

Official Transcript of Proceedings ACRST-3334

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
528th Meeting

Docket Number: (not applicable)

PROCESS USING ADAMS
TEMPLATE: ACRS/ACNW-005

SISP - REVIEW COMPLETE

Location: Rockville, Maryland

Date: Wednesday, December 7, 2005

Work Order No.: NRC-768 Pages 1-109

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

TROY

ACRS OFFICE COPY
RETAIN FOR THE LIFE OF THE COMMITTEE

DISCLAIMER

**UNITED STATES NUCLEAR REGULATORY COMMISSION'S
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS**

December 7, 2005

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, taken on December 7, 2005, as reported herein, is a record of the discussions recorded at the meeting held on the above date.

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

1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3 + + + + +

4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 + + + + +

6 528TH MEETING

7 + + + + +

8 WEDNESDAY,

9 DECEMBER 7, 2005

10 + + + + +

11
12 The Committee met in Room T-2B3 of the
13 U.S. Nuclear Regulatory Commission, Two White Flint
14 North, 11545 Rockville Pike, Rockville, Maryland, at
15 1:00 p.m., Graham B. Wallis, Chairman, presiding.

16 COMMITTEE MEMBER PRESENT:

17 GRAHAM B. WALLIS, ACRS Chairman

18 WILLIAM J. SHACK, ACRS Vice Chairman

19 JOHN E. SIEBER, ACRS Member-at-Large

20 MARIO V. BONACA, ACRS Member

21 RICHARD S. DENNING, ACRS Member

22 THOMAS S. KRESS, ACRS Member

23 DANA A. POWERS, ACRS Member

24 VICTOR H. RANSOM, ACRS Member

25

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

C O N T E N T S

| | <u>PAGE</u> |
|----|---|
| 3 | Introductions, Chairman Wallis 3 |
| 4 | Vermont Yankee Extended Power Uprate Application: |
| 5 | Remarks by Subcommittee Chair 5 |
| 6 | Entergy's Presentation 6 |
| 7 | Risk Evaluation of Proposed Credit 33 |
| 8 | Deterministic Evaluation 63 |
| 9 | Public Comment: |
| 10 | Bill Sherman 89 |
| 11 | Raymond Shadis 98 |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |
| 19 | |
| 20 | |
| 21 | |
| 22 | |
| 23 | |
| 24 | |
| 25 | |

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

PROCEEDINGS

(1:03 p.m.)

3 CHAIRMAN WALLIS: Good afternoon. The
4 meeting will now come to order.

This is the first day of the 528th meeting
of the Advisory Committee on Reactor Safeguards.
During today's meeting the committee will consider the
following: final review of Vermont Yankee extended
power uprate application and the associated safety
evaluation; draft ACRS report on the NRC Safety
Research Program; and preparation for meeting with the
NRC Commissioners, which will be tomorrow, the actual
meeting.

14 This meeting is being conducted in
15 accordance with the provisions of the Federal Advisory
16 Committee Act. Dr. John T. Larkins the Designated
17 Federal Official for the initial portion of the
18 meeting.

19 We have received several written comments
20 and two requests for time to make oral statements from
21 members of the public regarding today's session on
22 Vermont Yankee.

23 A transcript of a portion of the meeting
24 is being kept, and it is requested that the speakers
25 use one of the microphones, identify themselves, and

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

1 speak with sufficient clarity and volume so that they
2 can be readily heard.

3 I will begin with some items of current
4 interest. Dr. Medhat El-Zeftamy, who has been with
5 the agency for the past 27 years, 22 of which were
6 with the ACRS, is retiring on January 3rd, 2006. Even
7 though it will be good for Med, this will be a major
8 loss for the ACRS.

9 On behalf of the committee, I would like
10 to thank Med for his outstanding technical support to
11 the ACRS in its review of numerous matters. Some of
12 these were a first of a kind, such as the development
13 of the license renewal process and the first license
14 renewal application for the Oconee plant, and some of
15 the others included the design certifications of ABWR
16 and AP-1000, preapplication reviews of ESBWR and ACR-
17 700 designs, policy issues related to the licensing of
18 future plant designs, early site permit applications,
19 NRC Safety Research Program report to the Commission
20 for which he helped me, reactor fuels, human factors,
21 and safety culture.

22 Thank you very much, Med. We wish you
23 well in your future endeavors, and also I would add in
24 your future relaxation. Thank you, Med.

25 (Applause.)

1 CHAIRMAN WALLIS: After the discussion,
2 presentation, and questioning about Vermont Yankee,
3 which I would like to inform the committee will be
4 broadcast by telephone, we are invited to go to the
5 cafeteria to participate in Med's retirement party.

6 In the items of interest handout, you will
7 note that there's some remarks by the three
8 Commissioners, the first three items.

9 I'd now like to proceed with the meeting
10 and the first item on the agenda is the request from
11 Entergy regarding Vermont Yankee, and I turn to my
12 colleague, Rich.

13 MEMBER DENNING: Thank you.

14 Today because of time constraints, we are
15 going to have presentations on just two of the
16 critical issues, the integrity of steam dryers and the
17 containment over pressure credit. These two topics
18 were selected by the subcommittee because of high
19 interest in these areas and also the feeling that we
20 needed some more information in these areas to support
21 the committee's review.

22 There are a number of other issues that
23 have been considered that the committee will need to
24 deliberate. These include the adequacy of the
25 engineering inspection that was performed; the need

1 for large transient tests; reduced operator response
2 times; the GE nuclear and thermal hydraulic analysis
3 methods; flow accelerated corrosion; and PRA results
4 and application.

5 These areas are not cut and dry, but the
6 subcommittee feels that we've received adequate
7 information from the staff and the applicant to
8 support the committee's deliberations in these areas.

9 I don't discourage the committee members
10 from raising questions related to these areas if they
11 would like, but because of the time constraints, we'll
12 want to keep those discussions bounded.

13 Now, I see that George isn't here, and
14 that may help us considerably in that regard.

15 (Laughter.)

16 MEMBER DENNING: We also have two
17 presentations that are planned by the public, and I
18 will ask those speakers to limit their presentations
19 to five minutes. The first set of presentations
20 relates to dryer integrity, and I would like to ask
21 Mr. Thayer from Vermont Yankee to introduce that
22 topic.

23 MR. THAYER: Good afternoon, Mr. Chairman,
24 members of the committee. My name is Jay Thayer. I'm
25 a Vice President at Entergy, Vermont Yankee.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 And before we start this morning, I have
2 one brief message for you. I would like to thank you
3 for your deliberations on the Vermont Yankee extended
4 power uprate over the last four subcommittee meetings.
5 I've been impressed with the diligence and the rigor
6 of the discussions with the committee and also the
7 thoughtful questions coming from the subcommittee.

8 One message I want to leave you with this
9 afternoon is that the men and women of Vermont Yankee
10 and of Entergy Nuclear, for that matter, are fully
11 committed to this power uprate, and the message I want
12 to leave you is that we are committed to the continued
13 safe operation of that plant, and if this uprate is
14 granted, that commitment will not change, nor will our
15 focus on safety be distracted for any reason. And I
16 want to make sure you heard that from me as a
17 responsible person for Vermont Yankee

18 With that, I'd like to turn it over to Mr.
19 Brian Hobbs who will lead the presentation that the
20 Chairman mentioned on our dryer.

21 Thank you very much.

22 MR. HOBBS: My name is Brian Hobbs. I'm
23 the Entergy supervisor, Engineering Analyses for
24 Vermont Yankee extended power uprate project.

25 This afternoon, along with Mr. Enrico

1 Betti on my left, I'm presenting a summary of key
2 points from last week's subcommittee meeting regarding
3 Entergy's evaluation of the Vermont Yankee steam dryer
4 structural integrity.

5 These key points are: acoustic loads are
6 the primary source of industry dryer degradation
7 experience. Higher steam flows at power uprate
8 conditions can exacerbate acoustic loads.

9 Secondly, Vermont Yankee's measurement
10 configuration is capable of detecting acoustic loads
11 that affect the dryer.

12 And the third point specific to Vermont
13 Yankee, we have measured current loads and know there
14 is some acoustic energy caused by turbulence. There
15 is no evidence of significant acoustic resonance. The
16 Vermont Yankee dryer structural analysis shows
17 substantial margin to the applicable ASME fatigue
18 stress limit. A complete exterior and interior
19 baseline inspection and follow-up inspection of the
20 dryer shows no preexisting structural vulnerabilities.

21 The Vermont Yankee dryer has been modified
22 to strengthen it for operation at EPU conditions, and
23 Entergy will control power ascension to EPU conditions
24 using a dryer monitoring plan that insures dryer
25 structural integrity is maintained.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
(202) 234-4433 WASHINGTON, D.C. 20005-3701

www.nealrgross.com

1 So in summary, the key points, Vermont
2 Yankee does not have significant acoustic loads at
3 current power levels. We have a measurement system
4 that can detect acoustic loads and the onset of
5 resonance if it occurs during power ascension to EPU
6 operating conditions.

7 And finally, the Vermont Yankee dryer
8 structural integrity analysis demonstrates substantial
9 margin to the ASME fatigue limit which will be
10 monitored to insure structural integrity at EPU
11 operating conditions.

12 The VY dryer structural analysis relies on
13 obtaining fluctuating pressure measurements on the
14 main steam piping. We upgraded our flow induce
15 vibration detection capability during the recent
16 Vermont Yankee refueling outage by installing a second
17 generation measurement system consisting of six strain
18 gauges at two locations on each main steam line and
19 enhancing the data acquisition system.

20 We also monitor piping vibration using 21
21 accelerometers on the main steam piping. Baseline
22 strain gauge and accelerometer measurements indicate
23 that Vermont Yankee has very low vibration levels at
24 current license thermal power, as you will see in the
25 next slide.

As discussed in last week's subcommittee meeting, we performed an evaluation of main steam branch lines for potential acoustic excitation and concluded that some cavities may resonate at both current licensed thermal power and EPU operating conditions, but there is currently no evidence of such resonance.

This indicates that these sources at
Vermont Yankee do not couple with other system modes
resulting in a low magnitude response.

We also discussed how the onset of resonance would be detected via the dryer power ascension monitoring plant. Data from Vermont Yankee, the Quad Cities plant, and scale model testing indicates that excitation of acoustic sources, whether inside the reactor steam dome or in the main steam lines will be detectable in the Vermont Yankee strain gauge and accelerometer locations.

19 CHAIRMAN WALLIS: So what detects what's
20 going on inside the dryer itself? You said it would
21 detect excitation from the main steam line in the
22 reactor vessel. What will detect what's happening in
23 the dryer itself?

24 MR. HOBBS: We have data from the Quad
25 Cities instrumented dryver, which earlier this year

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701 www.nealrgross.com

1 installed the dryer with instrumentation on the face
2 of the dryer itself, and that data was compared to
3 strain gauge data at the Quad Cities plant, and it was
4 shown that whether caused by turbulence or vortex
5 shedding inside the vessel and on the dryer, or by
6 excitation of a cavity in the main steam lines, that
7 any acoustic excitation could be detected in the
8 strain gauges on the main steam lines just outboard of
9 the main steam nozzles.

10 MEMBER DENNING: But in that case, the
11 steam line itself is resonating with the dryer, and
12 our concern is suppose, different from what apparently
13 happened to Quad Cities, if there's some other mode of
14 excitation that causes vibrations within the steam
15 dryer that does not excited the steam line, can we be
16 convinced that the signal will propagate from the
17 dryer region into the steam line sufficiently that
18 you'd be able to measure it there?

19 MR. HOBBS: Yes, we believe, and the NRC
20 staff, I think, has also done work on this, that the
21 vibration that's occurring in the vessel itself and on
22 the steam dryer that's high enough to cause challenges
23 to the structural integrity of the dryer will be
24 detected on the measurement system on the main steam
25 lines itself.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MEMBER DENNING: But you don't have any
2 directly relevant analysis to convince us of that?

3 MR. HOBBS: Well, again, we have empirical
4 data from the Quad Cities instrument ed dryer that
5 shows that in their case, they were able to detect the
6 excitation within the vessel on the steam lines.

7 We also have scale model test data from GE
8 that shows that they were able to detect an excitation
9 source inside the scale model reactor vessel on the
10 main steam lines so that there's evidence that you can
11 detect it, and at levels that, again, challenge the
12 integrity of the steam dryer. That would be the case.

13 This curve here shows recent Vermont
14 Yankee strain gauge data on main steam line C seven
15 feet outboard of the main steam nozzle. This plot,
16 which is representative of the eight main steam line
17 monitoring locations at Vermont Yankee, shows that the
18 small amount of energy in the Vermont Yankee system is
19 generally below 70 hertz.

20 The peaks at 20, 35, 45, and 60 hertz are
21 caused by turbulent excitation with the latter three
22 coinciding with reactor steam dome acoustic modes.
23 The lack of energy at frequencies above 80 hertz
24 demonstrates suitability with the Vermont Yankee dryer
25 modification which shifted the frequency of the dryer

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 front hood from 20 hertz to 80 hertz.

2 This yellow curve is the Quad Cities'
3 strain gauge data at original licensed thermal power
4 at the same measurement location as on the Vermont
5 Yankee steam line. Quad Cities, as you can see, has
6 high acoustic energy in the 150 to 170 hertz range.
7 This is thought to be caused by coupled excitation of
8 the Quad Cities main steam relief valves. The Quad
9 Cities rated main steam velocity at original licensed
10 thermal power is approximately the same as the Vermont
11 Yankee steam velocity at full EPU operating
12 conditions.

13 The red curve is Quad Cities data at EPU
14 conditions. The high frequency peak grew sufficiently
15 at the higher steam flow rates to cause the damage to
16 the front hood plates of the steam dryer and looking
17 at the linear version of this same plot, it's evident
18 that power uprate exacerbated the original licensed
19 thermal power flow induced vibration phenomena at Quad
20 Cities.

21 As described in last week's meeting, we
22 used two methods to develop plant specific dryer loads
23 at Vermont Yankee, an acoustic circuit model with a
24 computational fluid dynamics model as well. The
25 acoustics circuit model uses time history inputs from

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 main steam system fluctuating pressure measurements
2 and projects those loads onto the dryer.

3 Quad Cities, as I mentioned previously
4 installed new dryers in both units earlier this year.
5 The first of those dryers was instrumented to measure
6 pressures and stresses acting on the dryer. The data
7 obtained from these measurements was used to benchmark
8 the acoustics circuit model that's applied to Vermont
9 Yankee and allowed us to determine what the model's
10 uncertainty was and factor it into our prior load
11 definition.

12 Entergy also developed a computational
13 fluid dynamics model which provided an understanding
14 of turbulent vortex shedding phenomenon in the reactor
15 steam dome. The CFD model analyzed conditions at both
16 100 percent and 120 percent power levels with both
17 loads run through our structural analysis.

18 The results indicate that turbulent forces
19 act primarily on dryer locations adjacent to the main
20 steam nozzles and have little structural impact on
21 dryer components.

22 In addition, the use of a compressible
23 fluid in our CFD model resulted in the prediction of
24 acoustic modes above 25 hertz which are similar to
25 those we measure in our strain gauge data. Acoustic

1 loads are detected in the latest strain gauge data at
2 current license thermal power at Vermont Yankee.

3 At the subcommittee meeting last week, we
4 discussed development and use of a finite element
5 model on the Vermont Yankee dryer using ANSIS
6 methodology. The CFD model and acoustic circuit model
7 pressure time history loads were run separately
8 through the finite element model and resulting
9 stresses combined. The maximum fluctuating pressure
10 at each frequency for either the 120 percent or 100
11 percent CFD model loads were used for the stress
12 analysis.

13 The peak alternating stress calculated by
14 the finite element model was compared to the fatigue
15 limits in the ASME boiler and pressure vessel code.
16 The results are shown here for the most limiting
17 component, which is the Vermont Yankee dryer weld at
18 the top of the vertical face. The peak calculated
19 stress of 5,450 psi combines the acoustic circuit
20 model and CFD model loads and includes weld geometry
21 and stress intensification factors.

22 The acceptance limit is the ASME fatigue
23 curve C limit of 13,600 psi. Our limit of power
24 ascension at Vermont Yankee is 7,400 psi, which gives
25 us a margin for uncertainty in our structural

1 analysis. Applying the limiting component margin to
2 the stress limit and incorporating uncertainty, we
3 calculate a limit curve factor to be applied during
4 power ascension.

5 CHAIRMAN WALLIS: Could I understand how
6 you came up with 7,500 psi?

7 MR. HOBBS: For our limit we can show you
8 how we did that, and I'll ask Mr. Betti to help out
9 here.

10 MEMBER DENNING: Definitely speak into the
11 mic and also introduce yourself.

12 MR. BETTI: Enrico Betti, Entergy.

13 The 7,400 is based on the sum of the
14 squares combination of 18,000, 1,850, and 5,124 from
15 the two analyses that we ran. With the addition that
16 we applied the limit curve factor that we're applying
17 in our start-up curve times the ACM number. So it's
18 the 1,857 times the 2.87; that quantity squared plus
19 5,124 squared, the square root of the combination of
20 that.

21 When we developed our limit curve factor
22 in uncertainties, we actually worked from the LCF
23 equation you see right here, and then that's also how
24 we developed our uncertainties based on the CFD and
25 ACM uncertainties.

Another interesting point to make here is even though the CFD value is larger here, we did quite a lot of evaluating of the CFD analysis, and of that 5,000 stress, about 1,000 is due to the turbulent forces and 4,000 is due to acoustic forces that were just a byproduct of the compressible gas modeling we used.

8 So it is a double dipping that we're
9 accounting acoustic forces, and we really meant the
10 CFD only to give us the effect of the turbulence in
11 our model, but we included both in this analysis.

12 CHAIRMAN WALLIS: So the acoustics are
13 counted twice.

14 MR. BETTI: Acoustics is counted twice.
15 It has a big factor here --

16 CHAIRMAN WALLIS: I would be a little
17 happier if you had shown there was no shaking. What
18 you're showing here is there is shaking, but it's
19 almost a factor of two below some limit in terms of
20 limiting stress. But there still is shaking. You're
21 not saying that it's not going to shake. It's going
22 to shake, but not shake apart is what you're saying.

23 MR. BETTI: I think I'd like to clarify
24 that a little. From our instrumentation system that
25 we --

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701 www.nealrgross.com

1 VICE CHAIRMAN SHACK: Don't go away yet.

2 MR. BETTI: From the instrumentation
3 system that we have there, our calculated shaking
4 stresses our under 2,000 psi peak stress, and that's
5 using a conservative stress intensification factor.

6 We have a CFD model that wasn't designed
7 to do acoustics. So we don't have proper dampening,
8 et cetera, but as a byproduct of compressibility, we
9 calculated a higher amplitude than we see on --

10 CHAIRMAN WALLIS: The thing that concerns
11 me with CFD and acoustics is that once the thing
12 starts to shake, it feeds back to the acoustics, and
13 your CFD doesn't consider a moving boundary, does it?
14 CFD is just rigid boundaries. You calculate the fluid
15 stress, and then you let it shake the object, but you
16 don't feed back the shaking of the object to the fluid
17 mechanics, which actually gets things really going if
18 they're in tune with each other.

