
20 found that Entergy had completed an appropriate extent  
21 of condition, which considered present power  
22 conditions in those that would exist at the proposed  
23 uprate, and identified about a dozen calculations that  
24 use non-conservative temperature values.

25 In fact, we identified two additional

1 examples, one of which Entergy identified but had  
2 dropped through an administrative error, and one -- it  
3 didn't involve a max temperature. It actually  
4 involved a minimum temperature. But that was on a  
5 valve torque calculation. So all of those extra  
6 examples really had negligible impact.

7 The inspection results for those issues  
8 are documented in Inspection Report 2005-04.

9 In September, we completed the inspection  
10 followup for the availability of power from Vernon  
11 station, and the motor-operated valve testing issues.  
12 For the Vernon station issue, as we already mentioned,  
13 Entergy completed and submitted a two-hour coping  
14 analysis to the NRC. They revised their station  
15 procedures to prioritize getting the hydroelectric  
16 station back, and they established protocols with the  
17 grid operator.

18 Regarding the MOV issue, Entergy  
19 appropriately revised their program for training and  
20 evaluating MOV performance. And they also made  
21 provisions to provide for validation of the motor  
22 control center test method. That validation program  
23 includes periodic reverification of the test method  
24 over an extended interval.

25 The inspection results for both of those

1 issues are documented in Inspection Report 2005-06.

2 Subsequent to that inspection, we also  
3 observed the table-top exercise with the grid operator  
4 with simulated at grid collapse and restoration, and  
5 determined that power could be restored to Vermont  
6 Yankee within two hours. That's very conservative.  
7 We actually think it's going to be much less than  
8 that.

9 It depends on how fast they can get the  
10 hydro station back, actually. That's -- once the  
11 hydro station is back, they will have power, and we  
12 think that can be done in 90 minutes, but certainly  
13 within the two-hour coping analysis.

14 The results of those observations will be  
15 documented in the next resident inspector quarterly  
16 inspection report.

17 As also documented in Inspection Report  
18 2005-06, two of the findings will require additional  
19 followup inspection. The corrective action for both  
20 involve replacing the RCIC lube valve core pressure  
21 control valve. Entergy had intended to replace the  
22 valve during a recent outage. However, the unexpected  
23 complexity of modification and delays in obtaining  
24 parts caused that schedule to slip.

25 When we inspected the issue in September,

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1 the valves were scheduled to arrive after the outage,  
2 and the modification package had not been completed.  
3 Entergy currently plans to implement the mod during  
4 the week of December 12, 2005.

5 While we did find Entergy's evaluation of  
6 the problem and extent of condition to be adequate, we  
7 intend to perform additional inspection and  
8 modification including the post-modification testing  
9 and the 50.59 evaluation as part of our baseline  
10 program.

11 There was also one unresolved item  
12 identified during the engineering team inspection  
13 regarding the adequacy of the 480-volt ungrounded  
14 system as already mentioned. NRR has recently  
15 completed a review of that issue under a task  
16 interface agreement with Region I.

17 The conclusion was that the current design  
18 meets the licensing basis, and that the issue is not  
19 risk-significant because of the low likelihood for  
20 failure of redundant or independent safety systems due  
21 to a failure to non-safety loads.

22 The result of that review will be  
23 documented in the next quarterly resident inspection  
24 report. And that concludes my followup of the  
25 inspection issues.

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1 MR. LEITCH: Just slightly off the topic,  
2 but do you happen to know, Larry, the licensee's  
3 current status with respect to the reactor oversight?  
4 Are all of their performance indicators green?

5 MR. DOERFLEIN: As far as I know, all of  
6 the performance indicators are green.

7 MR. LEITCH: And do you know if there are  
8 any --

9 MR. DOERFLEIN: And they're in the  
10 regulatory -- or the licensee response column. So the  
11 inspection findings --

12 MR. LEITCH: So the licensee is  
13 responsible. Yes, okay. And are there any -- are  
14 there any inspection findings greater than green that  
15 are open at the moment that you're aware of?

16 MR. DOERFLEIN: I'll have to get back to  
17 you on that.

18 MR. LEITCH: Perhaps it's not a fair  
19 question. I'm not -- I know it's not on the agenda.

20 MR. DOERFLEIN: The only reason I hesitate  
21 is there may be one EPU issue on phone alert radios  
22 that I don't have the answer to.

23 She's the resident inspector. She's  
24 telling me that issue is closed, so there are no  
25 greater than green items open.

1 MR. LEITCH: Okay. Thank you.

2 CHAIRMAN DENNING: Okay. Can Rick finish  
3 in 15 minutes? Is that reasonable, or is that too --  
4 okay. Let's go ahead and finish that up, then, before  
5 we go to lunch.

6 MR. ENNIS: Thank you. My name is Rick  
7 Ennis. I'm the Project Manager for Vermont Yankee in  
8 the NRC's office of NRR. I'll now discuss the impact  
9 the engineering inspection had on the EPU amendment  
10 review.

11 Shortly after the completion of the  
12 inspection, Jeff Jacobson and several members of the  
13 inspection team held discussions with the NRR staff  
14 that were reviewing the EPU amendment. And based on  
15 those discussions, as well as the technical areas that  
16 are covered in the review standard RS-001, as well as  
17 the information that has been submitted on the docket  
18 by Entergy to support the EPU amendment, we determined  
19 that four of the inspection findings impacted the EPU  
20 review.

21 The other four findings were determined to  
22 not relate specifically to the changes being proposed  
23 for the EPU.

24 Specifically, the findings that impacted  
25 the review were the issues related to station

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1 blackout, the timeline for operator action to place  
2 the reactor core isolation cooling system in service  
3 following Appendix R fire, periodic testing of the  
4 motor-operated valves, and condensate storage tank  
5 temperature.

6 The NRC staff held several conference  
7 calls with Entergy to discuss the issues from the  
8 engineering inspection. And the purpose of those  
9 calls was to ensure that Entergy's proposed corrective  
10 actions would include supplements to the EPU  
11 application to address the relevant findings.

12 Entergy subsequently submitted various  
13 supplements to address the findings. In some cases,  
14 the NRC staff issued requests for additional  
15 information, and further supplements were submitted by  
16 Entergy to fully address the issues. And now I'll  
17 discuss each of the issues.

18 With respect to the finding related to the  
19 Vernon hydrostation and station blackout, the EPU  
20 review standard RS-001, Safety Evaluation Section  
21 2.3.5, station blackout, requires that the NRC staff  
22 reach the conclusion that the licensee has adequately  
23 evaluated the effects of the proposed EPU on station  
24 blackout, and demonstrate the plant will continue to  
25 meet the requirements in 10 CFR 50.63 following

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1 implementation of the EPU.

2 The engineering inspection team found that  
3 in the event of a regional grid collapse, the Vernon  
4 hydrostation, which is the Vermont Yankee alternate AC  
5 source, would trip offline and have to be restarted.  
6 For station blackout scenarios where the licensee  
7 cannot demonstrate by test that the alternate AC  
8 source would be available in 10 minutes, 10 CFR 50.63  
9 requires the licensee to complete a coping analysis  
10 for the period of time it would take for the power to  
11 be restored.

12 Prior to the inspection, the licensee had  
13 credited the Vernon hydrostation as being available  
14 within 10 minutes. As such, the licensee had not  
15 performed a coping analysis. As a result of the  
16 issues raised during the inspection concerning mostly  
17 the communications and actions required to restart the  
18 hydrostation, the licensee created a preliminary  
19 timeline which estimated the time to restore power  
20 following a grid collapse could be somewhere between  
21 20 minutes and two hours.

22 Since it was determined that the Vernon  
23 hydrostation could not be made available in 10  
24 minutes, as was the previous assumption, the licensee  
25 performed a coping analysis which was submitted in

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1 Supplement 25 to the EPU application dated March 24,  
2 2005.

3 The coping analysis which the licensee  
4 performed assuming EPU conditions was based on a two-  
5 hour coping requirement, and that coping requirement  
6 means that the -- the period of time the hydrostation  
7 is assumed unavailable.

8 As discussed in Section 2.3.5 of the  
9 safety evaluation, the staff's draft safety  
10 evaluation, the licensee's coping analysis used the  
11 guidance in Reg. Guide 1.155 and NUMARK Standard 87-  
12 00.

13 The licensee -- the NRC staff's review of  
14 the coping analysis found that during this two-hour  
15 coping period there would be adequate condensate  
16 inventory to maintain core cooling. Class 1E  
17 batteries have adequate capacity to supply all  
18 required loads. Equipment operability will be  
19 maintained at the elevated room temperatures caused by  
20 a loss of ventilation.

21 Containment isolation capability will be  
22 maintained as required to ensure containment  
23 integrity, and the resulting Torus temperature  
24 satisfies the net positive suction head requirements  
25 of the residual heat removal and core spray pumps

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1 without the need for crediting containment accident  
2 pressure.

3 Based on these findings, the staff  
4 concluded that Vermont Yankee will meet the station  
5 blackout requirements in 10 CFR 50.63 under EPU  
6 conditions.

7 With respect to the finding related to the  
8 Appendix R timeline for initiation of the reactor core  
9 isolation cooling system, RCIC, EPU review standard  
10 RS-001, safety evaluation section 2.11, human  
11 performance, requires the staff to conclude that the  
12 licensee has appropriately accounted for the effects  
13 of the proposed EPU on the available time for operator  
14 actions.

15 The inspection team found that the  
16 timeline for operator actions to place the RCIC system  
17 in service from the alternate shutdown panels during  
18 an Appendix R scenario have been impacted due to  
19 procedure changes, and the licensee had not  
20 incorporated these changes into the Vermont Yankee  
21 safe shutdown capability analysis.

22 MR. APOSTOLAKIS: Now, let me understand  
23 something here. Why didn't -- I mean, I read the SER,  
24 which was -- which includes this discussion. But why  
25 did it take a special inspection to figure it out?

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1       Couldn't the reviewers have identified this as an  
2       issue without an inspection?

3               MR. ENNIS: I don't --

4               MR. APOSTOLAKIS: It seems to me that from  
5       the evaluation the staff relies too much on what the  
6       licensee has proposed. Why did it take an inspection  
7       to figure it out, that the time was close to the time  
8       to core uncover? I mean, what is special about the  
9       inspection?

10              How did you guys figure it out and the  
11       reviewers perhaps had not figured it out? Do they  
12       have any guidance what things to look for in EPU's, and  
13       which one of them would be the initiation of RCIC  
14       under a fire scenario? It's a mystery to me how that  
15       happens.

16              And I don't know if it's relevant here,  
17       but also there is a repetitive statement here that  
18       there are small reductions in time available for some  
19       operator actions, and then the licensee used the -- an  
20       industry standard technique to figure out that the  
21       response times were sufficient. And I'm wondering  
22       whether the NRC staff has actually reviewed these  
23       industry standard techniques.

24              Are they a black box, and we are accepting  
25       the results of these? Or has the staff actually

1 reviewed those? Is that an EPRI methodology?

2 MR. ENNIS: Let me address the -- you  
3 know, typically, when you're reviewing a license  
4 amendment request, you're reviewing changes to the  
5 licensing basis. So typically what the staff gets  
6 submitted is the results of the licensee's analyses  
7 and calculations.

8 Typically, we don't even get all of the  
9 calculations, unless there is some issue that we think  
10 needs further followup, and then we may request  
11 further information, that they submit the  
12 calculations.

13 In this case, as part of their power  
14 uprate safety analysis report, the PUSAR, there was a  
15 table in there that included the differences for EPU  
16 between the time to core uncover. So on the current  
17 power level, they had assumed it was going to take  
18 25.3 minutes, and then under EPU they said it would  
19 take 21.3 minutes.

20 So, you know, from a licensing standpoint,  
21 the information we have at that point is that there  
22 was a reduction of about four minutes to the EPU, and  
23 other past licensing basis information that we have,  
24 we'd go back and look at the fire safe shutdown  
25 analysis, and the assumptions in there, the

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1 assumptions would be that those actions could be  
2 completed within 15 minutes. That was the 1999  
3 analysis.

4 So based on that, taken alone, you know,  
5 it would appear to you that you have six minutes of  
6 margin. Okay? For EPU conditions.

7 MR. APOSTOLAKIS: For EPU conditions? No,  
8 that was 1999. Was it done under EPU?

9 MR. ENNIS: No. The safe shutdown  
10 analysis -- the Appendix R analysis assumed it was --

11 MR. APOSTOLAKIS: That was under the --

12 MR. ENNIS: -- on the licensing basis. So  
13 they had 10 minutes of margin previously, and then it  
14 was reduced. This was before the finding, okay? This  
15 is when -

16 MR. APOSTOLAKIS: Well, that's my  
17 question. Why did you find this and not the reviewer?

18 MR. ENNIS: Because, well, the issue had  
19 to do with the changes to procedure, which is covered  
20 under 50.59. So we -- you know, there's changes a  
21 licensee can make without prior approval of the NRC  
22 staff. So they typically change procedures, change  
23 calculations. It does not require NRC review and  
24 approval.

25 MR. APOSTOLAKIS: No. But the time to

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1 place RCIC in service, is that a 50.59 thing? I mean,  
2 that's an observation, is it not? That's not a 50.59  
3 issue.

4 MR. ENNIS: I'll try -- I understand your  
5 question, and I think what we've learned during this  
6 whole experience was that the inspection complemented  
7 the review --

8 MR. APOSTOLAKIS: Right.

9 MR. ENNIS: -- and found this. It would  
10 be doubtful that a reviewer could find this.

11 MR. APOSTOLAKIS: Why not?

12 MR. DOERFLEIN: Because they don't go to  
13 the site and --

14 MR. APOSTOLAKIS: Well, what did you do?  
15 Did you actually walk there and see how much time it  
16 takes, or --

17 MR. DOERFLEIN: Yes. We actually -- we  
18 actually walked through it and saw that -- what it  
19 took, the 19 minutes or whatever. We did do that.  
20 That was part of the inspection. And I think it was  
21 -- like I said, I think it complemented the review,  
22 the EPU amendment review.

23 And the Commission paper, at least the  
24 last version I saw, recommended that more of this  
25 inspection interaction take place in further EPU --

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1 MR. APOSTOLAKIS: So what happens at other  
2 plants that didn't have the benefit of such an  
3 inspection? I mean, typically what we see in the ACRS  
4 is that the licensee argued that the reduction in time  
5 was not significant, and usually the staff agrees.

6 I mean, shouldn't there be some guidance  
7 as to what they should look for? I mean, does the  
8 staff have this guidance, that maybe this issue now or  
9 in the future will become something that will be  
10 standard and people will focus on it?

11 MR. JACOBSON: The point you're raising I  
12 think is a fundamental question, which is, you know,  
13 what do we look at when we do licensing procedures,  
14 and what do we look at when we do inspections?

15 And I think what we found in this case is  
16 that there are certain things that are looked at  
17 during inspections that aren't typically looked at in  
18 licensing reviews, and there needs to be a better  
19 integration of those two activities, not just for EPUs  
20 but for any significant risk-important license  
21 information that the NRC is approving. And we have it  
22 as a commitment to go back and look at our licensing  
23 process and figure out how we can better integrate  
24 activities such as this in the future.

25 So we recognize the point that you're

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1 raising, that there is a vulnerability there, and that  
2 we need to better look at the types of things that are  
3 done during a license review and the types of things  
4 that are done during an inspection.

5 MR. APOSTOLAKIS: We have approved, as we  
6 saw earlier on a table, 607 such EPU's already. Do we  
7 go back now and check whether --

8 MR. JACOBSON: Well, I think the other  
9 thing you need to consider is that in the past these  
10 other licensees have gotten inspections, too. They  
11 just weren't called out as power uprate engineering.  
12 They all are subject to our routine engineering  
13 inspections that look at this type of issue as well.

14 MR. APOSTOLAKIS: Yes. But, I mean, as  
15 you show here, in 1999 it was okay. So those  
16 inspections, you know, if they are not related to an  
17 EPU, they would not look for it. I mean, they will  
18 find it's okay. So now that we have approved EPU's for  
19 several plants, and we were not aware of the issue, I  
20 don't know what do we do. Do we go back? Can we do  
21 that?

22 Now, in the future I hope there will be  
23 some guidance to the reviewer that this may be an  
24 issue. The issue of human performance has been a sore  
25 point with me.

1 MR. THADANI: Yes. George, let me --

2 MR. APOSTOLAKIS: Because I think the  
3 reviewers tend to accept what the licensee says.

4 MR. ENNIS: It's an integrated approach.  
5 I mean, you have an inspection approach, and you've  
6 got the reviews that are done on changes to the  
7 licensing basis. You can't -- you know, you have to  
8 rely on --

9 MR. APOSTOLAKIS: If you had done -- let  
10 me ask you this question. If Vermont had not insisted  
11 on a special review, and you had done your standard  
12 475-hour inspection, would you have found this?

13 MR. ENNIS: I don't know. I can't answer  
14 that. I don't know. It depends on what scope of the  
15 item they looked at. And maybe it would have been  
16 found through routine inspection by the resident  
17 inspector. Maybe it would have been found through  
18 some other -- through an Appendix R inspection that  
19 was I think scheduled. When was that going to -- it  
20 was a month after that.

21 So there are opportunities to find these  
22 in different types of inspections that are done. And  
23 we don't review every single calculation change that  
24 a licensee makes as part of an amendment review.  
25 We're assuming that the 50.59 process works, and we

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1 verify that through the inspection process.

2 MR. APOSTOLAKIS: I still don't understand  
3 what 50.59 has anything to do with this. It has  
4 nothing to do with this. This was an observation.

5 MR. ENNIS: No, it's --

6 MR. APOSTOLAKIS: Why not?

7 MR. ENNIS: Because there are procedure  
8 changes that are made under the 50.59 process, and  
9 those procedure changes didn't adequately account for  
10 their licensing basis.

11 MEMBER WALLIS: Well, I have another  
12 question here, which is sort of related. Is the 21  
13 minutes that's reported here an inspection team  
14 finding? What did the licensee say it was when they  
15 were comparing it with 21.3? You thought it was 21  
16 minutes. What did they think it was?

17 MR. APOSTOLAKIS: They probably assumed it  
18 was a very small change from the 15 minutes that --

19 MEMBER WALLIS: Therefore, they didn't  
20 bother to make any calculation at all? Is that what  
21 happened?

22 MR. APOSTOLAKIS: I don't know.

23 MR. ENNIS: Their assumption was --

24 MEMBER WALLIS: Is it still 15 minutes?

25 MR. ENNIS: Fifteen minutes.

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1 MEMBER WALLIS: Ah. So they claimed it  
2 was still 15 minutes.

3 MR. ENNIS: Right.

4 MR. THADANI: The issue, it seems to me,  
5 is actually broader, because not only for this  
6 Appendix R sequence, for station blackout, for ATWS,  
7 various scenarios, there is going to be less time  
8 available to the operators to take appropriate  
9 actions, because of extended POP.

10 Is that systematically looked at? At  
11 least in terms of risk analysis? I mean, looking at  
12 core damage frequency and large early release  
13 frequency, is that looked at systematically to see  
14 what the human contribution is to risk in terms of  
15 changes, because of the large uncertainties that --

16 MR. APOSTOLAKIS: That's why I wanted some  
17 guidance, specific guidance on --

18 MR. THADANI: It needs to be more  
19 systematic, it seems to me, not just one scenario.

20 MEMBER WALLIS: Right.

21 MR. APOSTOLAKIS: And I don't know, are we  
22 going to discuss 2.11 with the reviewers later, or --  
23 because, again, I find this thing that always bothers  
24 me. I mean, the industry has done something. We have  
25 not really reviewed it, but it's okay. The results

1 are okay.

2 MR. ENNIS: Section 2.11 --

3 MR. APOSTOLAKIS: Yes, that's not your  
4 responsibility.

5 MR. ENNIS: Okay. I was saying Section  
6 2.11 will be discussed as part of the meetings on the  
7 29th and 30th, the overall review of human  
8 performance.

9 MR. APOSTOLAKIS: Okay.

10 CHAIRMAN DENNING: Rick, I think we can  
11 move on.

12 MR. ENNIS: Okay. So, you know, to  
13 summarize, at the current power level, the safe  
14 shutdown capability analysis that was performed in '99  
15 determined it would take 25.3 minutes for the reactor  
16 water level to reach the top of active fuel following  
17 a loss of feedwater, and it would take 15 minutes to  
18 place the RCIC service from the open and shutdown  
19 panels.

20 Therefore, at current power conditions,  
21 the analysis concluded that there was adequate margin  
22 -- about 10 minutes -- to ensure that RCIS was placed  
23 in service and keep the core covered. As I mentioned  
24 as -- for EPU conditions, as shown in the PUSAR --  
25 and that's in Table 6-5 -- the licensee determined the

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1 time to core uncover would be reduced from the 25.3  
2 minutes to 21.3 minutes. They reduced it by four  
3 minutes.

4 The engineering team found that the 15-  
5 minute timeframe to place RCIC in service as  
6 documented in the safe shutdown capability analysis  
7 was actually closer to 21 minutes based on the  
8 procedure that was in effect at that time.

9 Therefore, the team concluded there was  
10 about four minutes' margin at current operating  
11 conditions, but virtually no margin at the proposed  
12 EPU conditions. As the corrective action to the NRC's  
13 inspection finding, the licensee revised the  
14 procedure, as Jeff mentioned, governing the required  
15 operator actions, completed training of the Vermont  
16 Yankee license operators on the revised procedure, and  
17 they performed timed walkthroughs of the actions  
18 required in the procedure with all six operating  
19 crews.

20 The results of the walkthroughs was  
21 documented in the licensee's Supplement 22 dated  
22 December 8, 2004, and the operating crew times ranged  
23 from slightly over 12 minutes to about 15 minutes,  
24 with the average time being about 13-1/2 minutes.

25 Based on this information, the NRC staff

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1 concluded that sufficient margin exists of six minutes  
2 to place to RCIC in service during an Appendix R event  
3 at EPU conditions.

4 MR. APOSTOLAKIS: I wonder how reliable  
5 these 13-1/2 minutes are. I mean, there were not  
6 really times on the real accident conditions, were  
7 they?

8 MR. ENNIS: Well, it was a walkthrough of  
9 actual procedure, though.

10 CHAIRMAN DENNING: Is this done on the  
11 simulator? I mean, is all of this occurring within  
12 the control room? And it's done in the simulator?

13 MR. ENNIS: You have to go to the aux  
14 shutdown panel.

15 CHAIRMAN DENNING: So you have to walk  
16 through the plant.

17 MR. ENNIS: Yes.

18 MEMBER WALLIS: Well, that's the whole  
19 question is what's sufficient margin? I mean, you  
20 look at this thing, and you use a judgment that if it  
21 takes 21 minutes and we've got 15 it's okay. Is this  
22 a judgment call?

23 MR. ENNIS: Yes.

24 MEMBER WALLIS: How do you know when to  
25 say, no, it's not enough? Do you --

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1 MR. APOSTOLAKIS: When it's 21 and the  
2 available is 21.3.

3 MEMBER WALLIS: No, that's not -- this  
4 doesn't seem a very convincing answer, then. Besides,  
5 I didn't ask you, George. I --

6 (Laughter.)

7 But I think you need to -- these human  
8 actions, how you decide sufficient margin exists? You  
9 need to explain that.

10 MR. APOSTOLAKIS: If you look at all the  
11 models that people have developed for human error  
12 probabilities, time is just one of the inputs. Here  
13 we are placing our whole argument on their time. I  
14 mean, I don't know how they will react when they  
15 actually have it higher, and they have to go to this  
16 alternate shutdown path. I mean, there are so many  
17 other things that are important.

18 But ultimately, you are right. It's just  
19 a judgment. Ten minutes is good enough now.

20 CHAIRMAN DENNING: Go ahead, Rick.

21 MR. ENNIS: I'll move on, briefly talk  
22 about the periodic testing of the MOV's findings. EPU  
23 review standard RS-001, safety evaluation section  
24 2.2.4, safety-related valves and pumps requires the  
25 NRC staff to reach the conclusion that the licensee

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1 has adequately evaluated the effects of the proposed  
2 EPU on its motor-operated valve programs related to  
3 Generic Letters 89-10, 96-05, and 95-07, and the  
4 lessons learned from those programs to other safety-  
5 related power-operated valves.

6 The inspection team found that the  
7 licensee did not manage NRC commitments and conditions  
8 documented in the safety evaluation for Generic Letter  
9 96-05 MOV periodic verification program.

10 Specifically, in a safety evaluation dated  
11 December 14, 2000, the NRC provided its basis for  
12 accepting Vermont Yankee's response to Generic Letter  
13 96-05, periodic verification of design basis  
14 capability of safety-related power-operated valves.

15 The safety evaluation documented the  
16 licensee's intentions to use motor -- current data  
17 required from the motor control centers, MCCs, as a  
18 way of detecting actuator and valve degradation.  
19 Safety evaluation also documented the licensee's  
20 intention to verify this testing methodology by  
21 comparing the data with direct torque and thrust  
22 measurements at the valve over extended intervals.

23 In addition, the safety evaluation stated  
24 that the licensee would have to determine MCC test  
25 instrumentation accuracies and sensitivities to MOV

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1 degradation, as well as evaluate changes in MCC data  
2 and MOV thrust and torque performance.

3 During the inspection, the team concluded  
4 the licensee had not validated the adequacy of the MOV  
5 test instrumentation to assure its adequacy and to  
6 establish test procedures with adequate acceptance  
7 criteria tied to stem thrust to our available design  
8 margin.

9 Additionally, the team found that MOV  
10 diagnostic testing had been conducted solely from the  
11 MCCs. The team did not identify any examples of  
12 degraded or inoperable valves during inspection. As  
13 part of the corrective actions, the licensee, in  
14 Supplement 16, dated September 30, 2004, committed to  
15 revise the MOV periodic verification program to  
16 include periodic at-the-valve testing and to formalize  
17 the process for DC motor trending by December 1, 2004.

18 In Supplement 32, dated September 10,  
19 2005, the licensee stated this commitment is complete.  
20 The staff's draft safety evaluation concluded the  
21 licensee has demonstrated that the safety-related  
22 valves and pumps will continue to meet the applicable  
23 requirements following implementation of the EPU.

24 MEMBER SIEBER: I take it that Vermont  
25 Yankee doesn't use diagnostic equipment like MOVATS or

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1 any of those?

2 MR. DOERFLEIN: The answer to your  
3 question is, right, they weren't using --

4 MEMBER SIEBER: Diagnostic equipment.

5 MR. DOERFLEIN: -- diagnostic -- but they  
6 have changed, and they are validating with at-the-  
7 valve equipment and comparing it with the MCCs now.  
8 That's the program they're starting to validate now.

9 MEMBER SIEBER: Okay.

10 MR. DOERFLEIN: But their goal is just to  
11 use the MCC testing.

12 MR. JACOBSON: Let me expand. They were  
13 using that type of equipment. The problem was they  
14 were using experimental versions of that equipment.  
15 This testing of motor current from the MCC, and then  
16 drawing analogies with regard to valve thrust and  
17 torque, was an experimental type of application that  
18 hadn't been properly validated.

19 So they actually were cutting edge, but  
20 hadn't properly validated what they were doing.

21 MEMBER SIEBER: Yes. But this -- the  
22 issue has been there for years, and the equipment has  
23 been there for years. And it's not clear to me,  
24 unless they don't want to buy the equipment, why  
25 they're trying to develop something new when they

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1 could just do what everybody else does.

2 MR. JACOBSON: Well, because it's less  
3 intrusive if you do it from the MCC -- it's at time-  
4 saving thing. See, that's the impetus to do it that  
5 way.

6 MEMBER SIEBER: You don't get the  
7 information either, all of the information that's  
8 helpful -- let me put it that way. You get the  
9 essential information.

10 MR. ENNIS: With respect to the finding  
11 related to the condensate storage tank temperature,  
12 EPU review standard RS-001 safety evaluation,  
13 Section 2.6.5, containment heat removal, requires the  
14 NRC staff to review the containment heat removal  
15 system's assessment provided by the licensee and  
16 concluded that the licensee has adequately addressed  
17 the effects of the proposed EPU.

18 This review includes the effects of the  
19 proposed EPU on the analysis of available net positive  
20 suction head, NPSH. The engineering inspection team  
21 found that the licensee used non-conservative  
22 condensate storage tank -- CSC temperatures and  
23 calculations for current plant conditions, as well as  
24 for EPU analyses.

25 As a result of this finding, the licensee,

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1 in Supplement 18 dated October 5, 2004, revised the  
2 ATWS analysis to take into account the higher  
3 suppression pool temperature resulting from the  
4 assumed change in condensate storage tank temperature.

5 The licensee estimated that this change in  
6 condensate storage tank temperature results in a 0.5  
7 degree increase in the suppression pool temperature  
8 from 190 up to 190.5.

9 The staff's safety evaluation concluded  
10 that the effects of this change is acceptable, since  
11 the peak suppression pool temperature as a result of  
12 the ATWS event was previously calculated to be 190,  
13 and the peak suppression pool temperature for the  
14 limiting event is actually the LOCA. And that  
15 temperature is 194.7.

16 Therefore, the staff concluded the effect  
17 of the change in CFT temperature was acceptable, since  
18 the limiting suppression pool temperature would not be  
19 exceeded.

20 MEMBER WALLIS: And this is the  
21 temperature we saw earlier today, which requires NPSH.

22 MR. ENNIS: Yes. I think it was 195.

23 MEMBER WALLIS: This is some other  
24 structural limit or something rather than NPSH on  
25 temperature? Is there some other limit on

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1 temperature, other than NPSH? There is, isn't there?

2 MEMBER SIEBER: Well, the higher the  
3 temperature, the higher containment pressure. And  
4 ultimately you get to a structural limit on  
5 containment. That's a long ways away.

6 MEMBER WALLIS: There's some limit on the  
7 air space temperature for structural reasons, isn't  
8 there? Well, maybe we'll look at that some other  
9 time, but that's also in the SER. I need to connect  
10 the two somehow.

11 MR. ENNIS: In conclusion, for all four  
12 findings that the NRC staff determined impact of --

13 MEMBER WALLIS: Excuse me. When you said  
14 the limiting temperature will not be exceeded, do you  
15 mean there's some other temperature which is bigger  
16 that -- in a different event; therefore, we don't need  
17 to worry about this.

18 MR. ENNIS: Right.

19 MEMBER WALLIS: It's not some sort of  
20 limiting criteria.

21 MR. ENNIS: No. No.

22 MEMBER WALLIS: Okay.

23 MR. ENNIS: The LOCA event is the limiting  
24 event.

25 MEMBER WALLIS: Okay.

1 MR. ENNIS: In conclusion, for all four  
2 findings the NRC staff determined the impact of the  
3 EPU review, the licensee submitted supplements to the  
4 application to address the findings. The staff has  
5 reviewed this information and concluded that the  
6 issues have been adequately addressed for the proposed  
7 EPU.

8 I also wanted to just briefly summarize  
9 the whole engineering inspection effort. We believe  
10 the inspection was responsive to the Vermont Public  
11 Service Board request for an independent assessment in  
12 terms of the hours spent, the scopes of the  
13 inspection, and the independence of the team.

14 MEMBER WALLIS: It's not just the scope.  
15 I think it's also the focus, that you focused on  
16 certain things which were important. It's not just  
17 the scope itself, but --

18 MR. ENNIS: Correct. We also considered  
19 that the pilot approach, inspection approach, is an  
20 improvement over the vertical slice inspection  
21 approach.

22 All of the inspection findings were of low  
23 safety significance and were not indicative of any  
24 programmatic concerns. All of the inspection findings  
25 have received followup inspection by the NRC for the

1 licensee's corrective actions, and the four findings  
2 that impacted the review have been adequately resolved  
3 as addressed in the staff safety evaluation.

4 MEMBER WALLIS: Well, they have low safety  
5 significance, unless the way in which they treat  
6 operator actions is sort of generic across the whole  
7 -- I know it's universal across the whole plant. I  
8 mean, maybe there is a problem with operator actions  
9 going beyond this particular one. I don't know. I  
10 haven't -- did you follow up to say, "Well, look,  
11 these operator actions were not treated very well, how  
12 about other ones"?

13 MR. JACOBSON: That was one of the issues  
14 that we did look at extent of conditions to see if  
15 there were other operator actions that were  
16 problematic, and we didn't find any that --

17 MEMBER WALLIS: Didn't find any.

18 MEMBER SIEBER: Good.

19 MEMBER RANSOM: Is there a measure of  
20 defense in depth for some of these operator actions  
21 that have to occur in, you know, certain time periods?  
22 You know, if it's -- if they fail, does it result in  
23 core damage?

24 MR. JACOBSON: I think it would depend on  
25 the scenario as to whether core damage would occur and

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1 what other assumptions you would assume in that  
2 sequence.

3 MR. APOSTOLAKIS: Well, you do conclude  
4 that all of your inspection findings were of low  
5 safety significance, right? So you didn't think  
6 that --

7 MR. JACOBSON: Well, that's based on the  
8 fact that ultimately, for instance, this operation  
9 action is now it could be done. If it couldn't be  
10 done, then you would have to do a --

11 MR. APOSTOLAKIS: So the inspection  
12 findings themselves were not of low safety  
13 significance. As a result of what happened after the  
14 inspection findings, now we don't have a problem with  
15 it.

16 CHAIRMAN DENNING: Well, I don't think  
17 that's the proper -- what he's saying.

18 MR. JACOBSON: Well, even for that one,  
19 you have to look at it for the conditions that existed  
20 at the time. They still had adequate margin, even  
21 with the problem with the procedure, so they could  
22 have performed their actions if that event had  
23 occurred at any time prior. That's how we assess  
24 risk.

25 MEMBER WALLIS: Well, it's sort of iffy,

1 isn't it, because we don't know how fast the level is  
2 going down. Maybe if they took 23 seconds -- minutes,  
3 the core would only be uncovered so little that  
4 nothing much would have happened. We don't really  
5 know the consequences of not quite doing it on time,  
6 do we? It isn't a question that the core instantly is  
7 destroyed when you take .1 minutes longer.

8 MR. JACOBSON: Well, that was to begin  
9 core uncovering. Correct.

10 CHAIRMAN DENNING: And exactly what do we  
11 mean by "core uncovering" here, too? There's another  
12 question -- are we talking collapsed level, or what  
13 are we talking?

14 MR. APOSTOLAKIS: Yes, yes, yes, yes.

15 MR. JACOBSON: I don't know off hand.

16 MEMBER WALLIS: So it doesn't mean much to  
17 me until you've coupled the thermal hydraulics with  
18 the PRA in a rational way.

19 MEMBER KRESS: It's not hard to calculate.  
20 You're just boiling down the water in --

21 MEMBER WALLIS: All right. I understand  
22 that. But how about the consequence of it not being  
23 quite right? What's the consequence of uncovering an  
24 inch of the core? Probably nothing.

25 MEMBER KRESS: It depends on your

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1 definition of what is --

2 MEMBER WALLIS: It doesn't depend on my  
3 definition. It depends on how --

4 CHAIRMAN DENNING: Well, clearly, there  
5 are some items that we've -- issues that we've  
6 identified here that are a little bit more generic  
7 than just Vermont Yankee that we have to discuss.  
8 Anybody want to discuss anything more on this  
9 inspection, because it is getting close to lunch,  
10 isn't it? And now we have --

11 MR. APOSTOLAKIS: I have a question.

12 CHAIRMAN DENNING: What's that?

13 MR. APOSTOLAKIS: I have a question, Mr.  
14 Chairman, of the committee. Can we have, in the  
15 future, all of the presentations be made by Mr.  
16 Doerflein? He doesn't use more than two slides.

17 (Laughter.)

18 All of them.

19 CHAIRMAN DENNING: I believe that that was  
20 a rhetorical question.

21 The bad news is that we are only going to  
22 have half an hour for lunch. So please be back here  
23 at 1:30.

24 Thank you. Good-bye.

25 (Whereupon, at 12:57 p.m., the

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1 proceedings in the foregoing matter went  
2 off the record for a lunch break.)

3 CHAIRMAN DENNING: It's clear that we're  
4 going to be late getting to the public comments. How  
5 late isn't totally clear at the moment. We're going  
6 to do our best to get there as quickly as possible.  
7 But I think for you members of the public that have  
8 heard -- been with us this morning recognize that it  
9 really is critically important the Advisory Committee  
10 critically review the presentations that are being made  
11 to us. And I hope that you will understand that.

12 Please, would you continue where you left  
13 off?

14 MR. LOBEL: Okay. Again, this is Richard  
15 Lobel. I am a Senior Reactor Systems Engineer with  
16 the Office of Nuclear Reactor Regulation.

17 I think I was talking about required NPSH  
18 and the Reg. Guide position, and maybe I can just  
19 summarize to take some time -- to save some time.

20 The licensee didn't exactly follow the  
21 guidance in the Reg. Guide, which is to perform --

22 MEMBER WALLIS: Rich, could you move a  
23 little bit this way? You're blocking the screen.

24 MR. LOBEL: The licensee didn't exactly  
25 follow the guidance in the Regulatory Guide 1.82,

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Revision 3, about required NPSH below head reduction of three percent, where it says that pump tests should be performed for the amount of time the pump is going to be in cavitation, and then a post-test examination should be done.

The licensee used some data from their own pumps -- I shouldn't say the licensee, but the licensee asked the pump vendor to evaluate the time at reduced required NPSH, and the pump vendor evaluated data from Vermont Yankee pumps, from pumps similar to Vermont Yankee pumps, and then used essentially engineering judgment for the amount of time these pumps could operate -- the Vermont Yankee pumps could operate at these reduced required NPSH values.

The similar pumps were pumps that the pump vendor picked based on the fact that the NPSH requirements of the pumps were identical to Vermont Yankee pumps. In other words, they had the same specific speeds, suction-specific speed, blade inlet angle parameters in the pump that affect NPSH.

On the basis of the pump vendor's expert judgment, the testing that was done, and experience of the staff with testing of pumps under similar circumstances, we accepted the use of the licensee's reduced required NPSH values.

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1           Let me go on to conservatism, because  
2           there's a couple of points I'd like to make in Slide  
3           5-12. The licensee stated that the conservative  
4           initial conditions assumed in the design basis  
5           calculations are responsible for the need to rely on  
6           containment accident pressure.

7           And the staff, after looking at licensee  
8           calculations and sensitivities, agrees with this  
9           statement, but even more it's not limited to just  
10          initial conditions. There are many other assumptions  
11          in the calculation that are conservative.

12          And no one is saying that conservatism  
13          should be removed from these calculations. There are  
14          uncertainties in these calculations that have to be  
15          accounted for, but it is worthwhile to appreciate why  
16          the licensee is in the situation of crediting  
17          containment accident pressure.

18          Also, as we have discussed with the ACRS  
19          in another context, we think there are ways of  
20          treating the conservatism, which give a more realistic  
21          but still conservative result.

22          I'm going to -- I enclosed a list of some  
23          of the conservatisms that are included in the  
24          analysis, and I didn't mean to ever go through all of  
25          these. I just put them in for interest. They would

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1 take a lot of time to explain.

2 So let me go to 5-17 -- page 5-17, and  
3 just say a final observation on conservatism is that  
4 a large factor in making these calculations so  
5 conservative is that all of these conservatisms are  
6 applied simultaneously.

7 MEMBER WALLIS: Rich, can I ask you  
8 something about that? They assume that none of the  
9 paint chips get to the strainer. Is that a  
10 conservative way to look at it? I would think the  
11 conservative thing to do would be to put them all on  
12 the strainer, if you do nothing else.

13 MR. LOBEL: Their decision not to include  
14 paint chips was based on experiments that they did  
15 where they set up a screen and -- and a pump flow  
16 similar to the Vermont Yankee pump flow, and the  
17 decision -- the conclusion that they didn't need to  
18 include paint chips was based on the fact that because  
19 of the large area of the suction screens at the flow  
20 rates they were using, and the specific gravity of the  
21 paint chips, the paint chips weren't reaching the sump  
22 screen.

23 MEMBER WALLIS: This is assuming there's  
24 no chemical reaction or anything that's putting  
25 bubbles on the paint chips and making --

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1 MR. LOBEL: Well, this is -- yes, this is  
2 a BWR, and there's no boron. It's --

3 MEMBER WALLIS: No boron. There's no --

4 MR. LOBEL: It's pure water.

5 MEMBER WALLIS: It's only pure water;  
6 there's nothing else in it?

7 MR. LOBEL: I'm not sure for Vermont  
8 Yankee. Some BWRs operate with hydrogen gas for  
9 stress corrosion and cracking.

10 MEMBER WALLIS: That won't come out on  
11 the --

12 MR. LOBEL: But no other --

13 MEMBER WALLIS: There's no dissolved gas  
14 which will come out on the paint chips and sort of  
15 make them buoyant and in some way --

16 MR. LOBEL: And do what?

17 MEMBER WALLIS: Dissolved gas come out on  
18 the paint chips as the -- as the pool heats up,  
19 dissolved gases come out of solution, and they tend to  
20 come out on particles.

21 MR. LOBEL: Right.

22 MEMBER WALLIS: I just --

23 MR. LOBEL: Well, these tests weren't done  
24 at temperature, I don't believe.

25 MEMBER WALLIS: Okay.

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1 MR. BANERJEE: Was the insulation such  
2 that it can't form particles? No, no, just the  
3 insulation.

4 MR. LOBEL: I don't remember the details  
5 and what kinds of materials they used, but they used  
6 materials typical of Vermont Yankee, and --

7 MR. BANERJEE: Which is what?

8 MR. LOBEL: I don't remember off hand.

9 MR. BANERJEE: Are they particles or fibers  
10 or --

11 MR. LOBEL: In the interest of time now,  
12 I said that I would get you the documents or the  
13 licensee will supply the documents to you. And if we  
14 need to discuss this after you've looked at the  
15 documents, could we do it at another meeting?