19 That's missing, isn't it, here?

20 MR. HOBBS: Dr. Wallis, if you remember
21 the blue curve from our strain gauge measurements,
22 there's almost no energy above 80 hertz. So the --

23 CHAIRMAN WALLIS: That's reassuring, yes.

24 MR. HOBBS: -- the energy that's reflected
25 here is a prediction from a CFD model that has some

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 uncertainty associated with it, and this is for a 120
2 percent flow case.

3 So what we're doing is we're projecting
4 our CFD load from our model to the 120 percent case
5 and applying that to today's load definition. So we
6 have the computer shaking, a small amount of shaking
7 going on that we don't reflect in our actual plant
8 measurements, but may occur at power uprate
9 conditions, and that's why we have a monitoring
10 program.

11 CHAIRMAN WALLIS: So you're saying that
12 these values are much bigger than you'd get from your
13 actual measurement.

14 MR. HOBBS: Yes.

15 MR. BETTI: Yeah, our measurement value is
16 the 1,857, and that's a peak value.

17 CHAIRMAN WALLIS: But you understand what
18 I'm saying about fluid structure and direction. I
19 don't think we're yet smart enough to put in the CFD
20 and the motion of the boundary.

21 MR. BETTI: We agree.

22 CHAIRMAN WALLIS: It would be good if you
23 could.

24 VICE CHAIRMAN SHACK: I mean, you're
25 computing your load factor on just the acoustic mode

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 stress. I mean, what gives you such confidence that
2 you can take your limit stress and just subtract off
3 the CFD? You know, this somehow seems as though
4 you're assuming that the CFD stresses are real. You
5 know those with minimal amount of uncertainty, and for
6 the reasons that Dr. Wallis has talked about, I'm not
7 sure why you don't consider them at least as uncertain
8 as the acoustic mode stresses.

9 MR. HOBBS: Right.

10 VICE CHAIRMAN SHACK: And yet you're not
11 doing that here. You're showing a load factor as
12 though those were the exact stresses, and all of my
13 uncertainties are just dumped on the acoustic mode.

14 MR. HOBBS: Right. Well, there's two
15 uncertainties we show here. One is the 3.91, and that
16 is the total uncertainty from both our acoustic
17 circuit model and our CFD analysis. What we are
18 basing the limit curve factor on is how much growth
19 can we tolerate for acoustic loads as we increase to
20 power uprate conditions, and the reason we hold this
21 CFD loads as being a Row B squared type load is
22 because we don't think the turbulent CFD loads are
23 going to increase with as much potential for residents
24 as the acoustic loads at EPU conditions.

25 So this is kind of the head space. The

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 2.87 factor is how much can we tolerate in the way of
2 increasing acoustic loads. That does not give you the
3 uncertainty number for the analysis.

4 CHAIRMAN WALLIS: Now, what surprised me
5 a bit is when we look at your red, blue, and yellow
6 curves, the Quad Cities values are four orders of
7 magnitude above yours. So I mean, here you're talking
8 about a factor of two, you know, in your previous
9 slide.

10 MR. HOBBS: Right.

11 CHAIRMAN WALLIS: Your 13,000 and 7,000,
12 but here you're talking about a factor of 10,000.
13 Now, I can believe that you're much better than Quad
14 Cities experimentally. Why aren't you so much better
15 when you calculate things?

16 MR. HOBBS: I think, Dr. Wallis, the
17 results are similar actually. I think that when we
18 take a CFD analysis , that gives us a localized
19 street. If you don't look at the CFD acoustic
20 effects, which really weren't tried to be modeled
21 correctly, and we don't measure those high amplitude
22 of bumps that the CFD created, that our actual
23 measured hydrodynamic stress on a model was on the
24 order of a couple hundred psi, and then we
25 conservatively multiplied that times -- because we

1 have so much margin, we use stress concentration
2 factor and conservative weld geometry factor of five.
3 So we take a stress that's a couple hundred. We turn
4 it into 1,000, and then we're including after
5 conversation with the staff this summer the -- we're
6 keeping in the acoustic portion of that load, not
7 filtering it back out, even though we're measuring the
8 acoustic loads in our piping and we're using our
9 acoustic model to project those back on our vessel.

10 Now, what they've done at Exelon is only
11 look at the acoustic portion of the load. So I think
12 this is a very conservative picture of the street
13 state at Vermont Yankee.

14 MR. HOBBS: This demonstrates how we'll
15 apply our limit curve factor during a power ascension.
16 Recall that on this curve here, the Vermont Yankee
17 measured strain gauge data is the blue line. If we
18 apply the limit curve factor of 2.87 to this spectra,
19 then what appears is the green line here.

20 And the green line is the limit curve that
21 will be applied during power ascension to assure that
22 the Vermont Yankee --

23 CHAIRMAN WALLIS: The green line is a
24 conservative version of the blue line. Is that what
25 I understand?

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MR. HOBBS: It's the blue line times 2.87.

2 CHAIRMAN WALLIS: Raised up by a factor.

3 MR. HOBBS: Which is our head space for
4 incurring acoustic residence at EPU operating
5 conditions.

6 Note that the Quad Cities original and EPU
7 acoustic peaks exceed the Vermont Yankee limit curve.
8 If the VY limit curve is challenged during power
9 ascension, we will evaluate to insure continued
10 acceptable dryer performance for maintaining
11 structural integrity.

12 CHAIRMAN WALLIS: That's as long as
13 nothing shakes at 60 hertz. Sixty hertz, it's a
14 minimum for Quad Cities and a maximum for you.

15 MR. HOBBS: Right, and there's some --

16 CHAIRMAN WALLIS: Your conclusions you
17 just drew are up in the 100 hertz and above region.

18 MR. HOBBS: That's right, and that's the
19 reason, again, that's caused by coupled resonance in
20 the main steam lines at Quad Cities. Vermont Yankee
21 has only one relief valve in each steam line, has only
22 one safety valve in each steam line. Quad Cities has
23 multiple safety valves and relief valves in each steam
24 line. So that's how the coupling occurs, because
25 they're in close proximity to each other.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 CHAIRMAN WALLIS: You measured the
2 mechanical resonances in this steam dryer?

3 MR. HOBBS: Yes.

4 CHAIRMAN WALLIS: You hit it and see how
5 it rings, that kind of thing?

6 MR. BETTI: No, we evaluate the steam
7 dryer with answers.

8 CHAIRMAN WALLIS: It's all calculation.

9 MR. BETTI: All calculation, and what we
10 do is we --

11 CHAIRMAN WALLIS: What sort of range of
12 resonance frequencies do you find?

13 MR. BETTI: For where these acoustics
14 began, with the turbulent load back, is the front face
15 of the dryer. Brian had mentioned earlier that the
16 fundamental frequency of the front face is around 85
17 hertz.

18 CHAIRMAN WALLIS: Eighty-five.

19 MR. BETTI: And that's based on the
20 modification that we did. We --

21 CHAIRMAN WALLIS: You stiffened it up and
22 braced --

23 MR. BETTI: We stiffened it up, yeah.
24 Based on GE's review of a lot of reactor data, the
25 bumps that we see in our strain gauge data at these

1 residencies and at this 20 hertz frequency are pretty
2 typical, not typical of Quad Cities to see these very
3 high frequency loads, but for the data that GE had,
4 they based the design that brought that vertical face
5 frequency above their experience base of reactor data,
6 and that's the modification that we have in place.

7 So, I mean, for us when we watch this
8 data, of course, we have to be very sensitive to
9 anything to show up around our fundamental frequency
10 of our front fix. That would be a very sensitive
11 area.

12 MEMBER RANSOM: What are the units of the
13 ordinate?

14 MR. BETTI: The units of the ordinate are
15 micro strain squared per hertz.

16 MEMBER RANSOM: Strains in -- strains?

17 MR. BETTI: It's strain, and the
18 correlation between micro strain and psi -- no micro
19 strain and psi is -- the correlation is approximately
20 3.9 psi per micro stain is the conversion for the VV
21 main steam piping. It's 18 inch, Schedule 80, and we
22 did do UT data on the piping when we installed our
23 strain gauges so that we would have an accurate
24 assessment.

25 MEMBER RANSOM: Psi seconds, I guess.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701 www.nealrgross.com

1 You've got frequency and per second, right?

2 MR. BETTI: It's power spectral density.

3 So we take the FFT response times conjugate. Times
4 conjugate, right, and then divide that by -- it's
5 shown as the per unit hertz. It's a way to normalize
6 it so that there wasn't a question on how you
7 normalized your curves. If we use PSD, power spectral
8 density, it's more of a uniform way that we could find
9 it doesn't make it subject to how something normalized
10 your FFTs, magnitude.

11 MEMBER DENNING: Let's continue because
12 there are only a few more slides, and if we have some
13 other questions we can come back to them.

14 MR. HOBBS: Okay. The Vermont Yankee
15 dryer power ascension monitoring will include power
16 increased steps and test plateaus at each five percent
17 of current licensed thermal power. Data will be
18 collected hourly when power is increasing and within
19 one hour of reaching each test plateau.

20 In accordance with the NRC license
21 condition if the limit curve is exceeded, power will
22 be reduced to a previously acceptable level within two
23 hours and an engineering evaluation performed to
24 document continued dryer structural integrity.

25 Also in accordance with the NRC license

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 condition each test plateau has a 24-hour minimum hold
2 time to collect strain gauge, accelerometer, and plant
3 data, perform inspections, and evaluate results.

4 The evaluation will be provided to the NRC
5 staff and power will not be increased until 96 hours
6 after confirmation of receipt by NRR.

7 In conclusion, the Vermont Yankee dryer
8 structural integrity evaluation demonstrates that the
9 VY dryer shows no significant vulnerability to flow
10 induced vibration at current licensed thermal power;
11 utilizes a methodology that can detect significant
12 acoustic excitation either in the main steam lines or
13 reactor steam dome; and finally, demonstrates ample
14 margin to the code allowable fatigue limit which will
15 be monitored during power ascension to insure dryer
16 structural integrity is maintained.

17 MEMBER DENNING: Would you comment on a
18 couple of things for me? One of them is on the cracks
19 that have been observed, could you give a quick review
20 for the committee members that weren't here as to what
21 your perception is, the origin of the cracks, what
22 you've done with those cracks that you've repaired,
23 what you believe the origin is of the cracks that have
24 not been repaired?

25 MR. HOBBS: Certainly. The Vermont Yankee

1 dryer was inspected for the first time in 2004 and a
2 complete internal and external inspection was
3 performed at that time in accordance with Silth 644
4 from General Electric. What we found in 2004 were a
5 total of 20 indications. Two of those were located in
6 the steam dam area of the dryer. Those were repaired
7 and the cracks ground out. Those cracks were
8 determined to be caused by fatigue, and it was thought
9 that they were created originally due to construction
10 of the dryer because they were 180 degrees out from
11 each other, and they grew to a length of about three
12 inches, and we concluded GE also analyzed this, that
13 it was cold spring that caused those cracks. So they
14 were ground out and repaired.

15 Two other cracks were found in the drain
16 channel and drain pipe areas of the steam dryer, which
17 is in the skirt where the water drains from the dryer
18 vein banks and down the skirt and back into the
19 reactor region. These two cracks were on the order of
20 14 inches or less in length. They were determined to
21 be caused by IGSEE based on their location and their
22 characteristics, and those were left as is. Those
23 were not repaired.

24 There were 16 other indications found on
25 the dryer vein banks, and the vein banks are in a low

1 stress area of the dryer. They basically hold the
2 veins that remove the moisture in the dryer, and
3 they're sort of the frame around the vein dryer
4 banks, and those were all inch and a half or less in
5 size and were thought to be caused by IGSCC, although
6 there may have been some fatigue involved in those
7 cracks as well.

8 The characterization of those is they were
9 very tight indications, and we did an analysis that
10 said even if those indications grew to the entire
11 length or to the entire width of the vein and bank,
12 they would still be structurally intact. So those
13 were not repaired also.

14 In 2005, last month we went back in and
15 did an inspection of all the indications we found, and
16 we also inspected the repaired indications from 2004,
17 and we found that there was no growth in the dryer
18 drain channel or drain pipe IGSCC indications. Those
19 had not grown in size, and we also checked the
20 previous indications on the dryer vein banks and found
21 that those also had not grown in size, but we did find
22 additional indications on the vein banks, and again
23 that's the areas that are on the edges of the dryer
24 vein banks.

25 The reason that we found additional

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 indications and the total additional indications we
2 found were 46, is because we used an enhanced digital
3 inspection system for this outage whereas previously
4 we had used an analogue inspection system with a VCR
5 type videotape. This time we used digital media, and
6 the resolution was much better.

7 So it's essentially an enhanced visual
8 inspection we did finding more indications similar to
9 those we had previously found.

10 The characterization was tight tracks, and
11 again, if they grew to the entire width of the dryer
12 vein bank and plate, they'd still be structurally
13 intact.

14 MEMBER DENNING: And you have a commitment
15 after power uprate to inspect the next three outages,
16 correct?

17 MR. HOBBS: That is correct, and it's a
18 thorough internal and external inspection for the
19 three refueling outages.

20 MEMBER DENNING: this is the only
21 presentation we're going to have on the integrity of
22 the dryer. So are there any other questions you'd
23 like to raise now?

24 VICE CHAIRMAN SHACK: I mean, we're
25 talking about carbon steels here. You're saying

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 IGSCC.

2 MR. HOBBS: Stainless steel, Dr. Shack.

3 VICE CHAIRMAN SHACK: Stainless steel.

4 MR. HOBBS: Yes.

5 MEMBER DENNING: Okay. Are there any
6 other questions?

7 VICE CHAIRMAN SHACK: One more question.

8 MEMBER DENNING: I'm sorry.

9 VICE CHAIRMAN SHACK: Is there any
10 consideration that your fatigue stress limit, which in
11 the code is based on air data, will be lower in the
12 environment?

13 MR. HOBBS: That's a good question. Mr.
14 Betti, can you help me out here?

15 MR. BETTI: No, I wouldn't be the best
16 person to ask.

17 MR. HOBBS: Can we get back to you on that
18 question? So the question is would the limit be lower
19 in a --

20 VICE CHAIRMAN SHACK: Like say a factor of
21 two.

22 MR. HOBBS: Okay.

23 MEMBER POWERS: Isn't there a relatively
24 famous publication by Dr. Shack on that subject?

25 VICE CHAIRMAN SHACK: Well, such effects

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 are known to occur. Now, whether they're particularly
2 applicable in this case is another question, but it
3 does seem like an issue that ought to be addressed.

4 MR. HOBBS: So two phase or liquid
5 environment versus air.

6 CHAIRMAN WALLIS: Or a changing liquid
7 and vapor environment.

8 MEMBER DENNING: If you could get back to
9 Mr. Caruso with any comments by tomorrow, is that
10 reasonable?

11 MR. HOBBS: Certainly.

12 MEMBER DENNING: Thank you.

13 MEMBER POWERS: We're not going to put any
14 pressure on you.

15 MEMBER DENNING: Not going to put any
16 pressure on you. Thanks.

17 Now we're going to switch to containment
18 over pressure credit, and we're going to have
19 presentations that relate to a PRA analysis of what's
20 the significance, and then we're going to also have a
21 presentation on what are the conservatisms and if you
22 do a realistic analysis what happens.

23 And the first presentation is going to be
24 by Mr. Stutzke on the PRA.

25 CHAIRMAN WALLIS: Now, we have two

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 presentations. You say one is PRA. One is
2 conservative. I had great difficulty figuring out in
3 the PRA whether there were conservatisms incorporated
4 or not and how things like uncertainties were handled
5 because if the conservative method shows there's no
6 problem, how can the PRA possibly reveal there is a
7 problem?

8 I mean, you're going to explain all of
9 that to me?

10 MEMBER DENNING: Rick, did you want to
11 make any introductory remarks?

12 MR. ENNIS: My name is Rick Ennis, and I'm
13 the project manager in NRC's Office of NRR for the
14 Vermont Yankee extended power uprate, and the two
15 presentations that we're going to present today
16 regarding containment overpressure credit are a risk
17 evaluation of the proposed crediting by Marty Stutzke
18 and then the deterministic evaluation by Rich Lobel.

19 MR. STUTZKE: Hi. I'm Marty Stutzke, a
20 senior reliability and risk analyst in the Office of
21 Nuclear Reactor Regulation, and I'm here today to
22 discuss Entergy's risk evaluation of the proposed
23 credit for containment accident pressure to provide
24 net positive suction head to the low pressure injector
25 or coolant injection and the core spray pumps.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 Briefly stated, Entergy has completed its
2 risk evaluation. I've reviewed the information that
3 they've submitted which confirms the conclusions that
4 are present in the current draft safety evaluation.
5 So we're in the process now of supplementing our
6 safety evaluation to reflect the additional
7 information that Entergy has provided in supplements.
8 I believe it's 38, 39, and 43, totaling some about 400
9 pages of information.

10 The second point is using the realistic
11 assumptions to estimate --

12 VICE CHAIRMAN SHACK: Excuse me. Is
13 Supplement 43 posted somewhere on the Web? Can I get
14 it? I don't believe I have it.

15 PARTICIPANT: Actually I think it's in the
16 package.

17 PARTICIPANT: It was received December
18 2nd.

19 PARTICIPANT: Yes.

20 MEMBER DENNING: Before you go on, would
21 you comment on maybe -- Mike may be the more
22 appropriate one to talk to -- but we have been
23 concerned about the fact that we did not have a final
24 SER, and we were told that the subcommittee that you
25 were looking at this as a confirmatory kind of

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 request. Is that still your comment? Is that still
2 the staff's position that basically the essence of
3 the SER is unchanged?

4 MR. STUTZKE: That's correct. I have not
5 changed my conclusions based on what Entergy has
6 provided recently.

7 So Mr. Lobel will talk about some
8 additional insights on the calculation of available
9 NPSH, the margins available, this sort of information.

10 CHAIRMAN WALLIS: Will you accept
11 questions on this slide now? I had great trouble
12 because your second bullet says if you -- I think it's
13 saying if you calculate the pool temperature,
14 suppression pool temperature, realistically you don't
15 need CAP credit.

16 Now, Mr. Lobel told us that if you
17 calculates conservatively, less conservatively than is
18 required by the design basis assumptions, but you
19 still calculate it conservatively. You don't need
20 CAP credit. So how can you possibly have any effect
21 on risk if you don't need it? How can NPSH -- if the
22 problem never arises, how can it ever affect risk?

23 MR. STUTZKE: It can't.

24 CHAIRMAN WALLIS: Well, so why are you
25 doing risk analysis that shows there is a risk? It

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 doesn't make sense?

2 MR. STUTZKE: Well, the risk analysis that
3 I did, it's a "what if" analysis.

4 CHAIRMAN WALLIS: You mean what if two is
5 not true anymore?

6 MR. STUTZKE: That's correct.

7 CHAIRMAN WALLIS: Well, that's silly
8 because risk is supposed to be realistic analysis,
9 isn't it?

10 MR. STUTZKE: Well, I don't know if it's
11 silly or not. We prefer to call it epistemic
12 uncertainty, I think.

13 CHAIRMAN WALLIS: I think it's more
14 regulatory assumption uncertainty, isn't it? You
15 shall make an assumption which is not realistic and
16 then look at what would happen if you did that. Isn't
17 that what you're doing?

18 MR. STUTZKE: That's correct.

19 MEMBER DENNING: Well, Marty, how strongly
20 do you feel -- how confident are you in that second
21 statement about the realistic assumptions indicate
22 that the overpressure credit isn't necessary?

23 MR. STUTZKE: As confident as I can be
24 without actually doing the experiment, which I hope
25 that we would never do like that.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MR. LOBEL: I'm going to get into that and
2 show some calculations in some detail. So you'll see
3 the assumptions that go into that statement.

4 MEMBER DENNING: Okay. Very good. Well,
5 at least we understand the ground rules then of what
6 the risk analysis is showing, which is it says a "what
7 if." We're getting into the --

8 CHAIRMAN WALLIS: You're going to clearly
9 explain what the "ifs" are.

10 MR. STUTZKE: Right, and I have some
11 additional information on that later on to try to
12 explain.

13 Okay. The last thing is that we have
14 compared the proposed containment accident pressure
15 credit to the five key principles of risk informed
16 decision making in Reg. Guide 1.174, and I'll discuss
17 how the insights from the risk evaluation support the
18 conclusion later.

19 Okay. I've continued my chronology that
20 I have provided to the subcommittee in various
21 meetings in December of how we go into doing the risk
22 evaluation here. I think what's important is what's
23 new since the last subcommittee here is that Entergy
24 has responded formally to the request for additional
25 information I sent on their supplements 38 and 39.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 That was done on Friday about noon as I remember,
2 which totally spoiled my weekend, but that's how
3 recent the information is here.

4 One thing I should point out, too, is
5 Entergy's evaluation is independent of mine. In other
6 words, I get to ask them questions, but they don't get
7 to ask me questions on what I did and why I did it
8 like that. So let me assure you they've not seen my
9 actual PRA model or any of the calculations that it
10 has produced. This is their own work.

I would also point out that they basically completed their evaluation before any of the subcommittee meetings we had. So they didn't even have the benefit of my results to drive them there. So it's about as independent an analysis, I think, as could be construed.

17 But let me talk to Dr. Wallis' question a
18 little bit more. What we're dealing with here is that
19 the proposed accident pressure credit introduced a
20 modeling uncertainty into the PRA. In other words, we
21 have success criteria for the PRA and the success
22 criteria says that we don't need containment integrity
23 in order to insure net positive suction head to the
24 pumps, and the success criteria are based on realistic
25 estimates of available NPSH. Okay?

**NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701**

That's a type of modeling uncertainty, and
the accepted way of attacking that type of modeling
uncertainty to get to the bottom of it is to do what's
called sensitivity analysis on this. And specifically
what people do then is to propose an alternative set
of success criteria. In other words, in the
alternative set, we would just assume the pressure
credit is necessary. In other words, the failure of
the containment's integrity actually gets us into
trouble with no positive suction head on the pumps.

17 CHAIRMAN WALLIS: So you're assuming
18 something which someone else has shown to be
19 impossible.

20 MR. STUTZKE: No necessarily.

21 CHAIRMAN WALLIS: I thought Rich was
22 going to show it was impossible. It's going to be so
23 conservative that it could never happen.

24 MR. STUTZKE: I'll say there's always the
25 uncertainty involved here.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

1 CHAIRMAN WALLIS: Well, I thought a
2 bounding analysis or a limiting analysis using
3 something like the first law of thermodynamics gave
4 you pretty much the certainty, but maybe we haven't
5 got that far. I just want to be sure how certain he
6 is about it will never happen.

7 MR. STUTZKE: Well, the way that I look at
8 the sensitivity study is we do two cases, one assuming
9 no credit is needed and one assuming that credit is
10 needed, and so the truth is somewhere in between those
11 two numbers.

12 CHAIRMAN WALLIS: But it's a huge leap to
13 say that something which you know is almost never
14 going to happen actually is needed. So you really
15 should downgrade your numbers you've got at the end
16 because of that.

17 MR. STUTZKE: Yes.

18 CHAIRMAN WALLIS: Is that why they get a
19 number which is much smaller than yours?

20 MR. STUTZKE: Actually the number is
21 higher than mine.

22 CHAIRMAN WALLIS: Theirs is higher than
23 yours.

24 MR. STUTZKE: Right, and I tried --

25 CHAIRMAN WALLIS: Ah.

1 MR. STUTZKE: I have a slide on that,
2 about why that is.

3 CHAIRMAN WALLIS: Okay.

4 MR. STUTZKE: Okay? Okay. Let's jump to
5 the next slide.

6 It took me some time to understand why
7 they got different results. Realize we're in the
8 realm of a sensitivity study. So different analysts
9 would tend to make different assumptions trying to get
10 at this.

11 But the difference between Entergy's
12 approach and my approach seems to boil down to two
13 main differences. Okay? One is they use different
14 success criteria than I did. The scenario is this.

15 CHAIRMAN WALLIS: You mean when you do a
16 PRA you can arbitrarily choose what you want?

17 MR. STUTZKE: Of course.

18 MEMBER POWERS: It is arbitrary.

19 MR. STUTZKE: Well, it does have basis.
20 I can explain why I did what I did, okay, in a little
21 bit. Let me get down the slide here.

22 First of all, they credit alternative
23 injection sources, and I didn't. These alternative
24 injection sources, for example, for medium size LOCAs,
25 they considered condensate, control rod drive system,

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 condensate transfer for transients and small LOCAs.

2 In addition to that, they included
3 feedwater, HPCI, RCIC, these sorts of things. For
4 large LOCAs, there's even a consideration of fire
5 water injections and interconnection with the service
6 water system and RHR loop alpha.

7 I gave no credit at all to alternative
8 injection sources in my risk assessment. The reason,
9 to be honest, is I was trying to save myself some
10 work. As you see, on the second line there, I had
11 credited; I had focused my attention on suppression
12 pool cooling following loss of containment integrity.
13 That was the notion that even if containment integrity
14 is lost early, it takes time to heat up the large mass
15 of water in the pool, and if the operator got
16 suppression pool cooling up and running in time, it
17 didn't matter that he had lost integrity.

18 Okay. How does that save me work? Well,
19 the answer has to do with human reliability. The fact
20 is a dependency among the operator actions to start
21 suppression pool cooling. It's a manual action, and
22 line up alternative injection sources. Okay?

23 And the nature of the dependency involves
24 the cognitive error. If he misses the scenario, he's
25 not likely to do any of these things. He won't

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 understand what's going on here.

2 The assessment of dependency between or
3 among various operator actions is rather involved, and
4 I tried to save the work by just not crediting the
5 alternative injection source whatsoever.

6 Okay. The second thing and perhaps more
7 puzzling here is the difference in the presumed
8 probability of preexisting leakage into the
9 containment. You'll see that Entergy's estimate is
10 almost two orders of magnitude below mine, and so I
11 had to question. In fact, that was the basis of one
12 of the RAIs that I had asked why do you get this large
13 number.

14 There's several things going on here.
15 First of all, Entergy picked a break size or a
16 containment leakage size of 60 L sub A. It's the
17 definition of failure of the containment in their
18 sensitivity analysis, whereas I had picked 35 L sub A.

19 Okay. Realistically, I guess it's
20 infinity times L sub A. Okay? So we have to pick
21 some sort of break size and assign a probability to
22 that number or to that break size like this.

23 CHAIRMAN WALLIS: I see. So yours is
24 smaller, therefore, more likely. Is that it? That's
25 the tendency that you would expect.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 CHAIRMAN WALLIS: Why does this have to
2 be preexisting? I mean, couldn't the actual high
3 pressure during the beginning of the LOCA cause a leak
4 which then causes the depressurization later on?

5 MR. STUTZKE: Well, it could, but the
6 probabilities related to the time between tests, time
7 between when you know the containment is actually
8 intact. So the mission time of the PRA is small we
9 consider as compared to the preexisting --

10 CHAIRMAN WALLIS: But you didn't consider
11 leaks caused by the accident itself.

12 MR. STUTZKE: But not phenomenological
13 leaks.

14 MEMBER DENNING: But I think our belief
15 would be that would be a very small probability.

16 CHAIRMAN WALLIS: Well, how small is
17 small?

18 MEMBER DENNING: Certainly smaller than
19 ten to the minus two probability.

20 MR. STUTZKE: I mean, what you're asking
21 is if you pump the containment up to a few PSI, will
22 you explode it.

23 CHAIRMAN WALLIS: Oh, no, no. Will some
24 small place get proper leak, not a real big failure,
25 but just a little hole?

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MEMBER DENNING: Still our evidence is
2 that containments can take like two to three times the
3 design pressure without introducing those kinds of --

4 CHAIRMAN WALLIS: With nothing connected
5 to the containment?

6 MEMBER POWERS: Has a containment failure
7 probability analysis done on this containment?

8 MEMBER DENNING: On this containment?
9 Probably not on this one, but very similar.

10 You meant for --

11 MEMBER POWERS: Yeah, the usual number of
12 two to three is quoting from some test rests.

13 MEMBER DENNING: Well, I think they really
14 preceded the test results, the two to three. The test
15 results have been confirmatory or indicated those are
16 pretty conservative, I think.

17 MEMBER POWERS: When we calculate
18 containment vulnerabilities, whatnot, we find that
19 they're very, very design specific. When we
20 experiment with them, we always find they fail at
21 flaws. They're not usually in the models.

22 MEMBER DENNING: But still well above the
23 design basis. I don't know any evidence of tests that
24 we've done that would indicate that containment would
25 fail, have a significant leakage as a result of this

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 kind of a pressure pulse.

2 MEMBER POWERS: No, it would be something
3 unexpected. It would usually, for these kinds of
4 containments, it will be a seal failure having nothing
5 to do with pressurization or whatnot. The principle
6 issue with all of these things is none of the analysis
7 take into account construction flaws.

8 PARTICIPANT: But that's why you do the
9 tests.

10 MEMBER DENNING: Continue.

11 MR. STUTZKE: Well, I should point out
12 that the basis of Entergy's containment failure
13 probability is a rather new EPRI report. It's based
14 on expert elicitation. The staff is in the process of
15 reviewing this report. It's being submitted in the
16 context of granting permanent 15-year ILRT extensions.

17 Okay. But the staff has, in fact, made a
18 number of comments on this report. So we haven't
19 accepted it or rejected it.

20 MEMBER POWERS: What particular thing was
21 elicited from the experts?

22 MR. STUTZKE: They asked the experts to
23 predict or estimate the probability of various
24 containment failure modes generating various leak
25 sizes, discrete leak sizes.

1 MEMBER POWERS: I'm always puzzled how you
2 find an expert on those particular subjects since we
3 haven't had any.

4 MR. STUTZKE: That's a large part of the
5 staff's discomfort with this report.

6 MEMBER POWERS: I understand.

7 MEMBER DENNING: Now, wait a second now.
8 But this relates to not an induced failure but a --

9 MR. STUTZKE: A preexisting.

10 MEMBER DENNING: -- a preexisting failure,
11 and we've had plenty of those historically with ILRTs,
12 not in recent history as much as earlier history.

13 MR. STUTZKE: That's correct.

14 At the same time, the failure probability
15 that I had used in my study came out of NEI interim
16 guidance on temporary changes to ILRTs. Okay? But
17 it's actually what I'll call a data driven approach,
18 zero failures in 182 tests. Okay? And they do their
19 Bayesian update of this.

20 The difficulty with this type of data is
21 it speaks nothing to the break size. All you know is
22 that you passed the ILRT, yes or no. Okay?

23 So in some respects the newer EPRI data is
24 a little better. It gives you a downward curve that
25 says the bigger the hole, the lower the probability,

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 and the question is how much do you want to believe
2 that.

Okay. The other thing that you have to realize is when you put these lines together, you have competing effects going on here. Okay? In other words, the credit for alternative injection sources, the probability of failure seems to be higher for those than for the expression pool cooling system. At the same time the containment failure probability is lower, and it took me a while to sort through all of this to understand.

12 But I think I understand it in terms of
13 the minimal cut sets and the numbers that drive the
14 answers now.

Let's jump to the next slide here.

16 CHAIRMAN WALLIS: Well, these credits,
17 presumably the whole picture is really some sort of
18 synthesis of what they did and what you did, and then
19 you can make various choices about do you credit this
20 or credit that, and I would think what you have to do
21 then is say, well, what's the probability of
22 suppression core cooling, not just arbitrarily
23 credited, but what's the probability of it happening?

24 MR. STUTZKE: No, but that's what the PRA
25 does. It's just that I worry about --

**NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701**

1 CHAIRMAN WALLIS: But if they don't
2 consider it at all, they can't have any probability
3 assigned to it except presumably --

4 MR. STUTZKE: Well, basing the failure
5 probability is one. That's their default assumption.

6 CHAIRMAN WALLIS: But the realistic thing
7 is to put yes everywhere and then evaluate a
8 probability.

9 MR. STUTZKE: That's correct.

10 CHAIRMAN WALLIS: I see.

11 MEMBER DENNING: You never showed the
12 bottom line.

13 CHAIRMAN WALLIS: Never talked about
14 them.

15 MR. STUTZKE: Well, I want to talk about
16 it, I guess, in terms of the plot on the next page.
17 The fact is that they generate a change in CDF due to
18 the over pressure credit assumption alone that's about
19 an order of magnitude higher than mine. When I add
20 that change in core damage frequency to the change in
21 core damage frequency due to other impacts of the
22 proposed EPU, I get a total change of about 90 minus
23 seven per year. Okay?

24 And plotting that against their baseline
25 CDF of 80 minus six per year, you end up with a black

1 dot, which you can see it's right on the border line
2 between Region 3 and Region 2, okay, but that's still
3 equivalent or translated in Reg. Guide 1.174 as a very
4 small change in risk.

5 CHAIRMAN WALLIS: And again, this is a
6 hypothetical change. The real change in risk is
7 probably much smaller than that.

8 MR. STUTZKE: It's much smaller than that.
9 Okay. So you're right. It is a hypothetical change,
10 depending on which set of success criteria you want to
11 believe like this.

12 Okay. Talking a little bit about the five
13 key principles of risk informed decision making --

14 VICE CHAIRMAN SHACK: The difference in
15 the success criteria, you kept the success criteria,
16 but actually tried to work out the actual probability
17 that you'd use the containment overpressure. As I
18 understand what they did, they just gave it up.

19 MR. STUTZKE: No, they have a probability
20 of -- another way to look at it is the scenario you're
21 talking about is you have a LOCA and the containment
22 is not intact. Okay? So that's kind of the challenge
23 to the system, and the question is what happens
24 following that.

25 In their study they say, well, we'll just

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 presume the low head pumps are all failed and we'll go
2 credit alternative sources with various probabilities.

3 CHAIRMAN WALLIS: When in reality they
4 would not fail if we believe this conservative
5 analyses. They would not fail.

6 MR. STUTZKE: That's right.

7 CHAIRMAN WALLIS: So they're assuming
8 something which analysis shows you to be very
9 unrealistic or, let's say, unrealistic.

10 MR. STUTZKE: That's right.

11 CHAIRMAN WALLIS: It's a strange way to
12 do things. I suppose if you want to be really sure,
13 you might as well do it. The whole idea of PRA was to
14 be as realistic as possible.

15 MR. STUTZKE: Well, I would shy away from
16 the bounding analysis. The reality is when you have
17 a modeling uncertainty like this, which set of success
18 criteria do you want to do, we turn to sensitivity
19 studies, and in my opinion sensitivity study is always
20 kind of a crap shoot. What you hope is that it's not
21 sensitive.

22 CHAIRMAN WALLIS: My solution is not to
23 do that at all, but to put the modeling uncertainty in
24 the PRA and do it right, not to have this crap shoot.

25 MEMBER DENNING: But, Graham, the other

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 point is from the licensee's viewpoint he's going to -
2 - what he's trying to show is it doesn't matter.

3 CHAIRMAN WALLIS: I understand.

4 MR. STUTZKE: It really doesn't matter.

5 CHAIRMAN WALLIS: But you create a
6 precedent. You've done it this way and it has been
7 accepted. Someone else will do it the same way, and
8 it might not look so good, and what do you do then?

9 MEMBER DENNING: And, in fact, this is the
10 way we really do look at the sensitivity to these
11 modeling uncertainties rather than attempting to get
12 into deep phenomenological details.

13 MR. STUTZKE: That's correct. It's
14 unfortunate that Professor Apostolakis is not here.
15 He has written several papers on this.

16 CHAIRMAN WALLIS: How about the length of
17 time involved? I mean, this credit is taken for days,
18 is it? Doesn't that make a difference? I mean,
19 you're just saying that your analysis covers that all,
20 all together. Nothing untoward happened. There would
21 be no more probability of leak in the containment if
22 it has lasted for a week than if it lasted for half a
23 day or something?

24 There's no influence of time on the
25 integrity of containment or any of the other

1 assumptions?

2 MR. STUTZKE: No, no, because the
3 probabilities are being driven by preexisting leaks,
4 not the mission time following the LOCA, following the
5 initiating --

6 CHAIRMAN WALLIS: So our concern in our
7 previous letters with time is irrelevant?

8 MEMBER DENNING: Only if it's a real
9 phenomenon. I mean, if it's a real phenomenon, then
10 it's not irrelevant.

11 CHAIRMAN WALLIS: Would you show me an
12 unreal phenomenon?

13 MEMBER DENNING: I think that's exactly
14 what we're doing, Graham.

15 CHAIRMAN WALLIS: So we should forget
16 about our concern with time? I mean, we're at a point
17 in three or four letters, I think, about only for
18 short times.

19 MEMBER DENNING: Well, again, if it's real
20 and you really need to operate pumps in cavitation,
21 then time makes a lot of difference.

22 MR. LOBEL: Can I? This is Richard Lobel
23 of the staff.

24 Let me clarify a little that what we're
25 talking about here is Vermont Yankee, and the

1 situation requiring overpressure for a certain amount
2 of time or it being more of a real effect may be the
3 case for other reactors going through the same type of
4 accident.

5 I think the numbers that we're showing,
6 the numbers that I'll show are really Vermont Yankee
7 specific, and I was going to make that point a couple
8 of times. So just I don't want to mislead the
9 committee.

10 And another point I'll make is that we're
11 really talking about Vermont Yankee here, and we're
12 not talking about the Reg. Guid 1.82, and the
13 conclusions we're drawing here are just for Vermont
14 Yankee. So your more general concerns remain for us
15 to answer, but in terms of Vermont Yankee, the numbers
16 we're showing show the kind of conclusions we've been
17 talking about

18 MEMBER BONACA: I have a question here.
19 During your presentation two meetings ago, you pointed
20 out a limiting case for which there is a need for the
21 NPSH credit is the case where you have RHR. You
22 assume failure of the RHR, right? I'm sorry?

23 MR. LOBEL: The single failure is the
24 failure of an RHR heat exchanger.

25 MEMBER BONACA: And that's really the

1 phase for which you're entering the credit. For the
2 other cases where you assume the single failure is
3 failure of the containment, okay, you do not need the
4 credit.