16 MR. BANERJEE: Right.

17 MR. LOBEL: Because I really don't  
18 remember all of the details to give you much more  
19 information.

20 MR. BANERJEE: Well, until we do, it's not  
21 necessarily a conservatism.

22 MR. LOBEL: No, I'm not saying it's a  
23 conservatism. And I didn't list it as a conservatism  
24 in the conservatism --

25 MR. BANERJEE: I thought it was.

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1 MEMBER WALLIS: On Slide 15 -- slide 15 it  
2 says value of ECCS strainer head loss used is greater  
3 than predicted. And we're saying, "Well, how about  
4 the assumptions that went into that prediction?"

5 But I think that you're right. We'll come  
6 back to it some day. We'll come back to it --

7 MR. LOBEL: Of the debris that does go to  
8 the screens, this conservatism applies.

9 Okay. So not only are there a lot of  
10 individual conservatisms, but the conservatisms are  
11 applied simultaneously. Vermont Yankee is assumed to  
12 be operating at its maximum power with the quantities  
13 controlled by tech specs, technical specifications, at  
14 their limiting values, with all phenomena such as  
15 break flow, decay heat, heat transfer, occurring in  
16 the most limiting way, and other quantities such as  
17 pump flows and heat exchanger effectiveness at their  
18 most limiting values, all at the same time.

19 5-18. One of the -- one of the  
20 conservatisms -- and we talked about this a little  
21 before -- is the assumption of the worst single  
22 failure, which for this case is failure of the RHR  
23 heat exchanger outlet valve to open, which results in  
24 only one RHR heat exchanger being available to cool  
25 the suppression pool.

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1 With the single failure, the suppression  
2 pool temperature following a large break LOCA is 194.7  
3 degrees Fahrenheit, and credit for containment  
4 accident pressure is needed. Without assuming a  
5 single failure, with all other conservative  
6 assumptions still included, the suppression pool  
7 temperature is 169 degrees, and credit for containment  
8 accident pressure isn't needed, and all other  
9 conservatisms still apply.

10 Another aspect of this calculation, which  
11 was discussed before, is that if I assume a single  
12 failure which results in losing containment pressure,  
13 I would have both trains of suppression pool cooling  
14 available, and this calculation shows that I don't  
15 have to rely then on containment pressure.

16 MEMBER WALLIS: The licensee gave a  
17 presentation which the -- this depended on the initial  
18 pool temperature. This 169 you give is for a low  
19 pool temperature of 80 degrees. If it starts off at  
20 90, I understand the peak is 185 according to that.

21 MR. LOBEL: I don't have the licensee's.  
22 I thought theirs was still conservative, so --

23 MEMBER WALLIS: So your 169 is a little  
24 optimistic perhaps, since you're also going back to a  
25 more realistic prediction of the pool temperature

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1 initially. I'm looking at Entergy slide 11.

2 MR. LOBEL: Yes, 169, case 2. They are  
3 still saying the other inputs are design basis.

4 MEMBER WALLIS: Yes.

5 MR. LOBEL: Which is my understanding.

6 Okay. And let me emphasize again that the  
7 Vermont Yankee calculations are done with the worst  
8 single failure assumption. This calculation just  
9 illustrates the margin that's available and the effect  
10 of crediting containment accident pressure on -- from  
11 just one assumption.

12 On 5-19 is another table that the licensee  
13 provided to the staff in response to a question we  
14 asked about conservatism. And let me go through the  
15 table a little, because this slide and the next slide  
16 I think help answer the question about sensitivities  
17 which has come up here other times.

18 The first item is the decay heat. The  
19 decay heat depends on the nuclear properties of the  
20 reactor core. The conservative assumption is to  
21 select properties which bound the nuclear properties,  
22 regardless of the specific reactor core and cycle.

23 This is what Vermont Yankee has done. A  
24 less conservative approach is to use a value derived  
25 for a specific cycle, and the difference between these

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1 two assumptions is a suppression pool temperature  
2 difference of two degrees.

3 The next item shows the results of another  
4 aspect of the worst single failure assumption. That  
5 is the loss of the -- one RHR heat exchanger. With  
6 the single failure of all injection pump -- with this  
7 single failure, all injection pumps remain in  
8 operation.

9 So if instead of these two LPCI, which is  
10 the same as RHR -- two LPCI and two core spray pumps  
11 injecting into the core, only one core spray pump was  
12 injecting, with many suppression pool cooling, a  
13 reduction in suppression pool temperature of eight  
14 degrees results.

15 This assumption of only one core spray  
16 pump injecting is reasonable for the time of peak  
17 suppression pool temperature, since the core has been  
18 covered for hours and the injection pump is only  
19 making up for boil-off from decay heat and spillage  
20 out the break.

21 MEMBER WALLIS: So this is something the  
22 operator could do.

23 MR. LOBEL: Right.

24 MEMBER WALLIS: If he finds he is getting  
25 not enough NPSH, he can switch off one of his core

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1 spray pumps.

2 MR. LOBEL: Right.

3 MEMBER WALLIS: And still have -- still  
4 has enough water.

5 MR. LOBEL: And I've had informal  
6 conversations with the Vermont Yankee operators in the  
7 control room, and we've kind of confirmed that this  
8 reasonable, and the operators would take actions to  
9 control the pumps.

10 MEMBER WALLIS: Well, I think rather than  
11 informal, you ought to have something that can go in  
12 the record and --

13 MR. LOBEL: Well, what's in the record, I  
14 think it's clear that the operators -- the assumptions  
15 that are made for the pump flow is that the RHR pumps  
16 are operating at runout flow, at full flow, for the  
17 whole transient, short term and long term. And I  
18 think it's clear that the operators, if they have any  
19 choice, aren't going to let the pumps operate at  
20 runout.

21 CHAIRMAN DENNING: Well, the question is,  
22 what do the emergency procedures tell them to do,  
23 isn't it?

24 MR. LOBEL: The emergency procedures are  
25 more in terms of -- of symptoms of keeping the

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1 suppression pool cool and keeping the core covered.  
2 And so that's what they're trying to do, and they  
3 would use I think their judgment about which pumps,  
4 you know, they need to do that. And the emergency  
5 operating procedures give them a choice of ways to  
6 keep the core covered and the suppression pool cooled.

7 The next item is a more realistic flow of  
8 suppression pool water through the RHR heat exchanger  
9 that results in a decrease in suppression pool  
10 temperature of .6 degrees. And the final one is an  
11 assumption of a more realistic RHR service water flow  
12 through the RHR heat exchanger, and this results in a  
13 decrease in suppression pool temperature of 4.8  
14 degrees.

15 Going to the next --

16 MEMBER WALLIS: How about the surface  
17 water -- service water temperature? That makes a big  
18 difference, doesn't it?

19 MR. LOBEL: Well, that wasn't one of the  
20 variables they --

21 MEMBER WALLIS: Service water really is  
22 pretty darn cold at Vermont Yankee.

23 MR. LOBEL: But they're assuming a rather  
24 high value, I think 88 degrees.

25 MEMBER WALLIS: But 88 degrees is

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1 miraculous.

2 MR. LOBEL: Yes.

3 MEMBER SIEBER: That's the standard  
4 temperature for most reactors.

5 MR. LOBEL: Yes, around there, 90 degrees,  
6 yes.

7 MEMBER SIEBER: Right.

8 MR. LOBEL: Okay. The next slide, 5-20.  
9 The licensee used these calculations to show the  
10 effect of conservative assumptions on NPSH  
11 calculations, and I modified their approach just  
12 slightly.

13 The licensee calculated the peak  
14 suppression pool temperature prior to extended power  
15 uprate to be 182.6 degrees. No credit for containment  
16 accident pressure was required for this suppression  
17 pool temperature. The peak suppression pool  
18 temperature as a result of extended power uprate is  
19 194.7 degrees, and credit for containment accident  
20 pressure is needed.

21 If we take the peak suppression -- peak  
22 extended power uprate suppression pool temperature of  
23 194.7 degrees, and subtract the sum of the  
24 conservatisms of the previous table, which is 15.4  
25 degrees, we obtain a suppression pool temperature

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1 below 182.6 degrees, and containment pressure isn't  
2 required.

3 Don't forget that all other conservatisms  
4 such as the worst single failure are still included in  
5 this calculation.

6 To be more realistic, I took a root mean  
7 square of the sensitivity results, and this -- this is  
8 roughly one standard deviation. And subtracting this  
9 root mean square value, 9.6 degrees from the peak  
10 suppression pool temperature, the result is 185.1  
11 degrees, and some credit for containment accident  
12 pressure is still required.

13 But don't forget all of the other  
14 conservatisms are still being applied, including the  
15 worst single failure and the fact that the pumps are  
16 operating at flow rates much greater than would be  
17 expected at the time of peak suppression pool  
18 temperature. The operator would be expected to  
19 throttle the pumps long before the times of peak  
20 suppression pool temperature.

21 One of the conservative assumptions the  
22 licensee makes is that the RHR pumps operate at runout  
23 flow for the duration of the large break LOCA, and, of  
24 course, the operator would be expected to throttle  
25 back from this flow early in the event.

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1           Based on the results of a sensitivity  
2 study by another licensee, which I previously  
3 presented to the ACRS Thermal Hydraulics Phenomena  
4 Subcommittee, removing this one additional pump flow  
5 rate conservatism is probably sufficient to eliminate  
6 the need to credit containment accident pressure.

7           So this exercise illustrates the effective  
8 conservatism on the NPSH analyses, and I hope puts the  
9 Vermont Yankee need for containment pressure in some  
10 perspective. But, again, this discussion is only for  
11 illustration of the source of the need for crediting  
12 containment accident pressure. The Vermont Yankee  
13 calculations supporting the extended power uprate are  
14 done with all of these conservatisms included.

15           In the interest of time, I think we've  
16 already had a discussion this morning of containment  
17 integrity and operator actions, and the staff concurs  
18 with licensee's conclusion that no changes are needed  
19 to the emergency operating procedures.

20           Let me just do one more slide before I get  
21 to the conclusion, and that's 5-23. And one aspect of  
22 the effect of the extended power uprate on containment  
23 integrity can be seen in this table, and it shows the  
24 peak containment pressure as a result of the most  
25 limiting design basis LOCA for pre-extended power

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1 uprate conditions and for the extended power uprate.  
2 And the difference, using the same analysis methods  
3 and assumptions, is only .2 psi.

4 So from the point of view of the maximum  
5 pressure the containment will see after the most  
6 limiting design basis accident, there is essentially  
7 no difference, and the conclusion is that the effect  
8 of the extended power uprate on containment integrity  
9 in terms of peak containment pressure, peak  
10 containment accident pressure, is minimal.

11 MEMBER WALLIS: So we know that the peak  
12 containment pressure is somewhere between 7.8 or  
13 something, which you get by being conservative one  
14 way, and 41.8 if you're conservative the other way.

15 MR. LOBEL: Right.

16 MEMBER WALLIS: And in reality, it's  
17 somewhere in between.

18 MR. LOBEL: Right. And that's another  
19 indication of the conservatisms in the calculations.

20 MEMBER WALLIS: Yes. It would be very  
21 nice to get away from all of this and be realistic.

22 CHAIRMAN DENNING: When does the peak  
23 occur?

24 MR. LOBEL: The peak occurs very early in  
25 the first couple of seconds. The peak pressure is

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1 limited by the flow through the vents and the  
2 downcomers, and that kind of thing. There is a lot of  
3 resistance to flow there. You have to -- it has to  
4 force the water out of the downcomers, and so the peak  
5 occurs at the time the water -- the steam is trying to  
6 be forced into the Torus, into the wet well.

7 CHAIRMAN DENNING: And this constant  
8 pressure upgrade makes it so --

9 MR. LOBEL: Right.

10 CHAIRMAN DENNING: -- insensitive to this.

11 MR. LOBEL: Right. Well, yes, that and  
12 the fact that the most sensitive thing is the  
13 resistance of the vents in the downcomers, and that  
14 isn't changing significantly.

15 So let me just go over the conclusions.  
16 Credit for containment on 5-25. Credit for  
17 containment accident pressure is determined  
18 conservatively. A more realistic but still  
19 conservative calculation would show that credit is not  
20 needed.

21 Based on stringent testing requirements  
22 and the Vermont Yankee EPU safety analyses,  
23 containment integrity is a reasonable assumption.  
24 Credit for containment accident pressure has no impact  
25 on the operator, and the staff finds that the Vermont

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1 Yankee credit for containment accident pressure is  
2 acceptable.

3 MEMBER WALLIS: Now, in the SER you go  
4 through a lot of discussion, or whoever wrote it, and  
5 then the conclusion is simply what's done is  
6 acceptable. There's no rationale presented in the SER  
7 for granting containment pressure credit. I think  
8 that's a -- this is an omission that should be  
9 corrected. You simply go through all the discussion,  
10 and at the end say that, no, it's all acceptable, but  
11 there's no explanation of why this containment  
12 pressure credit should be granted, and what the  
13 rationale is.

14 MR. LOBEL: Well, I tried to do that by  
15 discussing the conservatisms and the fact that --

16 MEMBER WALLIS: But that's okay. I think  
17 the discussion is fine, but it doesn't really -- it's  
18 not tied together with a rationale that leads to a  
19 conclusion. That's all.

20 MR. LOBEL: Okay.

21 CHAIRMAN DENNING: Have you considered --  
22 how significant is the integrated leak rate test  
23 towards assuring the high integrity reliability of the  
24 containment, and here we have this step where we're  
25 going to go from 10 years to 15 years. Should one be

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1 reconsidering that?

2 MR. LOBEL: We've talked about that. I  
3 think Mr. Stutzke can address that better, because the  
4 change in frequency is really based on risk, and he  
5 has been involved in those discussions. But I think  
6 the -- just an overview that the change in risk in  
7 going from 10 to 15 years is pretty minimal, and that  
8 was the basis for the change.

9 CHAIRMAN DENNING: How about going to  
10 five? Just because of added assurance.

11 MR. LOBEL: Going to -- test every five  
12 years?

13 CHAIRMAN DENNING: Test every five years.  
14 Does that give us a higher degree of -- well, we can  
15 see what --

16 MR. LOBEL: I don't know the answer to  
17 that. I imagine it would, but whether it's -- it  
18 would have to, but whether it's significant or not I'm  
19 not sure.

20 MEMBER WALLIS: I think it's not just a  
21 question of risk significance; it's a question of  
22 making a proper case so the public doesn't get  
23 confused. And the idea that you're only going to do  
24 something once every 10 years needs some sort of  
25 explanation. Or maybe it doesn't cost that much to do

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1 it a few more times and reassure people.

2 MR. LOBEL: Well, it's a pretty expensive  
3 test, and it has a large impact on an outage, because  
4 you have realize that while this test is going on,  
5 there can't be any work done in containment. So  
6 essentially while this test is being done, there isn't  
7 a whole lot of other work that can be done on the  
8 outage, so it does have an impact.

9 But let me also point out that this is  
10 just the ILRT for the overall containment that the  
11 frequencies of the Type B and C tests, the  
12 penetrations and isolation valves, haven't been  
13 trained -- changed since Option B. And they are based  
14 on -- they are performance-based.

15 As long as there is good performance, they  
16 can extend the interval to five years. If a  
17 penetration fails a test, then they have to test more  
18 often until -- until they have two successful tests,  
19 and then they can go back to five years again.

20 MEMBER SIEBER: Yes. The Type B and C  
21 tests are testing joints, as opposed to a Type A test  
22 which tests the shell. Okay. And the likelihood of  
23 the shell leaking is -- other than corroding all the  
24 way is minuscule.

25 MR. LOBEL: Right. And this test really

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1 -- the ILRT is really a leak test. It's not meant to  
2 be a structural test per se, although obviously it  
3 does test the --

4 MEMBER WALLIS: Well, the sort of thing  
5 you worry about is what we heard about in another  
6 plant where someone drilled holes in order to do  
7 something. And it happened that the drill holes --  
8 the drill went into the containment.

9 That's what you worry about is something  
10 that someone did inadvertently which was not detected.  
11 It's not as if the thing is solid and you don't expect  
12 anything to happen. That's fine. But there could be  
13 things that you didn't know about.

14 MR. LOBEL: Yes. Well, there was actually  
15 a case of that. I don't know if that's what you're  
16 referring to, but there's a case of that that's  
17 included in the database that's used for the ILRT  
18 extension.

19 CHAIRMAN DENNING: Okay. Thank you.  
20 Let's move on.

21 MR. THADANI: Rich, just one --

22 MR. LOBEL: Yes.

23 MR. THADANI: Rich, your conclusion is  
24 pretty encompassing it seems to me. But you only  
25 talked about LOCA, and you didn't talk about other

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1 accident scenarios.

2 MR. LOBEL: Well --

3 MR. THADANI: So I feel that's going to  
4 come at the next meeting.

5 MR. LOBEL: Well, I'm not sure there's  
6 going to -- I don't know. It's up to the committee  
7 whether there's going to be a next. There wasn't  
8 supposed to be, but the SER addresses the other  
9 events. And I did talk a little about the analysis  
10 methods that were used for the --

11 MR. THADANI: I think we talked about  
12 you're going to cover ATWS, I believe, at the next  
13 meeting.

14 MR. LOBEL: Yes. Well, I was saying that  
15 -- you were saying that ATWS doesn't require realistic  
16 assumptions, but actually the licensee made some --  
17 I'm sorry, some conservative assumptions, and I was  
18 saying that actually they did include some  
19 conservative assumptions.

20 MR. THADANI: But there is a difference  
21 here in terms of the operator actions. They have to  
22 be conducted earlier now than in the earlier --  
23 previous case.

24 MR. LOBEL: Well, we're talking here just  
25 in terms of pump NPSH and --

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1 MR. THADANI: And I'm talking about -- I  
2 understand. I'm talking about that aspect also.

3 MR. LOBEL: Okay.

4 CHAIRMAN DENNING: Okay. Thank you.  
5 Marty?

6 MEMBER SIEBER: Let me ask, before you  
7 disappear, one more question. Which decay heat model  
8 does the licensee use?

9 MR. LOBEL: The 1979 with the 2 sigma  
10 uncertainty.

11 MEMBER SIEBER: Okay.

12 CHAIRMAN DENNING: So when you showed that  
13 variation, it was with that uncertainty in there?

14 MR. LOBEL: Yes.

15 CHAIRMAN DENNING: Oh. Because that also  
16 is significant conservatism. I'm surprised you didn't  
17 identify it.

18 MR. LOBEL: Well, I did say it in my list  
19 -- it's on my list of conservatisms.

20 MR. STUTZKE: Good afternoon. I'm Marty  
21 Stutzke, a Senior Reliability and Risk Analyst in the  
22 Office of Nuclear Reactor Regulation. And I'm here  
23 today to talk about the scoping analysis the staff  
24 performed to look at the proposed credit for  
25 containment accident pressure.

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1 I realize that the staff uses the term  
2 "containment accident pressure." The licensee, in its  
3 documentation, uses "containment overpressure." So  
4 you may see some confusion in my viewgraphs. They're  
5 basically the same that way.

6 Next slide.

7 I thought I would begin, for the benefit  
8 of the public here, to briefly explain how the NRC  
9 uses risk information in reaching its regulatory  
10 decisions. Specifically, the proposed containment  
11 overpressure credit at Vermont Yankee.

12 This is somewhat of a continuation of a  
13 dialogue that the staff has had with this committee in  
14 September and October of this year. Specifically, I'm  
15 referring to the proposed revision to Regulatory Guide  
16 1.82, Revision 3. And I understand we're here to talk  
17 about Vermont Yankee and not that Regulatory Guide,  
18 but they have become intertwined to some extent. and  
19 so, in fact, the VY review has revealed some issues  
20 with our own regulatory guidance.

21 In order to help your understanding of the  
22 chronology, I have developed one for you, so you  
23 understand what we considered and when we asked  
24 questions, and so forth, and it will try to connect  
25 the relationship between the VY review and the Reg.

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1 Guide to some extent.

2 And, finally, I'll give you the details of  
3 the staff scoping risk evaluation.

4 Next slide.

5 I suppose the appropriate way to begin a  
6 discussion of the staff's use of risk information is  
7 to remind the committee and the public that in 1995  
8 the Commission -- that's the actual five-member body  
9 -- as opposed to people like me, I work for the staff  
10 -- but they issued a policy statement which we call  
11 the PRA policy statement, and encouraged a greater use  
12 of PRA techniques to improve safety decisionmaking and  
13 regulatory efficiency.

14 The risk evaluations here for the proposed  
15 Vermont EPU are a direct result of that policy  
16 statement. More to the point, in 1997, a COM was  
17 issued by Commission Jackson -- Chairman Jackson --  
18 COM-SAJ-9708, and the purpose of that COM was to talk  
19 about the nexus between compliance and safety.

20 One of the ramifications of that memo was  
21 the need to consider risk information when reaching  
22 regulatory decisions, even when evaluating non-risk-  
23 informed license amendment requests. Additional  
24 guidance has been developed elsewhere, this regulatory  
25 issue summary 2001/'02, and, finally, Standard Review

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1 Plan Chapter 19, Appendix D.

2 Just by way of --

3 MEMBER WALLIS: Is there anything in this  
4 Review Standard Number 1 about this?

5 MR. STUTZKE: Are you talking about Reg.  
6 Guide 1. --

7 MEMBER WALLIS: No, Review Standard  
8 Number 1.

9 CHAIRMAN DENNING: He means RS-001. Yes,  
10 there's a section in here on --

11 MR. STUTZKE: Yes, I'll get to that.

12 MEMBER WALLIS: I was wondering why you  
13 didn't mention it here. That's --

14 MR. STUTZKE: I'll get to it.

15 MEMBER WALLIS: Okay.

16 MR. STUTZKE: Next slide.

17 As with most of the things we're  
18 discussing, it's rather convoluted. But by way of  
19 clarification, a license amendment request is risk-  
20 informed when it's submitted under a risk-informed  
21 Reg. Guide, like Reg. Guide 1.174.

22 MEMBER WALLIS: When the whole thing is,  
23 right?

24 MR. STUTZKE: Right. Just because it has  
25 some risk information in it doesn't make it a risk-

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1 informed application. Okay?

2 Next slide.

3 Well, as indicated, the Code of Federal  
4 Regulation gives the staff the authority to require  
5 the submittal of information with connection to the  
6 license amendment request. Specifically, Standard  
7 Review Plan Chapter 19, Appendix D, provides the  
8 process by which we obtain risk information about non-  
9 risk-informed license amendment requests.

10 The process is basically as indicated  
11 here. The staff -- that's people like me -- working  
12 through the project manager can go to the licensee and  
13 request risk information. In other words, we've  
14 reached a sticky point. We need to understand  
15 something.

16 Here is where it gets difficult. Because  
17 it's not risk-informed, if the licensee declines, the  
18 burden shuffles over to the staff to show that the  
19 proposed license amendment request raises questions of  
20 adequate protection. Okay? And, therefore, we need  
21 the risk information in order to decide whether or not  
22 that's true.

23 Now, you have to realize it's not just --  
24 the staff has to show, but the staff has to show the  
25 senior NRC management and the Office of the General

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1 Counsel, and actually to the Commission itself, okay,  
2 so this second sub-bullet here is not to be undertaken  
3 lightly.

4 Generally, when we seek risk information,  
5 we expect licensees to address the five key principles  
6 of risk-informed decisionmaking that are listed in  
7 Reg. Guide 1.174. My next slide will list those, so  
8 that you understand what they are.

9 Now, again, if a licensee declines to  
10 provide the risk information, even after we have  
11 demanded it, then the license amendment request could  
12 be denied, if we can't reach a decision on purely  
13 deterministic grounds like that.

14 Specific to extended power uprates, none  
15 of them so far have been submitted as risk-informed  
16 license amendment requests. They have all been non-  
17 risk-informed.

18 However, as Dr. Wallis had noticed, RS-001  
19 Matrix 13 talks about the staff's expectation for  
20 licensees to submit risk information, because there's  
21 a concern that the proposed extended power uprate  
22 could create special circumstances that rebut a  
23 presumption of adequate protection from compliance  
24 with regulations.

25 Now --

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1 MEMBER WALLIS: So when you get to the  
2 end, you can ask for it, and you've got it? Go ahead.

3 MR. STUTZKE: The requirements in RS-001  
4 are consistent with Reg. Guide 1.174. But it's  
5 tailored specific to extended power uprates. In other  
6 words, it lists lessons, and we've learned over  
7 conducting several power uprates -- extended power  
8 uprates over the years, and tries to guide reviewers  
9 as to the sorts of issues that need to be assessed  
10 like them.

11 But realize that our purpose of using the  
12 risk evaluation and requiring licensees to submit them  
13 is we're attempting to probe the proposed extended  
14 power uprate to see if the special circumstances  
15 exist.

16 MEMBER WALLIS: Can I look at the first  
17 bullet here? Are you -- oh, I'm on the next slide.  
18 I'm sorry. Are you on the next slide?

19 MR. STUTZKE: I'm on 6-5.

20 MEMBER WALLIS: Are you still on 5?

21 MR. STUTZKE: Right.

22 MEMBER WALLIS: I'm sorry. I thought you  
23 had gone to the next one.

24 MR. STUTZKE: But it's important you  
25 realize that we're not -- when we're seeking risk

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1 information for a proposed EPU, we're after -- to  
2 detect if we can find something that rebuts --

3 MEMBER WALLIS: Right.

4 MR. STUTZKE: -- a presumption of adequate  
5 protection. Okay?

6 Let's go to 6-6. The top bullets list the  
7 actual five key principles. The proposed changes  
8 meets current regulation.

9 MEMBER WALLIS: Can I look at the first  
10 one here? We were told there was no regulation  
11 regarding containment overpressure credit. If there  
12 were a regulation which said, "Thou shalt not give  
13 containment overpressure credit," then that would mean  
14 that you couldn't use one certain core, because you're  
15 violating the current regulation."

16 MR. STUTZKE: Well --

17 MEMBER WALLIS: So there's sort of a  
18 window of opportunity by being vague about --

19 MR. STUTZKE: This is an abridged version.  
20 It says it either meets current regulations, unless an  
21 exemption to the regulation is --

22 MEMBER WALLIS: Okay. So there is a way  
23 around it. Okay.

24 MR. STUTZKE: Okay.

25 MEMBER WALLIS: Thank you.

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1 MR. STUTZKE: The second key principle was  
2 consistency with the defense-in-depth philosophy, and  
3 I'll speak to some detail about that.

4 MEMBER WALLIS: I always found it  
5 difficult to be consistent with a philosophy. I can  
6 be consistent with a regulation, but this is a rather  
7 -- this is liable to all kinds of interpretation, if  
8 you're trying to be consistent with a philosophy.

9 MR. APOSTOLAKIS: That was put there  
10 deliberately, Graham, because you can never be  
11 consistent with defense in depth.

12 MEMBER WALLIS: Try to explain to the cop  
13 when you're going too fast on the highway that you're  
14 consistent with some philosophy.

15 (Laughter.)

16 MR. APOSTOLAKIS: That's what we're trying  
17 to do, to get away from a compliance culture.

18 (Laughter.)

19 MR. STUTZKE: Okay. The third key  
20 principle was maintain sufficient safety margins.  
21 Should I cringe now, Dr. Wallis?

22 MEMBER WALLIS: Yes, that's fine. That's  
23 okay.

24 MR. STUTZKE: The fourth key principle is  
25 increases in risk should be small and consistent with

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1 the intent of the Commission's safety goal policy.  
2 And, finally, the impact of the proposed change should  
3 be monitored using performance measurement strategies.

4 I think what's important to point out here  
5 is that we use an integrated decisionmaking process.  
6 Licensees need to address all five principles. Staff  
7 will weigh the responses to the licensee against each  
8 principle in order to reach its decision.

9 In other words, we don't reach -- when  
10 we're talking about risk-informed license amendment  
11 request, it's not judged strictly on whether or not it  
12 meets a numerical risk acceptance criteria. As a  
13 matter of fact, we have no risk acceptance criteria;  
14 only guidelines. Okay? A licensee could meet the  
15 guidelines and still be rejected.

16 MEMBER SIEBER: What would be the basis  
17 for rejection in those circumstances? Uncertainty?

18 MR. STUTZKE: Could be uncertainty. But  
19 the risk guidelines speak to the fourth principle.  
20 Okay. So he could be rejected because of issues on  
21 defense in depth or safety margin or traditional  
22 engineering.

23 MEMBER SIEBER: Okay.

24 MR. STUTZKE: Okay. Besides 6-7 and 6-8  
25 are my chronology of the risk evaluation that has gone

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1 on so far, I put this here as kind of your road map  
2 through the process. But I think it points out three  
3 things. One is we've been working to understand the  
4 risk implications of the proposed containment  
5 overpressure credit since we first got the EPU  
6 application from Entergy. My first RAI to Entergy  
7 addressed overpressure, and that was issued in  
8 December of 2003.

9 So you could meet the guidelines and still  
10 be rejected.

11 MEMBER SIEBER: What would be the basis  
12 for a rejection in those circumstances? Uncertainty?

13 MR. STUTZKE: Could be uncertainty. But,  
14 again, the risk guidelines speak to the fourth  
15 principle. Okay? So you could be rejected because of  
16 issues on defense in depth or safety margin or  
17 traditional engineering.

18 MEMBER SIEBER: Okay.

19 MR. STUTZKE: Okay. Slides 6-7 and 6-8  
20 are my chronology of the risk evaluation that has gone  
21 on so far. I put this here as kind of your road map  
22 through the process, but I think it points out three  
23 things.

24 One is we have been working to understand  
25 the risk implications of the proposed containment

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1 overpressure credit since we first got the EPU  
2 application from Entergy. My first RAI to Entergy  
3 addressed overpressure. And that was issued in  
4 December of 2003.

5 Second of all, as you will see here, there  
6 have been numerous interactions between the staff and  
7 you guys concerning the proposed revision to reg guide  
8 1.82. At one of those meetings, Dr. Kress had  
9 suggested we expand our risk evaluation to consider  
10 more types of initiating events. And we have done  
11 that. That is my way of letting you know I actually  
12 listen to what you tell me.

13 MR. APOSTOLAKIS: But did you actually  
14 include late containment failure in your --

15 MR. STUTZKE: I'll get to that.

16 (Laughter.)

17 MR. APOSTOLAKIS: You listen up to a  
18 point, right?

19 MR. STUTZKE: Finally I would like to  
20 point out that the version of the staff's safety  
21 evaluation report that you have now was issued on  
22 October the 21st. That is the same date that we got  
23 the partial risk evaluation from Entergy, supplement  
24 38.

25 Supplement 38 actually contained about 30

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1 pages of text that addressed principles number 1, 2,  
2 3, and 5. You'll notice 4, which is my forte, the  
3 actual risk assessment, wasn't supplied until October  
4 the 26th. That supplement alone has 303 pages with  
5 the result that we're still in the process of  
6 reviewing it.

7 MEMBER WALLIS: They're not pages of text  
8 in the normal sense.

9 MR. STUTZKE: There are text. There are  
10 computer printouts.

11 MEMBER WALLIS: The text is very brief.  
12 Most of the pages are details of the PRA printouts,  
13 aren't they? They're pretty brief.

14 MR. STUTZKE: Yes. But it's possible to  
15 ferret out. When you read that, you understand what  
16 they're actually --

17 MEMBER WALLIS: Some people can ferret it  
18 out, yes. It would help to have more guidelines to  
19 know how to interpret all those pages of printout.

20 MR. STUTZKE: Yes. It's a case in point.  
21 I expect to ask RAIs of the licensee to --

22 MEMBER WALLIS: Clarify.

23 MR. STUTZKE: -- clarify what has gone on.  
24 Okay. Let's talk about the scoping risk evaluation  
25 that the staff performed that's on slide 6-9.

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1 As was discussed earlier today, it seems  
2 clear that a realistic thermohydraulic calculation of  
3 available net-positive suction had indicates that no  
4 containment overpressure credit is actually required.

5 MEMBER WALLIS: Do you know what  
6 realistically conservative means? I know what  
7 conservative means. I know what realistic means.  
8 Somewhere in between is this hybrid, which is neither  
9 one thing nor the other.

10 MR. STUTZKE: Well, the phrase was coined  
11 by our Chairman. So I will defer to him.

12 MEMBER WALLIS: But you must know what it  
13 means if you make this conclusion. So maybe you can  
14 tell us --

15 MR. STUTZKE: Specifically with respect to  
16 --

17 MEMBER WALLIS: When we next meet, you  
18 will tell us what you really mean, how to interpret  
19 that?

20 MR. STUTZKE: Well, specifically with  
21 respect to containment overpressure, from discussion  
22 with the licensee and Mr. Lobel, one of the  
23 conservatisms he had listed there, no overpressure  
24 credit is required.

25 MEMBER WALLIS: I think that's what you

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1 mean, that Mr. Lobel has 15 conservatisms he can  
2 remove. He removed one or two. And the problem goes  
3 away. You think that has now become realistic enough  
4 that you can reach a decision. It's a judgment of  
5 some sort.

6 MR. STUTZKE: That's right. But, as you  
7 had noted earlier today, PRAs' attempt to model the  
8 actual plant attempts to be a realistic analysis like  
9 this. So now we have raised the philosophical issue  
10 that you had before.

11 What is the change in core damage  
12 frequency from credit in the containment overpressure?  
13 Realistically the number is zero because the  
14 overpressure is not required realistically.

15 So when I discussed the staff's scoping  
16 risk evaluation, I think the appropriate way to look  
17 at it is that we're doing a sensitivity analysis to  
18 try to capture modeling uncertainties.

19 The uncertainty is in the success  
20 criteria. Do you need the overpressure or not? If  
21 you do, it changes the systems required to prevent  
22 core damage in the risk assessment. And that is  
23 something we can examine pretty well.

24 So in order to do this analysis, I made  
25 the assumption that core damage will occur only if all

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1 of the following conditions occur. You need to  
2 discharge reactor coolant into the suppression pool in  
3 order to heat it up. You need to run either the  
4 low-pressure core injection or the core spray pumps in  
5 order to provide inventory control or decay heat  
6 removal. You have to lost containment integrity,  
7 which is the loss of overpressure, which leads to the  
8 inadequate net-positive suction head. And, finally,  
9 as a realization, the operator needs to get involved  
10 to initiate suppression pool cooling.

11 MEMBER WALLIS: On bullet number 2 here,  
12 you don't have to run all the pumps, do you?

13 MR. STUTZKE: Not in PRA space.

14 MEMBER WALLIS: So your success criterion  
15 is that one pump works?

16 MR. STUTZKE: One pump works.

17 MEMBER WALLIS: That's good enough.  
18 That's your success criterion.

19 MR. STUTZKE: That's right.

20 MEMBER WALLIS: One out of four  
21 essentially?

22 MR. STUTZKE: One out of four. Now, I  
23 think I would like to emphasize the last bullet there  
24 is how the operator got involved. If containment  
25 integrity is lost, say, before the LOCA occurs, it's

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1 lost and it's undetected and the plant is operating  
2 that way for some time or there is a failure perhaps  
3 of the containment isolation system so that the  
4 overpressure is lost right about time zero like this  
5 to the point where the containment never pressurizes  
6 following the LOCA, that doesn't immediately cause a  
7 loss of net-positive suction head to the pumps. The  
8 reason is there's a lot of water in the suppression  
9 pool at room temperature. And it takes time to heat  
10 that inventory up.

11 Now, I've described to this Committee  
12 before I have done a hand calculation just looking at  
13 the massive water in the suppression pool and  
14 indicated a pretty simple decay power curve and  
15 concluded it takes about four hours to heat this up.

16 Realizing I'm not a thermohydraulic  
17 analyst, this is a freshman-level type of calculation,  
18 we asked the licensee to make a real thermohydraulic  
19 calculation. They ran the MAP code, and they  
20 confirmed that four hours is about the right time.

21 MEMBER SIEBER: Isn't it a fact that if  
22 you lose containment integrity, now you've got a hole  
23 in containment and you never get to the temperatures  
24 that you would otherwise achieve if you had  
25 containment integrity because the heat has gone out?

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1 MR. STUTZKE: That is true.

2 MEMBER SIEBER: Did you take that into  
3 account?

4 MR. STUTZKE: No. We're not accounting  
5 that.

6 MEMBER SIEBER: That's a --

7 MEMBER WALLIS: Are you running the RHR  
8 system when you are cooling this pool?

9 MR. STUTZKE: No. This four-hour heat-up  
10 is if all RHR pumps have failed, all --

11 MEMBER WALLIS: Are you assuming some  
12 other things fail as well?

13 MEMBER SIEBER: Yes.

14 MR. STUTZKE: Yes. Okay.

15 MEMBER WALLIS: So this is realistically  
16 conservative or this is overly conservative?

17 MR. STUTZKE: I think it's pretty  
18 realistic.

19 MEMBER WALLIS: If all pumps fail, all of  
20 RHR's pumps fail?

21 MR. STUTZKE: Well, what we're trying to  
22 get on is a timing here.

23 MEMBER WALLIS: I know. I understand.

24 MR. STUTZKE: How much time could we  
25 possibly have here?

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1 MEMBER WALLIS: So you really do a  
2 conservative analysis? If all the heat goes into the  
3 pool, I don't see how anything could be much more  
4 conservative.

5 MR. STUTZKE: Okay. 6-10. So let's talk  
6 about how the scoping risk model was developed. It's  
7 basically a modification of the SPAR models,  
8 Standardized Plan Analysis of RISK models, that are  
9 developed by the Office of Research. These models are  
10 simple PRAs that are used to drive the significance  
11 determination process as well as the accident sequence  
12 precursor program.

13 The SPAR model was benchmarked against the  
14 licensee's PRA back in 2003. Okay?

15 MEMBER SIEBER: So that's pretty good.

16 MR. STUTZKE: Well, we understand where  
17 the disagreements are --

18 MEMBER SIEBER: Okay.

19 MR. STUTZKE: -- is the appropriate way to  
20 characterize it. The SPAR model itself has 11  
21 transient initiating events, 5 types of LOCAs, small,  
22 medium, and large, as well as inadvertent open relief  
23 valves and interfacing system LOCAs. It models what  
24 I will call special sequence types, such as station  
25 blackout, stuck-open relief valve scenarios, and

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1       countless like this.

2               You have to realize that the SPAR model is  
3       only what we call a level I PRA type of model. In  
4       other words, it ends at a consideration of core  
5       damage. So it's not considering the consequence of  
6       the behavior of the containment to that much. It  
7       doesn't consider external events, like seismic or  
8       fires or things like this.

9               6-11. What you have here is a picture of  
10       an event tree. This is the logical modeling tool that  
11       risk analysts use to delineate accident sequences. I  
12       thought I would put that up so the licensee could  
13       actually see what I was doing in PRA space. And I  
14       thought it would be of some interest to the public.

15               On the left-hand side of the tree -- first  
16       of all, there are many, many trees like this. I  
17       picked perhaps the most simple one, which was large  
18       break LOCA. On the left-hand side of the tree, you  
19       see the initiating event: large LOCA. That is the  
20       single line.

21               To read this tree, the upward branches,  
22       when it goes upwards on the page, that is success.  
23       The downward branch is failure. Okay? So you read  
24       the first event, the large LOCA occurs. We asked the  
25       question, is the reactor shut down?

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1           The reactor is not shut down. You  
2 transfer down to sequence here, number 27, all the way  
3 at the bottom of the page. We say core damage occurs,  
4 end of discussion.

5           MEMBER WALLIS: Seventeen? Number 17?

6           MR. STUTZKE: Seventeen is all the way at  
7 the bottom of the page. If the reactor is shut down,  
8 we then ask, does the vapor suppression system work?  
9 If the vapor suppression system fails, we go to the  
10 bottom of the page. It's sequence 16. And we say  
11 core damage occurs and so on and so forth through this  
12 tree.

13           The essence of the PRA, what we want to do  
14 is calculate the probabilities of whether it goes up  
15 or it goes down. Now, that's a perhaps overly  
16 simplistic explanation of how we go about calculating  
17 the probabilities, but that's the nature of it.

18           What I did in order to handle the proposed  
19 containment overpressure credit was I introduced an  
20 event in the middle of this tree called containment  
21 integrity. Okay?

22           And you'll see that coming into that event  
23 is either the successful operation of core spray or  
24 LPSI pumps. If we're running one of these systems and  
25 the containment integrity is lost, what happens?

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1 Okay.

2 Realize the upward branch here means at  
3 least one core spray pump or one LPSI pump are  
4 working. If the containment integrity is lost, we  
5 come down and we ask a question about the suppression  
6 pool cooling system and the reason goes back to that  
7 four-hour time that we had calculated before, it takes  
8 time to heat up the suppression pool to the point  
9 where the pumps actually cavitate. All right?

10 The only difference between the top  
11 consideration of suppression pool cooling and the  
12 bottom is the timing. In the bottom, the operator has  
13 to get the system lit off within the four hours.

14 On the other hand, if containment is  
15 actually tight, it's withholding pressure, there is  
16 still a need to run suppression pool cooling. That  
17 heat is going to go someplace. And it goes into  
18 heating up the suppression pool. And eventually you  
19 could overpressurize the containment like this.

20 The time frame that's much longer, that's  
21 a 24-hour time frame. Those of you familiar with  
22 reactor safety study, that is sequence TW being  
23 involved in here, the real long-term heat-up.

24 MEMBER SIEBER: What was the assumed  
25 containment pressure at failure? Is it realistic or

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1 the design pressure?

2 MR. STUTZKE: Normally for PRA we use the  
3 realistic failure probability.

4 MEMBER SIEBER: That would be like 100  
5 pounds?

6 MR. STUTZKE: A hundred pounds or so. I  
7 don't know the exact number here.

8 MEMBER SIEBER: Yes. Okay.

9 MR. STUTZKE: So the point being here is  
10 when you read this, you will see I have introduced two  
11 additional sequences here that deal with the loss of  
12 containment integrity and, therefore, the loss of  
13 containment overpressure like this. As I said before,  
14 I had done these or all of the initiating events, all  
15 of the events in the PRA. Okay?