5 MR. LOBEL: Yeah, and I'll show that in my
6 presentation.

7 MEMBER BONACA: Okay. The question I have
8 is that in your PRA analysis, what do you assume? You
9 assume that the RHR also is not working?

10 MR. STUTZKE: No, it includes failure of
11 both trains, all the trains of RHR progressing to core
12 damage.

13 MEMBER BONACA: Okay. That's the entergy
14 assumption, if I can see that table before.

15 CHAIRMAN WALLIS: They made a bigger
16 assumption, right? They've assumed the failure of
17 containment leads to loss of NPSH, whereas in fact
18 even with loss of an RHR, if you're realistic, you
19 still don't need the NPSH credit.

20 MEMBER BONACA: I'm sorry. Could you
21 repeat what you said?

22 CHAIRMAN WALLIS: I think I'm right in
23 saying that they claim that if you lose RHR train and
24 you realistically calculate the suppression pool
25 temperature and you fail the containment, you still

1 don't have a problem with NPSH.

2 MR. STUTZKE: That's correct.

3 CHAIRMAN WALLIS: So it's three things.

4 That's why it's piling things on, isn't it?.

5 MEMBER DENNING: Marty, I'd like you to
6 finish in ten minutes. I realize that's not totally
7 under your control.

8 MR. STUTZKE: Yeah. I'll do my best, but
9 I'm determined I'm going to present these slides
10 because I stewed over them for a couple of months now.

11 Let me jump right to Slide No. 8 because
12 I think it's one of the hearts of the matter here.
13 When we look at the five key principles of risk
14 informed decision making, I think there's two
15 important things you need to bear in mind here. One
16 is all of the principles have to be considered in
17 reaching a decision. Okay?

18 Let's continue to Slide 8 here.

19 In other words, no individual analysis is
20 sufficient. So in other words, we reach decisions
21 that are not risk based, but they're risk informed
22 like that.

23 But the reality is that there's an
24 interconnectiveness among the various principles like
25 this. I make the analogy to checks and balances in

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 federal government between judicial and executive and
2 things like this, and you guys have written several
3 papers that reflect that balance and the struggle of
4 trying to decide what the appropriate balance is here.

5 I have cited two of my favorites here
6 because I love the language that was used like this,
7 but the points here are trading off defense in depth
8 when PRA tells you that maybe you don't need it. On
9 the other hand, if the PRA is uncertain enough, you
10 use defense in depth to try to compensate for that
11 uncertainty.

12 So we have this balance, and that's all
13 I'm trying to point out here, is that the issue is not
14 what the PRA says, you know, as far as what's delta
15 CDF, but these other factors need to be considered in
16 here.

17 That being said, let me tell you how we've
18 looked at defense in depth here. Slide No. 9 says
19 we're consistent with defense in depth philosophy
20 because we've met four objectives stated in the
21 standard review plan Chapter 19, and you can read them
22 for yourselves on there.

23 What I would point out here is, first of
24 all, that the bottom line there you say overall
25 redundancy and diversity among the varies is

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 sufficient to insure compatibility with the risk
2 guidelines.

3 So in other words, it implies if delta CDF
4 is small enough, I must have adequate defense in
5 depth. It's an example of the interconnectiveness
6 among the various principles in my mind.

7 More importantly for this, if you look at
8 the top three, it allows some increase in challenges
9 to barriers or barrier failure probabilities or
10 dependencies among barriers. That may be acceptable.

11 The operative word here in my mind is
12 "significant." Okay? But the reg. guide and standard
13 review plan are silent on what we mean by
14 "significant," and the fact is we have to use our
15 judgment on a case-by-case basis to decided when it's
16 okay.

17 So there is a struggle in trying to decide
18 what the appropriate balance is among these elements.

19 MEMBER DENNING: At the risk of destroying
20 my plan, I do question the number two bullet there in
21 terms of "does not significantly change the total
22 probability of individual barrier if this is a real
23 problem, and if, indeed, containment isolation failure
24 is the proximate cause of cavitation and core melting,
25 then we have a unit probability of containment failure

1 as well.

2 I think that's the essence of the dilemma
3 that we're in here. Now, --

4 MR. STUTZKE: Right. In my mind, I think
5 it's the third bullet. It's the issue here of
6 dependency, and when we think about the dependencies,
7 one of the things that needs to be examined is the so-
8 called balance between accident prevention and
9 mitigation here because truly if you needed the
10 overpressure credit realistically and the containment
11 has failed and the scenario progresses to core damage,
12 you have some type of a release, be it large or small
13 or early or late, but you know the containment has
14 failed.

15 And that's the dilemma here like this.

16 CHAIRMAN WALLIS: This is a LOCA, and
17 you're main steamization valves are closed?

18 MR. STUTZKE: Yes. Well, that's one way
19 to fail the containment.

20 CHAIRMAN WALLIS: But it could fail to
21 close because of a piece of steam dryer that got in
22 them? Did you consider that scenario?

23 MEMBER SIEBER: What's the probability of
24 it?

25 CHAIRMAN WALLIS: I mean you could

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 construct. It's not an incredible event.

2 MR. LOBEL: There's two MSIVs on the BWRs.

3 So you would have to destroy both the inside
4 containment and the outside containment.

5 CHAIRMAN WALLIS: Yes. But you didn't
6 consider this?

7 I think Entergy did consider MSIV closure,
8 but I don't think they considered debris in it.

9 MR. STUTZKE: Right. I mean, I had
10 modeled failure of MSIV closures as well, but not
11 necessarily due to the debris.

12 CHAIRMAN WALLIS: And there's no chance
13 the operator is going to open it?

14 MR. STUTZKE: Possibly. I mean, I've
15 looked at the physical construction of the MSIVs in
16 the context of another issue the staff is pursuing,
17 and it doesn't seem credible. The seat is up.

18 MEMBER DENNING: Continue.

19 MEMBER SIEBER: You would have to plug
20 both valves with debris.

21 MR. STUTZKE: That's correct.

22 MEMBER SIEBER: You would have to have two
23 chunks flowing eight feet apart at the same velocity
24 to accomplish that. That to me seems incredible.

25 MEMBER DENNING: Go ahead, Marty.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MR. STUTZKE: Okay. Let's jump to Slide
2 10 now.

3 So I will try to go down these objectives
4 briefly. There's no impact on any initiating event
5 frequency or probability of preexisting containment
6 leakage that would be created if the proposed credit
7 is accepted like this because you haven't changed the
8 normal operation of the power plant.

25 CHAIRMAN WALLIS: This failure of

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701 (202) 234-4433 www.nealrgross.com

1 suppression pool cooling is apparently more than just
2 one RHR train realistically.

3 MR. STUTZKE: That's right.

4 CHAIRMAN WALLIS: So it's failure of more
5 than one RHR train.

6 MR. STUTZKE: That's right. When I say
7 "pooling," I'm talking about the entire system. So
8 there's multiple pumps.

9 CHAIRMAN WALLIS: To fail the suppression
10 pool cooling, you have to fail two independent
11 systems.

12 MR. STUTZKE: That's correct.

13 CHAIRMAN WALLIS: So you've really got
14 five things here maybe.

15 MR. STUTZKE: But it's one of the uses of
16 PRA. You see this by looking at minimal cut sets, and
17 you look at the number of events in the cut set, and
18 it takes a lot to get there.

19 The other thing that we've said before is
20 the change, even if we assume the credit is necessary,
21 the change in core damage frequency is small. The
22 results appear to be robust. I've certainly looked at
23 the uncertainties.

24 By the way, the numbers we're reporting
25 here are mean values of parametric uncertainty

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 distributions. They're not point estimates like this.

2 I presented to the subcommittee earlier
3 it's possible to calculate the change in conditional
4 containment failure probability, and again, it seems
5 to be very small based on this.

6 MEMBER DENNING: Now, I'm going to
7 interrupt you, Marty.

8 I think that we may have time to get to
9 your conclusions, but indeed, it's pretty obvious. A
10 good presentation.

11 MR. STUTZKE: Right.

12 MEMBER DENNING: Thank you.

13 I think we definitely want to go on and
14 hear the next presentations. Shall we go ahead and do
15 that now?

16 MR. LOBEL: How much time will I have?

17 MEMBER DENNING: We have until quarter of.

18 MR. LOBEL: Quarter of? Okay. I think I
19 can get through.

20 Good afternoon. My name is Richard Lobel.
21 I'm a senior reactor systems engineer in the
22 Containment and Ventilation Branch in NRR.

23 Let me skip the purpose. I think we all
24 know why we're here.

25 I want to go over the conclusion first,

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 and then I'll try to present the information that
2 supports them. I'll show you that the crediting of
3 containment accident pressure and calculating
4 available net positive suction head for the Vermont
5 Yankee extended power uprate arises from the
6 conservative nature of the calculations that were done
7 by the licensee, and that a more realistic but still
8 conservative calculation would show the credit for
9 containment --

10 CHAIRMAN WALLIS: Would you take out the
11 "would" please and say "shows." I mean, do you have
12 such a real calculation? Does it show or is it "would
13 show" if it were performed? Is this a conditional
14 sentence or what?

15 MR. LOBEL: I don't have --

16 CHAIRMAN WALLIS: I'm really bothered by
17 that "would" in there.

18 MR. LOBEL: I have a --

19 CHAIRMAN WALLIS: -- statement.

20 MR. LOBEL: I have a calculation that's
21 close to best estimate.

22 CHAIRMAN WALLIS: So you don't really
23 know if it's true, do you?

24 I'm really worried about it. I think this
25 is a very key argument. If it is true, I think that

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 would influence me very much, but when you say "would
2 show," I don't know if this calculation exists or not.

3 MR. LOBEL: That calculation that I have
4 is -- well, it's more realistic, but still has some
5 conservatism in it, and it shows even with the
6 conservatism that containment pressure is not
7 necessary.

8 CHAIRMAN WALLIS: But it still has some
9 conservatism.

10 MR. LOBEL: It still has some
11 conservatism.

12 CHAIRMAN WALLIS: Some. So it's no
13 longer a bounding calculation.

14 MR. LOBEL: It's not a bounding
15 calculation, right.

16 CHAIRMAN WALLIS: So we don't know --

17 MR. LOBEL: And I have a curve --

18 CHAIRMAN WALLIS: We don't know what the
19 probability is of it being wrong, right?

20 MR. LOBEL: And I have a curve comparison
21 with the bounding calculation.

22 CHAIRMAN WALLIS: So this is a vague
23 statement. I thought it was a hard, really impressive
24 statement, but I guess it's a little vaguer than that
25 because we don't really know how uncertain giving up

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 some conservative assumptions makes the --

2 MEMBER DENNING: When we see your results,
3 we'll come back to this. I think you can move on and
4 we'll come back.

5 MR. LOBEL: Okay.

6 CHAIRMAN WALLIS: But I'm just trying to
7 get my rationale for doing A or B, you know, and if I
8 really believe this statement, it makes a big
9 difference to me.

10 MEMBER DENNING: I understand.

11 MR. LOBEL: Okay. Furthermore, a
12 hypothetical single failure which results in loss of
13 containment's capability to maintain accident pressure
14 will not result in loss of NPSH margin, and I'll talk
15 more about this later.

16 Credit for containment accident pressure
17 has no impact on the operators since NPSH guidance in
18 the Vermont Yankee emergency operating procedures
19 already takes into account containment accident
20 pressure, and so, therefore, based on conservative
21 calculations done with acceptable analytic methods,
22 the data and expert judgment of the ECCS pump vendor,
23 consistency with the emergency operating procedures,
24 and an acceptable level of risk, the staff finds that
25 the licensee's proposal to credit containment accident

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 pressure is acceptable.

2 Okay. The only point I wanted to make on
3 this slide about Reg. Guide 1.82 I've already made.
4 Keep in mind that what we're talking about here is
5 just Vermont Yankee, and the conclusions apply just to
6 Vermont Yankee, and we're not talking about the more
7 general case where some of these statements may not
8 hold.

9 And we're scheduled to come back to you
10 again and talk about our revisions to the reg. guide
11 early next year.

12 I've made this statement before on the
13 next slide about regulations, that there is no
14 regulation prohibiting credit for containment accident
15 pressure for available NPS --

16 CHAIRMAN WALLIS: There's a whole reg.
17 guide which does say that, isn't there, which has
18 never been withdrawn?

19 MR. LOBEL: Well --

20 CHAIRMAN WALLIS: Yes. I know it's a
21 reg. guide, but there is an old reg. guide.

22 MR. LOBEL: Yeah, there is an old reg.
23 guide, safety guide, and as part of what we're trying
24 to do with reg. guide 1.82, we're withdrawing -- well,
25 not withdrawing -- we're going to put a note in Reg.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 Guide 1.1, the old reg. guide, that will say that it
2 shouldn't be used in the future. We're not
3 withdrawing it because there are some licensees out
4 there who still reference that reg. guide as part of
5 their licensing basis.

6 Okay. Another point that I've made before
7 that I'd like to restate is that boiling water reactor
8 design basis accidents already credit containment
9 integrity and containment accident pressure for other
10 considerations. Radiological dose, analyses assume
11 that the containment leaks at a rate L sub A that's
12 defined in the regulations in Appendix J and in the
13 tech. specs.

14 And Appendix K to Part 50 talks about
15 minimizing containment pressure, not eliminating it,
16 not assuming it isn't there, just minimizing it for
17 the effectiveness of core spray cooling.

18 Okay. Now we're getting into more of the
19 discussion that we've been talking about. This next
20 slide is one example of the conservative nature of the
21 calculation.

22 The licensee calculated the effect of
23 considering the worst single failure. This was
24 determined to be failure of an RHR heat exchanger
25 outlet valve to open, which eliminates that heat

1 exchanger.

2 So there are two trains of RHR. So that
3 leaves one RHR heat exchanger for cooling the
4 suppression pool. The resulting pressure pool
5 temperature with all other variables at their limiting
6 design basis values is 195 degrees Fahrenheit.

7 If instead we choose as the single failure
8 the loss of the containment with all other variables
9 at their limiting design basis values, then there are
10 two RHR heat exchangers to cool the suppression pool.
11 So the peak suppression pool temperature is 169
12 degrees Fahrenheit.

13 The licensee has determined that with a
14 suppression pool temperature below 185 degrees
15 Fahrenheit, credit for containment accident pressure
16 is not needed. So with the worst single failure, the
17 temperature of the suppression pool is 195 degrees,
18 which is greater than 185 degrees. So containment
19 pressure is needed for available NPSH with failure of
20 the containment.

21 So assuming the containment is at
22 atmospheric pressure with two trains of RHR now
23 because I've already taken my single failure, the
24 temperature I get is 169 degrees and credit for
25 containment accident pressure isn't needed for NPSH.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 Okay. Next slide.

2 I'm told this may be a unique way of
3 looking at defense in depth, but because of the need
4 to credit containment accident pressure for Vermont
5 Yankee is due to the conservatism in the calculations,
6 eliminating some of this conservatism would eliminate
7 the need to credit pressure for NPSH margin.

8 And I just showed you the sample that
9 changing the single failure from the worst single
10 failure to the loss of containment pressure with all
11 other conservative assumptions and input the same,
12 adequate NPSH margin exists without crediting
13 containment accident pressure.

14 So since the dependence between barriers
15 is a function of the way the calculation is done and
16 not a physical dependence, we consider that the
17 defense in depth principle is maintained.

18 MEMBER POWERS: I want to ask you
19 something on this. If you go through this analysis
20 and, as I understand it, say you failed the
21 containment, that reduces your sump pressure. You
22 don't need the net positive suction head.

23 Do you get into a Part 100 problem?

24 MR. LOBEL: Well, you have to keep in mind
25 -- sure, if you didn't have the containment, but you

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 have to keep in mind, again, this is a design basis
2 type analysis which is a stylized --

3 MEMBER POWERS: So was the Part 100
4 analysis.

5 MR. LOBEL: Right, right, but for each one
6 you make a different set of assumptions that is
7 limiting and sets the design of some parameters in the
8 reactor or in the plant. So it's not surprising that
9 there's an inconsistency from one analysis to another.
10 Even maintaining containment pressure, for example,
11 when you do the calculation for the peak containment
12 pressure, you use a totally different set of
13 assumptions, and the peak containment pressure -- I
14 forgot the exact value for Vermont Yankee -- is around
15 43 psi. For the minimum pressure it's around 10 psi.

16 So I'm calculating the same parameter, but
17 I'm interested in a different result. I'm interested
18 in biasing my analysis to a different result, and so
19 I get a far different analysis result.

20 That's not unusual in the way we do
21 things.

22 MEMBER SIEBER: With the failure to cool
23 containment and a failure of containment integrity,
24 that's two failures which takes you beyond the design
25 basis. Part 100 applies to --

1 MR. LOBEL: Was that the question? I
2 missed the question.

3 MEMBER SIEBER: -- applies to the design
4 basis.

5 MR. LOBEL: Yeah, right, and that's why
6 I'm saying it's one failure or the other.

7 MEMBER SIEBER: Right.

8 MEMBER DENNING: I think you actually
9 interpreted the question correctly.

10 MR. LOBEL: Okay. The next slide, the
11 licensee provided the staff with some additional
12 sensitivity studies to present to the committee. This
13 first is related to the sensitivity I just discussed.
14 It's a plot of the peak suppression pool temperature
15 as a function of the service water temperature. The
16 service water cools the RHR heat exchanger, which in
17 turn cools the suppression pool.

18 The dotted horizontal line is the
19 suppression pool temperature above which credit is
20 needed for containment accident pressure for available
21 NPSH, and this number, like I said, is 185 degrees.

22 Two other curves are plotted. The upper
23 curve is the design basis peak suppression pool
24 temperature as a function of the service water
25 temperature. The assumed single failure is the

1 failure of one RHR heat exchanger.

2 Notice that above a service water
3 temperature of approximately 65 degrees, credit for
4 containment accident pressure is necessary with this
5 single failure.

6 The second curve is the same calculation,
7 except that the assumed single failure is now loss of
8 containment and, therefore, loss of containment
9 accident pressure.

10 And notice that even if the maximum
11 assumed service water temperature of 85 degrees, no
12 credit for containment accident pressure is required
13 since both RHR heat exchangers are available. So this
14 is just another way of looking at what I presented on
15 the previous slide.

16 MEMBER KRESS: How good do we know that
17 185 value?

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

19 MEMBER KRESS: How good do we know the
20 value of 185 as being the limit?

21 MR. LOBEL: I think I'll have to ask the
22 licensee that question. It was their calculation. I
23 can tell you though that the pre-extended power uprate
24 temperature was 182.6 degrees and no containment
25 pressure was needed. So it's close to another number

1 that we know.

2 MEMBER KRESS: Yeah, that doesn't really
3 answer my question.

4 MEMBER RANSOM: Just a point of
5 clarification. The pink curve assumes both failures
6 or only a single failure?

7 MEMBER KRESS: Single.

8 MR. LOBEL: They're different single
9 failures.

10 MEMBER DENNING: We don't want to spend
11 too much time on that containment single failure
12 because it's kind of irrelevant, I think.