16 Now, one of the ingredients we need in  
17 order to calculate the risk is we need data to  
18 quantify the probability of loss of containment  
19 integrity. And it's broken into three parts: what  
20 I'll call preexisting undetected leaks; containment  
21 isolation system failures, which also include failure  
22 to close the main steam isolation valves. I'd added  
23 the latter one in on the MSIVs after some discussions  
24 with Mr. Sherman. I appreciate him finding the  
25 oversight like that.

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1           As far as the containment isolation system  
2 failures and the preexisting undetected leaks, I  
3 extracted data from the licensee's recent submittal in  
4 the last couple of months for a one-time extension of  
5 the ILRT frequency to 15 years. This, in turn, is  
6 based on a report issued by Electric Power Research  
7 Institute, but it's an older sort of report.

8           What you need to realize is the actual  
9 data for the size of leaks we're talking about is  
10 rather sparse. In fact, there have never been any  
11 failures. So in order to generate a probability, one  
12 is forced to rely on Bayseian statistics with not  
13 informative prior distributions. And I'm glad George  
14 has already left because we would be discussing this  
15 the rest of the day.

16           But realize there is not strong evidence  
17 here that containments fail with holes big enough to  
18 create problems to lose the overpressure.

19           MEMBER SIEBER: Well, there have been some  
20 scaled or containment failure tests. Did you use any  
21 of that data?

22           MR. STUTZKE: No, no. I'm relying  
23 strictly on this new EPRI --

24           CHAIRMAN DENNING: And if you did, you  
25 wouldn't get into that regime where you get that kind

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1 of --

2 MR. STUTZKE: I wouldn't think so, no.

3 CHAIRMAN DENNING: No.

4 MEMBER WALLIS: The most likely failure is  
5 a human action, where something which appears to be  
6 bolted on was not bolted on properly or something or  
7 something wasn't installed properly during some  
8 unexpected maintenance or something like that, but  
9 that is most likely.

10 MR. STUTZKE: Right.

11 MEMBER WALLIS: It's not likely that the  
12 thing is going to pop as a result of the pressure.

13 MR. STUTZKE: Common cause failure of  
14 containment isolation valves, things like that, show  
15 up to be important.

16 MEMBER KRESS: By the way, I think George  
17 would have approved of the non-informative prior  
18 invasion approach.

19 MR. STUTZKE: Right. The reason why I  
20 wanted to point that out is that when you get into  
21 this regime, right, you had heard the licensee talk  
22 about how big a hole he needs, right, 27 L<sub>a</sub>, right?

23 Well, the number that I have is for 35 L<sub>a</sub>,  
24 but, in fact, there have never been any failures of  
25 either size. So you're in this problem. It's very

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1 analogous to calculating the frequency of LOCAs. And  
2 you're well aware of the effort the Office of Research  
3 undertook in the 5046A effort to generate that curve.

4 MEMBER WALLIS: Yes.

5 MR. STUTZKE: Okay. As far as the human  
6 failure events, the one we're talking about is  
7 operator-initiated suppression pool cooling within  
8 four hours.

9 There are two types of human errors.  
10 There's what's called a cognitive error. That is, the  
11 operator doesn't diagnose what's going on in time. He  
12 just runs out of time or he can't decide what he  
13 should be doing like this.

14 Maybe the symptoms are confusing. In  
15 order to calculate that probability, we're using a  
16 report from the, again, EPRI cause-based decision tree  
17 method.

18 I think one of the reasons why that one  
19 was picked is it was developed in part by Dr. Garrett  
20 Perry. He's now the senior-level adviser where I  
21 work. So we had some comfort with it.

22 The other part of the human errors are  
23 what are called action errors or implementation  
24 errors. Now the operator understands what he's doing,  
25 but he pushes the wrong button, reads the wrong gauge,

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1 these sorts of things like that.

2 I'll put this into some discussion here  
3 about the use of ATHENA. Again, it's a pity George is  
4 not here. ATHENA, a technique for human error  
5 analysis, has been evolved by the Office of Research  
6 over many, many years.

7 In the end of the summer, we received a  
8 draft addendum to NUREG 1624. The addendum is  
9 entitled "The ATHENA User's Manual." The office, NRR,  
10 had sent comments back on the use of ATHENA in early  
11 October of this year, so about six weeks ago. And we  
12 have some reservations with what is going on there.

13 So based on discussions within NRR, I  
14 decided I would not employ the ATHENA methodology at  
15 all here. But you will see I have done sensitivity  
16 with many, many other human reliability techniques to  
17 get at it.

18 Okay. As far as the scoping risk model on  
19 slide 6-13, looking at truncation limits on the order  
20 of  $10^{-12}$  per year, which is extremely low frequency  
21 like this, we have done full parametric uncertainty  
22 analysis, 5,000 Monte Carlo samples. It seemed like  
23 it converged appropriately.

24 We're regenerating minimal cut sets every  
25 time we do a sensitivity analysis case because of the

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1 issues over truncation. Again, I pointed out we had  
2 done parametric uncertainties. I also looked at  
3 modeling uncertainties on how big a hole you actually  
4 need to depressurize; another one concerning the MFIB  
5 success criteria; and, finally, the human reliability.

6 MEMBER SIEBER: How big a hole do you  
7 need?

8 MR. STUTZKE: My best model is assuming 35  
9  $L_a$ . And the reason is that is the number in that EPRI  
10 report that was the justification behind the one-time  
11 15-year ILRT.

12 MEMBER SIEBER: Okay.

13 MR. STUTZKE: That 35  $L_a$  is presumed to be  
14 a large release.

15 MEMBER SIEBER: Right.

16 MEMBER WALLIS: How big a hole?

17 MR. STUTZKE: Like that.

18 MEMBER WALLIS: How big?

19 MR. STUTZKE: Physically I don't know. My  
20 guess is a little over a half-inch or so, something  
21 like that.

22 So the results of the analysis are like  
23 this. The change in core damage frequency solely due  
24 to the proposed overpressure credit is on the order of  
25 6 times  $10^{-8}$  per year like this. And I'll point out

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1 that is a real mean value. That is not a point  
2 estimate. Okay?

3 I have also provided probability ranges.

4 MEMBER WALLIS: The licensee got four  
5 percent or something like that?

6 MR. STUTZKE: It's about 2.4 percent.

7 MEMBER WALLIS: The licensee got something  
8 slightly bigger, I think, but it was --

9 MR. STUTZKE: Right. This number is an  
10 order of magnitude higher than mine. That's why they  
11 can expect a lot of RAIs while we try to unravel this  
12 situation like this.

13 At face value, if I take this --

14 MEMBER WALLIS: Well, let's see. If you  
15 are still writing RAIs, how are we going to make some  
16 kind of a decision in two weeks, three weeks?

17 MR. STUTZKE: We will write very fast.

18 MEMBER WALLIS: They will answer very  
19 fast? They will answer very fast, too?

20 MR. STUTZKE: I think so. I think so.

21 If I take these numbers and put them into  
22 the risk acceptance guidelines from reg guide 1.174,  
23 you find out that is, in fact, a small change in core  
24 damage frequency.

25 One of the things I would like to point

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1 out about these risk acceptance guidelines in that  
2 regulatory guide, I've heard a lot of discussion  
3 today, "Gee, if it's below  $10^{-6}$ , it's okay." And the  
4 implication is if it's higher than  $10^{-6}$ , there's  
5 something wrong. That's not true.

6 The risk acceptance guidelines actually  
7 allow delta CDF to go above  $10^{-6}$  as long as the  
8 baseline core damage frequency is below  $10^{-4}$  per year.  
9 I'll hold up -- I don't have a viewgraph of it.  
10 That's what the guidelines actually look like. And  
11 you have to be in the gray area, not the black. So  
12 don't be fooled. And numbers above  $10^{-6}$  are not  
13 necessarily bad. Okay?

14 Now, on slide 6-15, I've tried to provide  
15 a breakdown of the risk profile, what's driving the --  
16 you can see the CDF is dominated by core damage  
17 accidents from transients.

18 The sorts of accidents we're most  
19 interested in, LOCA stuck-open relief valves, are  
20 relatively small contributors overall. The largest  
21 change was in the stuck-open relief valve sequences.  
22 That's about 80 percent of the total increase I saw,  
23 was in stuck-open relief valves.

24 On the next slide, I showed importance  
25 measure for the events that I introduced into the tree

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1 to look at the overpressure credit. They vary. It  
2 depends on which measures to which event is most  
3 important. But, as you would suspect, these  
4 preexisting undetected containment leaks are  
5 important, as is the operator error, as is the failure  
6 containment isolation system. The only one that  
7 doesn't seem to be important are the MSIV failures.

8 So in order to get at these modeling  
9 uncertainties, I did some sensitivity studies.  
10 Starting on page 6-17, I looked at sensitivity to  
11 containment leak size.

12 Now, for the public, in order to  
13 understand that, the big dot is mean value, the  
14 average core damage frequency. The height of the bar  
15 indicates a 90 percent probability bound around that  
16 mean. Okay? So it gives you an idea of how uncertain  
17 we are in the PRA just due to the parametric  
18 uncertainties.

19 My point here is that when you compare  
20 these and you say, "Oh, you know, the core damage  
21 frequency went up by a factor of two," if the  
22 uncertainty is two orders of magnitude, it's not as  
23 important an effect, as you might expect.

24 So my baseline was 35 L<sub>a</sub> leak size. I had  
25 data on actual ILRTs from the separate report, the

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1 number of failures in there, and put that probability  
2 in. So this is saying if you had a leak now at one  
3  $L_a$ , let's assume you've lost the overpressure.

4 And you can see the mean value goes up by  
5 about an order of magnitude. But, still, in  
6 comparison to reg guide 1.174 acceptance guidelines,  
7 it's okay.

8 CHAIRMAN DENNING: Marty, I hate to  
9 interrupt you, but I think we need to talk a little  
10 bit with the Advisory Committee here. We really  
11 should be moving out of this. And I think that it's  
12 pretty obvious here what the magnitude is of results  
13 that Marty has.

14 MR. STUTZKE: Right.

15 CHAIRMAN DENNING: I don't know whether we  
16 ought to go to a conclusions -- there is a question on  
17 the defense in depth. Is there something here to say  
18 on defense in depth?

19 MR. STUTZKE: Oh, absolutely. Let's jump  
20 to 6-21.

21 CHAIRMAN DENNING: Continue.

22 MR. STUTZKE: Okay. One way to look at  
23 defense in depth that PRA is helpful in doing is  
24 looking at the balance between accident prevention and  
25 mitigation. And so I attempted to do that by looking

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1 at the impact of the proposed credit on the  
2 conditional containment failure probability.

3 The CCFP includes both small releases,  
4 large releases, early, late. It's all releases put in  
5 there. Okay? And realizing the situation we're  
6 talking about, if containment integrity is lost, it  
7 leads to some sort of release.

8 I'm not willing to commit myself at this  
9 time, whether it's big or small, late or early, like  
10 that, but it's some sort of release. But it plays in  
11 well to the calculation of CCFP. And one can come up  
12 with a fractional change in conditional containment  
13 failure probability as a function of all of the others  
14 in here.

15 But, jumping to 6-23, if I look at that,  
16 I put in generic numbers for BWR mark I that I took  
17 out of the IPE studies. And you can see there's a  
18 relatively small change in the conditional containment  
19 failure probability as a result of the proposed  
20 containment overpressure credit. That suggests the  
21 existing balance is not significantly perturbed.

22 Other things in here when we were talking  
23 earlier before about how to evaluate defense in depth,  
24 standard review plan provides four objectives, talks  
25 about it, doesn't significantly increase existing

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1 challenges to the integrity of barriers. We don't  
2 change the failure probabilities of barrier, just not  
3 introduce newer, additional failure dependencies that  
4 significantly increase the likelihood of failure.  
5 I'll emphasize the word "significant." And, finally,  
6 redundancy and diversity are adequate to ensure  
7 compatibility with the risk guidelines.

8 Okay. So I have an evaluation here  
9 starting on 6-25 against these criteria. Crediting  
10 containment overpressure doesn't affect the  
11 frequencies of LOCAs or transient-induced stuck-open  
12 relief valves. It doesn't affect the normal plant  
13 operation. It won't affect the probability of  
14 containment failure. Containment will either fail or  
15 not, as it always says.

16 MEMBER WALLIS: Can I ask what is going to  
17 happen now? I mean, you're telling us this, but it's  
18 not yet in the SER.

19 MEMBER KRESS: Right.

20 MEMBER WALLIS: Something like this will  
21 be in the SER?

22 MR. STUTZKE: Yes.

23 MEMBER WALLIS: And it will also have the  
24 RAI responses considered and all of that? We can see  
25 this by the time we next meet with you folks?

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1 MR. STUTZKE: It will have the results of  
2 the RAI responses but not the --

3 MEMBER WALLIS: I think we ought to have  
4 the up-to-date SER hopefully by the time we meet with  
5 you again.

6 CHAIRMAN DENNING: I am actually going to  
7 draw this to a conclusion now, Marty.

8 MR. STUTZKE: Okay.

9 CHAIRMAN DENNING: Thank you. I think we  
10 really do understand this.

11 MR. STUTZKE: Yes.

12 CHAIRMAN DENNING: And we will look at it  
13 more carefully.

14 MR. STUTZKE: Great.

15 MEMBER KRESS: These slides relate to the  
16 containment overpressure, but you're not drawing the  
17 conclusion about the power uprate?

18 MR. STUTZKE: No. I'm here specifically  
19 to the containment overpressure.

20 MEMBER KRESS: Right. Okay. I wanted to  
21 get that clear.

22 CHAIRMAN DENNING: We now are going to  
23 move into a public comment period. And we have a  
24 number of speakers. Are there any congressional  
25 staffers here? If they are, would they like to make

1 a presentation or a statement? Any public officials  
2 who are here who would like to make any statements?

3 (No response.)

4 CHAIRMAN DENNING: Okay. Now we're going  
5 to ask you, the speakers, to come here to the front.  
6 I'm going to move these out of the way. Can you move  
7 those out of the way? And we're going to have people  
8 sit up here at the table.

9 We have right now 35 speakers. So we only  
10 have until 5:30. So if things move as well as they  
11 did yesterday, we should be able to accommodate those.

12 If we run out of time, then people are  
13 going to have to submit their statements. And they  
14 can do that through Ralph. We'll again tell you at  
15 the end how to do that.

16 MEMBER WALLIS: Mr. Chairman, I have a  
17 question about the scope of these statements. I mean,  
18 are any statements having anything to do with nuclear  
19 power allowed or is it specific to Vermont Yankee and  
20 the uprate? Because that's really what we're looking  
21 at.

22 CHAIRMAN DENNING: Well, I --

23 MEMBER WALLIS: I just wonder. I mean,  
24 the public can say anything they like.

25 CHAIRMAN DENNING: Yes.

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1 MEMBER WALLIS: But I would hope that  
2 people who have the most to say that will influence  
3 our decision directly would actually be allowed to say  
4 it.

5 CHAIRMAN DENNING: Certainly. People can  
6 say whatever is on their mind, but obviously those  
7 things that relate most directly to the Vermont Yankee  
8 uprate have the greatest impact on us.

9 The first speaker, then, will be Rod  
10 Gander. And, again, please come up to the microphone  
11 here, this one up here. On deck is Joe Hoppenfeld.  
12 And in the hole if you are discuss is Paul Blanch.

13 MR. GANDER: Well, thank you. Briefly I  
14 would like to -- can you hear me? I'm not sure this  
15 is working.

16 CHAIRMAN DENNING: Yes.

17 MR. GANDER: Okay. Fine. To identify  
18 myself, I am Rod Gander. I am the state senator  
19 living in Brattleboro serving in Montpelier.

20 I will try to cut this in half and be  
21 about five minutes because I know you have so many  
22 people. Unfortunately, I really do think we need to  
23 talk about this in context.

24 I certainly understand your role. For  
25 instance, I didn't understand much of what has just

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1 been said the last hour. So I had to keep my eyes  
2 open this way because I am not a scientist. And I  
3 couldn't follow it.

4 Certainly I understand your role is to  
5 give advice to the NRC about safety. So I understand  
6 that. But at the same time, we are all human. And I  
7 think that we have to look at this thing in context.  
8 I really do. And I want to talk about my frustration  
9 over a period of time, not with you, my frustration  
10 with the process, the frustration of most of my  
11 friends and neighbors.

12 First of all, my understanding is that you  
13 do do the independent safety review, and we're  
14 actually counting on you. We really are counting on  
15 you. This is about the last opportunity that we have  
16 to speak and so on.

17 I think that all of us really believe that  
18 you are honorable guys. I really mean that. If there  
19 had been any discourtesy at all, it only comes from  
20 the frustration that we have faced in this process  
21 over the last two or three years.

22 I think that probably in your service, you  
23 have faced frustration at times as well in attempts to  
24 get information and also in not having recommendations  
25 that you have made to the NRC be adopted by the NRC.

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1 So you don't have total control. We understand that.  
2 But you are a powerful voice, very powerful voice.  
3 And we hope to convince you of the merits of our case.

4 First of all, we worry about the  
5 democratic process. We have had two referenda. They  
6 really are plant or no plant. That's what it amounts  
7 to, no matter what the wording is and so on. And they  
8 were overwhelmingly that we do not want the plant  
9 relicensed and also that we do concomitantly want to  
10 go through the uprate process, which will lead to the  
11 plant being relicensed. I feel strongly about that.  
12 I will go into that in a minute or two.

13 In those referenda, in one of them, all of  
14 the towns except two in the County of Windham voted  
15 overwhelmingly against the company position in the  
16 uprate and the relicensing. In the other ones, all  
17 but one voted and so on.

18 So you exercise your democratic privilege,  
19 which we have done. And I'm not blaming you folks.  
20 I'm in the legislature. I couldn't convince them. So  
21 whenever here locally exercise our democratic  
22 privilege, and we see no result, which, unfortunately,  
23 could even be a forerunner or a reason for civil  
24 disobedience. And what do you do when you --

25 (Applause.)



1 MR. GANDER: I'm not advocating this. I  
2 in no way advocate civil disobedience because I don't.  
3 But, anyway, the frustration we must understand is  
4 real.

5 And it is not just the usual suspects who  
6 come to these meetings and so on. These people  
7 represent hundreds and hundreds of other people who  
8 are not here today. The problem in the Vermont Yankee  
9 has -- one of the frustrations has been the  
10 compartmentalization.

11 You know, the Public Service Board only  
12 handles economic consequences. You handle safety.  
13 And in the meantime, within the company, maybe up to  
14 -- there was a decision, not a decision. They talked  
15 about the big three within the company. You pick them  
16 off one at a time.

17 You've got your uprate. You've got your  
18 hard cask. You've got your relicensing. Pick them  
19 off one at a time. As long as you separate things and  
20 put them in a vacuum or, rather, don't put them into  
21 context, it's a lot easier to go ahead on that basis.

22 I feel strongly that from the very  
23 beginning, all of these things should have been  
24 bundled. All of them should have been bundled and  
25 handled in that manner. It's been absolutely

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1 maddening.

2 Now, when you go -- again, I'm off the  
3 track for you guys. But when you go to the Public  
4 Service Board, we're talking about the economic  
5 impact. Public Service Department withheld approval.  
6 It actually gave tentative approval until the company  
7 came up with \$27 million.

8 Now, to the ordinary public and to me,  
9 that just sounds like certificates of public good are  
10 for sale. What's the price? Is it 27 million? Is it  
11 50 million? Then we get to the uprate. No. I'm  
12 sorry. Hard cask storage last year up in the  
13 legislature.

14 Negotiations are held. And the last final  
15 bit of negotiation is what is the price. And the  
16 price was 2 million, 2,500,000, something like that,  
17 that if the uprate goes through, that will be -- those  
18 funds will go for a very useful purpose. They will go  
19 for nuclear energy concerns and things like that.  
20 Nevertheless, once again, it sounds like a price. Dry  
21 cask is for sale.

22 So you can begin to understand the  
23 frustration, but at the same time, let me go to the  
24 science side, which I know almost nothing about.  
25 We're coming off of decades and decades along a

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1 moratorium on the building of nuclear plants. There  
2 has been a reason for that. There really has.

3 And now we have a new energy policy, much  
4 of it dedicated to going back into nuclear energy.  
5 This policy of this particular administration is very  
6 strong now. That's the thing when wanting to drill  
7 for a teacup of oil in Enwar. And then we're also  
8 going to have this return to nuclear energy. We're  
9 returning to nuclear energy not having solved in the  
10 slightest effect, any way whatsoever, the problem of  
11 nuclear waste.

12 Now, if you're talking safety, if you're  
13 going to look at like the presentation you just had  
14 and, you know, this valve goes into that pipe and it  
15 comes over here and does this and that's all you're  
16 looking at, you're not looking at safety, not in its  
17 entirety. Maybe you don't have the purview to look at  
18 it in its entirety.

19 But putting hard cask storage on the banks  
20 of a Connecticut river forever -- and it might as well  
21 be forever as far as we are concerned -- one estimate,  
22 the best estimate, I've heard of how long it would  
23 take to get rid of those casks, that's if Yucca  
24 Mountain did open -- it's not going to. We all know  
25 it's not. They just cut the funding last week.

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1 Congress cut the funding for Yucca Mountain. It's not  
2 going to open.

3 So, even if they find another repository,  
4 they get right on it, and you start moving the stuff  
5 out, Vermont Yankee probably will be in the line.  
6 There's so much of the stuff around it takes a while  
7 to get -- you have to line and queue up to when you're  
8 going to get the stuff gone. And the estimate, the  
9 best estimate, I have heard is with a minimum of 40  
10 years, minimum 40 years.

11 Okay. Now, this is on the banks of the  
12 Connecticut River. My understanding is that in the  
13 geological survey -- of course, that comes into your  
14 safety, obviously comes into your safety, concerns  
15 that we are using data that wouldn't make sense, data  
16 from 1960 to 1990, 30-year period, rainfall, this,  
17 that, and everything else.

18 The only problem with it is there hasn't  
19 been a single hurricane come up here in that time. We  
20 had plenty before. We had 1939. We had Donna in '57  
21 and so on. And in 1927, we had if not the flood of  
22 the millennium -- and it wasn't, but it was certainly  
23 the flood of the century, which took the major island  
24 away, et cetera, and so on.

25 So, you know, we can't fool around with

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1 this waste. We really can't. And it isn't fair to  
2 ask them. It's going to be there anyway, I admit, no  
3 matter what you decide, our task is the best method at  
4 the present time to store the damn stuff. But to add  
5 to it is really I think unconscionable. It's just  
6 plain wrong.

7 (Applause.)

8 MR. GANDER: Scientists can do wonders,  
9 absolutely wonders, and have and also in technology  
10 and science, absolutely wonders. They cannot change  
11 the half-life of the stuff that is coming out of that  
12 place. They can't change the half-life, which is  
13 thousands and thousands of years. And we don't know  
14 where to put it.

15 Once in a while way back we thought we  
16 would shoot it up into space. That would have been  
17 great. Bury it in the ocean. That would have been  
18 great. We still don't know where to put it.

19 So here's little Brattleboro. It's one  
20 plant. And here the real context is far broader. The  
21 real context is you have an opportunity to really say  
22 this isn't making sense. This really I think would be  
23 very hard for you. I really do think it would be very  
24 hard for you. But you have an opportunity to say this  
25 really doesn't make sense in the long run. Partly

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1 it's our fault to some degree.

2 Last point. When we had the Arab boycott  
3 in 1973, there was all kinds of investment in  
4 alternative energy. And then the oil spigot was  
5 turned back on. Energy dried up entirely, no longer  
6 competitive, et cetera and so on.

7 We have wasted 35 years, not entirely  
8 wasted, but, on balance, we have really wasted 35  
9 years. Can you imagine where we would be in biomass  
10 and various other things, this and that, where we  
11 would be if we had concentrated for 35 years on those  
12 things? At some point we have to make this an  
13 imperative renewable energy, absolutely imperative.

14 As long as we talk about oil, as long as  
15 we talk about nuclear power with its waste problems --  
16 I'm sorry I said it. I will quit in a minute.

17 One last thing. My understanding -- and  
18 I may be wrong. First of all, I really do believe in  
19 your integrity utterly. I really do. I believe in  
20 the integrity of the engineers and so on at the NRC as  
21 far as that is concerned.

22 My understanding is you have to rely,  
23 absolutely rely, in much of the data on what is given  
24 to you. You have to assume the accuracy of the data  
25 that is given to you. I don't have complete

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1 confidence in that. I really don't.

2 When you have a major self-interest -- and  
3 that is Entergy has obviously -- the estimate on what  
4 this is going to be worth, the uprate is a minimum of  
5 \$20 million a year. So if you spend 60, you amortize  
6 it in 3 years. And the high estimate is a lot more,  
7 lot more, almost a license to coin money. I would  
8 believe in profit for the Entergy things so they can  
9 go on and do this. Profit is fine, but this is  
10 license to steal.

11 In the public posture, I think Entergy has  
12 been extremely clever. I really do. And I admire the  
13 way they have handled things. From the first start of  
14 the premier point of view, when they first started  
15 talking about the uprate originally, they refused to  
16 talk about relicensing, "Oh, that's in the future."  
17 The future isn't 2012. My God, the 2012 is here  
18 today. We all know that. It's right here.

19 So you talk about the uprate, but we'll  
20 get back to that later on. This has been about  
21 relicensing since the day they bought the place.  
22 You've got to understand that that has to be true.  
23 They wouldn't have made the investment unless they  
24 were making a bet. In Las Vegas, they call it betting  
25 on the come.

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1 Well, the difference is if you're looking  
2 at a situation where -- let's take uprate. The NRC it  
3 is my understanding has never refused an uprate. We  
4 think the odds are pretty good. So you're out there  
5 spending your 60 million in there, you know, why does  
6 it sound to us, "Well, a decision hasn't been made.  
7 We'll get around to a decision and everything else.  
8 But in the meantime we've spent \$60 million." Holy  
9 mackerel. Of course, that isn't a whole lot of money  
10 in these days, but at the same time.

11 Anyway, I plead with you. One last thing.  
12 I've got to get out of here. I realize that. I get  
13 so wound up on this damn subject. Just one thing, and  
14 that is this, that when you're talking about economics  
15 and safety, they're absolutely intertwined. They're  
16 inexplicably intertwined. They have to be  
17 intertwined.

18 Brattleboro and Windham County doesn't  
19 even need to have an accident down here. All you need  
20 is an accident within the industry, frankly, in these  
21 kinds of computers and so on. And you can take 20  
22 percent off your grab list within 5 years. That's an  
23 estimate. obviously. I don't have the science  
24 background. But honestly you've got to understand.  
25 But to me the major thing is to stop this process of

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1 building the piles of waste, which we don't have any  
2 idea what to do with them.

3 And I really do thank you for the  
4 privilege of being here.

5 (Applause.)

6 CHAIRMAN DENNING: Okay. Now, the next  
7 speaker is Joe Hoppenfeld. He's going to be followed  
8 by Paul Blanch, Jane Newton, Sally Newton, Ellen  
9 Kinney, in that order.

10 Now, one thing, please. Let's not speak  
11 in the audience while the speaker is speaking. No  
12 problem with applauses afterwards. We understand that  
13 you want to make some statement of support. But  
14 please let's not have any speaking while the speaker  
15 is talking.

16 And I'm assuming that it would be your  
17 desire to have Mr. Hoppenfeld have a little additional  
18 time. Is that true? Yes.

19 MEMBER WALLIS: Mr. Chairman, are you  
20 going to go to 5:30 with no break at all?

21 CHAIRMAN DENNING: Yes. I think we'll go  
22 to 5:30 with no break. And people will get up and --

23 MEMBER WALLIS: We'll get up and come  
24 back?

25 CHAIRMAN DENNING: Get up and come back.

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1 Would someone object if while we're setting this up  
2 perhaps Mr. Blanch came and --

3 MR. BLANCH: No. I'm Mr. Blanch.

4 CHAIRMAN DENNING: Oh, you're Paul Blanch.  
5 I'm sorry. I forgot. What about Jane Newton? Would  
6 she be willing to speak at this time? Do you think  
7 we've got it all set?

8 MS. NEWTON: I'm Jane Newton.

9 CHAIRMAN DENNING: Hold on just a second.  
10 Do you think we've got it or -- in that case, why  
11 don't you just have a seat here for a moment? I think  
12 we're pretty close to having it set up. Sit that  
13 right there for a moment, and I'll introduce you.

14 MR. HOPPENFELD: My name is Joe  
15 Hoppenfeld. I was asked by the coalition to help  
16 them. I was asked by the New England Coalition to  
17 help them with the evaluation of the NRC SER.

18 By way of introduction, I have a Ph.D.  
19 degree from the University of California at UCLA. I  
20 have 40 years of experience in nuclear engineering,  
21 including private industry, AEC, DOE, and NRC. I  
22 published more than 15 papers in peer-reviewed  
23 journals. I own eight to ten patents. I can't  
24 remember how many.

25 The first time I made a presentation

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1 before the ACRS, it was in 1964. And it related to  
2 the burn-up of the SNAP 8 reactors. The last time it  
3 was in year 2000, and it was related to the steam  
4 generator tube rupture and Indian Point 2.

5 Today I would like to focus my attention  
6 on four subjects: steam dryer failure, where I agree  
7 with VY that the dryer itself is not a safety  
8 component, but the issue is what happens when the  
9 dryer fails, what happens to the fragments, where do  
10 they go.

11 There was a book written in the early  
12 1960s. I believe it was entitled *We Almost Lost*  
13 *Detroit*. And it related the story of Fermi or the  
14 Fermi nuclear reactor, where small plate downstream  
15 got loose because of flow vibrations and found itself  
16 in the core, damaged the core, and the reactor never  
17 saw the light of day after that.

18 The next one relates to NPSH margin, which  
19 we heard a lot about this morning. The issue here is  
20 is the containment going to stay intact following a  
21 LOCA accident? Are the pumps going to be adequate?  
22 It's not whether they are going to be working or not.  
23 They are going to work. Are they going to be working  
24 so adequately to remove the heats or the containment  
25 will stay intact?

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1 Flow-accelerated corrosion, I don't know  
2 why they called it "flow-accelerated corrosion." It's  
3 usually called corrosion erosion. And it relates to  
4 excessive metal loss, excessive corrosion of critical  
5 components. And I will get in a little bit more  
6 detail about that. And then the iodine release  
7 relates to meeting the 10 CFR 100 and 10 CFR 50  
8 radiation requirements.

9 Next, please. The theoretical predictions  
10 of what is going to happen to that dryer are based on  
11 two computer models. One is called the CFD, the other  
12 one ACM. These are excellent tools that they use that  
13 have been used for maybe over 30 years in the  
14 industry.

15 The problem that we have here is what are  
16 the input parameters. The flow of geometry in the  
17 dome, in the veins, in the uprisers is very complex.  
18 And you have to understand it. You have to describe  
19 it to the computer. The computer is not going to give  
20 you better than what you put in there.

21 The only way to do that is to benchmark  
22 the code against full-scale experiments. And this  
23 hasn't been done. Now, DOI indicated that they will  
24 get the information during ascension to power.  
25 However, you do not run a LOCA accident when you go up

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1 power. What you want to know is what is going to  
2 happen to that dryer when the non-loads are generated  
3 when a steam line break, for example, breaks outside  
4 the containment.

5 In conclusion, the uncertainty is that two  
6 models are not sufficient to rely on it and the  
7 ascension to power does not really give you more  
8 confidence in the ability of predicting what happens  
9 to those vibrations and whether the dryer will fail or  
10 not.

11 Next, please. The recently discovered  
12 cracks, 62 cracks, and those that were discovered a  
13 year ago are significant. Now, if there are  
14 manufactured defects, that's fine. You can forget  
15 about that. And that's not that important.

16 But if those arose as a result of stresses  
17 which exceed design stresses, they are very, very  
18 significant because now when you increase the  
19 vibration of the amplitude of the vibration on that --

20 MEMBER WALLIS: I think that can be moved  
21 so that it fits the screen. It seems to have left  
22 from one side to the other. Can't you just --

23 CHAIRMAN DENNING: There is some  
24 incompatibility.

25 MEMBER WALLIS: Can't you just twist

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1 something and make it --

2 CHAIRMAN DENNING: I don't think so.

3 (Laughter.)

4 MEMBER WALLIS: Can't you just twist?

5 Either move the screen or the projector. Move the

6 screen a little bit or the projector a little bit.

7 Don't fiddle with the electronics. Do it

8 mechanically. It doesn't work. Oh, it's a problem in

9 the computer. It's not the screen.

10 MR. HOPPENFELD: It's in this device here.

11 CHAIRMAN DENNING: Incompatibility.

12 MEMBER WALLIS: I think it was due to  
13 operator action myself.

14 (Laughter.)

15 MEMBER WALLIS: Well, okay. I guess we  
16 have to put up with it, right?

17 CHAIRMAN DENNING: I think we do.

18 PARTICIPANT: Change your screen  
19 resolution.

20 MEMBER WALLIS: Now make it smaller.

21 PARTICIPANT: Yes, that could be it. It  
22 could be your screen resolution on that.

23 MEMBER SIEBER: Go down to that ten  
24 percent.

25 MEMBER WALLIS: Now zoom it up a bit.

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1 MR. HOPPENFELD: We don't have experience  
2 with many dryer failures, especially catastrophic  
3 failures, but the experience at Quad Cities is a very  
4 important data point because they had a similar  
5 design. They increased the power by 20 percent, which  
6 increased the flow-induced vibrations. And they have  
7 experienced a severe fragmentation of the dryer and  
8 migration of the fragments to the steam line and to  
9 the core, top of the core.

10 MEMBER WALLIS: How do they get shed down  
11 onto the fuel?

12 MR. HOPPENFELD: I'm sorry?

13 MEMBER WALLIS: I can imagine them going  
14 down on the steam line, but how do they get to the  
15 fuel? I'm sorry. You claim that they get to the fuel  
16 and --

17 MR. HOPPENFELD: To the top of the core.  
18 They do not -- I didn't say the fuel -- I understand  
19 they came down on the top of the core, where the  
20 surges were. One or two were found there. Is that --

21 MEMBER WALLIS: Okay.

22 CHAIRMAN DENNING: One second. Please go  
23 to a mike.

24 MR. SHADIS: I'm sorry. If I could just  
25 interject, the event reports for the Quad Cities

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1 incidents related that portions of the steam dryer had  
2 fallen on top of the reactor.

3 MEMBER WALLIS: Okay. Thank you.

4 MR. SHADIS: Yes.

5 MR. HOPPENFELD: I misspoke if I said  
6 entered the fuel. It came on the top. So you really  
7 should look at that thing as a near miss. Now, really  
8 the question is, what happens under, say, a LOCA  
9 accident like the MSIV, where the loads, the dynamic  
10 loads, which could cause excitation of the resonant  
11 frequency of the dryer and basically a catastrophic  
12 failure, on all of these chunks flying around in the  
13 team line? Are you going to have the MSIV when you  
14 need it? You've got two of them, but are you going to  
15 have them?

16 That issue is not being addressed. That  
17 is an important issue. You can't just forget about  
18 these components, even though the dryer is not a  
19 safety-related component. They must go somewhere.

20 MEMBER WALLIS: So what you are worried  
21 about is the failure to close the MSIV, rather than  
22 blockage of the line?

23 MR. HOPPENFELD: As a result of the  
24 dynamic loads, not your normal condition. Now, under  
25 normal condition, you probably increased the

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1 probability. You increased the crack propagation.  
2 You've got have more.

3 Potentially they're going to be larger,  
4 but the issue is and the question is, what is going to  
5 happen on the dynamic loads? And that I have not seen  
6 addressed. And it is required to be addressed because  
7 it does affect the delta CFE.

8 Can I have the next slide? I don't  
9 believe, although that was viewed as a new phenomena,  
10 the failure of Quad Cities, I don't believe that, even  
11 -- I don't believe that after two years, our  
12 understanding has really significantly been improved  
13 or the SER does not reflect an increase in  
14 understanding. That statement was made by the  
15 industry two or three years ago. And I don't think in  
16 the last three years there has been a significant  
17 improvement in this area.

18 Next, please. Now, the requirements are  
19 very, very specific. If you are coming and requesting  
20 EPU or you are changing the tech specs, that's what  
21 you've got to do. And I don't see that in that SER  
22 that that was done, that these requirements are met.

23 I heard a lot of statements about  
24 conservatism, and I would like to talk about that a  
25 little bit more because maybe it's there, but it's not

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1 clear. The calculation doesn't show that. Let me  
2 discuss that.

3 The main uncertainty with whether you are  
4 going to have enough pressure of the inlet to the  
5 pump, really there are a lot of uncertainties. The  
6 whole issue of containment pressure, flow, delta T max  
7 in the pool, they're all interrelated.

8 The equations are all coupled. So you  
9 really can't talk about one without talking about the  
10 other. And the issue here is what are the  
11 uncertainties. There are many. And because of  
12 complexity, you have to make a lot of assumptions.

13 But the one that I'm bothered by the most  
14 is where the pressure drops across the screen. The  
15 reason for that is because it relates to the  
16 interaction between the debris and the sludge and the  
17 crud and the corrosion product that you have in the  
18 coolant following the LOCA.

19 There is inconsistency in the report  
20 itself, in the SER evaluation. On one side, VY states  
21 that the EPU will not increase the source term for the  
22 debris. The EPU is not going to detect the amount of  
23 debris that you are going to have there. They state  
24 that.

25 On the other part of the report, they

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1 said, "No. We've got another one. We're going to  
2 have more because we're going to have flow-induced  
3 corrosion. The conductivity is going to check, which  
4 means the pH is going to be changing."

5 You change the pH. You change the  
6 chemistry. And you change the mechanism of how the  
7 screen or not the screen itself, the fiber degree  
8 material that is going to be deposited on that screen,  
9 and then plug it up.

10 If you were sitting here and starting from  
11 scratch, you ask yourself, first thing, what kind of  
12 part was that? What is the distribution? There is  
13 nothing here. They are not even discussing that. But  
14 we are here from the NRC, we are here from VY. We  
15 have got plenty of conservatism. If there is one,  
16 just please show me where it is. It's just not there,  
17 just ain't there.

18 Now, when you see inconsistency within the  
19 report and you see that that has been reviewed, now,  
20 it's a very valid question how you even go and  
21 calculate your delta CDF when you can't even rely on  
22 the analysis?

23 The last subject or I believe it's the  
24 last subject -- and here I will be preaching to the  
25 choir. That has to do with the iodine release because

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1 there are two or three ACRS meetings discussing this  
2 issue. And I think that we will be all in agreement  
3 here around this table that the NRC, not necessarily  
4 the NRC, that we don't understand the mechanism that  
5 governs that.

6 Well, I can say one thing. The fact that  
7 you are going to be running at a higher flow rate, you  
8 are going to -- the concentration of iodine in the  
9 coolant will be lower. It's also true that the  
10 concentration in the gap in the fuel is going to be  
11 higher or there will be more effusion products.

12 But what is not true, the fact that I am  
13 going to have more efficient products in the fuel and  
14 a lower concentration, they cancel each other. And I  
15 can go home and sleep well. That's just not true. It  
16 doesn't make any sense. There's no correlation  
17 between the initial concentration of the coolant of  
18 iodine and the amount of appearance that you have or  
19 I've looked for it. It's not there. So you can't  
20 make that statement.

21 So what the bottom line of all of this is  
22 that -- and this is not a safety issue in the sense  
23 like a core mill, but we do have requirements. And  
24 they are listed here, 10 CFR 15, which relates to the  
25 control room radiation of those is in 10 CFR across

1 the fence and GDC 19, requires you to meet those dust  
2 releases.

3 There is nowhere in this report besides  
4 the statement that we meet those. You ask yourself,  
5 how can they say they meet those dose releases where  
6 they have just started a new generic issue to resolve  
7 what the issues are.

8 So you have a generic GSI. I think it's  
9 197 they just started to rely on these iodine  
10 releases, iodine spikes. And I'm not a chemist. So  
11 I don't really understand it. I do know I have seen  
12 the data and I didn't bring the curve, but you can --  
13 I guess everybody around the table is familiar with  
14 it. I'm showing the order of magnitude or more  
15 increase in the iodine release as you lower the  
16 initial concentration. So if they lower the initial  
17 concentration, they're going to have increase.

18 In addition to this, I didn't see in the  
19 SER any references to increasing -- to using iodine,  
20 concurrent iodine. By doing that six seconds before  
21 that MSIV shut down, you're going to have a big  
22 pressure change. I haven't seen anything there.

23 Now, if you have orders of magnitude of  
24 safety there between what the -- I believe it's like  
25 5 rem from the control room and I think it's 25 across

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1 the fence. I don't remember the number, but if you  
2 have plenty of room there, well, that's fine. And I  
3 don't know whether it's from rewire, but I've seen it  
4 on similar reactors because it depends on the weather  
5 around here.

6 If you have plenty of leeway, then it's  
7 fine. You've got plenty of safety. But I think  
8 they're very, very close to the limit as it is. So  
9 when you neglect all of these mechanisms, there's a  
10 lot of uncertainty in there. Now, you know, it's up  
11 to the local cop who lets you drive 65 miles an hour.  
12 That's fine. But that's what this is.

13 To summarize, the main issue is the dryer.

14 CHAIRMAN DENNING: Thank you very much,  
15 Dr. Hoppenfeld.

16 (Applause.)

17 CHAIRMAN DENNING: I would like to have  
18 Jane Newton go next if she'll move up into this area  
19 right here.

20 Did you leave us a copy of your  
21 presentation or you can mail it to us? We've got it.  
22 I'm sorry.

23 MR. NEWTON: I think this is going to be  
24 very different because I am going to talk mostly about  
25 fears and the people who live around here. I'm going

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1 to speak for myself first. And then I am going to  
2 speak for my daughter, Sally, who can't be here  
3 because she is a school teacher and she couldn't come.

4 I have to read it because I am not very  
5 good at this. My name is Jane Newton, and I live in  
6 South Londonderry, Vermont. Because what is happening  
7 between the NRC and Entergy Corporation threatens the  
8 very lives of those who live within hundreds of miles  
9 of Vermont Yankee, we feel betrayed by the shameless,  
10 indeed criminal behavior of our governor, our state  
11 legislature, the corporate-owned federal government,  
12 and you, the members of the NRC, the only people  
13 actually charged with our safety, who, with  
14 unbelievable irony, are in the process of forsaking  
15 us. The NRC, as we all knew but still had a trace of  
16 hope for, is just one more benefactor of corporate  
17 crime bent on selling us all out by placing corporate  
18 profits before the possibility of unthinkable  
19 suffering and death in this case some form of  
20 radiation.

21 A Chernobyl-type accident, which will not  
22 be an accident if this uprate goes forward, will  
23 become not just a vague possibility but a nightmare  
24 that is likely to happen.

25 So we are all in a death grip of corporate

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1 crime, be it in war and militarism and the expectation  
2 of the corps over the world in the pollution of our  
3 environment, to the point of making it uninhabitable  
4 and to the threat of a nuclear disaster.

5 The threat of nuclear disaster comes  
6 currently in the form of nuclear weapons, in the  
7 groundwater, the air, the sea, the surface of the  
8 earth, and even in space, partly as a byproduct of  
9 nuclear power, depleted uranium, which is deposited by  
10 the tons whenever the U.S. has been at war since 1991,  
11 causing birth defects, cancers, and deaths by the  
12 thousands in soldiers and civilians, especially in the  
13 world's children, and partly from nuclear power  
14 plants.

15 We all know that these plants produce  
16 waste that is turning the world into a nuclear dump  
17 since nobody knows what to do with it, provide a handy  
18 target for terrorists, and present the unspeakable  
19 possibility of an accident or a meltdown, which grows  
20 astronomically when all of those plants are asked to  
21 do more than they were built to do.

22 This heartbreaking situation has us here  
23 before you full of hopelessness and fear for our  
24 children, begging you who are supposed to be keeping  
25 us safe but are, instead, violating or trust to please

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1 think again before you allow Entergy to go ahead with  
2 this uprate. We cry out with tears, with our hearts,  
3 with our minds, and with our despair, pleading with  
4 you to decipher life, not the end of life as we know  
5 it.

6 This is from my daughter, Sally. My name  
7 is Sally Newton, and I live in West Townsend, Vermont.  
8 For the last couple of years, I have been hopeful that  
9 the Public Service Board, the governor, the  
10 legislature of our state, and the NRC would listen to  
11 the safety concerns of the people who live in the  
12 vicinity of Vermont Yankee and heed the advice of many  
13 of the experts who have stated that the 20 percent  
14 uprate of the old nuclear plant is a bad idea.

15 Now it seems that, in spite of the risk of  
16 this proposed uprate to the people and the  
17 environment, there are many problems that Vermont  
18 Yankee has had these past few years through lack of a  
19 solution to the waste storage problem. And in spite  
20 of the thousands of signatures collected calling for  
21 an independent safety assessment, our requests are  
22 being ignored. And these various governing bodies are  
23 one by one caving into the demands of Entergy  
24 Corporation. My heart sank as I realized our safety  
25 is less of a concern than the topics of the

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1 corporation.

2 I teach at a very small elementary school  
3 in Windham, Vermont, 30 miles north of Vermont Yankee.  
4 I wonder how we will know if something goes wrong at  
5 Vermont Yankee and what we should do as we have no  
6 evacuation plan.

7 Do we take the kids to Bellows Falls or  
8 should we take them some other place, such as Canada?  
9 How will parents know where their children are? How  
10 will I solve the dilemma of whether I should save  
11 other people's children or go and find my own son, who  
12 is in another school? What if something happens at  
13 night and we are all sleeping with radios and TVs off?  
14 How will we know? How can the regulating body in  
15 charge of so many people's safety allow this kind of  
16 confusion?

17 Do you really expect us to believe that  
18 the people outside the designated ten-mile radius will  
19 be safe if there is an accident at Vermont Yankee? On  
20 top of all of this, most people in my area are not  
21 educated about the dangers or the effects of radiation  
22 or what to do if an accident happens.

23 It is completely negligent of the NRC to  
24 approve of a power uprate in an aging plant without at  
25 least requiring an independent safety assessment and

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1 a working evacuation plan for at least 50 miles around  
2 the plant.

3 Schools, hospitals, and homes should all  
4 have emergency notification systems. And people  
5 should be educated, not left in the dark, about the  
6 dangers of radiation.

7 Please do not just write our concerns off.  
8 Think of what you would want if your families lived in  
9 this area and your children attended our schools.  
10 Please require an authentic independent safety  
11 assessment and an expanded and approved evacuation  
12 plan. Please be responsible to the people who live  
13 here. Do not sacrifice our safety for the profits of  
14 Entergy Corporation.

15 Thank you.

16 (Applause.)

17 CHAIRMAN DENNING: Thank you.

18 The next speaker will be Paul Blanch,  
19 followed by Ellen Kinney, Tom McLean, Pete Newton, and  
20 Sally Shaw.

21 MR. BLANCH: Thank you, Mr. Chairman.  
22 Thank you, ACRS members and members of the public, to  
23 take time out to listen to this long session today and  
24 yesterday.

25 Again, my name is Paul Blanch. I reside

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1 in West Hartford, Connecticut. And I have about 40  
2 years of nuclear experience, both with the utilities  
3 and with the Navy.

4 As far as this proceeding goes, I have no  
5 political or financial interests. And I am not being  
6 compensated whatsoever for any of my efforts related  
7 to the Vermont Yankee efforts.

8 Our first speaker yesterday was a former  
9 governor of Vermont. And he stated that the EPU  
10 should be approved "if all regulatory requirements are  
11 met." I know I'm going to get at this point some of  
12 the members of the public, but I don't disagree with  
13 that statement "if all regulatory requirements are  
14 met."

15 I have been concerned about the EPU  
16 primarily related to the containment overpressure and  
17 the interdependence of the barriers, meaning the  
18 failure of one barrier could result in the possible  
19 failure of another barrier.

20 I was very troubled and very surprised by  
21 Mr. Hobbs' statement this morning that there already  
22 is an interdependence of the barriers. He clearly  
23 stated -- and I believe I heard this correctly -- that  
24 the failure of the Torus -- and I assume he is talking  
25 about a catastrophic failure of the Torus -- will

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1 result in core damage in disabling some of the safety  
2 instruments, which would result in -- well, the  
3 failure of the Torus would result in failure of the  
4 ECCS, which would result in the failure of the fuel or  
5 fuel meltdown.

6 Now, either Mr. Hobbs does not understand  
7 the design basis of Vermont Yankee -- and he is the  
8 engineering supervisor. And I believe that that event  
9 -- I could be wrong, but catastrophic failure of the  
10 Torus I believe is outside of the design basis and is  
11 not considered.

12 If he believes it is inside the design  
13 basis, he is misinformed. Either he is misinformed or  
14 he was trying to mislead this group and members of the  
15 general public by trying to convince everyone that we  
16 already have this interdependence of the independent  
17 barriers that provide the defense in depth. That is  
18 extremely troubling to me.

19 I have reviewed the ACRS' mission. And I  
20 believe the ACRS reviews certain changes and license  
21 amendments and makes recommendations to the  
22 Commission. When I say "the Commission," I'm talking  
23 the five commissioners.

24 I have reviewed some of the ACRS letters  
25 and typically find words along the lines -- I'll

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1 paraphrase it -- the ACRS is satisfied that the  
2 licensee will comply with all applicable regulations.  
3 Those are not the exact words but words along those  
4 lines whenever they are commenting on a proposed  
5 change, be it life extension, power upgrades, other  
6 license changes that the ACRS elects to review.  
7 That's not their sole responsibility. I believe that  
8 it is one of their responsibilities.

9           So how does the ACRS determine that this  
10 plant is in compliance with the applicable  
11 regulations? The Atomic Energy Act and the Energy  
12 Reorganization Act -- and, again, I'm going to  
13 paraphrase this -- make the statement along the lines  
14 that adequate protection to the public is provided if  
15 the licensee complies with the regulations. Those are  
16 not the exact words. I do have the exact words  
17 available, but it's pretty much the thought.

18           We have numerous indications that neither  
19 the licensee nor the NRC is fully cognizant of the  
20 compliance with the regulations. We brought up an  
21 issue. And we have written to Senators Leahy and  
22 Jeffers about the general design criteria.

23           The general design criteria were developed  
24 back in the mid '60s. I look at them as sort of the  
25 Ten Commandments. How do you design a power plant?

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1 And the other and then the old regulations  
2 and reg guides and bulletins, orders, and all the  
3 other documents are interpretations of those  
4 commandments, such as one of the commandments "Thou  
5 shalt not kill."

6 Well, how does that apply in wartime? And  
7 there is always the area of abortion. These things  
8 are very vague and need clarifications. And other  
9 regulations interpret them and support it by various  
10 other supporting documents produced by the NRC.

11 When we reviewed this initial application  
12 and the updated final safety analysis report, we found  
13 that there was no commitment to the general design  
14 criteria in any of the licensing documents. In fact,  
15 in appendix F to the updated final safety analysis  
16 report, Vermont Yankee clearly made the statement that  
17 in this appendix, these are for historical purposes  
18 only.

19 About a year and a half ago, Mr. Arnold  
20 Gunderson and I asked for some clarification. So we  
21 filed a 2.206 because it really, really was not clear  
22 what the applicable general design criteria were.

23 And part of that 2.206 is up on the  
24 screen. And it requests basically that the NRC seek  
25 from Vermont Yankee clear and unambiguous definition

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1 of the general design criteria applicable to Vermont  
2 Yankee and how the facility's design conforms or  
3 deviates from the 70 draft or 62 final -- actually, 55  
4 final.

5 The 2.206 petition was rejected after a  
6 year. And it's really not clear to any of us -- when  
7 I say "us," I mean the NRC and the licensee -- exactly  
8 what regulatory requirements are applicable.

9 To give you an example, the NRC in their  
10 safety evaluation report mentions 64 general design  
11 criteria, final general design criteria. And the NRC  
12 isn't aware that there are only 55 of these general  
13 design criteria.

14 And then the safety evaluation report, the  
15 draft safety evaluation report, goes on to talk about  
16 compliance with the 70 draft design criteria.

17 Well, I went through a computer search of  
18 the SER, and they only mention 48 out of 70 draft  
19 criteria, how the other 22 got dropped -- and, believe  
20 me, those other 22 are not addressed in any of the  
21 other documents the NRC claims they are. The general  
22 design criteria is an example of compliance with  
23 regulations.

24 There are many other examples. If one  
25 goes through ADAMS at the NRC Web site, you will find

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1 that there are literally hundreds of exemptions to  
2 various regulatory requirements, including appendix J  
3 to 10 CFR 50, which I believe has to do with  
4 containment leak testing; appendix R, which is a fire  
5 prevention.

6 There are literally hundreds of exemptions  
7 that on their own may have been evaluation in  
8 isolation, but combined, we don't know the combined  
9 effect of all of these deviations from the  
10 regulations.

11 The ACRS contemplates a letter to the  
12 Commission. However, I believe the ACRS must assure  
13 itself that Vermont Yankee poses no undue risk to the  
14 public. In order to make that call, I believe the  
15 ACRS needs assurance that VY is in compliance with NRC  
16 regulations and identify all regulatory noncompliance.

17 It is the decision of the ACRS as to how  
18 to accomplish this clarification, whether it be an  
19 independent safety assessment, a matrix produced by  
20 the NRC, or some other vehicle that the ACRS can  
21 assure themselves that this plant is in compliance  
22 with the regulations and, therefore, provides  
23 reasonable assurance of public safety. Further  
24 verification of compliance with the NRC regulation,  
25 there is no assurance that the public will be

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1 adequately protected.

2 I would be more than happy to respond to  
3 any questions the Committee may have. Thank you.

4 MEMBER WALLIS: I had a question for you.  
5 It's a clarification. You started out giving me the  
6 impression that the GDCs were not referred to at all.  
7 And then later on you gave a list which seemed to  
8 indicate that most of them were but there may be some  
9 still missing. Which of those is it?

10 And if you know which ones are missing,  
11 maybe you could let us know so we know more  
12 specifically which ones you're concerned about.

13 MR. BLANCH: Yes. I have actually  
14 produced a list. In fact, I could give the Committee  
15 the draft 70 criteria, which are not easy to find, by  
16 the way. And I have them circled as to which ones  
17 have not been addressed.

18 As far as addressing the general design  
19 criteria, we look at the safety evaluation report, the  
20 draft one, that was just recently issued. That is  
21 only the applicability of the draft general design  
22 criteria to this change. It's not the general  
23 applicability.

24 One of the draft general design criteria  
25 -- I believe it's number 22 -- is single failure.

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1 That is not addressed. And Ms. Hobbs this morning was  
2 talking about a single failure that could take out two  
3 of our three primary barriers protecting the public.  
4 That is very troublesome to me.

5 I think the ACRS really needs to determine  
6 the degree of compliance and, therefore, safety of the  
7 Vermont Yankee plant, with or without the uprate.

8 MEMBER WALLIS: If we're talking about an  
9 uprate, it might be that some of these criteria are  
10 not relevant to the uprate in some way and that the  
11 changes brought about by the uprate make no difference  
12 or something I don't know yet until I have looked at  
13 it.

14 MR. BLANCH: Well --

15 MEMBER WALLIS: But we're not talking  
16 about Vermont Yankee in total. We're talking about an  
17 uprate.

18 MR. BLANCH: Well, I think if I were  
19 adding 20 percent to a building out in California, I  
20 would want to make sure that if I were adding 2 floors  
21 to a 10-story building, I would want to make sure that  
22 that building before I put the 2 stories complies with  
23 today's seismic requirements. That's my point.

24 (Applause.)

25 MEMBER KRESS: Let me put the onus back on

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1 you. How would you advise the ACRS to assure itself  
2 that the Vermont Yankee is in compliance with the  
3 regulations?

4 MR. BLANCH: I'm sorry. My --

5 MEMBER KRESS: How would you tell the ACRS  
6 to go about assuring itself that the Vermont Yankee is  
7 in compliance with all the regulations?

8 MR. BLANCH: Well, again, it's the ACRS'  
9 decision on how they determine that there is  
10 reasonable compliance with the regulations. The ACRS  
11 could write or direct the Commission that the staff  
12 evaluate Vermont Yankee for its compliance with the  
13 regulations and identify where it complies and where  
14 it deviates.

15 The ACRS could recommend to the Commission  
16 that they have some type of team in there and they go  
17 in, rather than an engineering inspection that had no  
18 acceptance criteria, to have a checklist. How do you  
19 meet the single failure criteria? How do you meet  
20 criterion 64, which is effluent rad monitoring, and,  
21 again, containment penetrations, fuel clad  
22 temperature? They're all in the design criteria.  
23 It's not an easy task. And this is the same request  
24 the Vermont state legislature made of the NRC, and  
25 that was rejected.

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1           And I will not be confident that this  
2           plant can operate safely unless someone can reasonably  
3           demonstrate to me that it is in compliance, hopefully  
4           with today's regulations, but they don't want to go  
5           there.

6           CHAIRMAN DENNING: Thank you. Well, I  
7           think we understand.

8           MEMBER WALLIS: I guess we're going to  
9           stop now? That's fine.

10          CHAIRMAN DENNING: What's that?

11          MEMBER WALLIS: We can stop if you like.

12          CHAIRMAN DENNING: Yes. I think so.  
13          There are a lot of people still who would like to.

14          Thank you very much.

15          MR. BLANCH: Thank you very much for your  
16          time.

17          (Applause.)

18          CHAIRMAN DENNING: Ellen Kinney is next,  
19          followed by Tom McLean, Pete Newton, Sally Shaw,  
20          Arthur Pattey. Tom McLean is next, followed by Pete  
21          Newton, Sally Shaw. Is Tom McLean there?

22          (No response.)

23          CHAIRMAN DENNING: Is Sally Shaw?

24          MS. SHAW: Yes.

25          CHAIRMAN DENNING: Okay. And that will be

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1 followed by Arthur Pattey and then Ed Anthes, I  
2 believe is the name.

3 MS. SHAW: Hello. My name is Sally Shaw.  
4 I am a member of the Gail Montague Regional School  
5 District Committee. I am speaking here on my own  
6 behalf, although the school committee has written  
7 letters to the Public Service Board and to the NRC  
8 opposing the uprate.

9 My basic comment on the recent SER is  
10 going to be delivered in code to show you what it felt  
11 like trying to read it. NRC's SEs and QA of RA is  
12 based on IEBGIDSSLATSsE's and QCSFAS, not on BATAILA  
13 or the PP. I give it an F.

14 (Applause.)

15 MS. SHAW: Now, if you would like to know  
16 what that means, I will translate. NRC's so-called  
17 safety evaluation and timid assertion of reasonable  
18 assurance is based on inconsistent evidence,  
19 bureaucratic gymnastics, industry deregulation,  
20 self-serving license amendments, technical  
21 specification exemptions, and theoretical calculations  
22 substituted for actual surveillance and monitoring  
23 whenever and wherever it suits the industry.

24 It is not based on best available  
25 practices, actual inspections, legitimate analyses, or

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1 the precautionary principles. I give it an F.

2 (Applause.)

3 MS. SHAW: I do have some examples to  
4 substantiate my opinions. In summary, I believe that  
5 the NRC removes design margins and technical  
6 specifications. And then they find no risk based on  
7 their own lack of standards.

8 This is not oversight. It is overlooking  
9 the obvious. Examples: NRC is grandfathering design  
10 and safety criteria for a plant nearing its license  
11 termination that is increasing power over its  
12 as-designed capacity. This is not the reasonable  
13 assurance of public health and safety.

14 We request the ACRS to send the uprate  
15 application back to the drawing board and require  
16 Vermont Yankee Nuclear Power Station to meet current  
17 design and safety standards if they wish to restart  
18 and operate at 100 percent power with the highly  
19 enriched fuel which they're loading now or if they  
20 wish to operate at 120 percent of what the plant was  
21 designed to run at.

22 In the SE on page 3, the NRC staff wrote  
23 that "Continuing improvements in analytical techniques  
24 have resulted in significant increases in the design  
25 and operating margins between calculated safety

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1 analysis and the current plant licensing."

2 My take on that is that if you look at  
3 what has been going on in the Federal Register for the  
4 past few years, alarm license amendments, elimination  
5 of surveillance requirements, and changes in technical  
6 specs have been dribbling out in the Federal Register  
7 for the past two years.

8 We think that what the NRC calls  
9 improvements in analytical techniques are actually  
10 relaxation of standards, deregulation, or a shift  
11 toward industry self-regulation.

12 What impact do changes such as the  
13 following and to do accountability have on the bottom  
14 line analysis? Here are some of the things that have  
15 been changed: elimination of annual worker  
16 occupational radiation exposure reporting  
17 requirements, increases in allowable mainstream  
18 isolation valve leakage rates, permanent exemptions  
19 from ILR tests, exemption from the schedule 2005  
20 integrated primary containment leak rate testing.

21 Do these changes allow Entergy to increase  
22 their operating margin? But at what cost to workers  
23 and the public? How has NRC adjusted its standards  
24 for radiation exposure in effluent releases, leakage  
25 allowances in light of the National Academy of

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1 Sciences study. We are seven, which definitely states  
2 that there is no safe level of radiation exposure,  
3 whether to average man, woman, child, elder,  
4 immunocompromised, or Charles Atlas.

5 How has or will the NRC respond to this?  
6 How can the NRC justify grandfathering a lengthy old  
7 nuke using a weaker design criteria than is currently  
8 required for new reactors? What are the best  
9 practices precautionary principles in light of this  
10 loud warning from National Academy of Science  
11 scientists?

12 We request that the ACRS call a halt to  
13 all uprates and relicensing until the NRC revises  
14 allowable radiation exposure limits in light of the  
15 NAS recommendations and until they conduct an  
16 independent safety analysis on Vermont Yankee as was  
17 done at Maine Yankee.

18 The issuance -- this is on page 7 of the  
19 SE. The issuance of the license amendments will not  
20 be amicable to the common defense and security or to  
21 the health and safety of the public. Any increase in  
22 spent fuel, inside or outside of the spent fuel pool,  
23 is amicable to the common defense and security and to  
24 the health and safety of the public.

25 Not requiring Entergy to report annual

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1 occupational radiation exposure for their workers is  
2 inimicable to worker health and safety and that of  
3 their families. Increasing allowable mainstream line  
4 leakage rates and eliminating the 2005 scheduled  
5 integrated primary containment leak rate testing is  
6 inimicable to reasonable assurance of no added risk to  
7 the public. Why was this allowed?

8 On page 8 of the SE, the September 2004  
9 engineering inspection, in selecting samples for  
10 review, the engineering inspection team focused on  
11 those components and operator actions that contribute  
12 the greatest risk to an accident that could involve  
13 damage to the reactor coolant.

14 As you know, the inspection team found  
15 eight problems or ten, depending on whether you could  
16 the unresolved issue and the one that had been already  
17 relegated to corrective actions, within a carefully  
18 selected set of high-risk operator actions and  
19 components. That represents 18 to 22 percent of the  
20 items that they looked at which were dysfunctional.

21 If these high-risk actions and components,  
22 those to which the industry and the NRC should be  
23 paying closest attention, are not being managed  
24 properly, what does that imply about the balance of  
25 plant operations and components?

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1           We hope that the engineering inspection  
2           was inadequate to provide reasonable assurance that  
3           the uprate is not amicable to the common defense and  
4           security and to the health and safety of the public.  
5           We beg you to require an independent safety assessment  
6           as performed at Maine Yankee. Our children deserve no  
7           less protection than Maine's children.

8           And I would also like to point out that at  
9           Three Mile Island, the mechanical failure that  
10          precipitated operator mistakes was not a low-margin,  
11          high-risk component.

12          The Vermont Department of Public Service  
13          -- I am sorry that they have left; I guess they don't  
14          want to hear from the public they are supposed to  
15          serve -- does not speak for the people of Vermont or  
16          for us downwinders in Massachusetts and New Hampshire.

17          And having signed a memorandum of  
18          understanding with Entergy, they can't even comment on  
19          the 62 steam dryer cracks. If they can't comment on  
20          the consequences of dangerous conditions with the  
21          reactor, they should resign. I know that doesn't  
22          involve you, ACRS, but they stood up and volunteered  
23          their opinion when they were not asked. So I'm  
24          volunteering mine.

25          I also want to point out that two of nine

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1 operator teams could not shut down the reactor in a  
2 January 2004 NRC inspection. This is documented on  
3 the ADAMS database.

4 The NRC gave this a green rating because  
5 it was a simulation, not an actual accident, and  
6 because "less than one-third of the operator teams  
7 failed to scram." That is not reassuring, and that is  
8 not reasonable.

9 The NRC claims that the operator response  
10 time to shut the plant down from an alternate panel  
11 was evaluated for uprate conditions. The September  
12 2004 engineering assessment rejected operator response  
13 time, only for a 15 percent uprate, not for a 20  
14 percent uprate, as requested by the licensee.

15 At least in my copy of that inspection  
16 report, the table provided showed the difference  
17 between current operating conditions and the 15  
18 percent uprate.

19 So all of this talk about 21.3 minutes and  
20 the 18-second margin should be revised. We request  
21 that the actual retested operator margin of error be  
22 reported to the public in terms of the 20 percent  
23 uprate, not in terms of the 15 percent uprate the  
24 inspectors analyzed before ACRS signs off on it.

25 The surveillance data from the Susquehanna

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1 unit 1 -- this is on page 15 of the SE -- "The  
2 surveillance date from the Susquehanna unit 1 will be  
3 utilized to monitor the impact of neutron radiation on  
4 the Vermont Yankee Nuclear Power Station outline  
5 materials." This is in reference to testing the  
6 reactor for embrittlement.

7 The NRC is allowing data shared between  
8 nuclear plants to substitute for actual surveillance  
9 testing and monitoring of Vermont Yankee's  
10 embrittlement.

11 In keeping with Entergy's record of using  
12 flawed projections, fuzzy calculations, and peculiar  
13 math, rather than actual instrument readings, to  
14 determine, for example, radiation exposure, they  
15 prefer to use test data from another reactor in  
16 Pennsylvania as a proxy for the Vermont Yankee reactor  
17 vessel material integrity while Vermont Yankee's  
18 untested capsules, originally part of the licensee's  
19 plant-specific surveillance program, having received  
20 significant amounts of neutron bombardment, will  
21 remain in place. That's a quote from the SE, that  
22 latter. This does not provide the public with any  
23 sort of reasonable assurance of anything.

24 The use of an alternate assessment is only  
25 allowable if the reactor has an adequate dosimetry

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1 program. How is adequate defined? What I know about  
2 Entergy's calculation of doses follows. Entergy uses  
3 one roentgen is equal to .71 rem, instead of the  
4 standard one roentgen equals one rem. Thus, they have  
5 a 29 percent discount on their calculations.

6 They no longer have to report annual work  
7 occupational exposure. They haven't adjusted  
8 allowable radiation limits based on the BEIR number 7  
9 report of the National Academy of Sciences. So how  
10 can NRC staff call that an adequate dosimetry program?

11 We request the ACRS to require that  
12 Entergy pull out at least one test capsule from the  
13 Vermont Yankee reactor vessel and compare it to the  
14 neutron bombardment levels of a similarly located  
15 Susquehanna capsule before making the assumption that  
16 the two are interchangeable.

17 One has to wonder if NRC staff figures  
18 that if you replace actual monitoring and testing with  
19 alternate methods of projection and calculation,  
20 Entergy can then pass the test. It appears to the  
21 public that they seem to be more interested in  
22 protecting corporate profits than public health and  
23 safety. We need to build trust here, and there is a  
24 way to do that. And that is to conduct an independent  
25 safety assessment.

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1 (Applause.)

2 MS. SHAW: One more point regarding stress  
3 corrosion cracking. This draft SE report was released  
4 before Entergy revealed the nugget that there are not  
5 14 cracks in the steam dryer but 62.

6 The NRC staff assessment that the biggest  
7 crack would only increased from 12 inches to 13.32 and  
8 not to 15, so it was, therefore, safe is not  
9 reasonable assurance of steam dryer integrity.

10 In light of new revelations about the  
11 extent of steam dryer defects, we request the ACRS to  
12 require Entergy to pull the aged, cracked steam dryer  
13 and replace it with a new one before uprating, before  
14 ascension testing, before operating with super hot  
15 fuel.

16 Before even starting, they must pull it  
17 out and either subject it to radiography and dye  
18 penetrant testing to determine the actual extent and  
19 depth of the cracks or replace it. I understand that  
20 reactors in France test their steam dryers in this way  
21 every time they refuel.

22 That's all I have to say.

23 (Applause.)

24 CHAIRMAN DENNING: Thank you very much.

25 The next presenter is -- we'll let Mr.

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1 Newton go next, Pete Newton. And he will be followed  
2 by Arthur Pattey and then Ed Anthes.

3 MR. NEWTON: My name is Pete Newton from  
4 Windham, Vermont. And I am representing myself, my  
5 parents, my wife, and my two children. Thanks for  
6 your attention.

7 History has shown that government  
8 regulators can be compromised by the close  
9 involvements with the industries that they should  
10 regulate. Because of the enormous consequences of  
11 failure, as regulators of the nuclear industry, you  
12 have a special responsibility to remain impartial and  
13 to rule in the public interest.

14 Because of the apparent contradiction of  
15 changing design capacities without useful independent  
16 safety assessment or a long-term waste storage plan,  
17 the proposed uprate can at best be considered risky,  
18 short-sided, and of benefit only to the plant owners.

19 Please say no to uprate. Thank you.

20 (Applause.)

21 CHAIRMAN DENNING: The next speaker will  
22 be Arthur Pattey.

23 MR. PATTEY: My name is Arthur Pattey,  
24 pronounced like the race car driver. I live in  
25 Guilford. Thank you for taking the time to listen to

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1 me today. I sincerely hope that you hear what I and  
2 my fellow citizens are saying.

3 I am not an expert on nuclear energy. We  
4 have heard from them. I was amazed at how much I did  
5 understand. But, quite frankly, I am not reassured.

6 I am not affiliated with any group of  
7 organization. I am a simple carpenter. Because of a  
8 minor back injury, I am not out earning my living  
9 today. I have the time to stand and listen to these  
10 two days of testimony. I probably should be out  
11 looking for a good set of snow treads, but I believe  
12 safe driving this winter and in the winters to come  
13 has a lot to do with what goes on here today.

14 I am nervous speaking in front of a group  
15 of people, which is why I am reading this. The only  
16 other times I would be speaking in front of the public  
17 is as an amateur actor in local theatricals. I thank  
18 Vermont Yankee for their generous sponsorship of the  
19 arts in Windham County and their other fine corporate  
20 citizenship.

21 But I am not here speaking as an actor  
22 today. And the clowns were yesterday. I'm speaking  
23 for myself, my family, and I believe for many  
24 like-minded friends and neighbors. I'm speaking from  
25 my heart.

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1 Yesterday there was some discussion of  
2 what a safe distance from a nuclear power plant is.  
3 Ten miles? Fifty miles? I would venture to guess  
4 that my home in Guilford is within the five-mile  
5 range.

6 Vermont ain't flat. And for that, we  
7 thank God. Because of Huckel Hill, you can stand in  
8 my garden, fish the trout stream if you like. It's  
9 not posted. And you would never know that you were in  
10 a danger -- excuse me -- an evacuation zone.

11 In nice weather, we have guests who have  
12 said, "Hey, if it weren't for I-91 in your back yard,  
13 this would be heaven." Well, I know better. I live  
14 there during the Ski-Doo season.

15 I also know better because I get the  
16 calendar. It's a good calendar. It's got nice  
17 pictures. There's lots of space on the dates to write  
18 down important appointments, like a baked bean supper  
19 at the Grange, Ally's birthday, all school sing, and  
20 missed appointments -- glad I missed that one -- oh,  
21 and safety hearing on Vermont Yankee.

22 I use these calendars every year. And  
23 every year I read the emergency instructions, at least  
24 most of the 15 pages. It always scares the hell out  
25 of me.

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1           If we were told to evacuate, even under  
2           the best of circumstances, it would be a mess. And if  
3           it happened on a night of flooding, like we had last  
4           month, a lot of my neighbors up on Slate Rock Road,  
5           some of them VY employees, wouldn't have a road to  
6           evacuate on. Sorry, neighbor. We don't have any more  
7           room in this car.

8           This nasty scenario is assuming that we  
9           did get the evacuation notice. We don't have sirens  
10          in Guilford. If it's real quiet, no trucks on the  
11          highway, we might be able to hear one from Bernardston  
12          or Northfield.

13          We do have a tone alert radio. Many times  
14          I've breathed a great sigh of relief to hear "This was  
15          only a test" or "The flood watch in Rensselaer County  
16          has been canceled."

17          The radio isn't working right now. It  
18          needs a battery. I filled out the questionnaire that  
19          Vermont Yankee sent me and sent in a request for a new  
20          one and a manual on how to program the thing. I'm  
21          still waiting. Until I get a new battery and the  
22          instruction booklet, we will have to rely on option  
23          number 3, route alerting.

24          I do have great faith and great admiration  
25          for our local emergency personnel. I cannot say the

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1 same about the present owners of this facility.

2 This is the first time I've spoken  
3 publicly about this issue, but I am not new to the  
4 discussion. I was a school kid here in Brattleboro  
5 when plans were laid for building the plant.

6 I remember the 67 blackouts. And, to the  
7 best of my recollection, it was about two hours before  
8 we had the lights on back in Brattleboro, where some  
9 people were stuck in elevators in New York for eight  
10 to ten hours.

11 My dad and a friend were doing some work  
12 in the basement. At first, they thought they had  
13 caused it. "We knocked out the whole neighborhood."

14 When my father and I were not arguing  
15 about the length of my hair, we had long, if  
16 uninformed, discussions about this issue. As I  
17 remember, one of the big arguments against building  
18 the plant in the first place was how much it was going  
19 to raise the temperature of the Connecticut River.

20 None of us had heard of Three Mile Island  
21 or Chernobyl. We hadn't heard the fighter jets scream  
22 over this valley, as we did two nights after 9/11.  
23 Well, none of us were sleeping too well that night  
24 anyhow.

25 My dad was the shop teacher here in

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1 Brattleboro, 35 years working with young teenagers and  
2 power tools and no major accidents. He knew something  
3 about safety.

4 One of his repeated lessons on the topics  
5 was that you never took a tool or machine, whether it  
6 was as simple as a handsaw or as complex as a boiling  
7 water nuclear reactor, and tried to make it do  
8 something it was not designed for or push it beyond  
9 its exceededness.

10 (Applause.)

11 MR. PATTEY: Chances are you will only  
12 break it. He's gone now, but I know he would agree  
13 with me when I say to try and run this machine called  
14 Entergy Vermont Yankee 20 percent harder when it is  
15 already approaching the end of its designated life  
16 span is just plain stupid.

17 These days I continue to have discussions,  
18 hopefully more informed, with my 11-year-old daughter  
19 about the safety of the plant. When she asked me a  
20 couple of years ago on the way to the skating rink on  
21 a first Saturday morning of the month at noon what the  
22 siren we were driving past on Western Avenue was for,  
23 I did my best to explain. She then asked me, "What  
24 would happen if there were a real accident at the same  
25 time as the test?" I didn't have an answer for that.

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1 I do congratulate Vermont Yankee on its  
2 years of operational efficiency and safety. I cannot  
3 speak, as others have, to the dangers of low-level  
4 radioactive emissions.

5 I can only attest to the fact that the  
6 unusual events alert -- and I'm not sure if we've even  
7 ever had an actual site emergency or were those just  
8 tests, but I can say that none of this has been  
9 beneficial to my mental health.

10 I forgive Vermont Yankee for the  
11 statements about electricity being too cheap to need  
12 them. I don't think any of us believe them. I do ask  
13 how increasing output and possibly running the plant  
14 longer will deal with the unsolved problem of waste  
15 disposal.

16 I personally believe -- and I know some of  
17 my friends and family will disagree on this -- that  
18 given the past record of Vermont Yankee, the benefits  
19 do outweigh the risks of running this plant to its  
20 original capacity and life expectancy. I'm not saying  
21 shut the plant down, but let's not screw it up now.  
22 Maybe if I were a stockholder in Entergy and lived a  
23 lot further away, I would say, "What the heck? Let's  
24 go for it."

25 I'm a simple carpenter hoping that my back

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1 is better soon and I can get back to work, pay for  
2 some new snow treads, go on living my life with my  
3 family, my friends, my neighbors in this community  
4 around Vermont Yankee.

5 I can only repeat what I said earlier.  
6 The idea of an uprate of this facility is just plain  
7 stupid. I ask, I implore, I beg of you gentlemen of  
8 the NRC Advisory Committee here today to do whatever  
9 it is within your power to deny this request from  
10 Entergy to Vermont Yankee.

11 Thank you.

12 (Applause.)

13 CHAIRMAN DENNING: Thank you.

14 The next person is Ed Anthes, followed by  
15 Celia West, Ray Shadis, and Paul Bousquet.

16 MR. ANTHERS: Good afternoon. Thank you  
17 for taking comments from the public. I appreciated  
18 the comment from one of you yesterday that you're not  
19 restricted, you can look at everything you want as  
20 regards to the uprate request. And we're counting on  
21 you to do that.

22 I'm going to talk about some of the  
23 emergency planning zone issues and margins of safety.  
24 The difficulty that we have is that Entergy Nuclear is  
25 shaving margins at every possible point. And I'll

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1 talk about some of those.

2 It's appropriate that we're where at the  
3 Quality Inn. We're about nine miles from Entergy  
4 Nuclear, Vermont Yankee here. When they came to  
5 Vermont, Entergy decided they would set up a limited  
6 liability corporation. And they picked those words  
7 "Entergy Nuclear, Vermont Yankee," E-N-V-Y. It seemed  
8 to be a little while before they realized they had  
9 named themselves after one of the seven deadly sins.  
10 So they don't use the word "Nuclear" any more.

11 Anyway, where we are is right at the  
12 limits of the siren notification are in the emergency  
13 planning zone. Of the six towns in Vermont within ten  
14 miles of the reactor, only portions of two towns have  
15 siren coverage. According to maps in the Brattleboro  
16 emergency plan, we're right at the edge of that area,  
17 but we may not hear if a siren goes off.

18 Tone alert radio is a principal means of  
19 notifying people in the ETZ of an emergency situation,  
20 but most people and families don't have them.

21 Last year Entergy Nuclear was cited for  
22 losing control of the tone alert system, having no  
23 record of who does or does not have a radio. Entergy  
24 Nuclear could have mailed a radio to each family and  
25 business in the ten-mile zone but chose not to.

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1 Instead of sending a radio, they sent a letter. When  
2 they distributed out about 1,300 radios, the NRC was  
3 satisfied.

4 So I asked at the front desk if they have  
5 a tone alert radio to notify guests in case of an  
6 accident at Vermont Yankee. They don't. Most of you  
7 are visitors to Vermont. So if a bunch of the Entergy  
8 guys jump up and head to the door, drive north.

9 If implemented, this 20 percent power  
10 boost will take ENVY up to the limit or past it for  
11 off site radiation exposure. Vermont has a 20  
12 millirem standard. Measurements by the Vermont  
13 Department of Health one year ago showed that ENVY  
14 exceeded the standard in the fourth quarter 2004 and,  
15 in fact, pushed the margin on the 25 millirem federal  
16 standard. Not surprisingly, ENVY disputes the  
17 Department of Health data, and negotiations have been  
18 ongoing.

19 VY wants to push the limits on safety  
20 margins with the NPSH credit. In area after area,  
21 ENVY is shaving margins in a grand experiment to see  
22 if they can squeeze more schemes, more electricity,  
23 more dollars from this 33-year-old reactor.

24 The Vermont's Public Service Board is  
25 concerned about this and the reliability of ENVY. And

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1 in the final orders giving conditional approval for  
2 the uprate, it stated specific criteria for an  
3 inspection.

4 Public Service Board's August 16, 12, the  
5 final order, appendix D, the assessment would be a  
6 vertical site review of two safety-related systems and  
7 two maintenance rule non-safety systems affected by  
8 the uprate.

9 The level of effort necessary for this  
10 work has been described to us in testimony as  
11 requiring about four experts for about four weeks.  
12 This will provide a valuable check on reliability of  
13 the systems that are reviewed and allow for correction  
14 of any problems.

15 To date the Public Service Board has  
16 reserved judgment on whether these meet the nuclear  
17 requirements of their order, and they're really  
18 waiting to hear what you have to say on that.

19 The public does not believe that the  
20 inspection done was adequate. It took repeated  
21 requests from the Vermont Public Service Board to  
22 initiate the inspection. And when it was done, well,  
23 I was interested that this one got to a number of you  
24 as well. This jumped out at me. And as a long-time  
25 amateur in this, it was gratifying to see that it was

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1 important to you as well.

2 It's the safe shutdown analysis, the  
3 reactor core isolation cooling time estimates. The  
4 time line is in 1999 they determined that it would  
5 take 25.3 minutes to boil away the water and expose  
6 the core. And then it would take 15 minutes to start  
7 up the RCIC.

8 In 2001, the Operations Department  
9 determined at that time 15 minutes was wrong. It was  
10 actually 19.3 minutes. But they neglected to tell the  
11 Engineering Department. So the Engineering Department  
12 submitted their request for extended power uprates  
13 using the old figure. They didn't know that the Ops  
14 Department had increased the time estimate by 29  
15 percent.

16 In 2004, the NRC determined the time to be  
17 21 minutes; actually, 40 percent over what was used in  
18 the estimate. And it wasn't discovered, of course, as  
19 we have had thorough testimony today that that wasn't  
20 discovered until ENVY was forced to run a drill on it.

21 ENVY estimated it would take 21.3 minutes  
22 to uncover the radioactive core. I really appreciated  
23 the skepticism I heard from you in questions about  
24 what is adequate margin. What is the risk that is  
25 acceptable? What does that .3 mean to us who live

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1 here and to you are just putting your stamp on  
2 approval on this request?

3 If there's a question, though, what else  
4 has been miscalculated because of erroneous  
5 assumption? What other errors have been mapped? The  
6 Public Service Board, correctly identifying the  
7 extraordinary nature of the 20 percent power boost,  
8 wanted more than the standard inspections.

9 We have already experienced an unplanned  
10 shutdown at Vermont Yankee because of the uprate: two  
11 fires in 2005, the transformer fire and the  
12 simultaneous hydrogen leak fire. ENVY testified that  
13 it wasn't the uprate that caused the fires but poor  
14 maintenance, both before and after they took over.

15 What happened? Well, following the  
16 refueling outage in 2004, the air speed cooling the  
17 transformer was more than doubled, cracked metal  
18 slapped in this new wind tunnel breeze eventually  
19 sparking and shorting, igniting a pool of oil laying  
20 on top of it, and causing a fire that Brattleboro's  
21 fire chief described as flames leaping 30 feet into  
22 the area. The Public Service Department, electric  
23 companies, and ENVY are negotiating who will pay what  
24 for the resulting service disruption. But there's  
25 really little doubt that with the changes made for the

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1 uprate at the 2004 refueling, that increased air flow  
2 starting the chain of events that shut down the  
3 reactor.