13 Did Entergy want to make any comments on
14 the accuracy with which we know the 185, that that's
15 the limit at which the NPSH requirement becomes an
16 issue?

17 MR. NICHOLS: Craig Nichols from Entergy,
18 Vermont Yankee.

19 I'd like to ask our lead on this, Mr.
20 Bruce Slifer, to come up and address that question.

21 MR. SLIFER: Bruce Slifer from Vermont
22 Yankee.

23 The temperature for the Archer pumps is
24 based on the calculation of the available NPSH. So as
25 temperature goes up, the available NPSH is reduced

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 because of the increase in vapor pressure primarily.
2 So what we did is an evaluation looking at the
3 characteristics required of NPSH for both the core
4 spray and the RHR pump.

5 The 185 degree limit is based upon
6 actually the core spray pump being the most limiting
7 pump for our case, and the calculated point at which
8 you would lose available NPSH, assuming no credit for
9 overpressure, would be 185 degrees.

10 MEMBER DENNING: But I think there are two
11 conservatisms in there at least, one being the level
12 of water in the suppression pool and the other being
13 the temperature of water in the suppression pool. Is
14 that true?

15 MR. SLIFER: Correct.

16 MEMBER DENNING: Inherent in 185?

17 MR. SLIFER: Well, there's several
18 factors. It's the losses in the piping system,
19 including the suction strainers and the debris on the
20 strainers. This calculation was based on the maximum
21 values for those, i.e., the highest calculated loss
22 factors for all those conditions.

23 The suppression pool level was taken from
24 the actual calculation of the containment response.
25 So we assumed a certain value for that, and again, it

1 was based upon the vendor's recommended values for the
2 required NPSH.

3 MEMBER KRESS: That comes closer to
4 answering my question because you calculate it based
5 on pressure drops downstream that you get with a
6 certain flow rate.

7 Now, I guess my question involves this.
8 At 185 are you getting cavitation?

9 MR. SLIFER: Well, the limits are based
10 upon the vendor recommended values, and at these
11 operating conditions --

12 MEMBER KRESS: You will have some sort of
13 flow reduction, but it will be enough --

14 MR. SLIFER: You will probably like their
15 recommendations are based upon approximately a three
16 percent head drop. So there is some head drop due to
17 cavitation, but it's minimal.

18 MEMBER KRESS: But it's acceptable is what
19 you're --

20 MR. SLIFER: It's acceptable. You can
21 operate in these kinds of conditions for seven hours.
22 After that they made a recommendation that the
23 available NPSH should be higher.

24 MEMBER KRESS: And you've measured the
25 pressure drop you get on those lines or is it

1 calculated?

2 MR. SLIFER: This is calculated, supported
3 by the periodic testing that we do, also compared to
4 suction pressure at the pump inlet. Compared those
5 against our calculations, we show that they're
6 reasonable; the values are reasonable.

7 MEMBER KRESS: Do you actually test those
8 sprays occasionally? This is the spray you're talking
9 about.

10 MR. SLIFER: The core spray pumps and the
11 arterial (phonetic) pumps are subjected to periodic
12 testing on a quarterly basis.

13 MEMBER KRESS: And you measure flow and
14 pressures during that?

15 MR. SLIFER: Yes, we do. We compare the
16 flow requirements against a certain head requirement
17 to assure that we're still operating within acceptable
18 ranges.

19 MEMBER KRESS: Okay. Thank you.

20 MEMBER DENNING: Okay. Proceed. Thanks.

21 MR. LOBEL: Okay. The next slide is an
22 illustration of the conservatism that goes into an
23 input, and this histogram of the Vermont Yankee
24 service water temperatures for the last approximately
25 four years will illustrate that a little.

1 The histogram shows the percent of time
2 that the service water temperature is at a specified
3 value and also on the figure is a line representing a
4 percentage of the time the service water is less than
5 the given value, and notice that from the last slide
6 the design basis calculation predicted that credit for
7 containment accident pressure was needed when the
8 service water temperature is greater than 65 degrees,
9 and this is based on all the design conservative
10 assumptions.

11 From this figure you can see that 69
12 percent of the time the service water temperature is
13 less than 65 degrees. The design basis calculation
14 uses a service water temperature of 85 degrees
15 Fahrenheit. The service water temperature has never
16 been at this value in the last four years. Ninety-
17 eight percent of the time it has been below 80
18 degrees. Eighty-nine percent of the time it has been
19 more than ten degrees below the value assumed in the
20 design basis analysis.

21 Okay. Next. Next slide.

22 Okay. This next sensitivity study gets
23 more to the realistic calculation. This sensitivity
24 study shows the peak suppression pool temperature
25 plotted against the service water temperature, again.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 The single failure assumed is the design basis single
2 failure of one RHR heat exchanger. The figure shows
3 both the design basis calculation results, the solid
4 line, and the results of a best estimate calculation,
5 the dotted line.

6 And even though this is labeled the best
7 estimate calculation, there's still some conservatism
8 that's left that's still included.

9 The horizontal dotted line is the
10 temperature above which credit for containment
11 accident pressure is needed again, the 185 degrees.

12 At a service water temperature of 85
13 degrees, the assumed maximum value, the peak
14 suppression pool temperature is 195 degrees, which is
15 greater than 185 degrees, and so credit for
16 containment accident pressure is needed.

17 For the best estimate calculation with a
18 failure of one RHR heat exchanger, the peak
19 suppression pool temperature doesn't reach 185 degrees
20 until the service water is at its maximum assumed
21 value.

22 So for the best estimate calculation, but
23 assuming a single failure of one RHR heat exchanger,
24 essentially no containment accident pressure is
25 required.

1 VICE CHAIRMAN SHACK: Now, is this truly
2 a best estimate or this is a best estimate 95 percent
3 confidence?

4 MR. LOBEL: No, it's a best -- well, I
5 don't know the confidence, but it's a best estimate,
6 but still has some conservatisms. There's still a
7 bounding feedwater energy addition that was left in.
8 There's a cycle independent decay heat that was still
9 left in. It assumes that five percent of the RHR heat
10 exchanger tubes are plugged, and the bounding RHR
11 fouling factor, and that the operators don't secure
12 the ECCS pumps. So the pumps are operating, and they
13 are adding their heat to the suppression pool also,
14 which is significant.

15 So there's still some conservatism even in
16 the best estimate calculation. So although it's
17 labeled best estimate, it's still a little
18 conservative, which I think goes to prove the point
19 even more that a real best estimate calculation would
20 be an even lower line and wouldn't need containment
21 pressure at all. It's --

22 CHAIRMAN WALLIS: Now, if you actually
23 used the probability distribution in your previous
24 slide and you used it for some of the other inputs
25 into this calculation, you could come up with a

1 probabilistic output.

2 MR. LOBEL: Right.

3 CHAIRMAN WALLIS: And that would be a
4 much more convincing argument. These sort of bits and
5 pieces would show, well, if you take away this, it
6 looks better. We haven't really got something that
7 would show us how good it gets in reality.

8 MR. LOBEL: Well, yeah, that's right, and
9 as you may recall when we were talking about Reg.
10 Guide 1.82, that was one of the things that we added
11 and we're hopeful that we're not going to be able to
12 do something by February or March, but we're hopeful
13 that some licensee will decide to try that approach or
14 that --

15 CHAIRMAN WALLIS: Why don't we --

16 MR. LOBEL: -- try that ourselves.

17 CHAIRMAN WALLIS: Why don't we ask
18 Vermont Yankee to do it? Do the full job?

19 MR. LOBEL: Well, actually I talked to
20 Vermont Yankee not in terms of them doing it, but in
21 terms of the idea of doing it about a year ago, and I
22 can't speak for Vermont Yankee, but I think if we'd
23 have all realized that the review was going to go on
24 for this much more time that might have been a more
25 feasible thing to try, and we hopefully could have

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 gotten away from this whole controversy.

2 MEMBER DENNING: Let me ask a question,
3 including the committee, and that is if you look at
4 those things that are potentially variable, such as
5 the suppression pool temperature, you know, normally
6 we take a limiting value even for things like the
7 initial suppression pool temperature.

8 MR. LOBEL: And they use a limiting --

9 MEMBER DENNING: And they use that there,
10 and if you looked at variability over a year, that's
11 a marked difference. I mean that in itself would
12 bring down those temperatures with some high degree of
13 probability by maybe ten or 15 degrees.

14 MR. LOBEL: My understanding is the level
15 is controlled pretty carefully.

16 MEMBER DENNING: No, I meant -- did I say
17 level? I meant the temperature.

18 MR. LOBEL: The temperature. I had --

19 MEMBER DENNING: The temperature prior to
20 the event.

21 MR. LOBEL: Vermont Yankee gave me a curve
22 of the temperature over time just like the service
23 water one that we can provide to the committee.

24 CHAIRMAN WALLIS: And you get some
25 benefit just like this one.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
(202) 234-4433 WASHINGTON, D.C. 20005-3701

www.nealrgross.com

1 MEMBER DENNING: Yes.

2 CHAIRMAN WALLIS: So why don't you show
3 them all together? Why do we get these bits and
4 pieces if you only show us this piece.

5 MEMBER DENNING: Part of it is the
6 question of how do you do a realistic estimate with
7 uncertainties. Do you take things like you start
8 at --

9 CHAIRMAN WALLIS: Do 59 runs.

10 MEMBER DENNING: Well, no. The question
11 is do you say, okay, I'm going to start at the maximum
12 possible suppression pool temperature, or do you say
13 I'm going to look over your average and see
14 realistically how does it vary, and include that in
15 the probability.

16 And if you include that in the
17 probability, it dramatically decreases the probability
18 of exceeding it, but there still is kind of this
19 regulatory inconsistency or I don't know. Perhaps
20 people have really said this is how you do a realistic
21 estimate with uncertainties.

22 MR. LOBEL: It's been done for other
23 cases. It hasn't been done for this, but, for
24 example, for calculating departure from nuclear
25 boiling rations in PWRs, it's standard procedure now

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 to do a calculation that's best estimate and then
2 estimate the uncertainties in clad thickness and
3 diameter and flow and pressure drop and things like
4 that and then do just what we're talking about, add
5 then all together at a 95-95 limit.

6 CHAIRMAN WALLIS: So why don't you
7 require that they do it here? It can be done. It's
8 just a question of another few weeks to do it or
9 something, isn't it?

10 MR. LOBEL: Well, I think there's more to
11 it than that, and you have to realize, too, that --

12 CHAIRMAN WALLIS: The computer program is
13 there. Excuse me. they've obviously done a lot of
14 calculations in sensitivity. So doing enough to do a
15 full uncertainty analysis is just a matter of time.
16 It's not a matter of something new.

17 MR. LOBEL: You have to realize, too that
18 the purpose of doing a design basis analysis is to
19 show that I've piled so much conservatism on that
20 there's just no worry about whatever the bad outcome
21 is.

22 So in those cases, licensees tend to pick
23 bounding values where they can, and it may take a lot
24 more effort to define a realistic value and an
25 uncertainty.

1 A good example of that I would think of is
2 debris blockage and pressure drop where experiments
3 are done and analyses are done in a way to bound
4 things. For example, Vermont Yankee in their analysis
5 assumes that they lose all of the debris on half of
6 the reactor coolant system. That's not a realistic
7 assumption. It's a bounding assumption so that
8 somebody doesn't have to look at every possible place
9 where a pipe can break and calculate how much debris
10 can come off from that break.

11 MEMBER DENNING: Why don't you do your
12 summary slide and then we'll see if the committee has
13 other inquiries

14 MR. LOBEL: Okay. Okay. The summary I
15 already went through at the beginning, but in summary,
16 based on a few considerations, the conservative
17 calculations, acceptable analytic methods, the data
18 and expert judgment of the ECCS pump vendor,
19 consistency with emergency operating procedures, and
20 an acceptable level of risk were the bases for the
21 staff finding that the Vermont Yankee --

22 CHAIRMAN WALLIS: But you cannot have a
23 conclusion based on something which would show if it
24 were done. You cannot have a conclusion based on a
25 "would show" argument. You've got to say it does

1 show.

2 MR. LOBEL: Well --

3 CHAIRMAN WALLIS: And if it doesn't show,
4 then it's not an argument.

5 MR. LOBEL: What I was trying to show with
6 the slides that I had was that this need for
7 containment pressure is really a figment of the way
8 the calculation was done.

9 CHAIRMAN WALLIS: I think you're right.

10 MR. LOBEL: But what I was trying to say
11 here is these are the reasons that we found that the
12 licensee's use of --

13 CHAIRMAN WALLIS: Well, you see the
14 problem I have is you're asking me to make a judgment
15 that if you sort of did a little bit more of this, it
16 would just get more conservative and everything would
17 be even better.

18 But you're asking me to make judgment
19 decisions when a little bit more effort would make me
20 certain that I'm making the right decision.

21 MEMBER DENNING: I think the problem with
22 your second sub-bullet is the way you're worded that
23 you could say a more realistic but conservative
24 calculation shows that credit is not needed.

25 But what you haven't taken into account is

1 a probability. I mean, you've shown from your
2 conservative calculation that you don't -- by removing
3 conservatisms, I'm sorry, that you don't need it, but
4 you haven't demonstrated it with a degree of
5 confidence.

6 CHAIRMAN WALLIS: Well, I don't think he
7 has because he's given up some conservatisms to do
8 this realistic calculation. So it's not still
9 conservative. only some things are still
10 conservative.

11 So the whole calculation is not --

12 MR. LOBEL: Well, if you look at the
13 slides that I presented to the Thermal Hydraulics
14 Subcommittee when we were talking about the reg. guide
15 I had something like eight pages of conservative --

16 CHAIRMAN WALLIS: I saw that.

17 MR. LOBEL: I'm sure you did.

18 -- of conservative assumptions, and here
19 we're only talking about eliminating one at a time,
20 and we still get the result that the analysis turns
21 out to be that the need for overpressure is a figment
22 of the analysis. Removing more conservatisms would --

23 CHAIRMAN WALLIS: So no one is ever going
24 to do this full calculation which really wraps it up
25 instead of having these bits and pieces which lead us

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 to conclude that probably everything is okay?

2 MR. LOBEL: I don't have a realistic
3 calculation in that sense. I don't think the licensee
4 does, but they can answer for themselves.

5 CHAIRMAN WALLIS: I'm sorry, but in this
6 new 182, you're going to ask for a realistic
7 calculation with uncertainties, aren't you? A full
8 realistic calculation with uncertainties, which you
9 have not really got in this case. You have almost got
10 it. It's within sight, but it's not quite there.

11 MR. LOBEL: I was hoping that this would
12 be convincing enough that if you made that extra step,
13 if taking away one conservatism did the job, then
14 taking away a lot of conservatisms would be even
15 better.

16 CHAIRMAN WALLIS: Well, I agree with
17 that. That's a true statement.

18 MEMBER DENNING: And we do have
19 information that was submitted to the subcommittee
20 that has more examples of the magnitude of effective
21 individual conservatisms.

22 MR. LOBEL: Part of the purpose for
23 showing this was one of the criticisms from the
24 subcommittee when I was showing those conservatisms
25 was that I wasn't telling you how much each one was

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 weighted, how much each one was worth. So part of the
2 purpose of doing this was to show --

3 CHAIRMAN WALLIS: But you see my problem
4 is when you take away a conservatism, unless you put
5 an uncertainty on your new realism, you have given up
6 something which no longer gives you a full argument,
7 which we don't know how realistic the realistic
8 estimate is. It may have a lot of uncertainty
9 associated with it, in which case it's not as valuable
10 as one which is more tightly understood. So just
11 saying you've gone from conservative to realistic
12 doesn't tell me very much until you put in the
13 uncertainties in a logical way.

14 MEMBER DENNING: Are you ready now?

15 CHAIRMAN WALLIS: I'm sorry, but you know
16 what I'm saying.

17 MEMBER DENNING: Now, if the committee
18 agrees, we'll move now to the public comments.

19 Mr. Sherman, will you come and make a
20 presentation to us?

21 MR. SHERMAN: Good afternoon. I'm Bill
22 Sherman. I'm the state nuclear engineer for the State
23 of Vermont, and with me today is Sara Huffman. She's
24 the Director of Public Advocacy for the State of
25 Vermont, and on behalf of the Douglas administration

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 in Vermont, we appreciate your consideration of the
2 issue of overpressure.

3 We from the beginning of the Vermont
4 Yankee's application have been concerned about
5 overpressure. We appreciate greatly the further
6 analysis that the licensee has done in response to
7 RAIs, appreciate greatly the work of the staff in
8 looking at this, and your deliberation as well, and we
9 will also stay with you for the rest of this week and
10 weekend to see your deliberations and see how they
11 play out.

12 I'll try and be as brief as I can with my
13 nine slides here.

14 On the generic issue, the committee wrote
15 a letter September 20th, 2005. I won't summarize the
16 letter, but if you evaluate Vermont Yankee's proposal
17 in accordance with the September letter, it doesn't
18 appear to us that the proposal meets that letter. It
19 appears to us that Vermont Yankee is asking for
20 overpressure credit for longer than a few hours, that
21 there are practical alternatives to being the
22 overpressure credit, that there is not a full positive
23 indication of containment integrity, and containment
24 integrity has not been demonstrated for the credited
25 time period.

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 And here's the curve that Vermont Yankee
2 has put forth which shows that they're considering
3 overpressure credit for a period of about 56 hours.

4 The staff response to the letter we're all
5 aware of. Dr. Sharon came in in October, proposed a
6 risk informed process for this. The State of Vermont
7 believes that that has promise. As we stated in the
8 power uprate subcommittee, we suspect that Entergy and
9 the staff haven't analyzed the whole problem.

10 We talked about that at length at the
11 subcommittee. We provided this chart which is
12 modified. Actually number two is modified from the
13 chart that we provided.

14 What we feel is that the new top event
15 that should be reviewed should be pump fails due to
16 inadequate NPSH. We feel that two cases for this top
17 event should be evaluated, one case with overpressure
18 credit, one case assuming that the practical
19 alternative is implemented, that is, no overpressure
20 credit, and we went through at the subcommittee, and
21 I won't go through again how there's an uncertainty
22 that is in each one of these items that, though we
23 don't know what those uncertainties should be, we know
24 that there is an uncertainty in each one of those
25 items that could be considered, and we're not sure.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 We haven't seen the staff's evaluation. So perhaps
2 Mr. Stutzke has done all of this. He didn't respond
3 to all of these items in his presentation today.

4 But let me just give one example of the
5 pendency of our concern. What I've shown on this
6 slide, which is too dense for you to read but each of
7 you have in your own packets full size copies of this
8 license event report. This is something that just
9 came across our attention this week. This is a
10 license event report for a three-quarter inch
11 containment isolation valve which had been
12 mispositioned open for ten years, nine years, I think,
13 actually rather than ten years.

If you take time later and read the LER,
you'll see that there are compensating measures why
the fact that this was open may not have resulted in
a problem, but it also shows you that in the real
world things happen that are contrary to the overall
plan.

20 This was a three-quarter inch valve. In
21 my subcommittee presentation, I pointed out that the
22 licensee had shown that a half inch valve, half inch
23 opening in containment was what they calculated to
24 defeat containment overpressure.