4 Some areas of concern have been identified  
5 as potential problems because they have broken at  
6 other EPU reactors. While we don't know what will be  
7 the next thing to break, we can be sure there will be  
8 something. We don't know how these problems will be  
9 or the costs or if excess radiation will be released.

10 This morning and into the afternoon, Russ  
11 Kulas, who is a member, an engineer and member of the  
12 Vermont State Nuclear Advisory Panel, was able to be  
13 here for the proceedings. Last month at the Nuclear  
14 Advisory Panel meeting, he stated as an engineer, he  
15 was amazed that the NRC didn't include three points of  
16 performance below the uprated levels and suggested  
17 that ENVY be forecast at .75, .85, .95 as well as the  
18 1.05, 1.10, and 1.15 that they agreed to do so that  
19 you and the staff can see a progression as it goes  
20 along. And I request that you consider putting that  
21 in your recommendations.

22 Here in this room we have seen here those  
23 people who have enough time and interest to sit  
24 through this meeting. The group that I work with as  
25 a volunteer, Nuclear-Free Vermont by 2012, has worked

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1 to provide opportunities to speak out for people in  
2 the towns of Windham County who can't come out time  
3 after time to regulatory meetings.

4 In Vermont, we have a strong tradition of  
5 town meetings. Each month townspeople all over  
6 Vermont meet to discuss town and school budgets and  
7 the issues of the day and to vote on these things.  
8 Over several years, local towns have voted a town  
9 meeting day on Vermont Yankee issues.

10 As Senator Gander remarked earlier, the  
11 towns in the county have overwhelmingly said that when  
12 2012 comes, we have had enough. It's time, then, to  
13 shut down Vermont Yankee.

14 It's obvious that for Vermont Yankee EPU  
15 and on site dry cask storage are steps to make the  
16 continued running after 2012 more profitable, but it's  
17 likewise obvious that the operation of ENVY after 2012  
18 is contrary to the wishes of the majority of people in  
19 the ETZ and in Windham County.

20 We have been through six years of hearings  
21 and meetings, Public Service Board hearings on the  
22 sale of Vermont Yankee, regional and state meetings on  
23 dry cask waste storage, meetings on the condition of  
24 the river, and on the unannounced off-site dumping of  
25 excavation dirt from a power uprate building project

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1 to be done without Public Service Board approval.

2 In some ways, it's surprising that anyone  
3 at all comes out for these meetings anymore. But at  
4 every meeting, new people come out to voice their  
5 opposition.

6 I don't go along with the designation for  
7 NRC that nobody really cares. By the questions that  
8 you have asked and the issues that you have asked for  
9 more analysis, I believe that you do care.

10 The people of the tri-state region around  
11 Entergy Nuclear, Vermont Yankee are counting on you to  
12 advise against the uprate of this reactor. And your  
13 decision will be seen as a precedent nationwide.  
14 Vacuum breakers, steam dryers, NPSH, safe shutdown  
15 analysis, there are too many unmeasured unknowns to  
16 risk this experimental power boost.

17 Thank you very much for your time.

18 (Applause.)

19 CHAIRMAN DENNING: The next speaker is  
20 Celia West, followed by Ray Shadis, followed by Diana  
21 Sidebotham. You know, the presentations that we have  
22 had so far have had a lot of content. And I don't  
23 want to ask you to be brief for that purpose, but  
24 there are a lot of people who would like to speak.  
25 And so if you can, please be brief.

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1 Is Celia West not here or Ray Shadis?  
2 Yes. Ray, why don't you go ahead, please? Fine.  
3 Paul Bousquet?

4 MS. NEITLICH: Actually, I'm before Ray  
5 Shadis.

6 CHAIRMAN DENNING: Okay. You sit up  
7 there, please. Now, this is totally unfair.

8 MS. NEITLICH: This is fair. This is very  
9 fast. These are the children of our community. What  
10 is your name?

11 (Whereupon, children were introduced.)

12 MS. NEITLICH: Okay. So these are the  
13 children whose lives your decision is affecting.  
14 Sophie would like to say something.

15 SOPHIE: I think the nuclear power plant  
16 is unsafe. And I feel uncomfortable because it could  
17 hurt you. And I don't think it should operate.

18 (Applause.)

19 MS. NEITLICH: Thank you very much. Okay.  
20 So I would say just about all of these children live  
21 within the ten-mile evacuation zone. Oh, I'm sorry.  
22 My name is Jill Neitlich.

23 I see a lot of incredible parenting around  
24 this area, I mean, just parenting that I am really  
25 awed by, mothers, fathers. My primary job as a parent

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1 besides loving my child is to protect my child, to  
2 keep him safe.

3 Is your primary job, gentlemen, to keep us  
4 safe and our children safe or is it to protect the  
5 interests of Entergy?

6 CHAIRMAN DENNING: We know the answer: to  
7 keep you guys safe.

8 MS. NEITLICH: It is to keep us safe.  
9 Great. So we are all working --

10 (Applause.)

11 MS. NEITLICH: Great. Okay. Good. I'm  
12 glad to hear that. We are all working towards the  
13 same purpose. And because of that, I would like to  
14 give you this. This is my resume. I am not an  
15 engineer. I am a social worker. I am very strong in  
16 matters of ethics.

17 I am going to volunteer to work with you  
18 gentlemen. So whenever you have a meeting, please  
19 call me. I will get there. Here you go.

20 (Applause.)

21 MS. NEITLICH: And I really mean that. I  
22 would love to work with you guys. And I would like to  
23 be part of it. If you really want to keep us and our  
24 children safe, I would like to be part of it. Okay?

25 I would like to tell a story about Alfred

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1 Nobel. Everybody knows who Nobel is. He's known for  
2 the peace prize. Well, what a lot of people don't  
3 know is that he actually made dynamite until one day  
4 someone accidentally put his obituary in the newspaper  
5 when he was still alive. And they referred to him as  
6 something like Dr. Death. Nobel was horrified. And  
7 because of that, he created the peace prize.

8           So I just want to say one thing. I mean,  
9 yesterday I mentioned to you guys that I was wondering  
10 how your minds work. And I'm still wondering. So,  
11 you know, when people get towards the end of life --  
12 and I'm not saying you're getting towards the end of  
13 life. I'm just saying that what people do towards the  
14 end of life, they start to do a life review. And they  
15 think "What was the quality?" They don't think "How  
16 much money did I make for Entergy?" They think, "What  
17 was the quality of my love? How well did I love?"

18           And so I am wondering, when you get older  
19 and start doing a life review, are you going to start  
20 thinking, "Oh, boy, I really blew it, you know. We  
21 created more nuclear waste for my great grandchildren,  
22 great great great grandchildren. And they're going to  
23 be with this waste for 30 stinking years, 30" -- think  
24 of that -- or when you view this life, are you going  
25 to think, "I have really done a good job. I am so

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1 proud of myself. I bucked the system, and I protected  
2 the people of -- I protected New Englanders"?

3 So, gentlemen, please call me. I'll be at  
4 your meetings. And just think about this idea of  
5 matters of the heart. Thank you.

6 CHAIRMAN DENNING: You were going to go  
7 next. Is that --

8 MS. NEITLICH: Ray Shadis is next.

9 MR. SHADIS: Thank you, gentlemen. I will  
10 try to make this quick. I fully intended to balance  
11 the meetings at the end of the month. And I also have  
12 a couple of quick points.

13 Number one, I heard today as sort of an  
14 urban legend repeated over and over again that Vermont  
15 Yankee is unlike Maine Yankee. Maine Yankee was a  
16 plant that was -- the management was upset because of  
17 a manipulation of a computer code dealing with fuel  
18 clad temperatures under small break LOCA and that  
19 Vermont Yankee does not have any of those kinds of  
20 issues; therefore, shouldn't be considered for  
21 independent safety assessment.

22 I wonder if that is patently untrue. The  
23 independent safety assessment for Maine Yankee was not  
24 ordered because of any flaw in the management of Maine  
25 Yankee.

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1           That was already being taken care of.  
2           That question of a manipulation of the computer code  
3           was being dealt with by the Office of Inspector  
4           General and by a team convened out of NRC headquarters  
5           for lessons learned at Maine Yankee.

6           The question, the driving force behind the  
7           ISA, was the failed NRC oversight at Maine Yankee.  
8           The project manager, Pat Sayers, was getting ready to  
9           go on vacation. The computer code was one of the last  
10          things that needed to be signed off on. You know, he  
11          never checked it out. He took the company's word that  
12          they had rechecked it and everything was okay.

13          And what NRC did is they recognized that  
14          that was not adequate oversight, that was not the kind  
15          of oversight that was protective of public health and  
16          safety. And the ISA was ordered to yes, evaluate  
17          Maine Yankee but evaluate Maine Yankee in terms of  
18          NRC's ability to conduct real reactor oversight,  
19          whether or not their endless run of systematic  
20          licensing and performance scores were justified. How  
21          could they have missed this issue?

22          And what they found was they had missed  
23          many, many, many issues. There were 33, some major  
24          safety-significant issues that they missed. And, you  
25          know, even doing the ISA, they opened up the cable,

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1 say. They looked inside and said, "Yes, everything is  
2 firm and fully packed," but they never determined  
3 whether or not the company actually had wiring  
4 schematics that they understood or where there were  
5 cable separation issues. And ultimately that was the  
6 big ticket item that shut the plant down.

7 So I beg you. Don't tolerate the next  
8 salesman coming down the road to say that Maine Yankee  
9 underwent an ISA because of poor management. That was  
10 not it at all.

11 And I think here the issue is not so much  
12 whether Vermont Yankee deserves to have a diagnostic  
13 evaluation so much as whether or not the people of  
14 Vermont deserve to have Vermont Yankee undergo that.  
15 It is their community. And they are looking for  
16 reassurance.

17 I have the largest, probably the largest,  
18 collection of nuclear materials information records of  
19 anybody in New England, perhaps in the United States.  
20 I own an entire public document room. This is true,  
21 came from the Maine Yankee public document room. All  
22 9,000 pounds of microfiche are mine now.

23 Included in the documents are board  
24 meetings and executive committee meetings of the  
25 Yankee owners at the time that it was questionable as

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1 to whether Maine Yankee, Connecticut Yankee would  
2 continue operating. They openly referred to NRC  
3 terming the problems at the Yankee plant as the Yankee  
4 disease. And the question was, how can we escape the  
5 onus of the Yankee disease?

6 Ross Barkhurst, who was the CEO at Vermont  
7 Yankee, was at that meeting. And he scurried home  
8 from that meeting to see what he could do to bring  
9 Vermont Yankee out from under that shadow. And it's  
10 not ancient history. This is ten years ago.

11 CHAIRMAN DENNING: Would you comment on  
12 vertical slice versus --

13 MR. SHADIS: Sure. Pardon me?

14 CHAIRMAN DENNING: Yes. Would you comment  
15 on what your perception is of a vertical slice  
16 approach versus a risk-informed approach like was  
17 described?

18 MR. SHADIS: Yes. And if I may reference  
19 it to the experience at Vermont Yankee because I  
20 didn't follow through with the one at Cook or any of  
21 the earlier programs and what happened at Maine  
22 Yankee.

23 Maine Yankee had -- they had 25 people on  
24 site in 2 series of on-site visits. And I forget  
25 whether that was 2 weeks or 4 weeks, but one way it's

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1 4,000 hours, the other way it's 8,000 hours. And the  
2 team itself declared that they had spent twice that  
3 time back at headquarters preparing, analyzing,  
4 summarizing. And so you're looking at modestly 10,000  
5 to 20,000 hours and maybe more. So the intensity of  
6 that inspection was something quite different than  
7 what was recently done here at Vermont Yankee.

8 The other thing is that the deep vertical  
9 slice, the second, did pitch 4 systems at Maine  
10 Yankee, 4 out of 30-some plant systems. And we  
11 objected to that at the time. We didn't think it was  
12 enough.

13 They went down through the system top to  
14 bottom and investigated not only the material  
15 condition of the plant but all of the licensing  
16 documents that it had, the design basis documents, and  
17 then operations as it applied. And wherever they  
18 found anomalies, things would stop. And the  
19 inspection would then progress horizontally.

20 So it was both a prospecting slice down  
21 through the system and then, if you will, a strata  
22 mining slice to really determine extent of conditions.  
23 Root cause analysis was plugged into it.

24 And that really tells you not only is the  
25 plant in reality what it is supposed to be in its

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1 documents, but also it tells you something about the  
2 way that the plant has managed. More than that, it  
3 tells you whether or not oversight of the plant is  
4 tasked to do these things.

5 And so in so many respects, it's different  
6 because of that flexibility. In the case of Vermont  
7 Yankee, we had a team come to the plant that was not  
8 as independent of the plant as the one at Maine  
9 Yankee.

10 Maine Yankee they excluded people from NRR  
11 as far as I know and they excluded people from region  
12 I. They really had to scratch around the country to  
13 find the team. I lost my train of thought. And I'm  
14 sorry because I don't want to take up too much time  
15 with this.

16 They came in with a thorough understanding  
17 of the plant. They did an incredible amount of prep  
18 work before they came to do that inspection. It  
19 didn't happen at Vermont Yankee.

20 The team that came to Vermont Yankee had  
21 90 issues on a kind of wish list. Of those 90 issues,  
22 approximately half were eliminated because those  
23 particular items or activities did not exist at  
24 Vermont Yankee. The guys didn't know when they walked  
25 in.

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1           So when they did that first call, it  
2 wasn't because they were claimed because yes, they  
3 looked at it, it was okay, or any preliminary thing  
4 like that. It was largely because it didn't even  
5 apply to Vermont Yankee. Then they take 45 items. We  
6 mentioned that yesterday.

7           Out of that sample, the sample of 45 that  
8 you find 8 indications, that's a very strong signal  
9 that you ought to be looking further. As it was, they  
10 only did, in their words, limited extent of conditions  
11 review. They would not define what limited meant, and  
12 I suspect it was very limited, not to pick up on --  
13 so, anyway, sorry to go on like that, but you asked  
14 the question.

15           CHAIRMAN DENNING: Thank you very much.

16           MR. SHADIS: Yes. Any other questions we  
17 can take a quick shot at here?

18           (No response.)

19           MR. SHADIS: It was mentioned --

20           MEMBER WALLIS: Well, you know, the staff

21           --

22           MR. SHADIS: Sir?

23           MEMBER WALLIS: The staff claims that the  
24 approach they took in their --

25           MR. SHADIS: I'm sorry. I'm having

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1 difficulty hearing you.

2 MEMBER WALLIS: Well, I don't know whether  
3 I have to use a different language or what.

4 MR. SHADIS: No, sir.

5 MEMBER WALLIS: I don't want to deafen you  
6 because this seems to be resounding throughout the  
7 room here.

8 The staff this morning claimed that their  
9 approach was better than the Maine Yankee approach.  
10 And I understand that the people here from the state  
11 accepted that there needs to be such a level of the  
12 people who were here --

13 MR. SHADIS: Yes.

14 MEMBER WALLIS: -- accepted from the  
15 department --

16 MR. SHADIS: Yes.

17 MEMBER WALLIS: -- that this met what they  
18 were expecting.

19 MR. SHADIS: It's more, a little more,  
20 than dealing with the --

21 MEMBER WALLIS: We have somehow to weigh  
22 what the staff claims against what you are claiming.  
23 It's not as though there's a clear-cut issue.

24 MR. SHADIS: Yes.

25 MEMBER WALLIS: We have two different

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1 views of the adequacy of this inflection. And it's  
2 not clear-cut until -- you know, there are both sides  
3 to consider carefully as to what the result of this  
4 evaluation should be.

5 MR. SHADIS: My intent, Dr. Wallis, would  
6 be to provide you with the documents that build a  
7 history of this as it went along. I think right now  
8 suffice it to say that the Department of Public  
9 Services' prediction from the beginning of this call  
10 for an ISA in early 2003 was that it was unnecessary.  
11 And, in fact, this was fought through the Vermont  
12 Public Service Board right down to the wire.

13 And Mr. Sherman's testimony was that  
14 Vermont Yankee is an exemplary plant. And you do not  
15 bring this team of inspectors on an exemplary plant  
16 that doesn't deserve this sort of thing.

17 And so, you know, his perspective was  
18 informed by that viewpoint. If you're going into it  
19 -- and we have objected to his being included as the  
20 representative of the public member on that team.

21 I will tell you, by the way, in the Maine  
22 Yankee inspection, we had not only our state leaders  
23 inspected, but we also had hired in a consulting  
24 engineer. And then we had a review committee of five  
25 citizens appointed by the governor to follow; that is,

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1 section through.

2 But I will provide that information for  
3 you and see if we can't flesh that out. The other  
4 thing I'm going to recommend highly to you is that you  
5 read the reports.

6 The ISA, by the way, is not a big, fat  
7 report like this one. The SER is 75 pages. Read it.  
8 And we'll provide our comments that we also provided  
9 to the Commission at the time that that report was  
10 done. We had a citizens' review of that ISA. And I  
11 would be glad to provide that.

12 But the real comparison here is not  
13 between -- and I am forgetting myself -- not between  
14 the ISA and this inspection that was done here. It's  
15 between the request of the Vermont Public Service  
16 Board for a particular type of inspection for a  
17 particular purpose.

18 And that was the fourth, and they wanted  
19 it for the purpose of trying to determine reliability.  
20 That was their intent. They also stated that they  
21 wanted it for the purpose of satisfying to some extent  
22 the concerns of the public in calling for an ISA.

23 And I think if it doesn't -- it may be a  
24 wonderful exam. In fact, Dave Lochbaum, whom you have  
25 all heard from, thinks it was a tip-top inspection.

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1 And from everything that I looked at, it was a fine  
2 inspection. It was a heck of a lot better than the  
3 run-of-the-mill one that they are trying to replace.  
4 And let's not forget that that was the purpose of it,  
5 by the way.

6 CHAIRMAN DENNING: You do have somewhat  
7 similar points.

8 MR. SHADIS: I do. And I'm sorry to take  
9 so much time. You gentlemen were kind enough to  
10 invite New England Coalition to present at your  
11 meeting on reg guide 1.82, revision 4, the  
12 net-positive suction head question, containment  
13 overpressure question. And in that meeting, I  
14 suggested to you that you investigate the Vermont  
15 Yankee containment safety study of 1986. It was  
16 forwarded to Harold Denton at NRR in 1986.

17 That document done under pressure from the  
18 State of Vermont was Vermont Yankee's attempt to do a  
19 real analysis of containment safety at this plant.  
20 And I need to quote a couple of things to you.

21 There are two components or two activities  
22 that they bring up which are challenged when you start  
23 to move into the space of allowing containment  
24 pressure or depending on containment pressure to build  
25 up.

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1 And one of them is the dry well spray  
2 system. The other is primary containment denting if  
3 that option presents itself. And in both cases, the  
4 company says if you turn on the spray, you're going to  
5 lose the pump. You're going to chill the atmosphere  
6 in the containment. You're going to reduce pressure.  
7 And you will lose the pump. And they make it  
8 abundantly clear.

9 And, likewise, with denting, let me just  
10 read a couple of these quotes to you. I did ask NRC  
11 staff to provide copies of this to you. And I don't  
12 know if they did.

13 These are so definitive. This is not the  
14 hard-to-understand language that we heard yesterday  
15 and this morning. And I don't know if people will  
16 understand this kind of question, but okay. Dry well  
17 spray capabilities, 5.3, identified issues.

18 The first issue -- we're throwing this one  
19 in for free. The first issue is the task of  
20 containment implosion. Design negative pressure of  
21 two pounds per square inch will not be exceeded  
22 provided that vacuum breakers operate as design.

23 Someone here raised that question about  
24 vacuum breakers. The NRC staff didn't know anything  
25 about the vacuum breaker issue. All of us that had

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1 been reading in the LERs know that we have recently  
2 had an episode on vacuum breakers, but basically what  
3 we're looking at here is a design limit of two pounds  
4 per square inch negative pressure that would cause a  
5 collapse of the containment.

6 Secondly, ECCS, emergency core cooling  
7 system, pump, net-positive suction head is a concern,  
8 as is the case with containment venting, section 5.4.  
9 If sprays are utilized when the containment is  
10 pressurized and Torus water temperature is elevated,  
11 the resultant new pressurization could impact the  
12 available net-positive suction head of pumps taking  
13 suction from the Torus.

14 5.4, severe accident containment failure.  
15 If we go to venting, NRC believes that containment  
16 venting should be available to avert uncontrolled  
17 overpressure failure of the containment in certain  
18 severe accident scenarios.

19 5.4.3.2, anticipated transient without  
20 scram venting postulated to relieve pressure and  
21 preclude failure of the dry well shell, leading to an  
22 anticipated transient without scram success path.

23 However, it says. However, containment  
24 venting may also jeopardize continued core cooling in  
25 this scenario. The pressure suppression pool would

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1 quickly become saturated and would boil if pressures  
2 were significantly reduced.

3 The operability of the reactor vessel  
4 injection system pump that takes suction from the  
5 pressure suppression pool would be compromised due to  
6 inadequate net-positive suction heads and resultant  
7 pump cavitation.

8 If these injection systems are the only  
9 ones available, the degradation or failure of pumping  
10 capability could lead to core uncover and core melt  
11 might actually be caused by wet well venting.

12 I am not going to read the other couple of  
13 examples. It's just, in essence, a repeat of this.  
14 But basically what they were saying is here are two  
15 safety-related options you have. Use this system or  
16 use this method. Don't do it because if you do,  
17 you're going to lose the pump.

18 This is not a tempered statement. This is  
19 not qualified. This is flat out objective statements  
20 on their part. And what has not happened, as far as  
21 we can tell -- now, the attorneys for Entergy in the  
22 Atomic Safety and Licensing Board case have asked that  
23 they not have to provide discovery on the other  
24 party's issues to us.

25 So we, New England Coalition, have been

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1 precluded from getting the discovery on net-positive  
2 suction heads. Other than what may be in that, we  
3 have searched the documents.

4 We have searched the SER. We cannot find  
5 a reference to this containment safety study. And our  
6 objection is that if it has been surpassed with new  
7 information, that it must at least be referenced to  
8 say that the new information contradicts these  
9 conclusions and here is why. All right?

10 I beg that if you haven't already gotten  
11 it, get a copy of it and go through because, if for no  
12 other reason, these are the kinds of documents that  
13 those of who are concerned about safety and these  
14 plants review. We depend on the information in them  
15 as well as the NRC documents.

16 MEMBER SIEBER: What document is that,  
17 sir?

18 MR. SHADIS: This is entitled "Vermont  
19 Yankee Containment Safety Study." And it was provided  
20 to Harold Denton in a transmittal letter August 1986.

21 MEMBER SIEBER: And who is it from?

22 MR. SHADIS: This was performed by Vermont  
23 Yankee, apparently together with consultants because  
24 the voice and hand are different as you go through the  
25 document. But it doesn't say in the document that we

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1 have.

2 If you wish, if you have a hard time to  
3 find it, we will go ahead and copy all 300 pages of it  
4 and get it to you. You know, we'll be glad to do  
5 that.

6 MEMBER SIEBER: I'm not sure we want to  
7 put you to that burden. On the other hand, I'd like  
8 --

9 CHAIRMAN DENNING: We can handle that.

10 MEMBER SIEBER: I would like to see it.

11 MR. SHADIS: Yes. There is a section of  
12 -- there used to be. When the NRC public document  
13 room was on -- I think it was on Pennsylvania Avenue  
14 or right near Pennsylvania Avenue.

15 MEMBER SIEBER: Yes.

16 MR. SHADIS: There was a whole section of  
17 the PDR they called the black hole, which is where  
18 documents they didn't quite know how to label wound  
19 up.

20 CHAIRMAN DENNING: Are you done?

21 MEMBER SIEBER: If you could let Ralph  
22 know?

23 MR. SHADIS: I am. Thank you very much.

24 MEMBER SIEBER: Maybe you could let Ralph  
25 Caruso know how to find it.

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1 (Applause.)

2 MR. SHADIS: I'd be glad to.

3 CHAIRMAN DENNING: Paul Bousquet? And he  
4 will be followed by Diana Sidebotham, Bill Pearson,  
5 and Gary Sachs.

6 MR. BOUSQUET: Good afternoon. I promise  
7 not to be so articulate.

8 (Laughter.)

9 MR. SHADIS: Or long-winded.

10 MR. BOUSQUET: Or long-winded. I'm just  
11 a builder from up in the valley. My family has been  
12 in the hills forever. And I'm here as a terrorized  
13 citizen defending my homeland.

14 Paul Bousquet, Bousquet. So if I offend  
15 anybody, I have written this lastly. Don't take it  
16 personally. You seemed like a lot better, nicer guys  
17 than I really thought I was going to deal with.

18 (Laughter.)

19 MR. BOUSQUET: I realize you people were  
20 paid to be here today. And although that's not as  
21 good as you being here on your own, out of your own  
22 true concern for us, I still appreciate it anyway.

23 Of course, us are the unpaid citizens  
24 living in the danger zone around Vermont Yankee, not  
25 to include the paid employees from the plant or anyone

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1 else in a position to gain from your final decision.

2 For the life with me, I can't understand  
3 why an employee as mentioned would want the added risk  
4 of an uprate unless there was either a kickback or a  
5 threat involved.

6 That said, I would like to get to the real  
7 question. Are the benefits from an uprate worth the  
8 risks involved? It took VSNAP two years to even come  
9 up with that question. Hopefully they'll get to vote  
10 on it before the final decision is made.

11 I'm not sure as to how much pull you  
12 people actually have, but I do wonder what you think.  
13 If you have done your homework, I'm sure you know  
14 about the Maine group and the thousands of individuals  
15 that are opposed to this uprate. Personally I think  
16 it's immoral to even attempt, especially since Vermont  
17 has stated that at this time we don't need the extra  
18 power and we damn sure don't need the extra weight.

19 The Vermont Natural Resources and Energy  
20 Committee took months to work up a bill concerning the  
21 waste problem, only to be tricked into having the bill  
22 stripped of the earth and berm and the Health  
23 Department fence-line monitoring provisions, adding  
24 onto that the statement of no uprate, no tax paid on  
25 their way.

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1 Are you gentlemen aware of that? If the  
2 uprate does not go through, this waste stays in  
3 Vermont forever. And they won't have to pay a dime.  
4 If this bill

5 They took the bill behind - quickly,  
6 behind closed doors and voted, after suspending the  
7 house rules here in Vermont. Gentlemen, we were  
8 tricked and extorted by Entergy. We've had  
9 legislators publicly apologize for the way they were  
10 tricked into voting the way they did.

11 When questioned on why Yankee wanted the  
12 uprate, the Senior Liaison Engineer said that without  
13 the added revenue from the uprate, his company  
14 wouldn't be profitable enough to afford to pay storage  
15 fees. Does that make any sense to you? You're smart  
16 people. Does it make sense to make more waste to help  
17 pay to store the waste that you don't know what to do  
18 with?

19 All this on top of the fact that Entergy  
20 would not release any statement of what their profits  
21 actually were. This is a clear situation of a multi-  
22 billion dollar corporation extorting our legislators  
23 and then attempting to steamroller the thousands of  
24 people who opposed them. Years ago, when I went to  
25 get a license to drive tractor trailers, I was forced

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1 into getting a complete physical.. Not a check-up, but  
2 the most thorough physical available. The cost of a  
3 physical was not even discussed, because public safety  
4 was top priority. The exam that Vermont Yankee got -  
5 was given is a disgrace. We didn't even get the  
6 vertical slice that we were promised.

7 The number of hours varied, but if you  
8 don't count the hours of office time the Vermont  
9 nuclear engineers spent, they don't add up, either.  
10 Do we also count his hours eating his lunch? Even  
11 with the inflated numbers of 950 hours, this is not  
12 the most complete physical exam we could have.

13 Something so iffy as taking an old plant  
14 almost ready for retirement and taking the governor  
15 off, without the best inspection we could have, is  
16 irresponsible. Funny, that's the word our state  
17 nuclear engineer used when we demanded an ISA -  
18 irresponsible. I'm sure you are all familiar with the  
19 ISA that went on at Main Yankee in '96. Twenty  
20 thousand hours, give or take.

21 Our inspection was three or four percent  
22 of what Maine got. Do they feel that Vermont people  
23 are worth three or four percent of Mainers? No, Maine  
24 officials were out to prove how safe their reactor  
25 was, and it backfired. They found so many things

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1 wrong, they could not afford to fix it, so they closed  
2 it. Is this the fear here? If it is just the cost of  
3 the better inspection, then why don't you ask for  
4 money from the thousands and thousands of worried  
5 people who signed the petition, demanding a true ISA?

6 I, for one, have never been given a proper  
7 explanation why we can't have a similar IPA in Maine.  
8 The last thing I would like to speak about today is  
9 moral responsibility. Today, or in the near future,  
10 you will be asked on this uprate. You have a moral  
11 responsibility to make a good choice.

12 I am not stupid and I understand that many  
13 of you might be yes men, and your actual employment  
14 might be at stake. But through your actions, or  
15 through your inactions today, you are placing your  
16 name on a list and don't think that the corporation  
17 will take the heat and you will be spared if something  
18 goes wrong.

19 I have come to most of these meetings and  
20 begged and pleaded to people to take moral  
21 responsibility for their actions. I am done  
22 begging. Today I stand here as a possible radiation  
23 refugee, and I make you the promise, should anything  
24 happen as a result of this crazy proposition to uprate  
25 this old power plant, purely for Entergy's process,

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1 then I will personally distribute this list of names  
2 and do what I can to bring you to justice.

3 (Applause).

4 MR. BISQUET: One last bit and I will be  
5 out of here. I have had 180 degree turnaround this  
6 week, and I - my heart has changed, and I think I see  
7 through the smokescreen here. And in light of the  
8 many more cracks found at the steam dryer, why would  
9 Yankee use a better camera in the 11th hour to find  
10 cracks if they wanted it to go through?

11 It wasn't the NRC. It wasn't you guys.  
12 It was Yankee. They didn't have to do that. It think  
13 Yankee and Entergy will save face after seeming to  
14 push so hard for the uprate, only to be the real  
15 winners, escaping from the true cost of storing their  
16 waste here in Vermont until the end of time.

17 And the recent controversial Yucca  
18 Mountain and the lack of any new yucca, and the  
19 cutting of the funding for any interim sites - you can  
20 see my point here. We're going to get stuck with this  
21 waste. We're not - they're not going to pay a dime.  
22 Not a cent.

23 The last thing I want to say, why did this  
24 happen? Our legislators took four months to  
25 accomplish this. Three guys went behind three closed

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1 doors - the governor's men and the governor - they  
2 changed everything. They gutted it. Now, the  
3 governor is a man - I - you know what this is? You  
4 know what it represents?

5 A couple summers ago, they lose some fuel  
6 rod - a couple broken pieces. They looked for months  
7 and they couldn't find them. Our governor, who's  
8 running the show here, he went on public TV and he  
9 stated, thank God it wasn't new fuel.

10 (Laughter).

11 MR. BISQUET: I rest my case.

12 (Applause).

13 MR. BISQUET: Thank you.

14 CHAIR DENNING: Next, we have Diana  
15 Sidebottom, Bill Pearson, and Gary Sachs, in that  
16 order. Is Diana here? And correct me, please, if I  
17 mispronounced it.

18 MS. SIDEBOTTOM: Good afternoon,  
19 gentlemen. Thank you very much for the opportunity to  
20 speak. I'm President of the New England Coalition on  
21 Nuclear Pollution and was privileged in 1971 to be one  
22 of its founders. So I will just speak briefly today  
23 about a little history and a bit of philosophy.

24 We were involved with the New England  
25 Coalition and the original licensing of Vermont

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1 Yankee. One of the issues which we've pursued, of  
2 course, was the mark one containment. We did not know  
3 at that time something we discovered a number of years  
4 later, and that was that the - the deficiencies in the  
5 mark one were well-known by the nuclear industry and  
6 yet, it has - it was a license.

7 Since then, it has - various fixes have  
8 been instituted to relieve the - some of its  
9 deficiencies, such as the supposed venting of  
10 radioactive fume in the event of a serious accident to  
11 protect the machine.

12 In 1986, as Ray Shadis pointed out, a  
13 study of containment was ordered, because at an  
14 industry meeting, Harold Jenkins was quoted in  
15 *Nucleonics Week* as saying that in the event of a  
16 serious accident, there was a 90 percent chance of  
17 containment failure.

18 So, venting, a few years later, came into  
19 being to relieve the pressure on the containment in  
20 the event of an accident and now, we hear that perhaps  
21 there is need for a credit for overpressure in the  
22 event that an uprate should occur, and they would lose  
23 that.

24 In regard to protecting the mark one  
25 containment and venting, I was rather deeply involved

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1 in that particular issue when it came up in the mid-  
2 80s, and tried very hard to gain from various of the  
3 NRC people who came to Vermont to appear before the  
4 Vermont State Nuclear Advisory Panel how much  
5 radiation would emanate from the plant through the  
6 vent in the event that that needed to be used.

7 Several people simply refused to  
8 answer. Finally, from Dr. Banero (phonetic), I  
9 received the answer that a maximum of 50 REMs might be  
10 spewed forth onto the unsuspecting public in the event  
11 of an accident. About the same time, we learned of a  
12 study which had been done by Dr. Terry Las (phonetic)  
13 in Illinois to the effect that in the event of a fast-  
14 breaking accident, a thousand-megawatt BWR - as much  
15 as 1,600 REMs - would be discharged.

16 Now, just a bit of philosophy, or rather,  
17 early thinking. One of our science advisors had been  
18 a nuclear pioneer, he was professor emeritus and the  
19 University of Massachusetts, and a member of the San  
20 Francisco Bay Committee for Nuclear Responsibility.  
21 In August of 1973, he wrote the following words, which  
22 carry an even greater urgency for mankind today:

23 The dangers inherent in the production of  
24 nuclear power have been increasingly apparent and I  
25 consider it irresponsible to go ahead building new

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1 nuclear power plants. Of the many dangers, the three  
2 that concern me the most are the likely diversion of  
3 plutonium to make atom bombs for terrorists; the  
4 possibility of disastrous accident at nuclear power  
5 plants; and the unsolved problem of permanent storage  
6 of high-level radioactive waste.

7 We need a moratorium on nuclear power very  
8 soon. Until there has been urgent and determined  
9 development of alternative power sources to the point  
10 that wise decisions can be made about the best mix of  
11 energy sources for the future, without a moratorium,  
12 commercial sectors will preclude a decision and we  
13 will drift into a perilous dependence on a plutonium  
14 economy.

15 I'll simply close with a statement from a  
16 Nobel Laureate. This is an abbreviated version of a  
17 few more lines that he wrote. Energy is safe only if  
18 a number of critical devices work as they should; if  
19 a number of people in key positions follow all of  
20 their instructions. The enormous quantity of  
21 extremely dangerous material must not get into the  
22 hands of ignorant people or desperados. No Acts of  
23 God can be permitted.

24 Thank you very much.

25 (Applause).

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1 MS. SIDEBOTTOM: I'm pleased to meet with  
2 you today and to hear your very excellent questioning  
3 of this particular proposal, which threatens us, we  
4 believe - our lives, our property, our homes, and all  
5 we hold dear. Thank you very much.

6 (Applause).

7 CHAIR DENNING: Next is Bill Pearson,  
8 followed by Gary Sachs.

9 MR. PEARSON: Hi, my name is Bill Pearson.  
10 I'm really in awe of all of the comments that have  
11 been made. Maybe one thing that I can add to the  
12 discussion this afternoon is the dimension of  
13 morality. Using nuclear - using radioactive  
14 irradiants to heat water, to turn turbines, to make  
15 electricity, is a moral blunder of epic proportions.

16 By what conceivable system of morality can  
17 we justify the protection of deadly radioactive waste,  
18 thousands of tons of it, year after year after year  
19 after year, with, as we all know, still no safe and  
20 secure permanent depository, and then saddle our  
21 children and thousands of future generations to pay  
22 for its protection and safekeeping?

23 How is it morally justified to sanction  
24 the technology that knowingly produces raw materials  
25 suitable for nuclear bombs? What - that concoct

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1 evacuation plans that are currently doomed to fail and  
2 certain to doom thousands of people unable to flee,  
3 that subject the population to the worry and fear and  
4 uncertainty of a major catastrophe, such as Chernobyl  
5 or Three-Mile Island, happening right down the road?

6 What madness propels us in this enterprise  
7 when energy efficiency alone would preclude the need  
8 for even one watt of power from Vermont Yankee, when  
9 alternative energy sources are available, but just not  
10 with the billions of dollars in taxpayers' - I was  
11 saying, when alternative energy sources are available,  
12 but just not with the billions of dollars in  
13 taxpayers' subsidies doled out by Washington to the  
14 nuclear industry?

15 If Entergy Vermont Yankee is serious about  
16 safety, as they claim they are, and if the Nuclear  
17 Regulatory Commission is serious about safety, then  
18 there should be no - then they should be more than  
19 willing to conduct a thorough and complete independent  
20 safety assessment.

21 In closing, I'd like to tell you about a  
22 little boy, then almost five years old, who attended  
23 that public hearing in Vernon some years ago with  
24 about 500 other people. It was about the Vermont  
25 Yankee uprate.

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1 His name was Julian. Some of you may have  
2 been there. He came with his mother, bringing what he  
3 called tickets. I think he had traffic tickets in  
4 mind. He brought these tickets to the big boys in  
5 suits from the Vermont Yankee Factory. The tickets  
6 read: Stop polluting the air and the water. Stop  
7 harming the turtles, birds, and rabbits and making the  
8 fish sad. And keep the children safe.

9 We can get energy from the sun, Julian  
10 pointed out. The sun doesn't pollute. Smart kid.

11 (Applause).

12 CHAIR DENNING: Thank you. Gary Sachs,  
13 followed by Sophie Kaye and Water Swelinski.

14 MR. SACHS: The issue I wish to address -  
15 and I'm going to read, because I get too heated - but  
16 I'm also going to give myself time to make sure I get  
17 it right. I guess I want to say, this is the last  
18 hurrah, in a sense, before this uprate happens, and  
19 this uprate's tied in - as was spoken earlier - to  
20 dry-cast storage and license extension and if they get  
21 one, they get it all, and we lose.

22 So you're here because you guys said you'd  
23 be back and they brought you with them. The issue I  
24 wish to address is that the public is getting the  
25 wrong end of this proposed uprate.

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1 I have read ACRS quotes from I think it  
2 was 2001, which is when these extended power uprates  
3 began - although I've heard that they're so well-  
4 researched and so well-done, they've only been  
5 existing for four years - that extended power uprates  
6 increase risk of equipment breakdown, increase  
7 brittleness (phonetic), increase the risk of flow  
8 vibration, or damage from increased steam vibration,  
9 increase heat decay, possibly increase radiation  
10 dosage, decrease the time for operator reaction.

11 And I'm not an engineer. I don't intend  
12 to reach beyond my scope as a local concerned  
13 resident, and it's as a local resident that I'm  
14 wishing to offer you my concern. A lot of us are  
15 stressed out, so forgive me if I start something and  
16 lose it. There have been three nonbinding referenda  
17 locally. There's been something called Town Meeting  
18 Day, which is Vermont's annual exercise in  
19 participatory democracy.

20 Senator Gant (phonetic) spoke of that two  
21 of them lost 49.2 to 50.8. I personally don't really  
22 consider that losing. The last - oh, they spent huge  
23 bucks on it. The last one, we one. I think it was 52  
24 to 48.

25 MR. SIEBER: Could you tell us what the

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1 issue was on the last one?

2 MR. SACHS: The issue was to shut down the  
3 reactor in 2012 and for people stating - I think it  
4 was - I believe Mr. Anthes, who spoke earlier, read  
5 you the exact --

6 MR. SIEBER: Thank you.

7 MR. SACHS: I heard this morning that the  
8 Department of Public Services states itself to be  
9 firmly in support of Vermont Yankee, and they've also  
10 stated that position clearly to the Public Service  
11 Board. I get confused here. The Department of Public  
12 Service is supposed to be the ratepayer etiquette.

13 I get confused. Are they hedging their  
14 bets? The Department of Public Service says they're  
15 in support of Vermont Yankee. Vermont Yankee is a  
16 huge financial asset in the States. They are - they  
17 have the ability to pay things off \$20 million at a  
18 time - corporate citizenship. Yet, it was Bill  
19 Sherman who spoke to you earlier, quite loudly,  
20 speaking of containment overpressure, who found that  
21 issue and brought that forward.

22 To me, that feels like they're playing  
23 both sides of the coin, that no matter which way it  
24 goes, the Department's going to be able to come out  
25 saying, see what we did; weren't we good; we were on

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1 your side - to us, the public.

2 So on those referenda, Entergy spent huge  
3 amounts of money, I mean, a thousand percent more than  
4 what was spent by those people who oppose Vermont  
5 Yankee. Entergy often uses its assets, basically, to  
6 sway regulatory approval.

7 The Senator stated to you that the Public  
8 Service Board of Vermont makes their decisions based  
9 on economic issues. That's true. The Nuclear  
10 Regulatory Commission is mandated to make decisions to  
11 focus on safety. That is true. That leaves a vast  
12 gray area that no one yet has been willing to step  
13 into.

14 It would greatly please me if you  
15 gentlemen would have the courage to do so, to reach  
16 into that place between the economic interest to the  
17 State and the issues of safety that have been raised  
18 by the likes of the New England Coalition and by the  
19 other people.

20 To look at a safety evaluation report  
21 requires a huge amount of effort and a huge amount of  
22 study and a lot of time. That's my family time.  
23 That's Ms. Shaw's family time. That's every person  
24 out here's family time. We're not paid for it.

25 We don't like - I've got potassium iodide

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1 in my pocket. I don't like having to live with  
2 potassium iodide. I have to get woken up at 3:00 in  
3 the morning because of high winds in Albany. I don't  
4 like it. But it's something I live with, and I'd  
5 rather be informed than not.

6 I have plastic, because FEMA said, cover  
7 my windows in plastic. I don't - oh, sorry, that's  
8 Homeland Security. I don't believe it. I don't like  
9 living in that shadow.

10 So I want you gentlemen to know that it's  
11 your determination on this uprate issue that sets the  
12 precedent for the Public Service Board for Vermont.  
13 The Chairman of the Public Service Board who heard the  
14 uprate case is no longer the Chairman. The Chairman  
15 of the Public Service Board who heard the fail  
16 (phonetic) case is no longer the Chairman. The other  
17 two individuals of the three-person Public Service  
18 Board are the two making decisions.

19 Your decision sets the precedent. It is -  
20 there's more weight, more onus on you gentlemen.  
21 It's a huge, huge step. I know that no uprates have  
22 yet been denied by you gentlemen. I know that. I  
23 know what percentage - I know far more of this stuff  
24 than I'd like to.

25 The uprate proposed is entirely for

1 Entergy's profit. There is a member of the Public  
2 Service Department sitting in the front row here who  
3 stated in July of '04, I believe, that if Vermont  
4 Yankee would close tomorrow, there was enough  
5 electricity in the New England grid. We don't need  
6 it.

7 The only power from the proposed uprate  
8 that is being sold inside this space was an under-  
9 market rate agreement that Entergy made with a small  
10 company up North, and there is a - you don't know -  
11 there is a huge gap between what goes on in Wyndham  
12 County and why the hell there aren't 5,000 people from  
13 Mount Perior (phonetic) down here. Excuse my passion.

14 They don't get it. They don't even know  
15 where Vernon is. Do you? Okay. It's five miles -  
16 oh, nine miles south of here. I heard - okay, I want  
17 to step briefly to the issue of the - I don't know if  
18 it was the NRC - I think it was the NRC earlier that  
19 spoke that you've been doing routine engineering  
20 inspections for all uprates. I don't recall who it  
21 was that said that.

22 I'm not certain if that person was - or if  
23 it was ACRS, I'm - which is how I'm assuming you guys  
24 are positioned, although I don't know that - I'm not  
25 certain if you're referring to all the different types

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1 of the measurement uncertainty recapture uprates, the  
2 stretch uprates, and the fairly new extended power  
3 uprates. If it's the extended power uprates, you  
4 haven't been doing very many - many of the what are  
5 now extended power uprates happened after the earlier,  
6 smaller one.

7 Our Public Service Board, on March 15,  
8 2004, when they passed down their conditional approval  
9 of the uprate, did not ask for a routine engineering  
10 inspection. They called for very specifically, as a  
11 condition of uprate approval in the state regulatory  
12 process - and I'm grateful to live in a state with a  
13 regulated utility system - it's scary enough we may  
14 end up looking like California come this summer - they  
15 ask for an independent engineering assessment.

16 As I mentioned yesterday, six weeks later,  
17 the NRC wrote back saying, we have been working -  
18 planning this for a long time. As I said then, I  
19 don't believe it. They called for, very specifically,  
20 two safety-related systems, two maintenance-rule  
21 systems, and two deep vertical slices - one into each.

22 And X amount of people have laid out - I  
23 believe Mr. Anthes began, literally read you what the  
24 order stated - I do not believe that what the NRC did  
25 with their last August of '04 to September of '04

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1 independent engineering assessment - I do not believe  
2 that that foot the bill for two safety-related  
3 systems, two maintenance-rule systems, and of those,  
4 two vertical slice systems.

5 The most important thing I want to say,  
6 I'm going to reiterate, it's your determination that  
7 I believe sets the precedent for the Public Service  
8 Board. The Public Service Board - those two members  
9 left - are the ones who will decide for this state,  
10 whether or not you - if you give your approval to  
11 them.

12 One of the member's a teacher, one of  
13 them's a businessman. They're not engineers. The  
14 Chairman who left was a member of EPRI (phonetic). The  
15 man who has refused himself from this case is a former  
16 head of the department, so I'm not sure which side  
17 he's on.

18 You may or may not already know about what  
19 happened yesterday out in Dresden (phonetic) with the  
20 repairs made to their steam dryer. The repairs were  
21 made two years ago. Yesterday, the repairs were found  
22 to already have fissures in them. If you don't know  
23 yet, you will soon.

24 I also assume that you already know the  
25 quote from the former NRC Commissioner, Peter

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1       Bradford, that Vermont Yankee has never produced power  
2       for less than ten times the amount that the  
3       legislature in 1957 was told it would produce power  
4       for.

5               Thank you very much for allowing me to  
6       speak.

7               (Applause).

8               CHAIR DENNING: Walter Swelinski, please?

9               DR. SWELINSKI: I'm Walter Swelinski. I'm  
10       a physician, and a musician. I coach the jazz works  
11       up at the High School. I'm deeply embedded in this  
12       community and I'm knowledgeable in medical and basic  
13       science issues.

14               The first time I spoke at a meeting of  
15       this sort was about 30 years ago in Northern Ohio.  
16       There was a proposal that went through to build a  
17       nuclear power plant at that time. My concern then and  
18       many others' concern at that point was related to what  
19       was going to happen to the fuel once it's spent, no  
20       longer useful for generating electricity.

21               There had been assurances from the  
22       industry and from the Federal Government that this  
23       problem would be taken care of. The project has  
24       obviously gone forth without a solution to this  
25       serious recurrent, unsolved, and perhaps unsolvable

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1 problem.

2 As everybody knows, recently, the  
3 Legislature of Vermont allowed Vermont Yankee to store  
4 its spent fuel in dry-cast on site as a temporary  
5 measure, awaiting permanent storage in such a facility  
6 as Yukka Mountain. Most people in this room probably  
7 also know that that - Yukka Mountain has been  
8 enormously studied. There's enormous controversy  
9 around it and just in the last two days, the Congress  
10 of the United States cut the funding for continued  
11 investigation there.

12 For all practical purposes, there is no  
13 long-term solution for storage of spent fuel, and  
14 after 30 years, it's reasonable to think that there  
15 won't be. It's not controversial whether or not spent  
16 fuel poses a health risk to the community where it's  
17 stored. No one contests it.

18 For all practical purposes, Vernon has  
19 been turned into a high-level long-term radioactive  
20 waste dump. People in this area will live with this  
21 for the rest of their lives. I don't really have any  
22 question about this.

23 This is what I spoke to 30 years ago; this  
24 is what I speak to now. I'm not representing anyone  
25 but the public and - a public that feels betrayed by

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1 its government and this industry. This is a  
2 significant problem that won't go away. It hasn't  
3 been solved.

4 For that reason, I'm opposed to the  
5 current proposal to increase the productivity of  
6 Vermont Yankee. It will create more nuclear waste and  
7 increase the threat to the people living in this area.

8 I have one other thing to say that people  
9 might not be aware of. There's been a lot of  
10 discussion about evacuation plans, and whether or not  
11 we can get people out of the community fast enough, if  
12 something goes wrong at Vermont Yankee. Several years  
13 ago, I was curious about this and made some contacts,  
14 asking about some of the details of what went into  
15 this.

16 The general thought was that if enough  
17 radiation was released into the community, where it  
18 would increase the long-term cancer risks of people  
19 living under that amount of radiation by a factor of  
20 I believe it was three, then people should be  
21 evacuated from that area. People are concerned they  
22 can't get out fast enough.

23 My concern is actually the opposite. I  
24 want to stay. My concern is, I'm not going to be able  
25 to come back. The U.N. undertook a study in 2002 of

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1 the evacuation of Chernobyl. About 160,000 people  
2 were evacuated. It was the worst nuclear accident in  
3 the history of the world.

4 The result of the U.N. study was that in  
5 fact, they felt that the health consequences of the  
6 evacuation exceeded the likely health consequences of  
7 staying put. People were evacuated, they lost their  
8 community, they lost their jobs, they lost everything.  
9 They became wards of the state. They went on welfare.  
10 They developed diseases and conditions associated with  
11 not having anything to do: depression, obesity,  
12 diabetes, heart disease.

13 The U.N. felt that it was better that the  
14 evacuation never occurred in the first place. This is  
15 the worst nuclear accident in the history of the  
16 world. I'm not reassured by anybody's plan about how  
17 quickly I and my children can get out of here. I own  
18 my land. I own a house. I have no interest in ever  
19 living anywhere else.

20 I don't want to leave. And I'll tell you,  
21 if those whistles go off and there's an accident, I'm  
22 not. I'll be one of those that the - I'll be one of  
23 those troublemakers that - like the people in New  
24 Orleans who stayed, who didn't want to go off to some  
25 refugee uncertainty. I'm not eager about that.

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1                   Thank you for listening to me. I have  
2 grave doubt as to whether there will be any change in  
3 the course of nuclear energy in this country. The  
4 public that I see everyday has a sense of betrayal by  
5 its corporations and its government at this point. As  
6 much as you are well-meaning representatives of the  
7 government and the corporations involved, I came here  
8 to listen to what people have to say. I don't get  
9 paid at all for being here. It's my family time.  
10 It's not easy to come. The people in this community  
11 are concerned. We are not reassured. Thank you very  
12 much.

13                   (Applause).

14                   CHAIR DENNING: Thank you, Dr. Swelinski.  
15 I would very much like to thank the public for the  
16 input that they've provided. I'm sorry. I'm  
17 sorry. And there may be others like you, but you have  
18 had a chance to speak. We do have to catch a plane.  
19 I'm very sorry, but - because we have another meeting  
20 that we have to do tomorrow in Rockville.

21                   But I would like to say how much it's  
22 meant to us to hear from you people. I don't think  
23 that you could've presented your case in any better  
24 way than you did. You did it very effectively. It's  
25 up to us to assimilate a lot of information. We hear

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1 what it is you're saying. We understand the passion  
2 behind it. We understand your concerns, and we will  
3 do our best to integrate all the information we get  
4 and do it in a way that is best for the safety of  
5 everybody.

6 I would also like to say that anybody who  
7 has prepared a presentation, please provide it to us  
8 and we promise that we will have our staff go over it  
9 and summarize it for us at our next meeting.

10 Thank you very much, and good night.

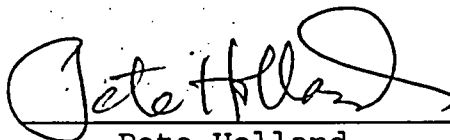
11 (Whereupon, the meeting was concluded).  
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CERTIFICATE

This is to certify that the attached proceedings  
before the United States Nuclear Regulatory Commission  
in the matter of:

Name of Proceeding: Advisory Committee on  
Reactor Safeguards  
Subcommittee on Power Upgrades  
Docket Number: n/a  
Location: Brattleboro, VT

were held as herein appears, and that this is the  
original transcript thereof for the file of the United  
States Nuclear Regulatory Commission taken by me and,  
thereafter reduced to typewriting by me or under the  
direction of the court reporting company, and that the  
transcript is a true and accurate record of the  
foregoing proceedings.



Pete Holland  
Official Reporter  
Neal R. Gross & Co., Inc.

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## **ACRS Subcommittee on Power Upgrades**

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NRC Staff Review of Proposed Extended Power Uprate  
For  
Vermont Yankee Nuclear Power Station



November 15-16, 2005

1-1

## **Opening Remarks**

---

Cornelius Holden  
Deputy Division Director  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

1-2

## **Opening Remarks**

---

- VY Proposed Extended Power Uprate (EPU)
  - 1593 to 1912 Megawatts Thermal (MWt)
  - 20% increase (319 MWt)
- 105 power uprates approved
  - 13 of 105 are EPUs
  - 11 of 13 EPUs are for boiling water reactors
  - 7 of 13 EPUs > 319 MWt
  - One other EPU approved for 20% (Clinton)
- Second EPU Review done with RS-001

1-3

## **Opening Remarks**

---

- Review took over two years, 9000 hours
- Technical issues included:
  - Steam dryer integrity (flow-induced vibration)
  - Crediting containment accident pressure
  - Transient testing
  - Analytical methods and codes
  - Engineering inspection

1-4

## **Introduction**

---

Rick Ennis  
Senior Project Manager  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

2-1

## **Background**

---

- Review Used Review Standard RS-001
- Requests for Additional Information (RAIs)
  - 8 Rounds
  - Nearly 400 Questions
- 41 Supplements to Application
- Audits & Independent Calculations & Analyses

2-2

### **Topics for 11/15 - 11/16**

---

- EPU Power Ascension and Testing (11/15)
  - Safety Evaluation (SE) Sections 2.12 & 2.5.4.4
- Credit for Containment Accident Pressure (11/16)
  - SE Sections 2.6.5 & 2.13
- Engineering Inspection (11/16)
  - SE Section 1.6

2-3

### **Topics for 11/29 - 11/30**

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- Mechanical and Civil Engineering
- Reactor Systems
- Materials and Chemical Engineering
- Electrical Engineering
- Plant Systems
- Source Terms and Radiological Consequences
- Health Physics
- Human Performance

2-4

### **VY EPU Schedule**

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- ACRS Subcommittee Meeting in Vermont (11/15/05 - 11/16/05)
- ACRS Subcommittee Meeting in Rockville (11/29/05 - 11/30/05)
- ACRS Full Committee Meeting in Rockville (12/8/05)
- Issue Final Safety Evaluation (2/24/06)
- ASLB Hearing (TBD)

2-5

### **EPU Power Ascension And Testing**

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Robert L. Pettis, Jr.  
Senior Reactor Engineer  
Plant Support Branch  
Division of Inspection Program Management  
Office of Nuclear Reactor Regulation

3-1

### **EPU Test Program**

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- Standard Review Plan (SRP) 14.2.1, "Generic Guidelines for Extended Power Uprate Testing Programs," provides guidance for testing programs based on Regulatory Guide (RG) 1.68 and plant specific initial test program.
- EPU test program should include testing sufficient to demonstrate structures, systems, and components (SSCs) will perform satisfactorily at the requested power level.

3-2

### **EPU Test Program - continued**

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- Staff guidance considers original power ascension test program and EPU related plant modifications.
- Staff guidance acknowledges that licensees may propose alternative approaches to testing with adequate justification. Supplemental guidance provided in SRP for staff evaluation of alternative approaches.

3-3

## **Large Transient Testing (LTT)**

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- LTT was part of the initial test program.
- Staff previously accepted the following justifications for not performing LTT for EPU:
  - Licensee's test program will monitor important plant parameters during EPU power ascension;
  - TS surveillance and post-mod testing will confirm the performance capability of the modified components;
  - Operating history and experience at other light water reactors (LWRs).
  - LTT not needed for Code analyses benchmarking.

3-4

## **Large Transient Testing - continued**

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- Staff requested additional information to support the licensee's basis for not performing LTT.
- The licensee's responses were based on the following factors presented in the SRP and consistent with previous staff approved EPUs:
  - Consideration of industry operating experience, including several unplanned generator load rejections which produced expected results;
  - Analysis of potential unexpected systems interactions;
  - Effects on design margin;
  - Limited scope of EPU modifications for balance of plant (BOP) systems;

3-5

## **Large Transient Testing - continued**

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- Analyses results bound operational transients experienced at VY and other uprated plants; and
- Conformance to previous NRC staff approved General Electric (GE) Constant Pressure Power Uprate (CPPU) topical report.

3-6

## **Summary**

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- SRP 14.2.1 allows licensee justification for not performing all initial test program power ascension tests.
- Thirteen domestic LWRs have implemented staff approved EPUs up to 120% original licensed thermal power (OLTP) without performance of LTT.
- Staff considered previous plant operating experience and no introduction of new credible thermal-hydraulic phenomena.
- Limited scope of EPU modifications.

3-7

## **Conclusion**

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- The licensee's proposed EPU test program, with testing required by license condition for the condensate and feedwater system discussed in SE Section 2.5.4.4, satisfies the staff guidance in SRP 14.2.1.

3-8

## **Test Considerations for Plant Modifications**

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**Steven Jones**  
Senior Reactor Systems Engineer  
Acting Chief, Balance of Plant Section  
Plant Systems Branch  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

4-1



### **Important-to-Safety Modifications**

- Physical Modifications
  - Feed Pump Low Suction Pressure Trip Logic
  - Recirculation Runback on Feed Pump Trip
  - Main Turbine
- Operational Changes
  - Three Feed Pumps Instead of Two at Full Power (Continue to Operate with Three Condensate Pumps)
  - Increased Feedwater and Steam Flow to Support EPU

4-2

### **Scope of Planned Power Ascension Testing**

- Measured Approach to Full EPU Power Level
  - Power Plateaus for Stabilization
  - Demonstration of Normal Control System Performance
  - Monitoring Instrumentation In Place
- No Licensee-Proposed Transient Testing
- Staff Identified Need for License Condition for Transient Testing

4-3

### **Operating Experience**

- Favorable BWR Post-EPU Transient Response
- Predictable Response and Adequate Safety Margins Have Been Observed
- Exception: Dresden Vessel Overfill Event
  - Incomplete Modeling of Change from Two to Three Operating Feed Pumps for EPU
  - Transient Resulted in Vessel Over-Fill and Water Entry into HPCI Steam Lines
  - HPCI Steam Lines at Dresden Unusual; Separate and Lower than Main Steam Line Penetration into Vessel

4-4

### **VY Transient Testing Review**

- Load-Rejection in 2004 Satisfies Many Objectives of Large Transient Test
  - About 80 Percent of CPPU Power Level (100 Percent of current licensed thermal power (CLTP))
  - Many EPU Mods Had Been Completed, Including Mods to Feedwater System and Main Turbine
- Significant Margin to Vessel Overfill Event
- Retains Substantial Turbine Bypass Capability
- Safety-Related System Performance Modeled in Safety Analyses - Adequate Margin Maintained

4-5

### **Vermont Yankee Transient Testing**

- Condensate/Feedwater Interaction on a Loss of a Condensate Pump
  - Potential for Loss of All Feed Pumps due to New Common Low-Low Suction Pressure Trip
  - Outside Range of Previous Operating Experience
- Transient Testing License Condition Will Be Added to VY License
- Licensee Identified Computational Error - Lower Margin than Previous Estimate
- Additional Modification for Direct Trip of a Feed Pump Proposed By Licensee and Currently Under Staff Review

4-6

### **Condensate Pump Trip Test**

- Tests Integrated Response of Many Control Systems and Modifications, Including:
  - Recirculation Runback
  - Feedwater Level Control
  - Reactor Pressure Control
  - Feed Pump Suction Pressure Trip Logic
- Design Outcome is Continued Operation at Reduced Power
- Safety Benefit in Demonstrating Proper Transient Response and Maintenance of Normal Heat Removal (Defense-in-Depth) Justifies Operational Impact

4-7

## **Conclusion**

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- **Limited Scope of Test Program Justified**
  - Industry Operating Experience
  - VY Load Rejection Event
  - Acceptable Analytical Results and Safety Margins
  - Limited Scope of Modifications
- **Transient Testing of Condensate/Feedwater Interaction Necessary**
  - Affected By Modifications
  - Outside Bounds of Previous Experience

## **Crediting Containment Accident Pressure for NPSH**

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**Richard Lobel**  
Senior Reactor Systems Engineer  
Probabilistic Safety Assessment Branch  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

5-1

## **Purpose**

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- To discuss NRC Staff review of the VY proposal to credit containment accident pressure in determining available net positive suction head (NPSH)

5-2

## **Regulations**

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- There is no regulation prohibiting credit for containment accident pressure in determining available NPSH for safety-related pumps

5-3

## **NRC Position**

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- NRC allows credit for containment accident pressure when:
  - a conservative analysis has demonstrated that this amount of pressure will be available for the postulated design basis accident; and
  - When examined from a broader perspective including design basis accidents, the level of risk is acceptable.

5-4

## **Postulated Accidents That May Require Credit**

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- Loss-of-Coolant Accident (LOCA)
- Anticipated Transients Without Scram (ATWS)

5-5

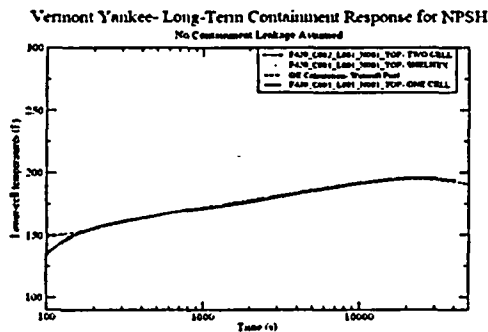
## **Calculating Containment Conditions**

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- SHEX computer code is used for LOCA and ATWS

5-6

## NRC Calculation of Supp Pool Temp



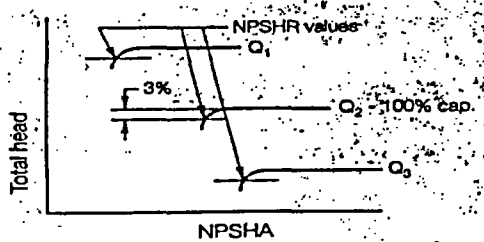
5-7

## Calculating Containment Conditions

- GOTHIC 7.0 computer code is used for Appendix R and Station Blackout

5-8

## Required NPSH Definition



5-9

## RG 1.82 Position on Required NPSH

- Credit may be taken for operation in cavitation provided:
  - Prototypical pump tests are performed
  - Acceptable post-test examination

5-10

## VY Required NPSH

- Based on pump vendor testing and expert judgment
- VY RHR and core spray pumps tested at reduced NPSH conditions - limited number of points.
- Additional data from other pump models
- Pump vendor states that pump design characteristics important to required NPSH are identical for non-VY pumps: specific speed, suction specific speed, blade inlet angle
- Pump affinity laws applied to adjust data
- Time at reduced NPSHR: pump vendor judgment

5-11

## Conservatism

- VY Response to NRC Staff RAI:
  - "The more conservative initial conditions assumed in the design bases calculations are responsible for identification of the need to rely on containment accident pressure..."

Vermont Yankee TS Change No. 263, Supplement 8, July 2, 2004

5-12

### LOCA Conservatism

- Reactor power 102% of licensed rated thermal power
- Decay heat at 2-sigma
- Decay heat bounds specific cycle
- Most conservative initial conditions
- All TS parameters at limiting value
- Worst single failure short-term: LPCI Loop Select failure results in pump runout flow

5-13

### LOCA Conservatism

- Worst single failure long-term: RHR heat exchanger unavailable
- RHR flow through RHR HX minimized
- RHR service water flow (ultimate heat sink) through HX minimized
- Break flow heat and mass transfer with drywell atmosphere minimizes torus pressure
- NPSH calculation based on a suppression pool water volume less than predicted at time of peak temperature

5-14

### LOCA Conservatism

- Value of ECCS strainer head loss used is greater than predicted
- No temperature correction made to required NPSH
- For the long-term, the distribution of debris on the one active CS strainer and one active RHR strainer will be the amount initially deposited in the short term + redistributed from inactive strainers + amount not removed in short term

5-15

### LOCA Conservatism

- Strainer temperature for head loss calculations less than predicted suppression pool temperature
- RHR pump runout flow used for long-term LOCA
- Maximum service water temperature
- Continuous spray operation (torus and drywell)
- Peak initial suppression pool temperature (90 F)
- Operation of containment spray is assumed for the duration of NPSH calculation
- RHR pump flow assumed at runout (maximum) value for duration of LOCA - operator never throttles pump

5-16

### LOCA Conservatism

- Cumulative conservatism due to the assumption that all conservatisms apply simultaneously

5-17

### LOCA Conservatism

Single Failure Assumption	Peak Suppression Pool Temperature
With RHRHX Failure	195 °F
Without RHRHX Failure	169 °F

5-18

### LOCA Conservatism

Input Parameter	Conservative Assumption	Anticipated Value	SP Estimated Temp Diff (F)
Decay Heat	Cycle Independent	Cycle Dependent	-2.0
Long-Term Vessel Recovery with Minimum SP Cooling	2 LPCI and 2 CS	1 CS	-8.0
RH-R Flow (as it affects RH-RHX performance) (gpm)	6,400	7,000	-0.6
RH-RSW Flow (as it affects RH-RHX Performance) (gpm)	2,700	4,000	-4.8

5-19

### LOCA Conservatism

- Pre-EPU Peak SP Temperature = 182.6 °F
- Peak EPU SP Temperature = 194.7 °F
- Peak SP Temp - Sum of conservatisms in table  
194.7 °F - 15.4 °F = 179.3 °F
- Peak SP Temperature - Root mean square of conservatisms in table  
194.7 °F - 9.6 °F = 185.1 °F

5-20

### Conservatism

- An analysis with realistic (nominal) assumptions shows that credit for containment accident pressure is not needed.

5-21

### Containment Integrity

- VY design basis analyses assume containment integrity. Based on:
  - VY compliance with 10 CFR 50 Appendix J Leak testing
  - VY compliance with 10 CFR 50.55a inspections
- Walkdowns prior to containment closure
- VY containment is inerted

5-22

### Peak Containment Pressure (psig)

Pre-CPPU	CPPU
41.6	41.8

5-23

### Impact on Operator

- Credit for containment accident pressure does not change VY emergency operating procedures (EOPs). Containment pressure is currently a consideration for NPSH.
- No impact on operator

5-24

## **Conclusions**

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- Credit for containment accident pressure is determined conservatively.
- A more realistic but still conservative calculation would show that credit is not needed.
- Based on stringent testing requirements, inerting and VY EPU safety analyses, containment integrity is a reasonable assumption
- Credit for containment accident pressure has no impact on the operator
- Staff finds the VY credit for containment accident pressure acceptable

## **Containment Accident Pressure Credit NRC Staff Risk Evaluation**

**Martin A. Stutzke**  
Senior Reliability & Risk Analyst  
Probabilistic Safety Assessment Branch  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

6-1

## **Presentation Outline**

- Overview of risk evaluations to support non-risk-informed license amendment requests (LARs)
- NRC staff scoping risk evaluation of proposed containment overpressure (COP) credit
- Risk insights concerning defense-in-depth
- Risk insights concerning performance monitoring
- Conclusions

6-2

## **Non-Risk-Informed Submittals**

- General references
  - COMSAJ-97-08, "Discussion on Safety and Compliance"
  - RIS 2001-02, "Guidance on Risk-Informed Decisionmaking in License Amendment Reviews"
  - Standard Review Plan (SRP), Chapter 19, Appendix D, "Use of Risk Information in Review of Non-Risk-Informed License Amendment Requests"
- The decision to submit a risk-informed LAR is voluntary on the part of the licensee

6-3

## **Process to Obtain Risk Information**

- 10 CFR 2.102 gives NRC authority to require the submittal of information in connection with an LAR
- SRP 19, App. D provides the process to obtain risk information about a non-risk-informed LAR:
  - Staff requests risk information
  - If licensee declines, staff must show that the LAR raises questions about adequate protection of the public health and safety in order to require the licensee to provide risk information

6-4

## **Process to Obtain Risk Information (Con't.)**

- Licensee needs to address the five key principles of risk-informed decisionmaking given in RG 1.174
- Licensee may decline to provide risk information, but could have its LAR denied
- Specific to extended power uprates (EPUs):
  - EPUs not submitted as risk-informed LARs
  - However, the staff expects licensees to submit a risk evaluation because a proposed EPU could create special circumstances that rebut the presumption of adequate protection from compliance with existing regulations and requirements
  - "Review Standard for Extended Power Uprates," RS-001, Rev. 0, Matrix 13

6-5

## **Five Key Principles in RG 1.174 and SRP 19**

- The five key principles:
  - Proposed change meets the current regulations
  - Proposed change is consistent with the defense-in-depth philosophy
  - Proposed change maintains sufficient safety margins
  - Increases in risk should be small and consistent with the intent of the Commission's Safety Goal Policy Statement (51 FR 30028)
  - Impact of proposed change should be monitored using performance measurement strategies
- Acceptability of proposed change is determined by an integrated decisionmaking process

6-6



## Risk Evaluation Chronology

9/10/03	Entergy submits EPU application
12/18/03	NRC staff sends Request for Additional Information (RAI); Question SPSB-7 asked about overpressure credit in the context of PRA operator actions
1/31/04	Entergy responded to the RAI (Supplement 5)
May 2004	Staff makes scoping risk evaluation of overpressure credit
3/28/04	NRC staff sends RAI; Question SPSB-C-1 asked about the overall impact of the overpressure credit on risk
7/2/04	Entergy responded to the RAI (Supplement 8)
12/21/04	NRC staff sends RAI; Question SPSB-C-45 asked about thermal-hydraulic calculations that support PRA success criteria
2/24/05	Entergy responded to the RAI (Supplement 23)
7/19/05	Staff presentation to ACRS Subcommittee on Thermal Hydraulics concerning revision to RG 1.82; discusses initial staff risk evaluation. Subcommittee suggests that the risk evaluation be expanded to include more initiating events

6-7

## Risk Evaluation Chronology (Con't.)

July - August 2005	Staff expands its risk evaluation by modifying SPAR models
9/8/05	Staff presentation to full ACRS Committee concerning revision to RG 1.82; discusses revised staff risk evaluation
9/10/05	ACRS letter on proposed revision to RG 1.82 recommends that it not be published for public comment without revisions
10/3/05	Staff requests Entergy to provide a risk evaluation of the overpressure credit that addresses the five key principles of risk-informed decisionmaking in RG 1.174
10/7/05	Staff presentation to full ACRS concerning proposed revision of RG 1.82; states intent to consider overpressure credit using risk-informed decisionmaking and make RG 1.82 a risk-informed regulatory guide
10/21/05	Staff completes draft Safety Evaluation; scope of risk evaluation based on NRR RS-001 and SRP 19, App. D
10/21/05	Entergy provides partial risk evaluation (Supplement 38)
10/26/05	Entergy completes risk evaluation (Supplement 39)
TBD	Staff to develop revised draft SE that includes review of Supplements 38 and 39

6-8

## Staff Scoping Risk Evaluation

- Realistically conservative licensee thermal-hydraulic calculation indicates that containment overpressure credit is not required
- Staff risk evaluation assumes that core damage will occur only if all of the following occur:
  - Reactor coolant is discharged to the suppression pool
  - Low pressure core injection (LPCI) or core spray (CS) is required to provide reactor inventory control or decay heat removal
  - Containment integrity is lost (loss of overpressure, which leads to inadequate NPSH)
  - Operator does not initiate suppression pool cooling within four hours

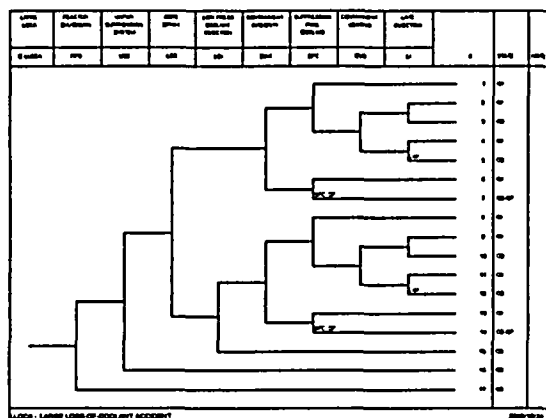
6-9

## Scoping Risk Model

- Modification of the Standardized Plant Analysis of Risk (SPAR) models developed by the Office of Research (RES). SPAR models are the basis of:
  - Significance Determination Process (SDP)
  - Accident Sequence Precursor (ASP) program
- Considered:
  - 11 transient initiators
  - 5 LOCA initiators (including ISLOCAs)
  - Special sequence types
    - Station blackout (SBO)
    - Stuck-open relief valve (SORV)
    - Anticipated transients without scram (ATWS)

6-10

## Scoping Risk Model (Con't.)



6-11

## Scoping Risk Model (Con't.)

- Data to quantify loss of containment integrity (including pre-existing undetected leaks and containment isolation failures) obtained from:
  - Licensee's recent submittal for a one-time ILRT extension to 15 years
  - Office of Research (RES)
- Human failure event (failure to initiate suppression pool cooling within four hours):
  - Cognitive Errors: EPRI Cause-Based Decision Tree Method (CBDTM)
  - Action Errors: NUREG/CR-1278, A Technique for Human Error Rate Prediction (THERP)

6-12

## Scoping Risk Model (Con't.)

- Quantification method:
  - Truncation limit:  $10^{-12}$  per year
  - 5000 Monte Carlo samples for parametric uncertainty analysis
  - Minimal cut sets regenerated for each sensitivity analysis case
- Uncertainty analysis:
  - Parametric uncertainties
  - Modeling uncertainties
    - Containment leak size
    - Main steam isolation valve (MSIV) success criterion
    - Human reliability analysis methods

6-13

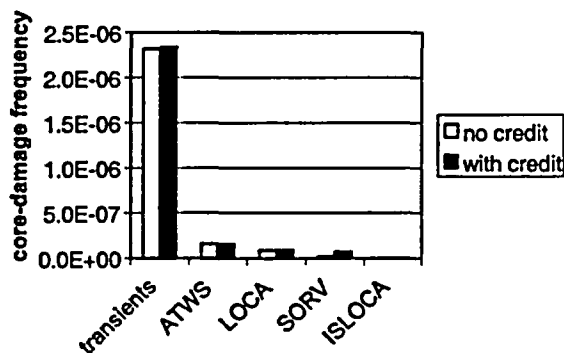
## Results of the Analysis

	mean	5th percentile	95th percentile
CDF for no overpressure credit	2.6E-06	2.5E-07	8.9E-06
CDF with COP credit	2.6E-06	2.5E-07	8.9E-06
change in CDF due to COP credit	6.2E-08 2.4%	2.6E-10	2.5E-07

- Very small change in core-damage frequency (CDF) using the risk acceptance guidelines in RG 1.174

6-14

## Contributions to Core-Damage Frequency



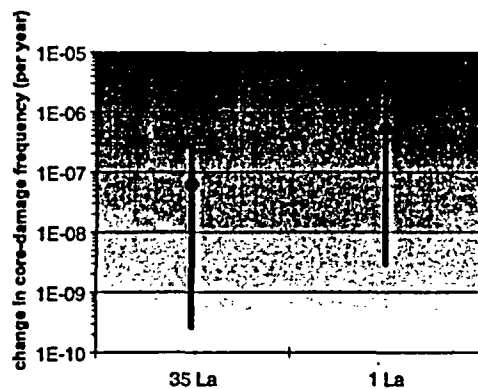
6-15

## Importance Measures

Event	Fussell-Vesely Importance	Risk Achievement Worth
Pre-existing, undetected containment leakage	2.50E-02	2.8
Operator error	8.90E-03	11.3
Containment isolation failure	7.40E-04	2.7
MSIV failures	1.30E-06	1.02

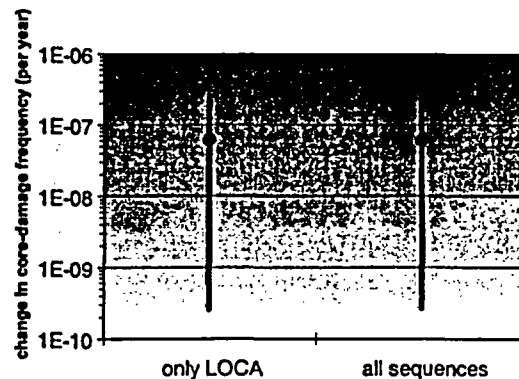
6-16

## Sensitivity to Containment Leak Size



6-17

## Sensitivity to MSIV Success Criterion



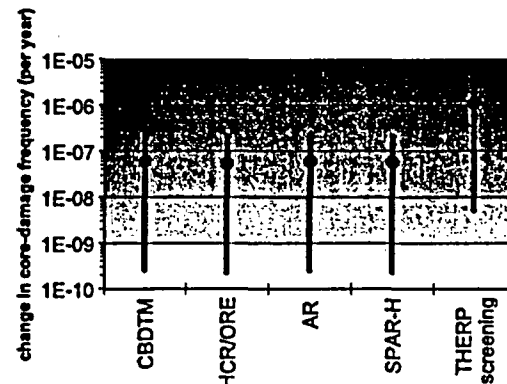
6-18

## Sensitivity to Human Reliability Analysis

- Alternative methodologies:
  - ▶ **HCR/ORE**: Human Cognitive Reliability/Operator Reactor Experiments, EPRI NP-7183-SL (1990)
  - ▶ **AR**: Annunciator Response, NUREG/CR-4772 (1987)
  - ▶ **SPAR-H**: SPAR-H Human Reliability Analysis Method, NUREG/CR-6883 (2005)
  - ▶ **THERP**: Technique for Human Error Rate Prediction, NUREG/CR-1278 (1983); used for initial screening analysis

6-19

## Sensitivity to HRA Method



6-20

## Risk Insight: Impact on Defense-in-Depth

- PRA can provide insights about how the proposed COP credit affects the balance between accident prevention and mitigation
- Consideration of this balance is important in weighing the necessity and sufficiency of defense-in-depth measures
- Staff considered how the proposed COP credit would affect the conditional containment failure probability (CCFP) in order to evaluate the balance between accident prevention and mitigation

6-21

## Approximate Impact on CCFP

$$\text{CCFP} = \frac{\text{accident release frequency}}{\text{core damage frequency}}$$

$$R_{\text{CCFP}} = \text{fractional change in CCFP}$$

$$R_{\text{CDF}} = \text{fractional change in CDF}$$

Since core-damage accidents caused by loss of containment integrity will cause some form of release, it can be shown that:

$$R_{\text{CCFP}} = \frac{1 - \text{CCFP}}{\text{CCFP}} \times \frac{R_{\text{CDF}}}{1 + R_{\text{CDF}}}$$

6-22

## Approximate Impact on CCFP (Con't.)

NUREG-1560, "Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance," Table 12.7 indicates that the CCFP for a BWR plant with a Mark I containment is generically about 0.6:

$$R_{\text{CCFP}} = \frac{1 - 0.6}{0.6} \times \frac{0.024}{1 + 0.024} = 0.016 = 16\%$$

This result suggests that the proposed COP credit does not significantly change the existing balance between accident prevention and mitigation.

6-23

## SRP 19 Defense-in-Depth Objectives

- The LAR does not result in a significant increase in the existing challenges to the integrity of barriers.
- The LAR does not significantly change the failure probability of any individual barrier.
- The LAR does not introduce new or additional failure dependencies among barriers that significantly increase the likelihood of failure compared to the existing conditions.
- The overall redundancy and diversity among barriers is sufficient to ensure compatibility with the risk acceptance guidelines.

6-24

### SRP 19 Defense-in-Depth Evaluation

- The proposed COP credit has no effect on LOCA or transient-induced SORV frequencies because it does not affect normal plant operating conditions.
- The proposed COP credit has no effect on the probability of containment failure because it does not affect normal plant operating conditions.
- Under the assumptions of the design-basis accident (DBA) analysis, the proposed COP credit introduces a dependency between the fuel and containment barriers; however, this does not appear to be probabilistically significant.

6-25

### SRP 19 Defense-in-Depth Evaluation (Con't.)

- Realistically conservative analyses indicate that no COP credit is needed. Even if the COP credit is presumed to change PRA success criteria, then:
  - There must be at least three failures to cause a core-damage accident:
    - LOCA (or SORV, which requires multiple failures)
    - Loss of containment integrity
    - Loss of suppression pool cooling
  - The mean change in CDF is very small and meets the RG 1.174 risk acceptance guidelines
  - Results are robust in terms of uncertainties and sensitivities to key modeling parameters and assumptions

6-26

### SRP 19 Defense-in-Depth Evaluation (Con't.)

- The scoping risk evaluation, based on the assumption that the proposed COP credit changes the PRA success criteria, indicates that the proposed COP credit does not significantly change the CCFP. Hence, it does not significantly change the existing balance between accident prevention and mitigation.
- Therefore, the proposed COP credit meets the four defense-in-depth objectives in SRP 19.