25 CHAIRMAN WALLIS: This was at Vermont

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701 www.nealrgross.com

1 Yankee, this event?

2 MR. SHERMAN: This is correct.

3 CHAIRMAN WALLIS: They claimed they could
4 detect leaks in containment.

5 MR. SHERMAN: This wasn't a leak. This
6 was one of two valves that was mispositioned open, one
7 of the two relied on containment isolation valves.

8 CHAIRMAN WALLIS: So it was making the
9 containment not completely tight, was it?

10 PARTICIPANTS: No.

11 CHAIRMAN WALLIS: Oh, no? It was in
12 series with another valve?

13 MR. SHERMAN: No, but it would feed into
14 the probability of the containment not having
15 integrity. It didn't defeat containment integrity,
16 but it would feed into the probability.

17 CHAIRMAN WALLIS: It was on a different
18 system?

19 MR. SHERMAN: It actually was on the RHR
20 system that would be directly in play. It would have
21 meant that in the LOCA situation that is under
22 consideration you would have had only single valve
23 protection. However, they're compensating additional
24 valves downstream.

25 But I pointed out that if you're doing a

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 risk informed evaluation, here's an example of
2 something that feeds into that.

3 Now I'm going to go into something that I
4 had planned. I didn't know of Mr. Stutzke's and
5 Lobel's presentation, and unfortunately I'm going to
6 be a little bit critical about what they said based on
7 the next two slides.

8 The ATWS NPSH evaluation deserves a few
9 more questions, I think. Most of what has been
10 focused on is the LOCA NPSH evaluation. Let me just
11 go to the next curve. This is the curve that the
12 licensee provided for the ATWS, and let's just take a
13 minute with it.

14 You can see at the bottom I put a time
15 scale on the bottom. They need overpressure credit
16 starting at 15 minutes, and they don't need it again
17 after an hour and 15 minutes. It's an ATWS. They
18 have 12 pounds pressure that they show.

19 Let me just flip back for a minute. On
20 the LOCA curve they only showed eight pounds, seven
21 and change of pressure available.

22 So now flipping back to the ATWS curve,
23 you ask yourself a question at ATWS. ATWS has as much
24 energy in it as a LOCA, and the way that ATWS develops
25 pressure is a little bit different than a LOCA, but

1 because of the way that it blows down through the
2 relief valves, but you say to yourself that if the
3 LOCA requires overpressure credit for 56 hours, then
4 why does ATWS only require it for an hour and 15
5 minutes.

6 And the answer is because these are
7 nominal values. These are not conservative values,
8 and so what that means is that in Mr. Stutzke's
9 presentation, using realistic assumptions to estimate,
10 evaluate available NPSH, no containment overpressure
11 credit is necessary. I don't believe that's true
12 because I believe that these are realistic
13 assumptions. I believe the nominal assumptions in
14 ATWS show that overpressure is available.

15 Mr. Lobel said --

16 CHAIRMAN WALLIS: Is required.

17 MR. SHERMAN: Required. I'm sorry.

18 Mr. Lobel said that because the need to
19 credit containment accident pressure for NPSH arises
20 from the conservatisms in calculation, eliminating
21 excess conservatisms eliminates the need to credit
22 containment accident pressure, but I don't think
23 that's right because I think that looking at the ATWS
24 analysis, they need overpressure credit because this
25 is a nominal analysis or realistic, if you like.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 And my only point in showing this is this,
2 that I'm not sure that the ATWS analysis meets the
3 proposed Reg. Guide 182 change that the committee
4 didn't accept because that proposed Reg. Guide 182
5 suggested that for overpressure they should do
6 conservative calculations, maximize the temperature,
7 minimize the pressure, but with ATWS they haven't done
8 it, and if ATWS was done that way, you don't really
9 know where it's going to come out compared to the
10 LOCA.

11 And it tells us, the state, that we
12 suspect that the best way to look at this is through
13 the risk informed methodology that Dr. Sheeron
14 (phonetic) suggests.

15 However, we suggest that the full
16 evaluation of that, as we showed in this earlier
17 slide, would be the better way to do it, taking into
18 account some probability that the operator fails to
19 retain, taking into account the probability that the
20 debris head loss is more than expected, and maybe Mr.
21 Stutzke's analysis did that. I don't think so, but
22 maybe it did.

23 And I don't think that we know what the
24 change in CDF would be. It might be in the ten to the
25 minus eighth or ten to the minus seventh region. If

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 they took in seismic, the seismic portion of that, it
2 might not. It might be more in the ten to the minus
3 fifth or sixth area, and therefore questionable in
4 whether it was desirable.

5 Here's my summary. Under the ACRS letter
6 that you wrote, we don't think overpressure should be
7 granted. Under Dr. Sheeron's proposal, we still are
8 troubled by the modification of defense in depth.

9 The answer to the question that somebody
10 asked a minute ago about is Appendix 1 or is 10 CFR
11 100 affected, well, 10 CFR 100 is affected if you fail
12 containment and you needed overpressure credit. Then
13 10 CFR 100 is affected because you're apt to have
14 those two failures result in fuel failure.

15 Ten CFR 100 is not affected if you fail
16 containment, but your pumps, your ECCS pumps don't
17 depend on overpressure.

18 At any rate, Item No. 2, if the whole
19 problem were analyzed, we'd think that we'd have more
20 light on the problem.

21 MEMBER DENNING: Thank you.

22 MR. SHERMAN: thank you.

23 MEMBER DENNING: Bill, we'd like to thank
24 you for your thoughtful input throughout this process.
25 Thank you.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MR. SHERMAN: Thank you very much.

2 MEMBER DENNING: Mr. Shadis, are you
3 available?

4 And, again, I'll ask you to be brief,
5 although I realize that you do have some important
6 things to present to us.

7 CHAIRMAN WALLIS: Well, how do we handle
8 something, Mr. Chairman of this session, when the new
9 question is raised, say, about ATWS? Can we ask the
10 staff to respond to that? I don't know --

11 MEMBER DENNING: We certainly can --

12 CHAIRMAN WALLIS: He's raised a new
13 question here.

14 MEMBER DENNING: Well, actually not a new
15 question on ATWS.

16 CHAIRMAN WALLIS: He said the credit is
17 needed even with a realistic -- you know, which is not
18 what they were claiming. So are we going to hear from
19 the staff on that?

20 MEMBER DENNING: Well, we're going to have
21 to discuss that.

22 CHAIRMAN WALLIS: Or are we going to make
23 that decision ourselves?

24 MEMBER SIEBER: We'll discuss it.

25 MEMBER DENNING: Mr. Shadis, will you

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 proceed?

2 MR. SHADIS: Thank you.

3 As a preliminary, just to pick up on one
4 comment I heard in the earlier discussion with respect
5 to debris from a failed skin dryer impacting the
6 ability of the MSIVs to close, and one panel member
7 suggested that having two pieces arrive eight foot
8 apart at the same speed and the same time was not a
9 credible event, I just want to remind you that the
10 first catastrophic failure of the steam dryer at Quad
11 Cities, a piece of steel nine feet in length and 18
12 inches in diameter was shed, and that folding up on
13 the outboard MSIV, number one, could affect two MSIVs,
14 but secondly, could form a trap for following debris.

15 I think the image that these pieces would
16 be small and discrete may be nonconservative.

17 My topic, again, and I spoke to the
18 subcommittee on this, is the question of the NRC's
19 pilot program inspection that was conducted at Vermont
20 Yankee, and this inspection program done in August of
21 2004, according to the SECY paper issued July 1st was
22 done in support of the uprate review, and items were
23 selected particularly to support uprate review.

24 The conclusion of the NRC staff conducting
25 that inspection was that, and their opinion, too much

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 reliance was placed on representations from the
2 licensees that were not confirmed by actual physical
3 inspection, and they noted, too, that I think with
4 some degree of surprise that there seemed to be still
5 latent design issues emerging at all of the power
6 plants that were part of that pilot inspection.

This committee may know that the Vermont
Public Service Board is anticipating that the
committee will at some level review the engineering
design pilot inspection that was done at Vermont
Yankee and give some opinion of it.

That inspection was also completed in part
to address a request from the Vermont Public Service
Board for what they termed an independent engineering
assessment, and that was a mini diagnostic evaluation
team type of assessment where four systems were to be
gone through in a deep vertical slice inspection.

18 They asked for it to be an independent
19 assessment, and independence was there, but it
20 consisted in that inspection of requiring that people
21 who had contact within the previous two years with the
22 licensee would be excluded from the inspection team,
23 the licensee or the owner-operator Entergy.

24 And this is a step back from the kind of
25 independence that was exhibited when the Maine Yankee

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

1 independent safety assessment, which was also a
2 diagnostic evaluation team derived inspection, was
3 done. In that case there was no one permitted to be
4 on the team from either Region 1 or the Office of
5 Nuclear Reactor Regulation.

6 So I just offer that comment. I have
7 provided for you a rough outline. They were intended
8 to be viewgraphs, and we didn't get that far.
9 However, I am hoping that this committee will, for the
10 benefit of the Vermont Public Service Board and the
11 people of Vermont, draw some kind of critique or
12 evaluation of that inspection report.

13 And finally, I'm sorry to repeat, but it
14 appears to be a matter of conviction at NRC still that
15 the plants as they are represented in licensee
16 documentation are the plants as they would be found in
17 a physical inspection, and that not only goes to the
18 physical components of the plant, but it also goes to
19 the actions that are represented in the licensee's
20 applications.

21 For example, at Vermont Yankee, one issue
22 was the restoration of off-site power and how long it
23 would take to switch over to an alternative power
24 source. Another issue that arose was the question of
25 how much time it would take to establish a remote

1 control panel and set up to operate the reactor should
2 the control room have to be abandoned because of
3 radiological, well, habitability considerations.

4 And it proved to be upon actual inspection
5 that what the licensee was relying on and representing
6 in their application was not true, was not the case.
7 So I guess the appeal here is that in reviewing this,
8 this committee consider the recommendation that all
9 extended power uprates be underwritten with a real
10 diagnostic, physical, on-site examination.

11 Thank you. That concludes my remarks.

12 MEMBER DENNING: Thank you, and I'd also
13 like to thank you, Mr. Shadis, for your input,
14 particularly the experience that you have related to
15 us that related to the Maine Yankee. Thank you very
16 much.

17 MR. SHADIS: Thank you.

18 MEMBER POWERS: Dr. Denning, did the
19 subcommittee look at the issue of unfiltered inlaid
20 heat (phonetic) in the control room at Vermont Yankee?

21 MEMBER DENNING: I'm sorry. Did we look
22 at?

23 MEMBER POWERS: Unfiltered inlaid heat.
24 There are a lot of other control things are well off
25 their design specs, and I just wondered where this

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealgross.com

1 client stood.

2 MEMBER DENNING: I don't know the answer.

3 Can Entergy make a comment about that?

4 MR. PEREZ: Good afternoon. My name is
5 Pedro Perez, representing Vermont Yankee.

6 At the Vermont Yankee plant there is no
7 control room filtration, such as charcoal or HEPA
8 filters. We assumed when we implemented the alternate
9 source term that basically the control room is left
10 open up to the full ventilation flow rate. So in
11 principle everything is unfiltered that comes into the
12 control room, and we meet the habitability
13 requirements.

14 MEMBER KRESS: By using face masks?

15 MR. PEDRO: No, sir. No KI and no SCBAs.

16 MEMBER POWERS: You can do it with IST.

17 MR. PEDRO: With the IST.

18 MEMBER DENNING: Thank you very much.

19 MR. PEDRO: You're welcome.

20 MEMBER POWERS: Probably wrong.

21 MEMBER DENNING: Those are the only two
22 comments that we had requested from the public. Does
23 anyone else from the public have any comments?

24 (No response.)

25 MEMBER DENNING: Thank you, and I turn it

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 back to you.

2 CHAIRMAN WALLIS: I would like to know
3 when we'll hear an answer to this ATWS question, and
4 apparently ATWS does require overpressure --

5 MEMBER DENNING: No.

6 CHAIRMAN WALLIS: If you take it away
7 does it affect the CDF?

8 MEMBER DENNING: If you look at those
9 things that reduce the suppression pool temperature
10 associated with the large local, most of those things
11 have applicability to the ATWS. If you want to reduce
12 that --

13 CHAIRMAN WALLIS: Yes, but then we have
14 a CDF calculation which gets to the borderline of some
15 region if we add on the ATWS.

16 Did the staff consider this at all or are
17 we --

18 MEMBER DENNING: Oh, yes. We had a
19 presentation on ATWS, but it was not -- the focus was
20 much more on the --

21 CHAIRMAN WALLIS: It wasn't focused on
22 NPSH was it?

23 MEMBER DENNING: What's that?

24 CHAIRMAN WALLIS: It wasn't focused on
25 the NPSH.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MEMBER DENNING: It wasn't, and there was
2 presentation related to NPSH, but the focus was on the
3 large LOCA just because it required more pressure for
4 a much more extended period of time.

5 CHAIRMAN WALLIS: I know.

6 MEMBER DENNING: Did you want to --

7 CHAIRMAN WALLIS: I was wondering if the
8 staff's conclusions that they presented to us are
9 changed by the points that were made here about ATWS.

10 MEMBER SIEBER: I don't think you get into
11 recirculation during an ATWS event because of the
12 short time that there is pressure relief, and the
13 minimum amount --

14 MEMBER DENNING: The staff will make a
15 response on that.

16 MR. LOBEL: This is Richard Lobel of the
17 staff.

18 We did look at the ATWS calculation. I
19 haven't looked at it lately, but Mr. Sherman is
20 correct that the ATWS is supposed to be or can be
21 analyzed with nominal realistic values, but Vermont
22 Yankee did use some conservative assumptions. They
23 used the maximum flow rate for the pump. They
24 considered that the debris from the LOCA was on the
25 ECCS strainers even though the only debris that would

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 be generated would be from the lifting of a safety
2 valve, not from the breakage of the largest pipe.

3 Maybe they can help me. I'm not sure
4 about these two, but I think the minimum suppression
5 pool level was assumed and only one heat exchanger was
6 assumed in the ATWS analysis.

7 MR. DREYFUSS: John Dreyfuss, Director of
8 Engineering, VY.

9 We'd like to provide some insight on this
10 question as well.

11 Craig.

12 MR. NICHOLS: Craig Nichols, Entergy,
13 Vermont Yankee.

14 And we do have several folks here who were
15 involved in that analysis, and Mr. Lobel is correct
16 that obviously the ATWS is a beyond design basis
17 event, which includes a single failure right off the
18 bat of both the RPS primary and secondary system
19 failure in describing the reactors. So we start from
20 that position.

21 Our analysis did include similar to the
22 LOCA analysis the design basis service water
23 temperature, torus temperature and level; it shows a
24 higher decay heat rate, et cetera. So there were many
25 evaluations or parts of the evaluation that did

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 include conservative values up to and including the
2 tech. spec. value similar to the design basis LOCA.

3 We also did do a PSA of the ATWS, and we
4 have people here that can also discuss the public
5 safety assessment that was done for containment
6 overpressure related to the ATWS.

7 So if the staff have particular questions
8 or the ACRS committee has particular questions, we
9 could assemble folks to discuss that.

10 CHAIRMAN WALLIS: What I was concerned
11 about was these conclusions on your slide, which we
12 might even quote in our letter not being true if you
13 included ATWS. That's what concerned me, saying
14 something which is not completely valid in our letter
15 or relying on a statement from you which is no longer
16 quite true as it was before.

17 MR. LOBEL: Well, I was aware of the ATWS
18 situation. I was debating whether to put that in the
19 presentation. I was trying to keep the presentation
20 focused, and I don't believe that because of the
21 conservatisms that we've just mentioned that if you
22 took those conservatisms out that it would change the
23 conclusion, you wouldn't need containment pressure.

24 If I would have thought differently, I
25 would have mentioned it and I wouldn't have made such

1 a point of those conclusions.

2 MEMBER SIEBER: Has the licensee asked for
3 an exemption in the ATWS situation?

4 MR. LOBEL: An exemption for?

5 MEMBER SIEBER: For overpresssure,
6 containment overpressure.

7 MR. LOBEL: You mean for crediting
8 overpressure?

9 MEMBER SIEBER: Yes.

10 MR. LOBEL: Yes, but that's based on --

11 MEMBER SIEBER: For ATWS?

12 MR. LOBEL: For ATWS, but that was the
13 curve that Mr. Sherman showed, but that was based on
14 the analysis we're talking about that had these
15 conservative assumptions in it.

16 VICE CHAIRMAN SHACK: Again, their Table
17 3.3 in their PRA analysis says that the ATWS
18 contribution, if you credit or don't credit the
19 overpressure, is 2.9 times ten to the minus ten.

20 MEMBER KRESS: The CDR.

21 MEMBER SIEBER: Pretty likely.

22 VICE CHAIRMAN SHACK: CDF.

23 MR. LOBEL: This is Richard Lobel again.

24 Let me say, too, that just so we're clear,
25 I think I mentioned this at the subcommittee, but

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 there were two other events, the Appendix R fire and
2 the station blackout that the licensee originally
3 credited containment overpressure and then revised
4 their analyses by crediting another service water pump
5 that changed that analysis.

6 MEMBER DENNING: Thank you for that full
7 disclosure.

8 Okay. Thank you, Graham.

9 CHAIRMAN WALLIS: Okay. I don't think we
10 have anything else we have to do at this time. I'd
11 like to recess, and we are supposed to be back at four
12 o'clock. We do not need the transcript from now on.

13 Thank you very much.

14 (Whereupon, at 3:22 p.m., the Advisory
15 Committee meeting was adjourned.)

16

17

18

19

20

21

22

23

24

25

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

528th Meeting

Docket Number: n/a

Location: Rockville, MD

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.



Tobias Walter
Official Reporter
Neal R. Gross & Co., Inc.



Entergy Vermont Yankee Extended Power Uprate

Presentation to the
Advisory Committee on Reactor Safeguards
December 7, 2005



Entergy

Steam Dryer

Key Points

- Acoustic Loads are Primary Source of Dryer Significant Degradation
- VY Measurement Configuration Detects Acoustic Loads
- VY Dryer:
 - No CLTP Acoustic Resonance
 - Substantial Margin to ASME Stress Limit
 - Baseline Inspection – No Structural Vulnerabilities
 - Modified to Strengthen for EPU Operation
 - Power Ascension Controlled via Monitoring Plan



Entergy

Steam Dryer VV Main Steam Vibration

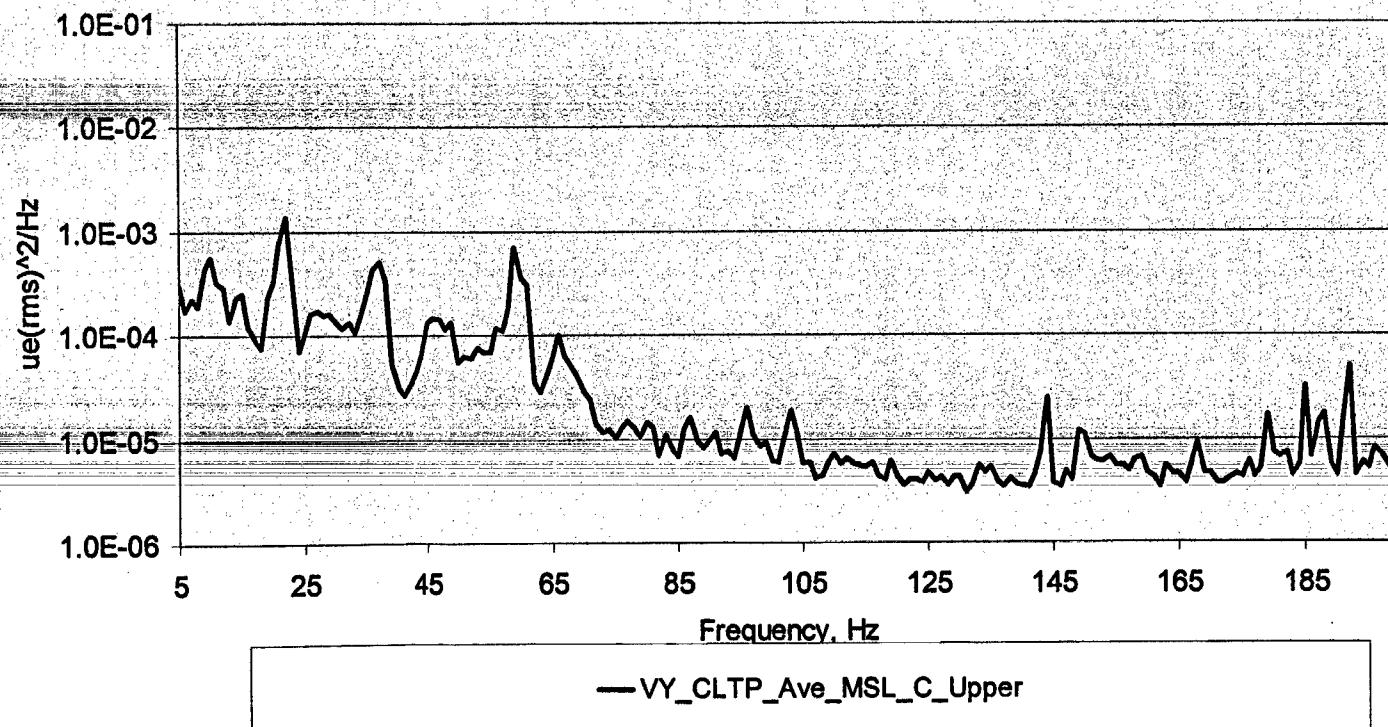
- MSL Measurements
 - Strain Gages
 - Accelerometers
- Main Steam Branch Line Potential Acoustic Resonators
- MSL Monitoring Will Detect Excitation from Sources in:
 - Main Steam Lines
 - Reactor Vessel



Entergy

Steam Dryer SG Measurements for Acoustic Monitoring

Figure 1a: VY SG Data CLTP



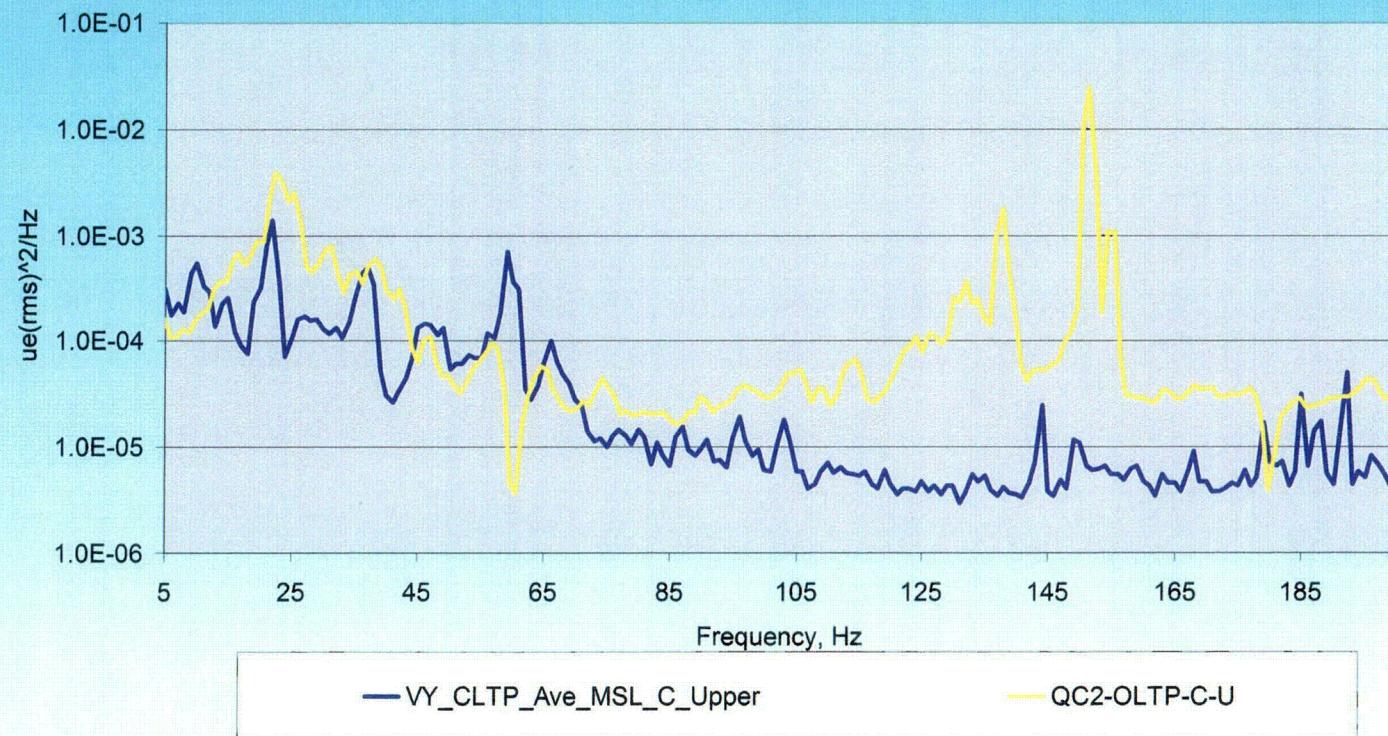


Entergy

Steam Dryer

SG Measurements for Acoustic Monitoring

Figure 1b: VY SG Data and QC OLTP



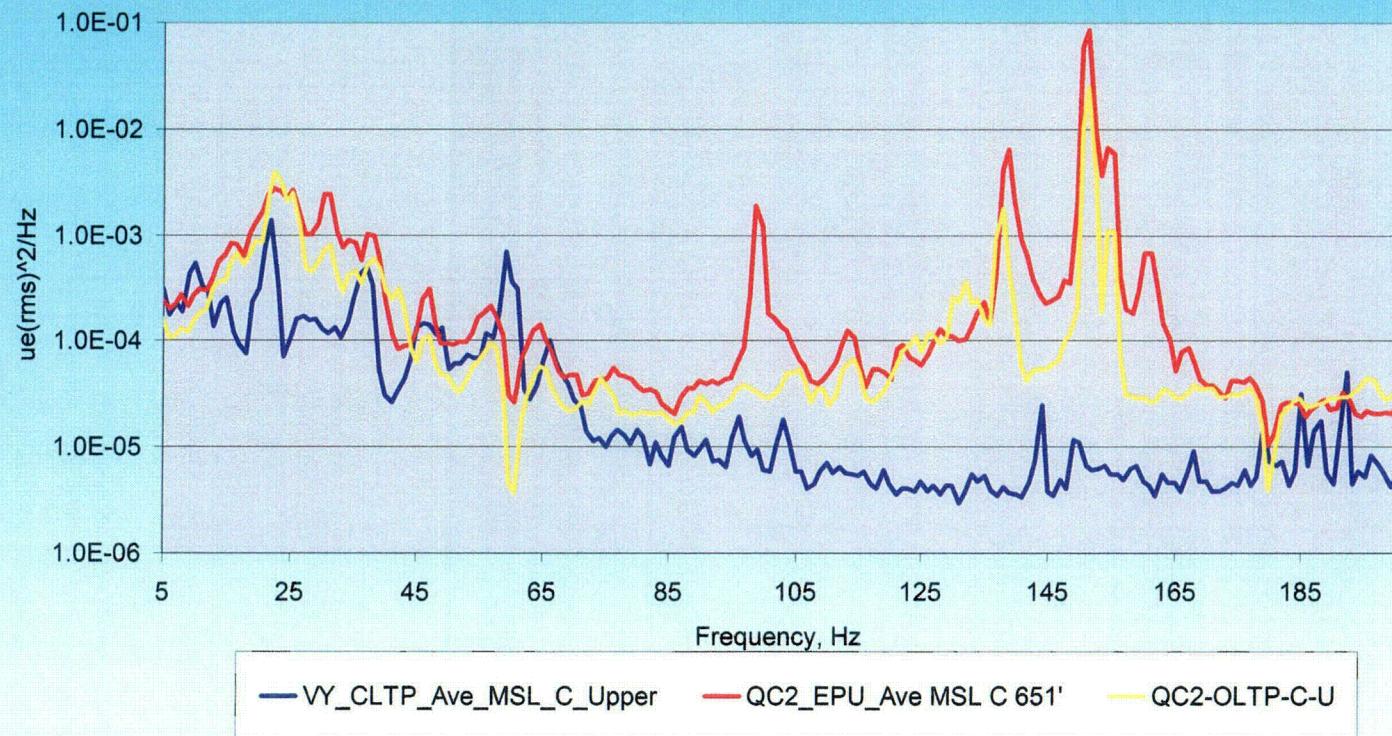


Entergy

Steam Dryer

SG Measurements for Acoustic Monitoring

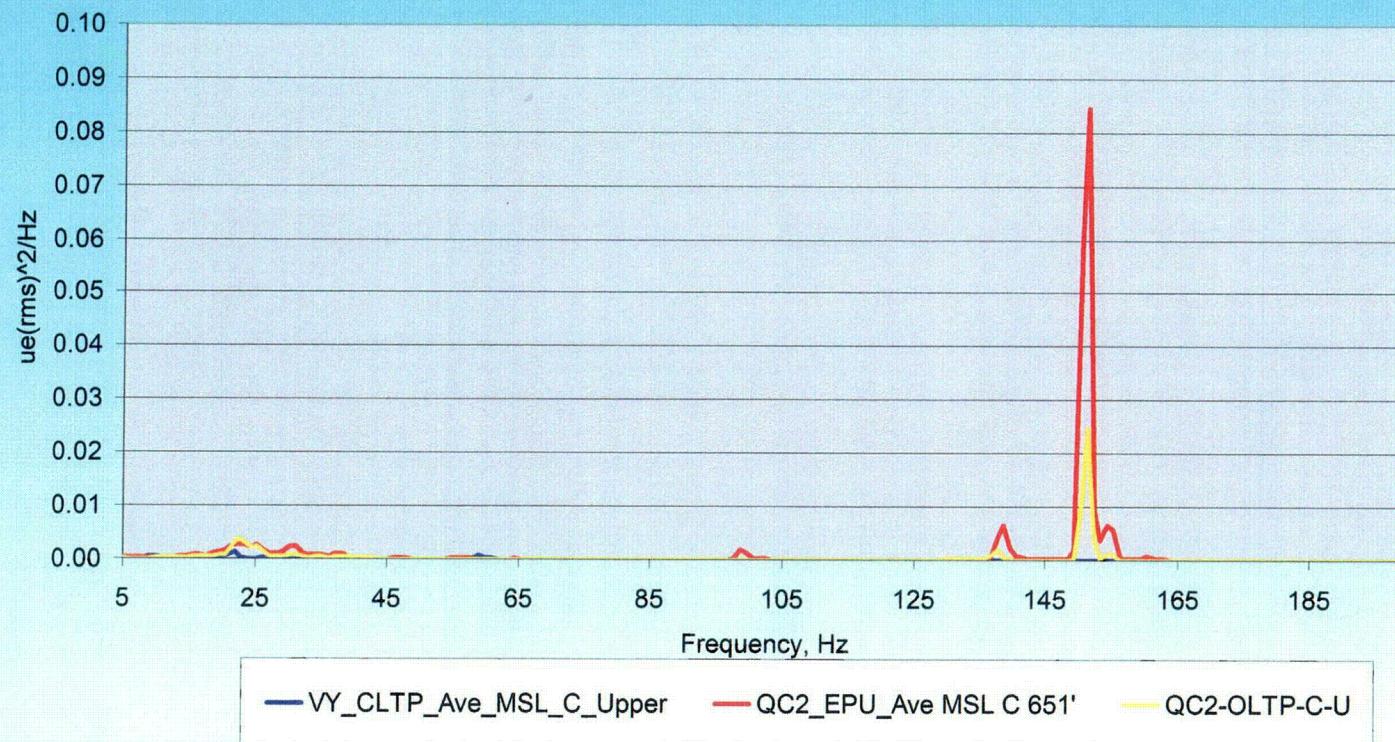
Figure 1c: VY SG Data and QC OLTP & EPU



Steam Dryer

SG Measurements for Acoustic Monitoring

Figure 1d: VY SG Data and QC OLTP & EPU (linear)





Entergy

Steam Dryer

VY Structural Analysis – Load Definition

- Acoustic Loads Impact Vertical Faces of the Dryer
 - Generated from Steam Line Data
 - Transfer of Steam Line Data Benchmarked via QC Data
- Turbulent Forces Act in the Area of the Nozzle
 - Little Effect on Dryer Components



Entergy

Steam Dryer

VY Structural Analysis – Peak Stress & LCF

VY Dryer Limiting Component – Vertical Face Top Weld

- o Peak Calculated Stress 5,450 psi
- o ASME Acceptance Criterion 13,600 psi
- o Limit for Power Ascension 7,400 psi
 - Reflects 2.78 Limit Curve Factor