6-27

### ACRS Comments on Defense-in-Depth

- ACRS letter of May 19, 1999
  - Expressed concerns about "arbitrary appeals to defense in depth" to avoid making changes to regulations and regulatory practices that seem appropriate in light of PRA results
  - Expressed the notion that there should be an inverse correlation between the uncertainty in PRA results and the extent to which defense in depth is applied
- Position reiterated in joint ACNW/ACRS letter of May 25, 2000

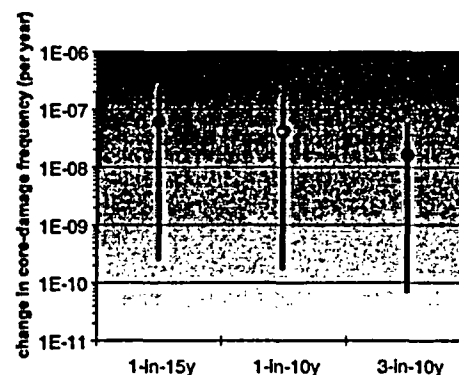
6-28

### Risk Insight: Performance Monitoring

- The probability of pre-existing, undetected containment leaks used in the scoping risk evaluation is conservative:
  - The VY containment is inerted with nitrogen
  - Probability was estimated from results of Type A integrated leak rate tests (ILRTs) for the entire U.S. commercial nuclear industry
  - More realistic approach would be to reduce this probability since inerting provides a continual means of detecting loss of containment integrity
- A sensitivity study was performed to assess the impact of the ILRT frequency on the change in CDF

6-29

### Sensitivity to ILRT Frequency



6-30

## **Conclusions**

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- Draft staff safety evaluation (SE) is based on consideration of adequate protection
- Staff will revise its SE after considering latest licensee supplements
- Staff scoping risk evaluation indicates that the proposed COP credit:
  - Has very small risk, even after considering parametric and modeling uncertainties
  - Does not significantly change the existing balance between accident prevention and mitigation
  - Meets the defense-in-depth objectives in SRP 19

6-31

## **Engineering Inspection**

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**Larry Doerflein**  
Chief, Engineering Branch 2  
Division of Reactor Safety  
Region I

7-1

## **Agenda**

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- Introduction - Larry Doerflein
- Inspection Background - Larry Doerflein
- Engineering Inspection - Jeff Jacobson
- Followup of Inspection Issues - Larry Doerflein
- Impact on EPU Amendment Review - Rick Ennis
- Questions and Comments

7-2

## **Inspection Background**

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- Biennial Safety System Design and Performance Capability Inspection Scheduled
- Request for Independent Safety Assessment
- Conditions Different than Maine Yankee
- New Inspection Procedure
- Team Independence
- Vermont State Nuclear Engineer Participation

7-3

## **Vermont Yankee Engineering Inspection**

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**Jeff Jacobson**  
Team Leader  
Vermont Yankee Engineering Inspection

7-4

## **Inspection Background**

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- VY inspection was responsive to the Vermont Public Service Board request to conduct an independent assessment and provide the inspection results to the ACRS for review
- VY inspection was part of a pilot program developed to improve the effectiveness of NRC engineering/design inspections
- VY inspection was the first of four pilot inspections
- The inspection involved about 900 hours of direct inspection versus 475 for a normal engineering team inspection

7-5

### **Inspection Staffing and Scope**

- The inspection team included an NRR team leader, four NRC regional inspectors, and three highly qualified independent contractors
- All team members were independent of any recent oversight responsibilities of VY
- The inspection team focused on components and operator actions that represented high risk and had the lowest relative safety margins
- Low margin areas were identified in part by consultation with NRR technical staff

7-6

### **Inspection Scope (continued)**

- Forty five components, operator actions, and operating experience samples were reviewed in detail
- The components reviewed were part of the following plant systems
  - On-site and off-site electrical systems
  - Reactor core isolation cooling system
  - Residual heat removal system
  - Safety relief valves
  - Reactor feedwater and condensate systems
  - Other risk significant systems

7-7

### **Pilot Inspection Areas of Review**

- Visual signs of degradation, installation errors, interference issues, environmental concerns
- Design and licensing basis documentation
- Review of design assumptions, system interfaces, failure modes
- Component history including maintenance, corrective action, and testing records
- Operating procedures
- Focus on functionality of equipment

7-8

### **Additional Reviews Conducted Specifically for VY Inspection**

- Comparison against current and uprated power levels
- Assessment of design control processes applied to power uprate

7-9

### **Inspection Results**

- Eight findings of very low risk significance (Green)
- Findings did not result in system inoperability either as compared to current or uprated power levels
- Findings were not indicative of any programmatic breakdown
- The inspection approach used during the four pilot inspections was determined to be more effective than the system based vertical slice approach that is part of the current baseline inspection program
- Plans are to adopt this low margin inspection approach into the baseline engineering inspection program beginning 1/1/2006

7-10

### **Inspection Findings**

- Capability of Vernon Hydro-electric station to supply power to VY in event of a regional blackout\*
- Adequacy of procedure used to monitor operability of offsite power
- Lack of degraded voltage analysis
- Reactor Core Isolation Cooling pressure control valve - reliance on instrument air
- Reactor Core Isolation Cooling pressure control valve - automatic operating mode inoperable

\* EPU related

7-11

### **Inspection Findings (continued)**

- Non-conservative input for condensate storage tank temperature used in transient analysis\*
- Safe shutdown analysis used incorrect time for initiating reactor core isolation system from alternate control panel\*
- Insufficient acceptance criteria and unverified diagnostic equipment used in motor operated valve testing\*
- In addition to 8 findings, one unresolved item (URI) - ungrounded 480 VAC electrical system

\* EPU related

7-12

### **Required Corrective Actions**

- The licensee is required to enter all the identified inspection findings into its corrective action program
- Corrective actions for all eight findings will be reviewed as part of the NRC's baseline inspection program -detail to be provided by Larry Doerflin
- In addition, corrective actions to the four findings that relate to areas covered by the NRC's power uprate were reviewed by the NRC's technical staff as part of the licensee's overall power uprate submittal - detail to be provided by Rick Ennis

7-13

### **Followup of Inspection Issues**

**Larry Doerflin**  
Chief, Engineering Branch 2  
Division of Reactor Safety  
Region I

7-14

### **Status of Inspection Issues**

- All Eight Inspections Findings Received Followup
- Inspection completed
  - IR 2005-002
    - RCIC startup time line
    - Procedure for assessing operability of off-site power
  - IR 2005-004
    - Degraded Relay Setpoint Calculations
    - CST Temperature
  - IR 2005-006
    - Availability of Power from Vernon Hydro Station
    - MOV Testing

7-15

### **Status of Inspection Issues**

- More Inspection Needed
  - Design of RCIC pressure control valve
  - Non-conforming operation of RCIC pressure control valve
- Other
  - URI on Ungrounded 480V System - Task Interface Agreement (TIA)

7-16

### **Engineering Inspection Impact on EPU Review**

**Rick Ennis**  
Senior Project Manager  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

7-17

### **Findings Related to EPU Review**

- The findings that impacted the EPU review were:
  - Station Blackout
  - Appendix R Timeline for Reactor Core Isolation Cooling System (RCIC) Initiation
  - Periodic Testing of Motor-Operated Valves (MOVs)
  - Condensate Storage Tank (CST) Temperature

7-18

### **Station Blackout (SBO)**

- Finding impacts Safety Evaluation Section 2.3.5, "Station Blackout"
- Coping analysis performed to address finding (Supplement 25 dated 3/24/05)
- Review of coping analysis determined for 2-hour coping period:
  - Adequate condensate inventory;
  - Adequate battery capacity;
  - Equipment operability with loss of ventilation;
  - Containment isolation maintained; and
  - NPSH met without crediting containment accident pressure.
- Staff concluded VY will meet SBO requirements under EPU conditions

7-19

### **Appendix R Timeline for RCIC Initiation**

- Finding impacts Safety Evaluation Section 2.11, "Human Performance"
- Time to core uncover:
  - 25.3 minutes (current power level)
  - 21.3 minutes (EPU level)
- Time to place RCIC in service for Appendix R:
  - 15 minutes (1999 analysis)
  - 21 minutes (inspection team finding)
- Procedure revised to address finding.
- Results of timed operator crew walkthroughs of revised procedure submitted in Supplement 22 dated 12/8/04:
  - Times ranged from about 12 to 15 minutes
  - Average time about 13.5 minutes
- Staff concluded that sufficient margin exists to place RCIC in service during an Appendix R event under EPU conditions

7-20

### **Periodic Testing of MOVs**

- Finding impacts Safety Evaluation Section 2.2.4, "Safety-Related Valves and Pumps"
- Licensee did not manage commitments and conditions in SE for GL 96-05 MOV Periodic Verification Program
- Supplement 16 dated 9/30/04 committed to revise MOV Periodic Verification Program
- Supplement 32 dated 9/10/05 stated commitment is complete
- Staff concluded safety-related valves will continue to meet applicable requirements following EPU implementation

7-21

### **CST Temperature**

- Finding impacts Safety Evaluation Section 2.6.5, "Containment Heat Removal"
- Supplement 18, dated 10/5/05 revised ATWS analyses for EPU
- Increase in CST temperature increased suppression pool temperature from 190F to 190.5F
- Peak suppression pool temperature for limiting event (LOCA) is 194.7F
- Staff concluded effect of CST temperature change is acceptable since limiting temperature will not be exceeded

7-22

### **Conclusions**

- Licensee submitted supplements to EPU application to address all 4 findings
- NRC staff has reviewed information and concludes the issues have been adequately addressed

7-23



## **Engineering Inspection Summary**

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- Engineering inspection was responsive to the Vermont Public Service Board request (hours spent, scope, independence)
- Inspection approach considered an improvement over vertical slice approach
- All of the inspection findings were of low safety significance
- All inspection findings have received followup inspection for corrective actions
- Findings impacting the EPU have been adequately resolved as addressed in the NRC staff Safety Evaluation



## ACRS Thermal-Hydraulic Subcommittee

Vermont Yankee Extended Power Uprate  
Containment Overpressure Credit

November 16, 2005

Bill Sherman – VT Dept of Public Service

1

## Vermont Appreciates

- The opportunity to speak today on Containment Overpressure Credit
- We presented on this subject:
  - T-H Subcommittee – July 19, 2005
  - Full Committee – September 8, 2005
- We have high confidence in the ACRS to consider this issue and to assist in resolving our concern.

2

## Brief History

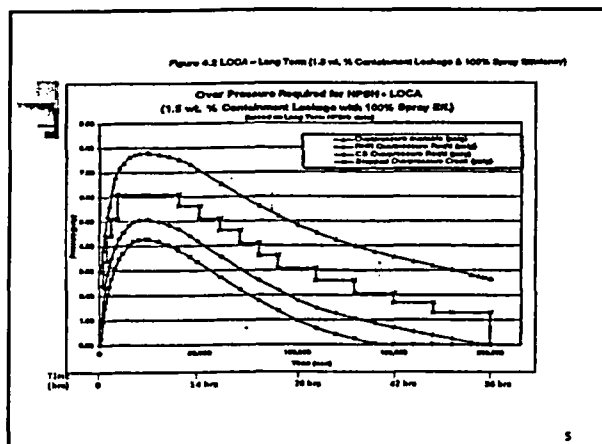
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- We found the staff not following its own guidance in this area.
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3

## ACRS Letter September 20, 2005

- No practical alternatives that can eliminate the need for such credit
- Positive means for indication of containment integrity
- The time intervals for such credit should be limited to a few hours, commensurate with the demonstrated capability of equipment to perform its intended functions during this time period

4



## Practical Alternatives 1

- Staff did not inquire about practical alternatives
- Entergy volunteered the following in Supplement No. 38 (Oct 21, 2005):
  1. Alternatives not fully evaluated
  2. Changes would be quite substantial
  3. New pump design would be required
  4. List of design implications
  5. Double length of refueling outage/alternative over two outages

## Practical Alternatives 2

- Entergy objections to alternatives appear to translate into costs
- Safety issues shouldn't be cost driven
- There is significant economic value to Entergy from the proposed power uprate

**Other Comments Re: ACRS Letter**

- Positive Indication Containment Integrity: Inerting, *per se*, is not effective means – a feed and bleed system
- Drywell at positive pressure but not torus
- Demonstrated capability for time period: Containment tested for 24 hours not 56 hours, and not for ten years



### **Summary Re: ACRS Letter**

- There are practical alternatives
- There is not full positive indication of containment integrity
- Containment integrity has not been demonstrated for the credited time period

9



### **Staff Response to ACRS Letter**

- On Oct 7, 2005, Dr. Brian Sheron proposed a risk based (RG 1.174) approach in lieu of implementing practical alternatives
- We believe this approach may have promise
- Entergy's PSA Supplements (#38-10/21/05, #39-10/26/05) are not sufficient to accomplish Dr. Sheron's proposal

10



### **Entergy's Risk Evaluation**

- 10/21 – An evaluation of the 5 elements from RG 1.174
- 10/26 PSA – New top event: Primary Containment Integrity
- CDF difference between containment pressure available and not available

11




### **VY Risk Evaluation: Items to Consider – RG 1.174 Elements**

- RG 1.174 – "The proposed change is consistent with defense-in-depth philosophy"

The proposed change makes the fuel cladding barrier dependent on the containment barrier, a significant modification of defense-in-depth philosophy

12



### VY Risk Evaluation: Items to Consider – RG 1.174 Elements

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Entergy claims credit for the 1.7 psi diff. pressure in the drywell as monitoring. This may be valid to monitor drywell leakage but is not valid to monitor torus leakage.

13



### VY Risk Evaluation: Items to Consider – Analysis Comments 1

1. The model claims to consider only the time when the hard-piped vent is used to prevent overpressure (p. 13). This is too limiting
2. For leakage paths 2" and greater, only selective pathways are considered
3. Leakage paths below 2" are not considered despite a determination that a ½" leak would defeat overpressure

14



### VY Risk Evaluation: Items to Consider – Analysis Comments 2

4. The case reported uses an initial small leak criteria double the value which would defeat overpressure (p. 21). This gives unconservative results.
5. MSIV leakage is not considered despite an operating requirement to create an open pathway from MSIVs after 30 min
6. MSIV leakage, when considered, should use plant specific leakage history.

15



### VY Risk Evaluation: Items to Consider – Analysis Comments 3

7. Seismic failure probabilities are not included at all because seismic is considered deterministically in the IPEEE. Since only a ½" leak could defeat overpressure, seismic failure probabilities of the containment and of small bore piping should be considered.

16

### VY Risk Evaluation: Items to Consider – Analysis Method 1

- Method presented: CDF difference between (a) containment pressure available and (b) not available
- Method desired:
- CDF difference between (a) the NPSH failure of cooling pumps with no use of containment overpressure and (b) the NPSH failure of cooling pumps with use of containment overpressure

17

### VY Risk Evaluation: Items to Consider – Analysis Method 2

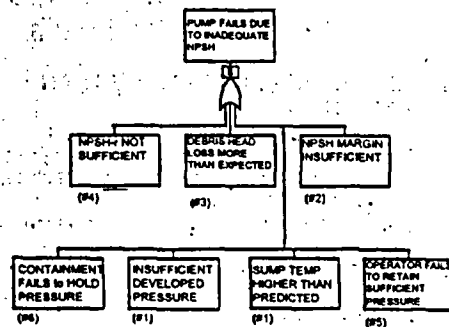
- The *Desired Method* would:
  1. Capture the loss of NPSH margin given up by crediting overpressure
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18

### VY Risk Evaluation: Items to Consider – Analysis Method 3

- Method presented: New Top Event: Primary Containment Integrity
- Method desired:
- New Top Event: Pump Fails Due to Inadequate NPSH

19



20

### VY Risk Evaluation: Items to Consider – Analysis Method 4

- NPSH-r NOT SUFFICIENT
  1. Staff SER discusses "reduced NPSH-r"
  2. NPSH-r used somewhere between NPSH-3% and NPSH-6% - in cavitation
  3. "Reduced NPSH-r" based on a Browns Ferry pump test of 10 minutes in severe cavitation and 25 minutes in less severe cavitation; and on engineering judgment

21

### VY Risk Evaluation: Items to Consider – Analysis Method 5

- NPSH-r NOT SUFFICIENT
  4. RG 1.82, Sec. 2.1.1.3 States: Pumps in cavitation should have performance tests at least as long as the pumps operate in cavitation.
  5. Summary – There is some non-trivial probability that the NPSH-r is not sufficient

22

### VY Risk Evaluation: Items to Consider – Analysis Method 6

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23

### VY Risk Evaluation: Items to Consider – Analysis Method 7

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  1. This is the single case Entergy analyzed.
  2. I have identified earlier "Items to Consider" regarding Entergy's analysis in this area.
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24

### VY Risk Evaluation: Items to Consider – Analysis Method 8

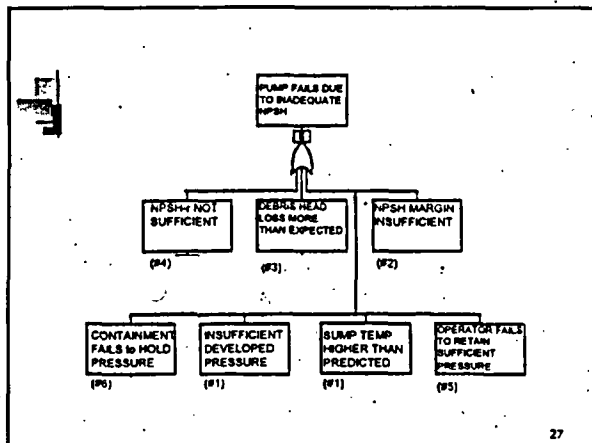
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25

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- 1 Operators trained to reduce containment pressure
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27

### SUMMARY

- Under the ACRS Letter of 9-20-05, overpressure credit should not be granted.
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# ACRS Thermal-Hydraulic Subcommittee

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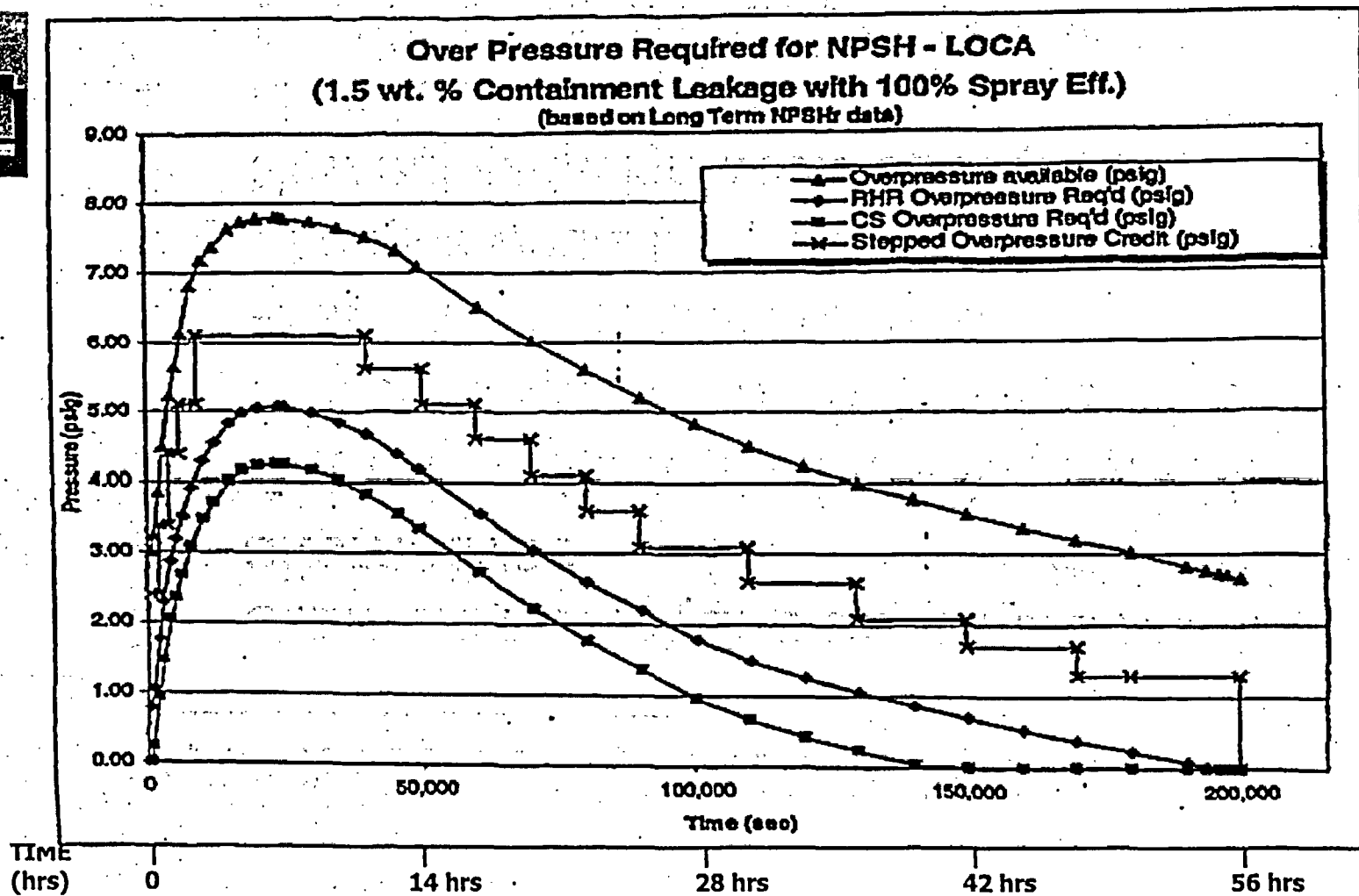


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Figure 4.2 LOCA – Long Term (1.5 wt. % Containment Leakage & 100% Spray Efficiency)





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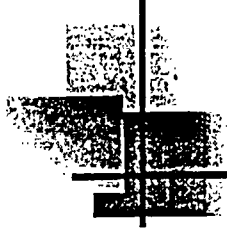
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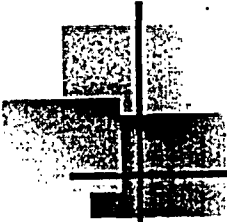


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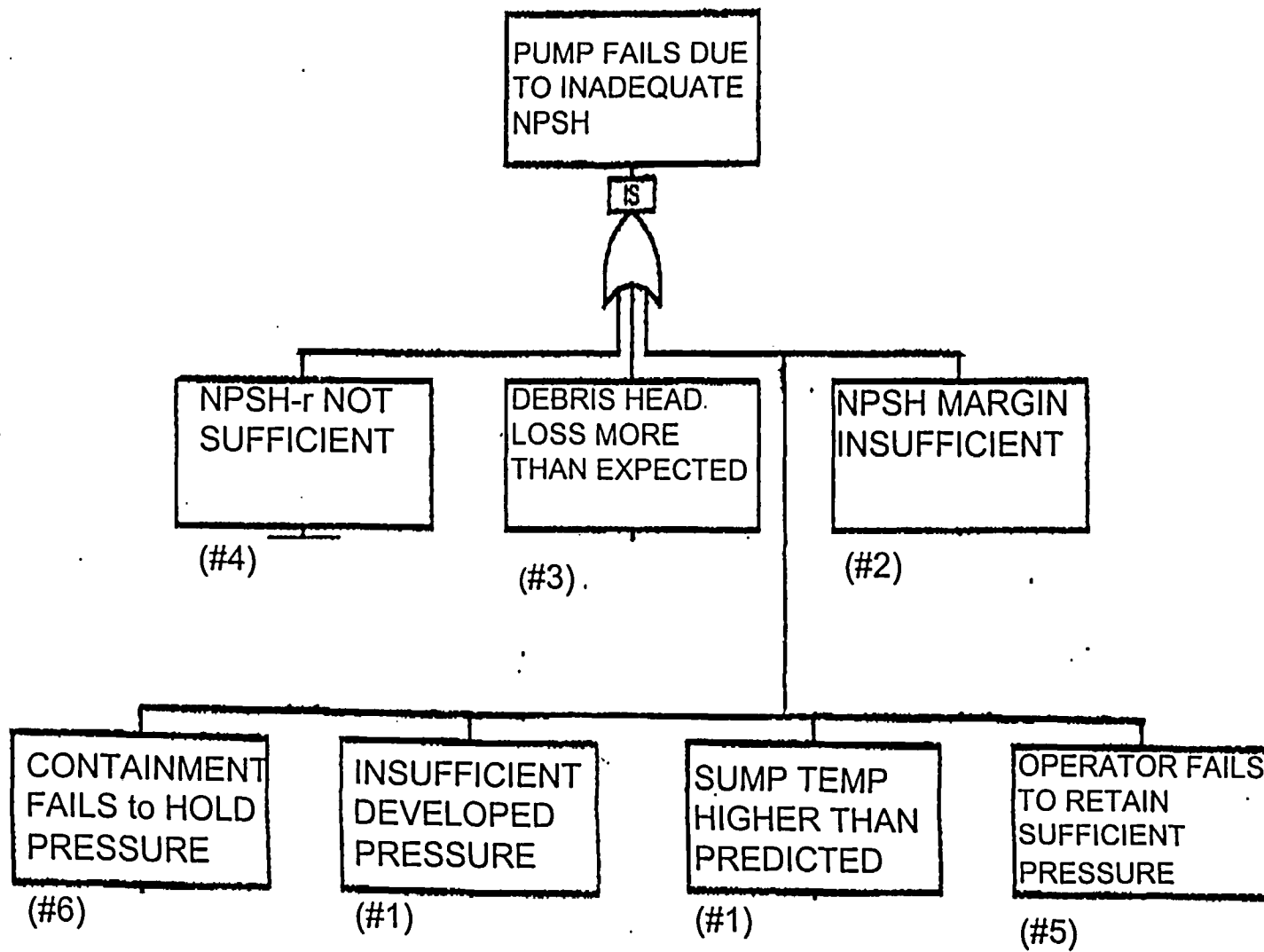
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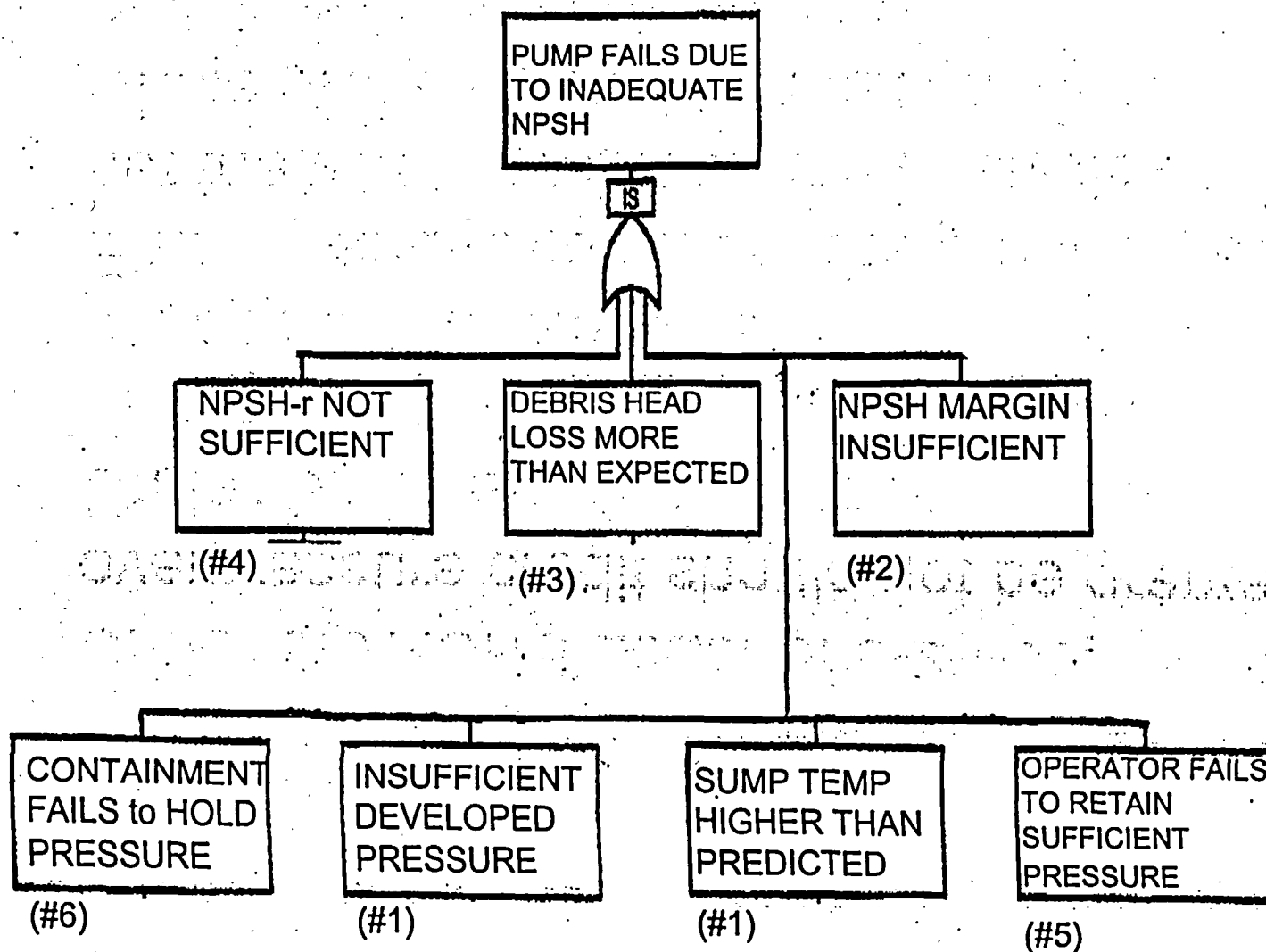
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# Containment Overpressure

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Brian Hobbs  
EPU Engineering Supervisor

# Containment Overpressure

## Presentation Overview

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- Regulatory/Industry Background
- Basis for Request
- Requested Overpressure Credit
- Risk Assessment of Crediting Overpressure

# Containment Overpressure

## Regulatory/Industry Background

---

- 25 Plants Credit Overpressure in Licensing Basis
  - Includes 7 BWR Extended Power Upgrades
- Regulatory Guide 1.82 Rev. 3
  - Defines Basis for Crediting Overpressure
- VYNPS Analysis Conforms to RG 1.82 Rev. 3 COP Basis

# Containment Overpressure

## Regulatory/Industry Background (cont.)

TABLE 1: BWR's With Mark I Containments Crediting Overpressure

<b>Plant</b>	<b>Max. Pressure Credited (psig)</b>	<b>Duration of Credit (hours)</b>
Duane Arnold	7.3	36
Dresden	6.6	>50
Peach Bottom	6.1	78
Pilgrim	5.0	48
Quad Cities	6.6	>50
VYNPS (requested)	6.1	56



# Containment Overpressure

## Basis for Request

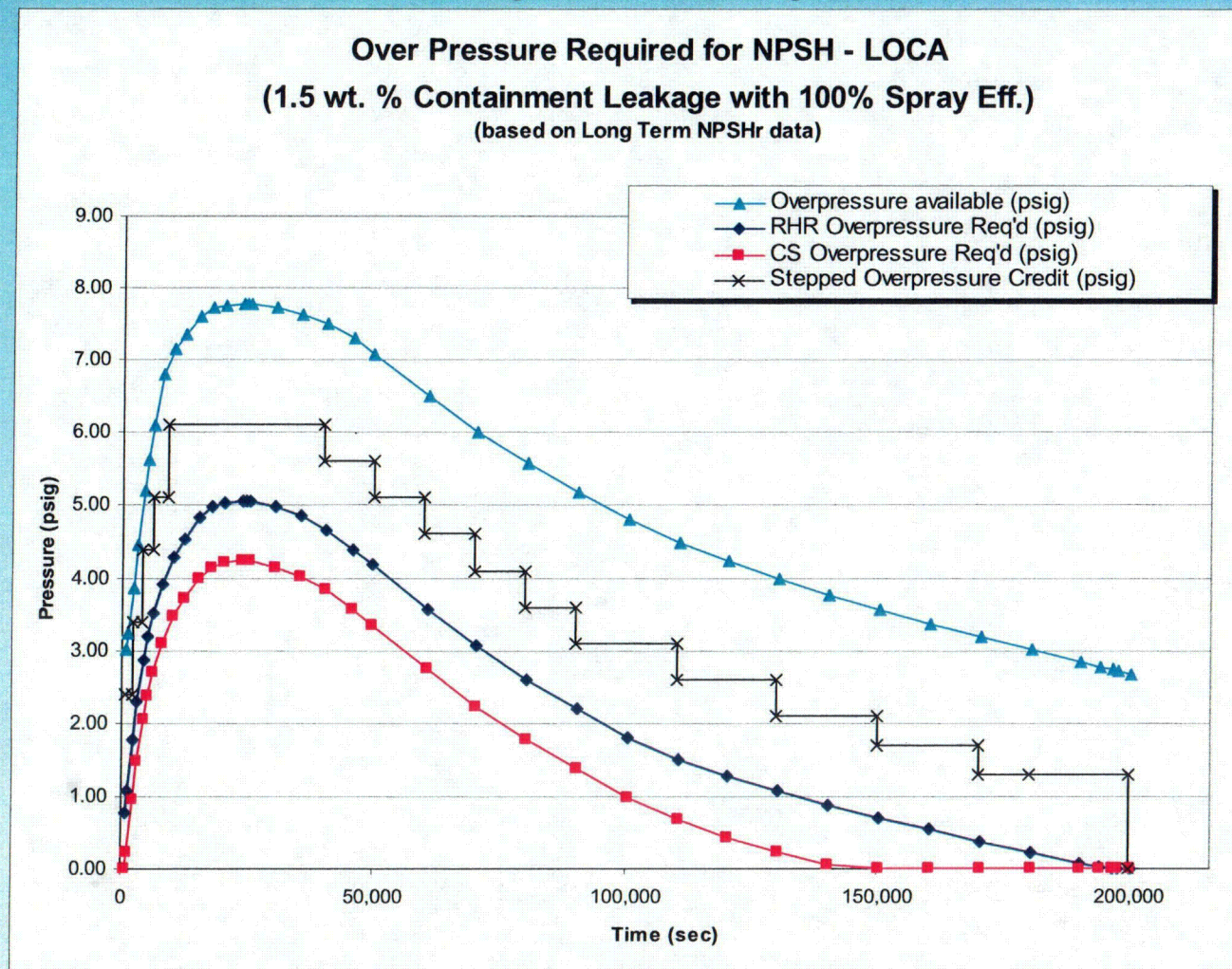
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- EPU Increases Decay Heat
- Pool Temperature Increases  $\sim 12^{\circ}\text{F}$  from Current Analysis to EPU
- Peak EPU DBA LOCA Temperature  $\cong 195^{\circ}\text{F}$
- Low Pressure ECCS Pumps  $\text{NPSH}_A < \text{NPSH}_R$ 
  - RHR Pumps
  - Core Spray Pumps



# Containment Overpressure Requested Credit

**Figure 1: Containment Overpressure Required for VYNPS Large LOCA**





# Containment Overpressure Risk Assessment

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- Regulatory Guide 1.174 Elements
  1. Meets Current Regulations
  2. Provides Defense-In-Depth
  3. Maintains Safety Margins
  4. Results In Small Risk Increase
  5. Performs As-Assumed Based on Monitoring

# Containment Overpressure Risk Assessment

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- VYNPS COP Credit Defense-In-Depth
  - Conservative Design & Construction
    - Meets Design Criteria for Redundancy, Diversity & Independence
    - Single Failure
      - Containment As The Single Failure Would Preclude Need for COP

# Containment Overpressure Risk Assessment

---

- VYNPS COP Credit Defense-In-Depth (cont.)
  - Conservative Design Basis Assumptions
    - Maximum Initial SP Temperature, Minimum Level
    - Maximum Reactor Power, Core Decay Heat
    - Maximum Initial SW Temperature, Minimum Flow
    - Minimum Heat Exchanger Effectiveness

# Containment Overpressure Risk Assessment

---

- o Realistic Analysis Would Not Require COP Credit
  - Sensitivity of Input Assumptions vs. COP Required Shown in Table 2

# Containment Overpressure Risk Assessment

Table 2: Sensitivity of Input Assumptions vs. COP Required

CASE	Inputs				Results		
	Single Failure	$T_{sw}$ (°F)	Initial $T_{pool}$ (°F)	Other Inputs	Peak $T_{pool}$ (°F)	RHR COP Req'd ?	CS COP Req'd ?
1	RHR HX	85	90	Design Basis	195	Yes	Yes
2	Containment	85	90	Design Basis	169	No	No
3	RHR HX	85	90	Nominal	185	No	No
4	RHR HX	80	85	Nominal	180	No	No
5	RHR HX	55	78	Nominal	166	No	No

# Containment Overpressure Risk Assessment

---

- VYNPS COP Credit Defense-In-Depth
  - Credits Existing Condition
  - Barrier Effectiveness is Maintained
    - No New Accidents
    - Failure Probability
    - Failure Dependencies



# Containment Overpressure Risk Assessment

---

- VYNPS COP Credit Defense-In-Depth (cont.)
  - Preserves Defenses Against Human Error:
    - No Additional Operator Actions
    - No Changes to Operator Actions
    - No Changes to Existing Operating Procedures

# Containment Overpressure Risk Assessment

---

- VYNPS COP Credit Maintains Adequate Safety Margin
  - Current Applicable Codes & Standards Continue to be Met
  - Bounding Design Basis Analysis Assumptions Include Margin (Conservatism)
  - Substantial Margin to Fission Product Barrier Limits is Maintained

# Containment Overpressure Risk Assessment

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- VYNPS COP Credit Risk Assessment
  - PSA Model Was Applied to Evaluate  $\Delta$ Risk When COP Is Needed for Adequate NPSH
  - Results: Very Small Change in Risk
    - $\Delta$ CDF =  $5.8 \text{ E-}7/\text{ry}$
    - $\Delta$ LERF =  $4.5 \text{ E-}8/\text{ry}$

# Containment Overpressure Risk Assessment

---

- VYNPS COP Credit Risk Assessment (cont.)

- COP Risk Assessment Actions

- Incorporate Containment Leakage Probability into the Level 1 PSA Model
  - New Fault Tree Top Event: Primary Containment Integrity
- Incorporate COP Impact on NPSH for Event Trees
- Perform Uncertainty Evaluation
- Characterize Risk Assessment Impacts

# Containment Overpressure Risk Assessment

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- Monitoring VYNPS COP Credit

- Containment Integrity Monitoring Methods:

- Containment Leak Rate Testing
    - Inservice Inspection
    - Surveillances & Operator Indications

- Allowable Primary Containment Leakage

- $L_a = 0.8$  wt% per day (Technical Specifications)
  - $27 * L_a$  Containment Leakage Rate Would Still Maintain Adequate Overpressure

# Containment Overpressure Risk Assessment

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- Monitoring VYNPS COP Credit (cont.)
  - DW Pressure 1.7 psi > Suppression Pool
    - Technical Specification Requirement
    - Control Room Alarm On Decreasing dP
    - If Not Met, Cold Shutdown in < 24 Hours
- Containment Inerted With Nitrogen
  - Consumption Monitored

# Containment Overpressure

## Conclusions

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- Overpressure Credit Request:
  - Meets Applicable Regulatory Requirements
  - Results in Very Small Change in Risk
  - Realistic Assumptions Preclude Need for Overpressure

# NRC Engineering Inspection

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John Dreyfuss  
Director – Engineering



# NRC Engineering Inspection

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- Inspection Scope
- Results – Summary and Findings
- Corrective Actions
- EPU Impact

# NRC Engineering Inspection

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- EPU Related Issues
  - Appendix R Operator Timeline
  - MOV Periodic Testing
  - Condensate Storage Tank Temperature
  - Station Blackout

# **Crediting Containment Accident Pressure for NPSH**

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**Richard Lobel**  
Senior Reactor Systems Engineer  
Probabilistic Safety Assessment Branch  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

5-1

## **Purpose**

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- To discuss NRC Staff review of the VY proposal to credit containment accident pressure in determining available net positive suction head (NPSH)

5-2

## **Regulations**

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- There is no regulation prohibiting credit for containment accident pressure in determining available NPSH for safety-related pumps

5-3

## **NRC Position**

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- NRC allows credit for containment accident pressure when:
  - a conservative analysis has demonstrated that this amount of pressure will be available for the postulated design basis accident; and
  - When examined from a broader perspective including design basis accidents, the level of risk is acceptable.

5-4

## **Postulated Accidents That May Require Credit**

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- Loss-of-Coolant Accident (LOCA)
- Anticipated Transients Without Scram (ATWS)

5-5

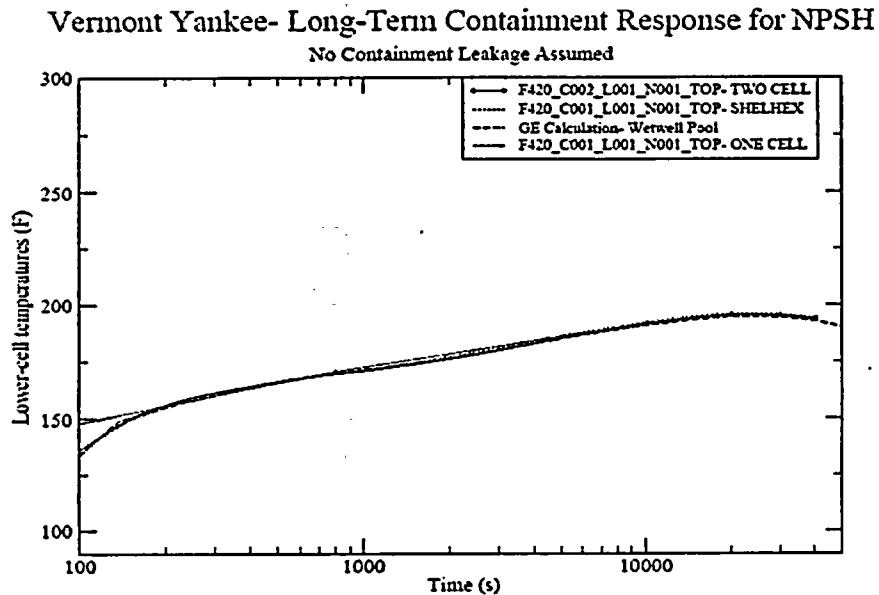
## **Calculating Containment Conditions**

---

- SHEX computer code is used for LOCA and ATWS

5-6

## NRC Calculation of Supp Pool Temp



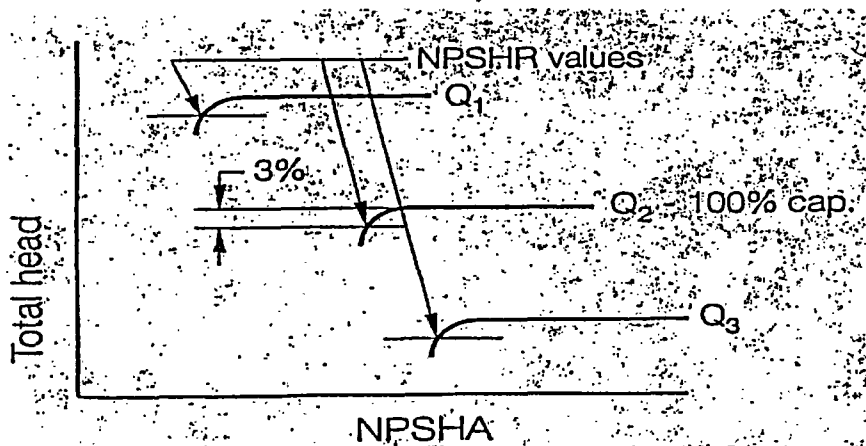
5-7

## Calculating Containment Conditions

- GOTHIC 7.0 computer code is used for Appendix R and Station Blackout

5-8

## Required NPSH Definition



5-9

## RG 1.82 Position on Required NPSH

- Credit may be taken for operation in cavitation provided:
  - Prototypical pump tests are performed
  - Acceptable post-test examination

5-10

## VY Required NPSH

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- Based on pump vendor testing and expert judgment
- VY RHR and core spray pumps tested at reduced NPSH conditions - limited number of points.
- Additional data from other pump models
- Pump vendor states that pump design characteristics important to required NPSH are identical for non-VY pumps: specific speed, suction specific speed, blade inlet angle
- Pump affinity laws applied to adjust data
- Time at reduced NPSHR: pump vendor judgment

5-11

## Conservatism

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- VY Response to NRC Staff RAI:
  - ▶ “The more conservative initial conditions assumed in the design bases calculations are responsible for identification of the need to rely on containment accident pressure...”

Vermont Yankee TS Change No. 263, Supplement 8, July 2, 2004

5-12



## **LOCA Conservatism**

---

- Reactor power 102% of licensed rated thermal power
- Decay heat at 2-sigma
- Decay heat bounds specific cycle
- Most conservative initial conditions
- All TS parameters at limiting value
- Worst single failure short-term: LPCI Loop  
Select failure results in pump runout flow

5-13

## **LOCA Conservatism**

---

- Worst single failure long-term: RHR heat exchanger unavailable
- RHR flow through RHR HX minimized
- RHR service water flow (ultimate heat sink) through HX minimized
- Break flow heat and mass transfer with drywell atmosphere minimizes torus pressure
- NPSH calculation based on a suppression pool water volume less than predicted at time of peak temperature

5-14

## **LOCA Conservatism**

---

- Value of ECCS strainer head loss used is greater than predicted
- No temperature correction made to required NPSH
- For the long-term, the distribution of debris on the one active CS strainer and one active RHR strainer will be the amount initially deposited in the short term + redistributed from inactive strainers + amount not removed in short term

5-15

## **LOCA Conservatism**

---

- Strainer temperature for head loss calculations less than predicted suppression pool temperature
- RHR pump runout flow used for long-term LOCA
- Maximum service water temperature
- Continuous spray operation (torus and drywell)
- Peak initial suppression pool temperature (90 F)
- Operation of containment spray is assumed for the duration of NPSH calculation
- RHR pump flow assumed at runout (maximum) value for duration of LOCA - operator never throttles pump

5-16

## **LOCA Conservatism**

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- Cumulative conservatism due to the assumption that all conservatisms apply simultaneously

5-17

## **LOCA Conservatism**

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<b>Single Failure Assumption</b>	<b>Peak Suppression Pool Temperature</b>
With RHRHX Failure	195 °F
Without RHRHX Failure	169 °F

5-18

## LOCA Conservatism

Input Parameter	Conservative Assumption	Anticipated Value	SP Estimated Temp Diff (F)
Decay Heat	Cycle Independent	Cycle Dependent	-2.0
Long-Term Vessel Recovery with Minimum SP Cooling	2 LPCI and 2 CS	1 CS	-8.0
RHR Flow (as it affects RHRHX performance) (gpm)	6,400	7,000	-0.6
RHRSW Flow (as it affects RHRHX Performance) (gpm)	2,700	4,000	-4.8

5-19

## LOCA Conservatism

- Pre-EPU Peak SP Temperature = 182.6 °F
- Peak EPU SP Temperature = 194.7 °F
- Peak SP Temp - Sum of conservatisms in table  
 $194.7\text{ °F} - 15.4\text{ °F} = 179.3\text{ °F}$
- Peak SP Temperature - Root mean square of conservatisms in table  
 $194.7\text{ °F} - 9.6\text{ °F} = 185.1\text{ °F}$

5-20

## **Conservatism**

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- An analysis with realistic (nominal) assumptions shows that credit for containment accident pressure is not needed.

5-21

## **Containment Integrity**

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- VY design basis analyses assume containment integrity. Based on:
  - VY compliance with 10 CFR 50 Appendix J Leak testing
  - VY compliance with 10 CFR 50.55a inspections
- Walkdowns prior to containment closure
- VY containment is inerted

5-22

## **Peak Containment Pressure (psig)**

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Pre-CPPU	CPPU
41.6	41.8

5-23

## **Impact on Operator**

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- Credit for containment accident pressure does not change VY emergency operating procedures (EOPs). Containment pressure is currently a consideration for NPSH.
- No impact on operator

5-24

## Conclusions

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- Credit for containment accident pressure is determined conservatively.
- A more realistic but still conservative calculation would show that credit is not needed.
- Based on stringent testing requirements, inerting and VY EPU safety analyses, containment integrity is a reasonable assumption
- Credit for containment accident pressure has no impact on the operator
- Staff finds the VY credit for containment accident pressure acceptable

# **Containment Accident Pressure Credit NRC Staff Risk Evaluation**

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**Martin A. Stutzke**

Senior Reliability & Risk Analyst  
Probabilistic Safety Assessment Branch  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

6-1

## **Presentation Outline**

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- Overview of risk evaluations to support non-risk-informed license amendment requests (LARs)
- NRC staff scoping risk evaluation of proposed containment overpressure (COP) credit
- Risk insights concerning defense-in-depth
- Risk insights concerning performance monitoring
- Conclusions

6-2



## **Non-Risk-Informed Submittals**

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- General references
  - COMSAJ-97-08, “Discussion on Safety and Compliance”
  - RIS 2001-02, “Guidance on Risk-Informed Decisionmaking in License Amendment Reviews”
  - Standard Review Plan (SRP), Chapter 19, Appendix D, “Use of Risk Information in Review of Non-Risk-Informed License Amendment Requests”
- The decision to submit a risk-informed LAR is voluntary on the part of the licensee

6-3

## **Process to Obtain Risk Information**

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- 10 CFR 2.102 gives NRC authority to require the submittal of information in connection with an LAR
- SRP 19, App. D provides the process to obtain risk information about a non-risk-informed LAR:
  - Staff requests risk information
  - If licensee declines, staff must show that the LAR raises questions about adequate protection of the public health and safety in order to require the licensee to provide risk information

6-4

## **Process to Obtain Risk Information (Con't.)**

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- Licensee needs to address the five key principles of risk-informed decisionmaking given in RG 1.174
- Licensee may decline to provide risk information, but could have its LAR denied
- Specific to extended power uprates (EPUs):
  - EPUs not submitted as risk-informed LARs
  - However, the staff expects licensees to submit a risk evaluation because a proposed EPU could create special circumstances that rebut the presumption of adequate protection from compliance with existing regulations and requirements
  - “Review Standard for Extended Power Uprates,” RS-001, Rev. 0, Matrix 13

6-5

## **Five Key Principles in RG 1.174 and SRP 19**

---

- The five key principles:
  - Proposed change meets the current regulations
  - Proposed change is consistent with the defense-in-depth philosophy
  - Proposed change maintains sufficient safety margins
  - Increases in risk should be small and consistent with the intent of the Commission’s Safety Goal Policy Statement (51 FR 30028)
  - Impact of proposed change should be monitored using performance measurement strategies
- Acceptability of proposed change is determined by an integrated decisionmaking process

6-6

## Risk Evaluation Chronology

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9/10/03	Entergy submits EPU application
12/18/03	NRC staff sends Request for Additional Information (RAI); Question SPSB-7 asked about overpressure credit in the context of PRA operator actions
1/31/04	Entergy responded to the RAI (Supplement 5)
May 2004	Staff makes scoping risk evaluation of overpressure credit
5/28/04	NRC staff sends RAI; Question SPSB-C-1 asked about the overall impact of the overpressure credit on risk
7/2/04	Entergy responded to the RAI (Supplement 8)
12/21/04	NRC staff sends RAI; Question SPSB-C-45 asked about thermal-hydraulic calculations that support PRA success criteria
2/24/05	Entergy responded to the RAI (Supplement 23)
7/19/05	Staff presentation to ACRS Subcommittee on Thermal Hydraulics concerning revision to RG 1.82; discusses initial staff risk evaluation. Subcommittee suggests that the risk evaluation be expanded to include more initiating events

6-7

## Risk Evaluation Chronology (Con't.)

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July - August 2005	Staff expands its risk evaluation by modifying SPAR models
9/8/05	Staff presentation to full ACRS Committee concerning revision to RG 1.82; discusses revised staff risk evaluation
9/10/05	ACRS letter on proposed revision to RG 1.82 recommends that it not be published for public comment without revisions
10/5/05	Staff requests Entergy to provide a risk evaluation of the overpressure credit that addresses the five key principles of risk-informed decisionmaking in RG 1.174
10/7/05	Staff presentation to full ACRS concerning proposed revision of RG 1.82; states intent to consider overpressure credit using risk-informed decisionmaking and make RG 1.82 a risk-informed regulatory guide
10/21/05	Staff completes draft Safety Evaluation; scope of risk evaluation based on NRR RS-001 and SRP 19, App. D
10/21/05	Entergy provides partial risk evaluation (Supplement 38)
10/26/05	Entergy completes risk evaluation (Supplement 39)
TBD	Staff to develop revised draft SE that includes review of Supplements 38 and 39

6-8

## Staff Scoping Risk Evaluation

---

- Realistically conservative licensee thermal-hydraulic calculation indicates that containment overpressure credit is not required
- Staff risk evaluation assumes that core damage will occur only if all of the following occur:
  - ▶ Reactor coolant is discharged to the suppression pool
  - ▶ Low pressure core injection (LPCI) or core spray (CS) is required to provide reactor inventory control or decay heat removal
  - ▶ Containment integrity is lost (loss of overpressure, which leads to inadequate NPSH)
  - ▶ Operator does not initiate suppression pool cooling within four hours

6-9

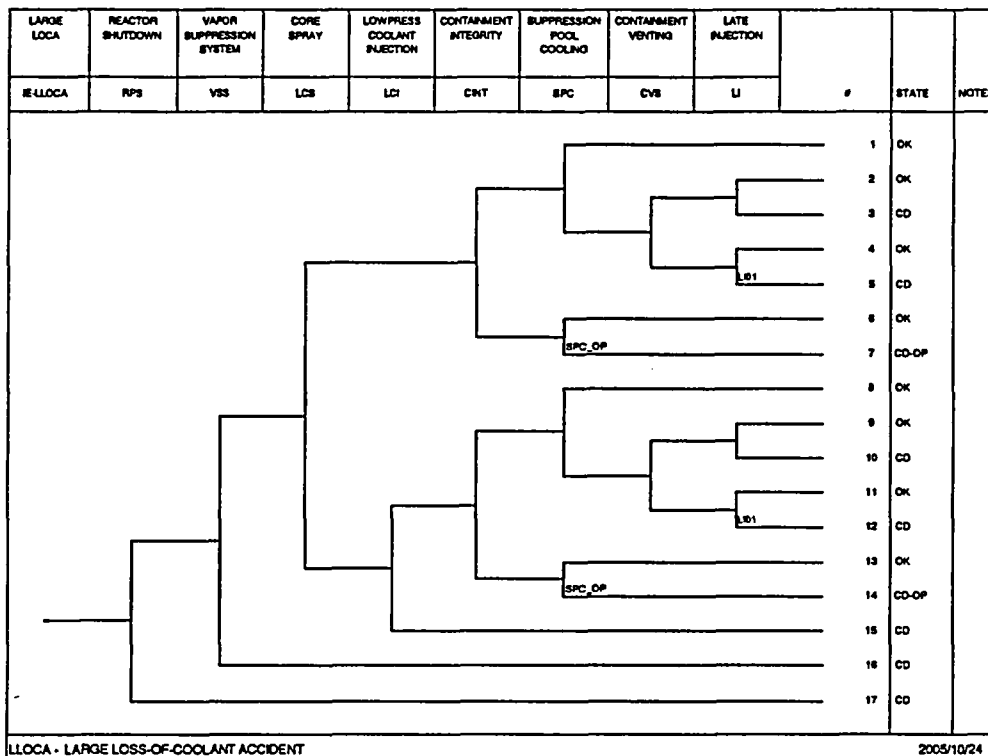
## Scoping Risk Model

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- Modification of the Standardized Plant Analysis of Risk (SPAR) models developed by the Office of Research (RES). SPAR models are the basis of:
  - ▶ Significance Determination Process (SDP)
  - ▶ Accident Sequence Precursor (ASP) program
- Considered:
  - ▶ 11 transient initiators
  - ▶ 5 LOCA initiators (including ISLOCAs)
  - ▶ Special sequence types
    - Station blackout (SBO)
    - Stuck-open relief valve (SORV)
    - Anticipated transients without scram (ATWS)

6-10

## Scoping Risk Model (Con't.)



6-11

## Scoping Risk Model (Con't.)

- Data to quantify loss of containment integrity (including pre-existing undetected leaks and containment isolation failures) obtained from:
  - Licensee's recent submittal for a one-time ILRT extension to 15 years
  - Office of Research (RES)
- Human failure event (failure to initiate suppression pool cooling within four hours):
  - Cognitive Errors: EPRI Cause-Based Decision Tree Method (CBDTM)
  - Action Errors: NUREG/CR-1278, A Technique for Human Error Rate Prediction (THERP)

6-12

## Scoping Risk Model (Con't.)

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- Quantification method:
  - Truncation limit:  $10^{-12}$  per year
  - 5000 Monte Carlo samples for parametric uncertainty analysis
  - Minimal cut sets regenerated for each sensitivity analysis case
- Uncertainty analysis:
  - Parametric uncertainties
  - Modeling uncertainties
    - Containment leak size
    - Main steam isolation valve (MSIV) success criterion
    - Human reliability analysis methods

6-13

## Results of the Analysis

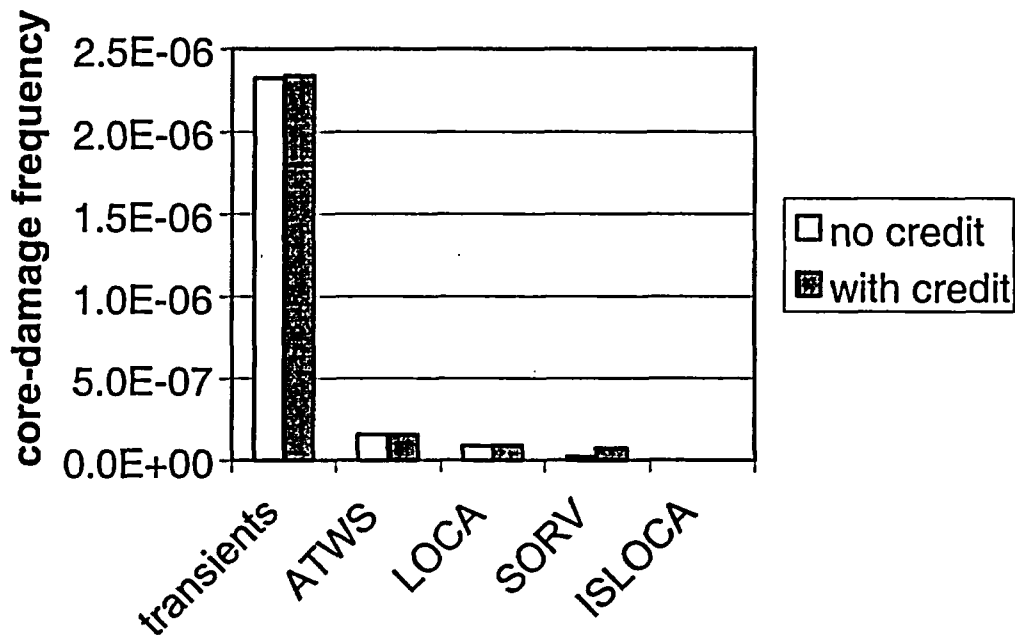
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	mean	5th percentile	95th percentile
CDF for no overpressure credit	2.6E-06	2.5E-07	8.9E-06
CDF with COP credit	2.6E-06	2.5E-07	8.9E-06
change in CDF due to COP credit	6.2E-08 2.4%	2.6E-10	2.5E-07

- Very small change in core-damage frequency (CDF) using the risk acceptance guidelines in RG 1.174

6-14

## Contributions to Core-Damage Frequency



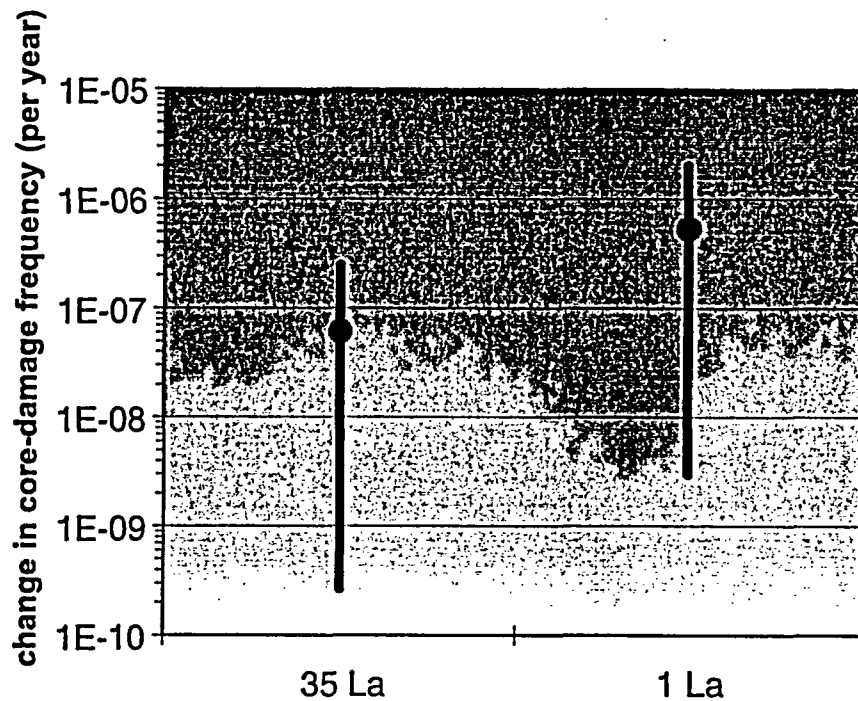
6-15

## Importance Measures

Event	Fussell-Vesely Importance	Risk Achievement Worth
Pre-existing, undetected containment leakage	2.50E-02	2.8
Operator error	8.90E-03	11.3
Containment isolation failure	7.40E-04	2.7
MSIV failures	1.30E-06	1.02

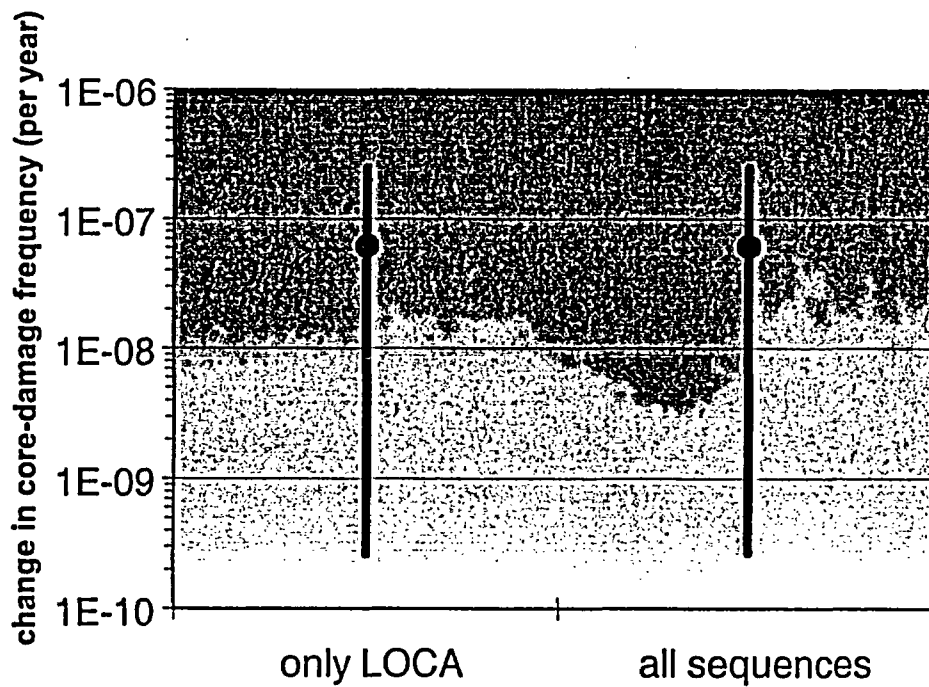
6-16

## Sensitivity to Containment Leak Size



6-17

## Sensitivity to MSIV Success Criterion



6-18

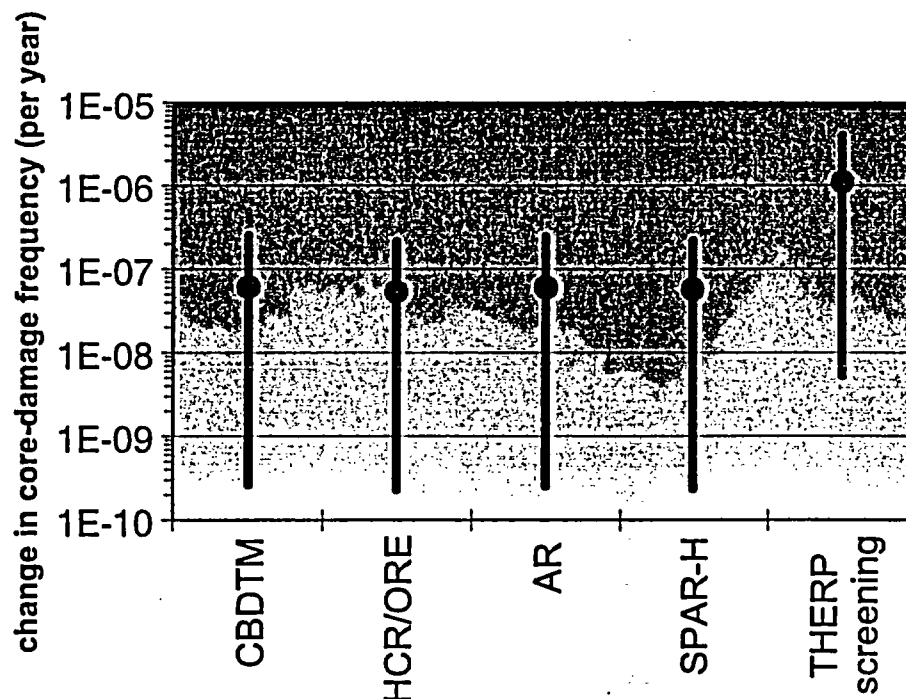


## Sensitivity to Human Reliability Analysis

- Alternative methodologies:
  - HCR/ORE: Human Cognitive Reliability/Operator Reactor Experiments, EPRI NP-7183-SL (1990)
  - AR: Annunciator Response, NUREG/CR-4772 (1987)
  - SPAR-H: SPAR-H Human Reliability Analysis Method, NUREG/CR-6883 (2005)
  - THERP: Technique for Human Error Rate Prediction, NUREG/CR-1278 (1983); used for initial screening analysis

6-19

## Sensitivity to HRA Method



6-20

## **Risk Insight: Impact on Defense-in-Depth**

- PRA can provide insights about how the proposed COP credit affects the balance between accident prevention and mitigation
- Consideration of this balance is important in weighing the necessity and sufficiency of defense-in-depth measures
- Staff considered how the proposed COP credit would affect the conditional containment failure probability (CCFP) in order to evaluate the balance between accident prevention and mitigation

6-21

## **Approximate Impact on CCFP**

$$\text{CCFP} \equiv \frac{\text{accident release frequency}}{\text{core damage frequency}}$$

$$R_{\text{CCFP}} = \text{fractional change in CCFP}$$

$$R_{\text{CDF}} = \text{fractional change in CDF}$$

Since core-damage accidents caused by loss of containment integrity will cause some form of release, it can be shown that:

$$R_{\text{CCFP}} = \frac{1 - \text{CCFP}}{\text{CCFP}} \times \frac{R_{\text{CDF}}}{1 + R_{\text{CDF}}}$$

6-22

## **Approximate Impact on CCFP (Con't.)**

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NUREG-1560, "Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance," Table 12.7 indicates that the CCFP for a BWR plant with a Mark I containment is generically about 0.6:

$$R_{CCFP} = \frac{1-0.6}{0.6} \times \frac{0.024}{1+0.024} = 0.016 = 1.6\%$$

This result suggests that the proposed COP credit does not significantly change the existing balance between accident prevention and mitigation.

6-23

## **SRP 19 Defense-in-Depth Objectives**

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- The LAR does not result in a significant increase in the existing challenges to the integrity of barriers.
- The LAR does not significantly change the failure probability of any individual barrier.
- The LAR does not introduce new or additional failure dependencies among barriers that significantly increase the likelihood of failure compared to the existing conditions.
- The overall redundancy and diversity among barriers is sufficient to ensure compatibility with the risk acceptance guidelines.

6-24

## **SRP 19 Defense-in-Depth Evaluation**

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- The proposed COP credit has no effect on LOCA or transient-induced SORV frequencies because it does not affect normal plant operating conditions.
- The proposed COP credit has no effect on the probability of containment failure because it does not affect normal plant operating conditions.
- Under the assumptions of the design-basis accident (DBA) analysis, the proposed COP credit introduces a dependency between the fuel and containment barriers; however, this does not appear to be probabilistically significant.

6-25

## **SRP 19 Defense-in-Depth Evaluation (Con't.)**

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- Realistically conservative analyses indicate that no COP credit is needed. Even if the COP credit is presumed to change PRA success criteria, then:
  - There must be at least three failures to cause a core-damage accident:
    - LOCA (or SORV, which requires multiple failures)
    - Loss of containment integrity
    - Loss of suppression pool cooling
  - The mean change in CDF is very small and meets the RG 1.174 risk acceptance guidelines
  - Results are robust in terms of uncertainties and sensitivities to key modeling parameters and assumptions

6-26

## **SRP 19 Defense-in-Depth Evaluation (Con't.)**

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- The scoping risk evaluation, based on the assumption that the proposed COP credit changes the PRA success criteria, indicates that the proposed COP credit does not significantly change the CCFP. Hence, it does not significantly change the existing balance between accident prevention and mitigation.
- Therefore, the proposed COP credit meets the four defense-in-depth objectives in SRP 19.

6-27

## **ACRS Comments on Defense-in-Depth**

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- ACRS letter of May 19, 1999
  - Expressed concerns about “arbitrary appeals to defense in depth” to avoid making changes to regulations and regulatory practices that seem appropriate in light of PRA results
  - Expressed the notion that there should be an inverse correlation between the uncertainty in PRA results and the extent to which defense in depth is applied
- Position reiterated in joint ACNW/ACRS letter of May 25, 2000

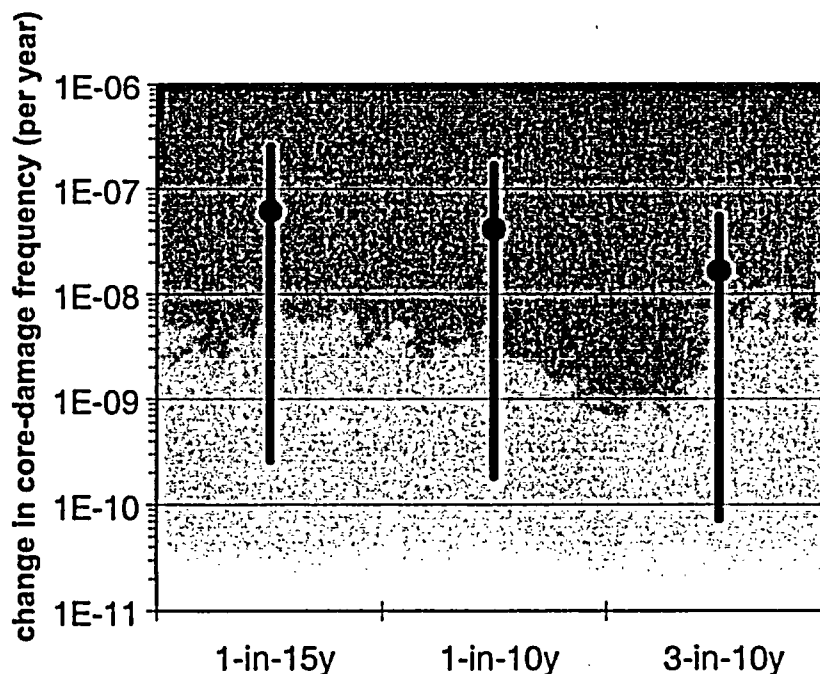
6-28

## Risk Insight: Performance Monitoring

- The probability of pre-existing, undetected containment leaks used in the scoping risk evaluation is conservative:
  - ▶ The VY containment is inerted with nitrogen
  - ▶ Probability was estimated from results of Type A integrated leak rate tests (ILRTs) for the entire U.S. commercial nuclear industry
  - ▶ More realistic approach would be to reduce this probability since inerting provides a continual means of detecting loss of containment integrity
- A sensitivity study was performed to assess the impact of the ILRT frequency on the change in CDF

6-29

## Sensitivity to ILRT Frequency



6-30

## **Conclusions**

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- Draft staff safety evaluation (SE) is based on consideration of adequate protection
- Staff will revise its SE after considering latest licensee supplements
- Staff scoping risk evaluation indicates that the proposed COP credit:
  - Has very small risk, even after considering parametric and modeling uncertainties
  - Does not significantly change the existing balance between accident prevention and mitigation
  - Meets the defense-in-depth objectives in SRP 19

6-31

## **Engineering Inspection**

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Larry Doerflein  
Chief, Engineering Branch 2  
Division of Reactor Safety  
Region I

7-1

## **Agenda**

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- Introduction - Larry Doerflein
- Inspection Background - Larry Doerflein
- Engineering Inspection - Jeff Jacobson
- Followup of Inspection Issues - Larry Doerflein
- Impact on EPU Amendment Review - Rick Ennis
- Questions and Comments

7-2

## **Inspection Background**

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- Biennial Safety System Design and Performance Capability Inspection Scheduled
- Request for Independent Safety Assessment
- Conditions Different than Maine Yankee
- New Inspection Procedure
- Team Independence
- Vermont State Nuclear Engineer Participation

7-3



# **Vermont Yankee Engineering Inspection**

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**Jeff Jacobson**  
Team Leader  
Vermont Yankee Engineering Inspection

7-4

## **Inspection Background**

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- VY inspection was responsive to the Vermont Public Service Board request to conduct an independent assessment and provide the inspection results to the ACRS for review
- VY inspection was part of a pilot program developed to improve the effectiveness of NRC engineering/design inspections
- VY inspection was the first of four pilot inspections
- The inspection involved about 900 hours of direct inspection versus 475 for a normal engineering team inspection

7-5

## **Inspection Staffing and Scope**

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- The inspection team included an NRR team leader, four NRC regional inspectors, and three highly qualified independent contractors
- All team members were independent of any recent oversight responsibilities of VY
- The inspection team focused on components and operator actions that represented high risk and had the lowest relative safety margins
- Low margin areas were identified in part by consultation with NRR technical staff

7-6

## **Inspection Scope (continued)**

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- Forty five components, operator actions, and operating experience samples were reviewed in detail
- The components reviewed were part of the following plant systems
  - On-site and off-site electrical systems
  - Reactor core isolation cooling system
  - Residual heat removal system
  - Safety relief valves
  - Reactor feedwater and condensate systems
  - Other risk significant systems

7-7

## **Pilot Inspection Areas of Review**

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- Visual signs of degradation, installation errors, interference issues, environmental concerns
- Design and licensing basis documentation
- Review of design assumptions, system interfaces, failure modes
- Component history including maintenance, corrective action, and testing records
- Operating procedures
- Focus on functionality of equipment

7-8

## **Additional Reviews Conducted Specifically for VY Inspection**

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- Comparison against current and uprated power levels
- Assessment of design control processes applied to power uprate

7-9

## **Inspection Results**

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- Eight findings of very low risk significance (Green)
- Findings did not result in system inoperability either as compared to current or uprated power levels
- Findings were not indicative of any programmatic breakdown
- The inspection approach used during the four pilot inspections was determined to be more effective than the system based vertical slice approach that is part of the current baseline inspection program
- Plans are to adopt this low margin inspection approach into the baseline engineering inspection program beginning 1/1/2006

7-10

## **Inspection Findings**

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- Capability of Vernon Hydro-electric station to supply power to VY in event of a regional blackout\*
- Adequacy of procedure used to monitor operability of offsite power
- Lack of degraded voltage analysis
- Reactor Core Isolation Cooling pressure control valve - reliance on instrument air
- Reactor Core Isolation Cooling pressure control valve - automatic operating mode inoperable

\* EPU related

7-11

## **Inspection Findings (continued)**

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- Non-conservative input for condensate storage tank temperature used in transient analysis\*
- Safe shutdown analysis used incorrect time for initiating reactor core isolation system from alternate control panel\*
- Insufficient acceptance criteria and unverified diagnostic equipment used in motor operated valve testing\*
- In addition to 8 findings, one unresolved item (URI) - ungrounded 480 VAC electrical system

\* EPU related

7-12

## **Required Corrective Actions**

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- The licensee is required to enter all the identified inspection findings into its corrective action program
- Corrective actions for all eight findings will be reviewed as part of the NRC's baseline inspection program -detail to be provided by Larry Doerflien
- In addition, corrective actions to the four findings that relate to areas covered by the NRC's power uprate were reviewed by the NRC's technical staff as part of the licensee's overall power uprate submittal - detail to be provided by Rick Ennis

7-13

## **Followup of Inspection Issues**

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**Larry Doerflein**  
Chief, Engineering Branch 2  
Division of Reactor Safety  
Region I

7-14

## **Status of Inspection Issues**

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- All Eight Inspections Findings Received Followup
- Inspection completed
  - ▶ IR 2005-002
    - RCIC startup time line
    - Procedure for assessing operability of off-site power
  - ▶ IR 2005-004
    - Degraded Relay Setpoint Calculations
    - CST Temperature
  - ▶ IR 2005-006
    - Availability of Power from Vernon Hydro Station
    - MOV Testing

7-15

## **Status of Inspection Issues**

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- More Inspection Needed
  - Design of RCIC pressure control valve
  - Non-conforming operation of RCIC pressure control valve
- Other
  - URI on Ungrounded 480V System - Task Interface Agreement (TIA)

7-16

## **Engineering Inspection Impact on EPU Review**

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**Rick Ennis**  
Senior Project Manager  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

7-17

## **Findings Related to EPU Review**

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- The findings that impacted the EPU review were:
  - Station Blackout
  - Appendix R Timeline for Reactor Core Isolation Cooling System (RCIC) Initiation
  - Periodic Testing of Motor-Operated Valves (MOVs)
  - Condensate Storage Tank (CST) Temperature

7-18

## **Station Blackout (SBO)**

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- Finding impacts Safety Evaluation Section 2.3.5, "Station Blackout"
- Coping analysis performed to address finding (Supplement 25 dated 3/24/05)
- Review of coping analysis determined for 2-hour coping period:
  - Adequate condensate inventory;
  - Adequate battery capacity;
  - Equipment operability with loss of ventilation;
  - Containment isolation maintained; and
  - NPSH met without crediting containment accident pressure.
- Staff concluded VY will meet SBO requirements under EPU conditions

7-19



## **Appendix R Timeline for RCIC Initiation**

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- Finding impacts Safety Evaluation Section 2.11, "Human Performance"
- Time to core uncover:
  - 25.3 minutes (current power level)
  - 21.3 minutes (EPU level)
- Time to place RCIC in service for Appendix R:
  - 15 minutes (1999 analysis)
  - 21 minutes (inspection team finding)
- Procedure revised to address finding.
- Results of timed operator crew walkthroughs of revised procedure submitted in Supplement 22 dated 12/8/04:
  - Times ranged from about 12 to 15 minutes
  - Average time about 13.5 minutes
- Staff concluded that sufficient margin exists to place RCIC in service during an Appendix R event under EPU conditions

7-20

## **Periodic Testing of MOVs**

---

- Finding impacts Safety Evaluation Section 2.2.4, "Safety-Related Valves and Pumps"
- Licensee did not manage commitments and conditions in SE for GL 96-05 MOV Periodic Verification Program
- Supplement 16 dated 9/30/04 committed to revise MOV Periodic Verification Program
- Supplement 32 dated 9/10/05 stated commitment is complete
- Staff concluded safety-related valves will continue to meet applicable requirements following EPU implementation

7-21

## **CST Temperature**

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- Finding impacts Safety Evaluation Section 2.6.5, “Containment Heat Removal”
- Supplement 18, dated 10/5/05 revised ATWS analyses for EPU
- Increase in CST temperature increased suppression pool temperature from 190F to 190.5F
- Peak suppression pool temperature for limiting event (LOCA) is 194.7F
- Staff concluded effect of CST temperature change is acceptable since limiting temperature will not be exceeded

7-22

## **Conclusions**

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- Licensee submitted supplements to EPU application to address all 4 findings
- NRC staff has reviewed information and concludes the issues have been adequately addressed

7-23

## **Engineering Inspection Summary**

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- Engineering inspection was responsive to the Vermont Public Service Board request (hours spent, scope, independence)
- Inspection approach considered an improvement over vertical slice approach
- All of the inspection findings were of low safety significance
- All inspection findings have received followup inspection for corrective actions
- Findings impacting the EPU have been adequately resolved as addressed in the NRC staff Safety Evaluation

# **ACRS Subcommittee on Thermal-Hydraulics**

November 16, 2005

**Comments on the Vermont Yankee  
Proposal for the Extended Power Uprate**

**Dr. Joe Hopenfeld**

**On Behalf of  
New England Coalition**

# **PRINCIPAL AREAS OF CONCERN**

- Steam Dryer Failure
- Lack of Adequate NPSH Margins
- Flow Accelerated Corrosion
- Iodine Release

# Steam Dryer Vibrations

## Theoretical Predictions

- Predictions of fatigue failure of the dryer are based on two computer models: the **Computational Fluid Dynamics model (CFD)**, and the **Acoustic Circuit Model, (ACM)**
- Neither the **CFD** nor the **ACM** were benchmarked against full scale tests.
- The flow field in the dryer is complicated by its complex geometry. And the thermal expansion of the dryer during transients may affect the natural frequency of the dryer. These are only two examples of why a validation of the models under steady state and transient conditions is required.
- The ascension to power tests do not validate the **CFD** nor the **ACM**. The ascension to power test do not represent the loads that the dryer would experience during transients such as Main Steam Line Break (MSLB), for example.
- In conclusion, the uncertainties in the **CFD** and the **ACM** reduce the reliability of converting plant data into dryer loads.

# **Steam Dryer Vibrations**

## **Dryer Failure**

- Recently discovered cracks in the VY dryer indicate that stresses in the dryer may be exceeding design levels.
- The growth of such cracks from flow induced vibrations during steady state operations or from dynamic loads during coolant depressurization will cause an accelerated crack growth and possible steam dryer fragmentation.
- Based on the experience at Quad Cities, dryer fragments may migrate to the steam line and fragments may be shed down on to the fuel.

# **STEAM DRYER VIBRATIONS**

## **Safety Consequences**

- The Quad Cities dryer failures should be viewed as precursors of similar incidents at VY under the EPU.
- The Quad Cities incidents should also be viewed as a “near misses” of fuel channel blockage or MSIV blockage during LOCA events.
- VY should be required to analyze the above worst case scenarios in a manner that provide adequate assurance that the EPU will not increase the core damage frequency beyond the present level.
- Assumptions per 10CFR50.92 criteria should be presented and defended.



# Steam Dryer Vibrations

## Lessons Learned

- After the Steam Dryer failures at Quad Cities, the Industry attributed the event to:  
***“ the lack of industry knowledge of flow-induced vibrations dryer failures”***
- This assessment, it appears, still applies to the VY methodology.

# **Steam Dryer Vibrations**

## **Conclusions**

It has yet to be demonstrated, per 10CFR50.92, that the proposed EPU will not –

1. Involve a significant increase in the probability or consequences of an accident previously evaluated.
2. Create the possibility of a new and different kind of accident from any accident previously evaluated.
3. Involve a significant reduction in a margin of safety.

# **Lack of Adequate NPSH Margins**

- Pressure drop across inlet pump screen is a major uncertainty
- Increase in coolant sludge concentration and other debris increases the potential for screen blockage.
- In one part of their analysis VY indicated that the EPU will increase sludge content. In another part of the analysis VY indicated that the EPU has no effect on the debris source term.
- The VY analysis with respect to NPSH margins is not conservative.

# Flow Accelerated Corrosion, FAC

- VY analysis of wall thinning is based on a computer model, CHEKWORKS
- CHEKWORKS can only be used to rank components with respect to their susceptibility to FAC but not as a predictive tool of actual material loss.
- Many failures have occurred from FAC since CHEKWORKS was developed in 1986 (La- Salle, Sequoyah, ANO-2, San-Onofre, Mihama)
- VY's account of the effects of EPU on the wall thinning of critical components is not conservative. Material loss is assumed by VY to be proportional to the velocity. It is more likely to be proportional to velocity squared.

# Iodine Release

- Because of higher feed water flow rates at EPU conditions the initial iodine concentration of the coolant will decrease.
- Empirical data indicates that the iodine spike increases with the decrease in iodine concentration.
- VY did not evaluate the pre accident iodine spike in terms of the actual iodine concentration in the coolant at EPU conditions.
- The empirical concentration of the 4uCi/g used by VY may not be applicable to the EPU.
- VY did not discuss why the effect of the concurrent iodine spike during the MSLB accident was not included in the calculations.
- The ACRS, in NUREG 1750, and at the 02/03/04-04/04/04 meetings, concluded that the NRC is not addressing the iodine spike adequately. They could not conclude that the allowable dose limits (10CFR 50, 10CFR100 10CFR50.67 and GDC 19) would be met during the MSLB accident.
- The NRC has recently initiated work on a new generic issue (GSI 197) to resolve the iodine spiking issue. NRC must bound the uncertainties in GSI 197 before one can be assured that VY will meet federal laws with the proposed EPU.