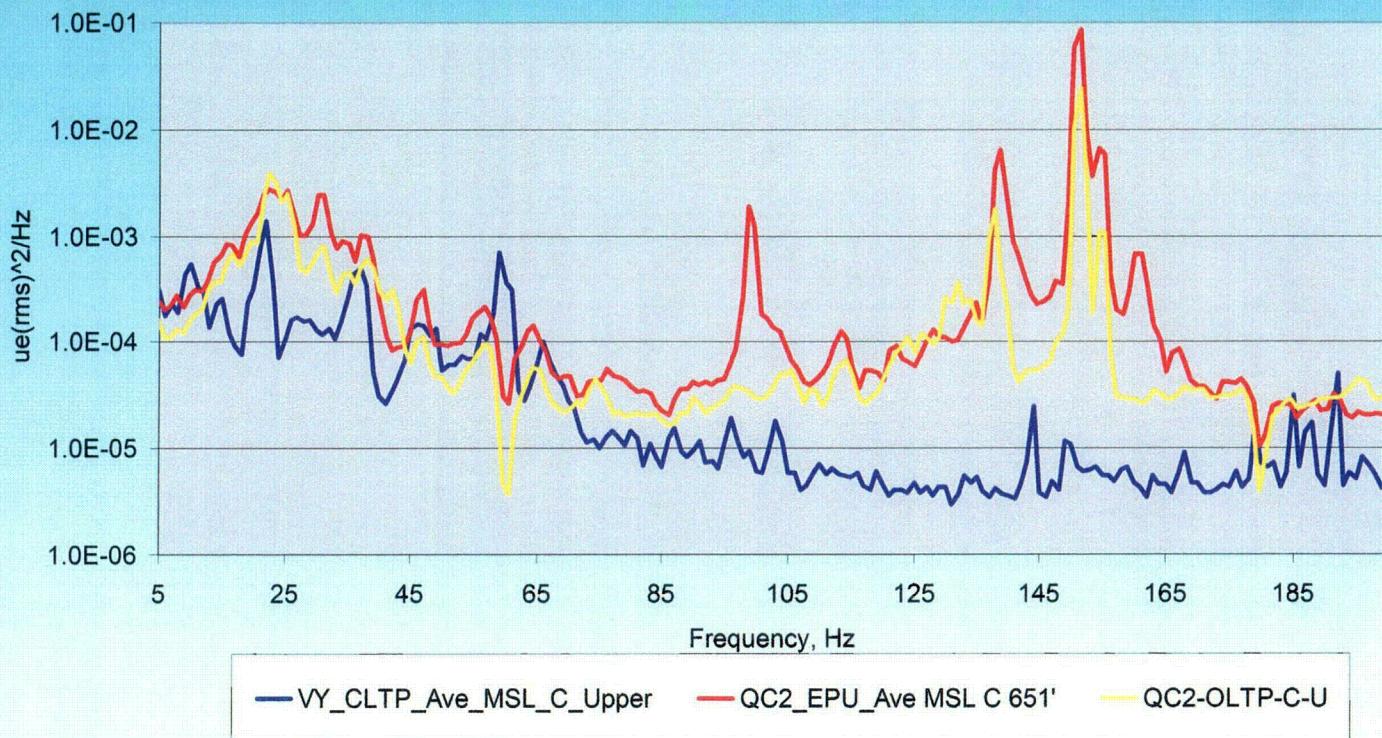


Entergy

Steam Dryer

SG Measurements & Power Ascension Limit Curve

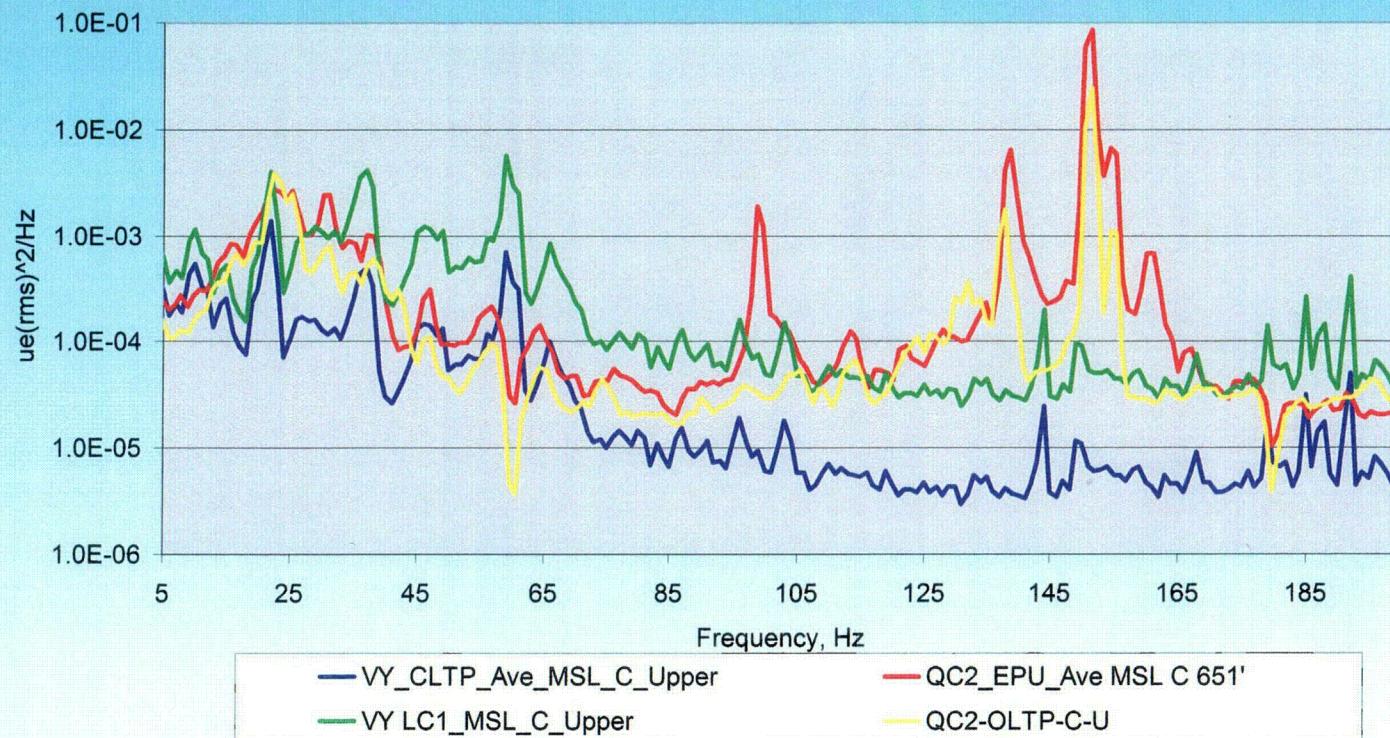
Figure 2a: VY SG Data and QC OLTP & EPU



Steam Dryer

SG Measurements & Power Ascension Limit Curve

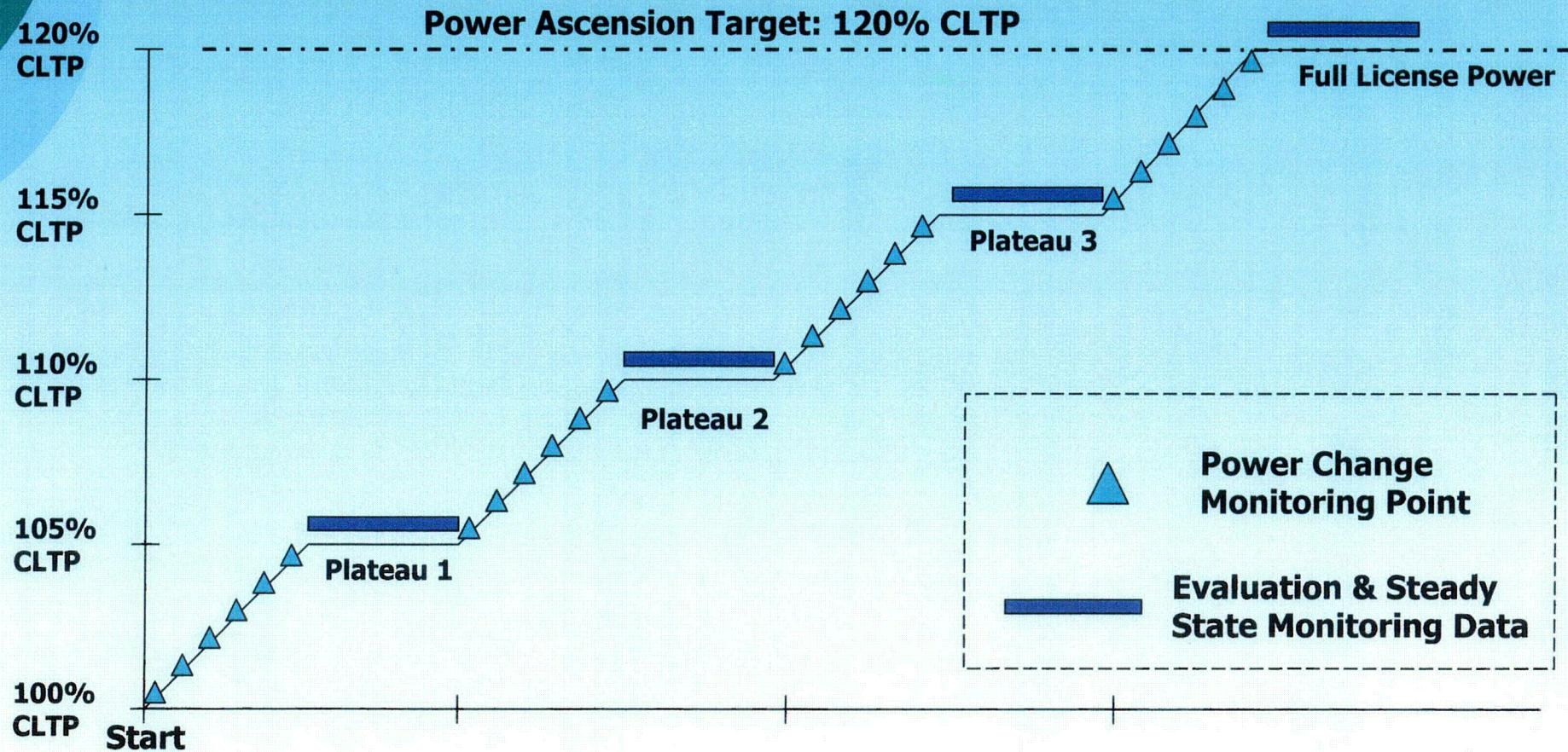
Figure 2b: VY SG Data and QC OLTP & EPU



Steam Dryer

Power Ascension Monitoring – Test Plateaus

Figure 3: Dryer Monitoring & Test Plateaus





Entergy

Steam Dryer Conclusions

- o No Vulnerability at CLTP
- o VY Measures Acoustic Loads
- o Margin to Fatigue Stress Limit

ACRS Full Committee Meeting

**NRC Staff Review of Proposed Extended Power Uprate
For
Vermont Yankee Nuclear Power Station**



December 7, 2005

1

Risk Evaluation of Proposed Credit for Containment Accident Pressure

Martin A. Stutzke
Senior Reliability & Risk Analyst
Probabilistic Safety Assessment Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

2

In a Nutshell...

- Entergy has completed its risk evaluation of the proposed credit for containment accident pressure (CAP) to provide adequate net positive suction head (NPSH) to the emergency core cooling system (ECCS) pumps.
- Using realistic assumptions to estimate available NPSH, no CAP credit is necessary. Thus, granting the proposed CAP credit does not increase the risk associated with operation of Vermont Yankee (VY).
- The proposed CAP credit meets the five key principles of risk-informed decisionmaking.

3

Entergy's Risk Evaluation

• Chronology:

| | |
|------------|--|
| 10/05/2005 | Staff asks Entergy to provide risk evaluation that addresses the five key principles of risk-informed decisionmaking in RG 1.174 |
| 10/21/2005 | Entergy provides partial risk evaluation (Supplement 38) |
| 10/26/2005 | Entergy completes risk evaluation (Supplement 39) |
| 11/25/2005 | Staff issues RAI about the risk evaluation |
| 12/02/2005 | Entergy responds to the staff RAI (Supplement 43) |

- To address PRA modeling uncertainty introduced by the proposed CAP credit, Entergy performed a sensitivity analysis.

4

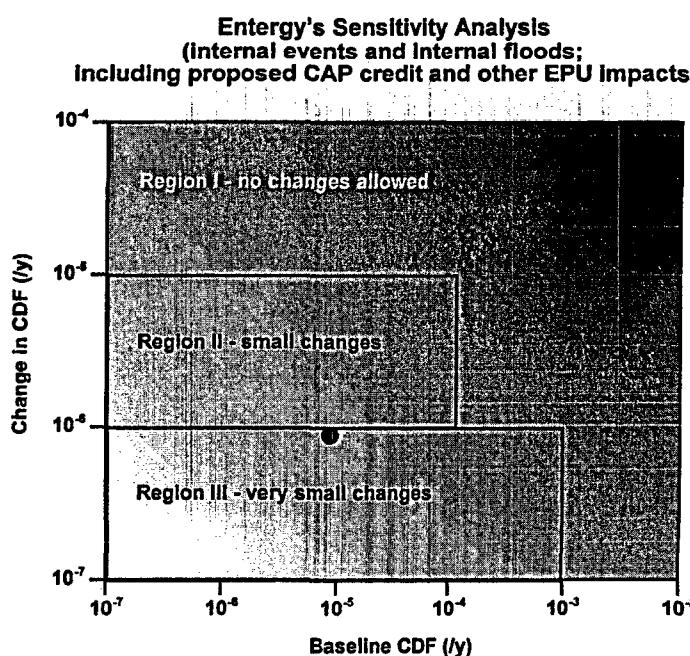
Entergy's Risk Evaluation (continued)

- Differences between the Entergy and staff sensitivity analyses:

| | Entergy | Staff |
|--|-------------------------------------|--|
| Credit for alternative injection (AI) sources after loss of LPCI and CS pumps due to loss of containment integrity | yes | no |
| Note: No credit for AI after large LOCA for injection systems that take suction outside the suppression pool! | | |
| Credit for suppression pool cooling following loss of containment integrity | no | yes |
| Probability of pre-existing containment leakage | | |
| Failure hole size | 60 x La | 35 x La |
| Failure probability | 2.5E-04 | 1.4E-02 |
| Data source | EPRI TR-1009325 | NEI Intermin Guidance |
| Basis | December 2003 expert elicitation | 11/13/2001 Bayesian (Jeffrey's non-information prior; no failures in 182 tests) |
| Change in CDF | 5.8E-07 | 6.2E-08 |

5

Entergy's Risk Evaluation (continued)



6

Five Key Principles of Risk-Informed Decisionmaking 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.

7

Integrated Decisionmaking

- RG 1.174, Section 2.2.6 discusses integrated decisionmaking, and states that “None of the individual analyses is sufficient in and of itself.”
- ACRS guidance:
 - ▶ ACRS letter of May 19, 1999 expressed concerns about the staff making “arbitrary appeals to defense in depth” to avoid making changes to regulations and regulatory practices that seemed appropriate in light of PRA results.
 - ▶ Joint ACNW/ACRS letter of May 25, 2000 discussed establishing limits of necessity and sufficiency on defense-in-depth within a risk-informed regulatory framework.

8

Defense-in-Depth Evaluation

- The proposed CAP credit is consistent with the defense-in-depth philosophy because it meets the four defense-in-depth objectives stated in SRP 19:
 - ▶ Does not result in a significant increase in the existing challenges to the integrity of barriers.
 - ▶ Does not significantly change the failure probability of any individual barrier.
 - ▶ Does not introduce new or additional failure dependencies among barriers that significantly increase the likelihood of failure compared to existing conditions.
 - ▶ Overall redundancy and diversity among barriers is sufficient to ensure compatibility with risk acceptance guidelines.

9

Defense-in-Depth Evaluation (continued)

- The proposed CAP credit does not affect normal plant operating conditions. So, no impact on:
 - ▶ Frequency of any initiating event, or
 - ▶ Probability of pre-existing containment leakage.
- Using realistic assumptions to estimate available NPSH, no CAP credit is necessary. Therefore, the proposed CAP credit does not:
 - ▶ Change the failure probability of the fuel barrier,
 - ▶ Increase the risk of VY operations, or
 - ▶ Significantly change the existing balance between accident prevention and mitigation.

10

Defense-in-Depth Evaluation (continued)

- Even if the CAP credit is assumed to change in PRA success criteria, then:
 - ▶ There must be at least four failures to cause a core-damage accident (LOCA followed by loss of containment integrity, suppression pool cooling, and alternative injection sources).
 - ▶ The 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.
 - ▶ No significant change in conditional containment failure probability (CCFP).

11

Performance Monitoring

- Diverse methods for detecting containment leakage:
 - ▶ Drywell/torus air space differential pressure > 1.7 psi - control room alarm; measured once per shift.
 - ▶ Low torus air space pressure - continuous.
 - ▶ Unusual nitrogen makeup - measured daily.
 - ▶ Oxygen concentration $\geq 4\%$ - weekly measurements.
 - ▶ Integrated leak rate tests (ILRT) - Type A test done once every 15 years (temporary change).
- The fraction of time that the plant would be operated with a containment leak is small:
 - ▶ Leaks will be promptly detected, and
 - ▶ TS preclude prolonged operation with known leaks.
- Leak detection not explicitly considered in PRA.

12

Conclusions

- Entergy has completed its risk evaluation of the proposed credit for CAP to provide adequate NPSH to the ECCS pumps.
- Using realistic assumptions to estimate available NPSH, no CAP credit is necessary. Thus, granting the proposed CAP credit does not increase the risk associated with operation of VY.
- The proposed CAP credit meets the five key principles of risk-informed decisionmaking.

13

Deterministic Evaluation of Proposed Credit for Containment Accident Pressure

Richard Lobel

Senior Reactor Systems Engineer
Probabilistic Safety Assessment Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

14

Purpose

- To discuss NRC staff review of Entergy's proposal to credit containment accident pressure in determining available net positive suction head (NPSH) for emergency core cooling system (ECCS) pumps for certain Vermont Yankee (VY) design basis accidents (DBAs).

15

Conclusions of NRC Review

- Need for crediting containment accident pressure for VY arises from conservative nature of design basis analyses.
- A more realistic, but still conservative, calculation would show that credit is not needed.
- A single failure resulting in loss of containment integrity will not result in a loss of NPSH margin.
- Credit for containment accident pressure has no impact on the operators.
- NRC staff finds proposed crediting of containment accident pressure for VY to be acceptable.

16

Regulatory Guide (RG) 1.82

- RG 1.82 is currently being revised by the NRC staff to address ACRS concerns.
- Entergy has stated as part of VY extended power uprate (EPU) submittals that it does not intend to make RG 1.82 part of the VY licensing basis.
- Methods and solutions different from those set out in RGs will be acceptable to the staff if they provide a basis for the requisite safety findings.
- Bottom line - all unresolved issues regarding revisions to RG 1.82 do not need to be resolved to find VY proposal acceptable.

17

Regulations

- There is no regulation prohibiting credit for containment accident pressure in determining available NPSH for safety-related pumps.

18

Design Basis Accidents

- Boiling Water Reactor (BWR) DBAs currently credit containment integrity and containment accident pressure for other considerations:
 - ▶ Radiological dose
 - ▶ Effectiveness of core spray cooling

19

Single Failure Considerations

| <u>Single Failure</u> | <u>Peak Suppression Pool Temp</u> |
|-----------------------|-----------------------------------|
| RHR Heat Exchanger | 195 F |
| Containment* | 169 F |

*If it is assumed that a single failure causes a loss of containment integrity, both RHR heat exchangers would be available and peak suppression pool temperature would be 169 F.

Credit for containment accident pressure is not needed if the suppression pool temperature is less than 185 F.

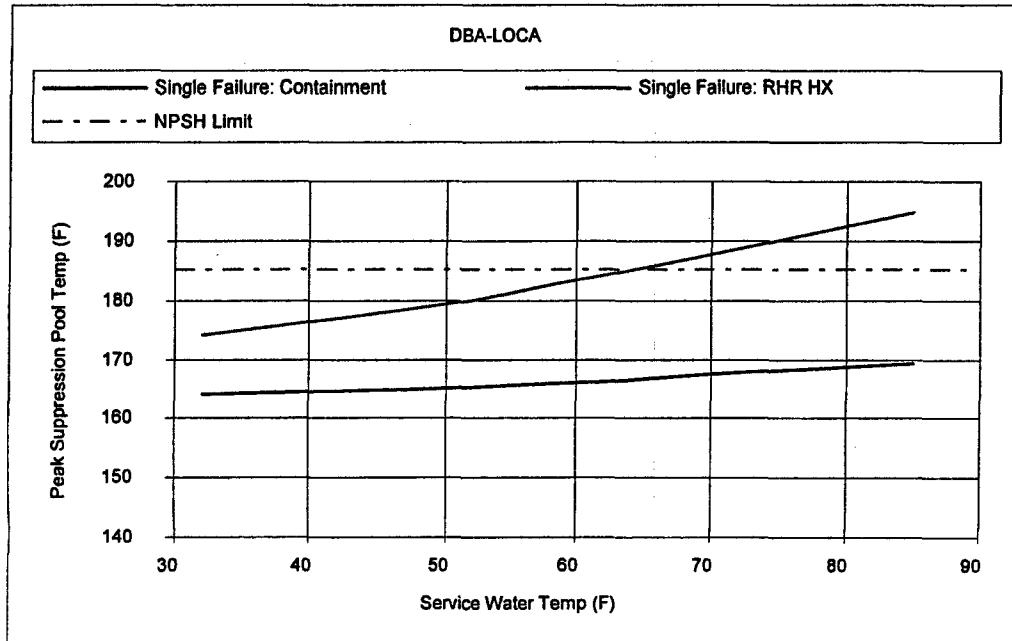
20

Defense-in-Depth

- Because the need to credit containment accident pressure for NPSH arises from the conservatisms in the calculations, eliminating excess conservatism eliminates the need to credit containment accident pressure.
- Dependence between barriers has been raised as an issue, however for VY based on the way calculation is done, there is no realistic physical dependence between barriers.
- Therefore, NRC staff considers defense-in-depth is maintained.

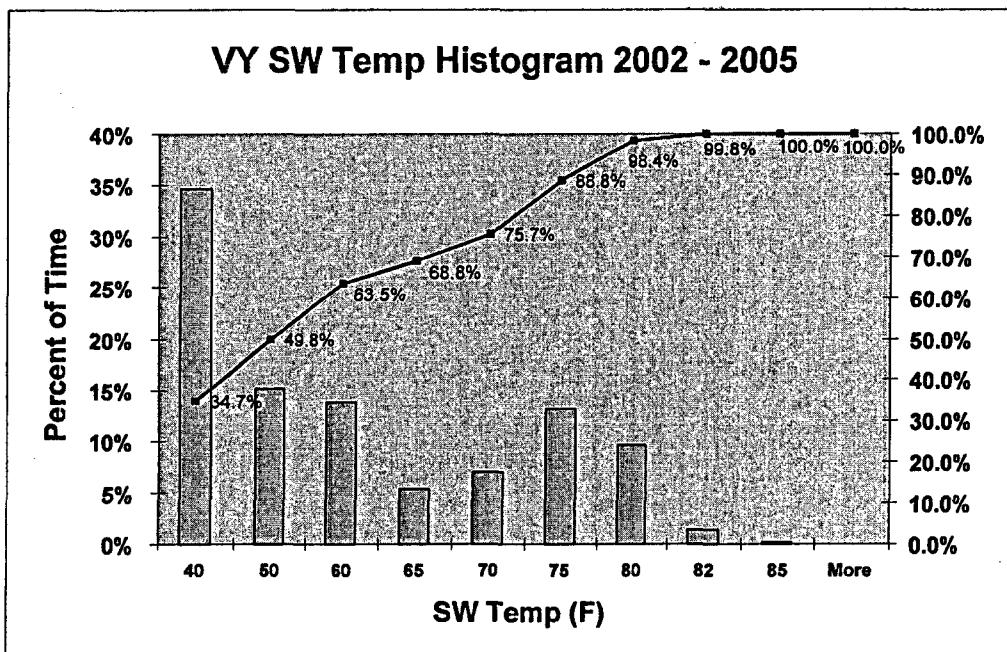
21

VY Sensitivity Study



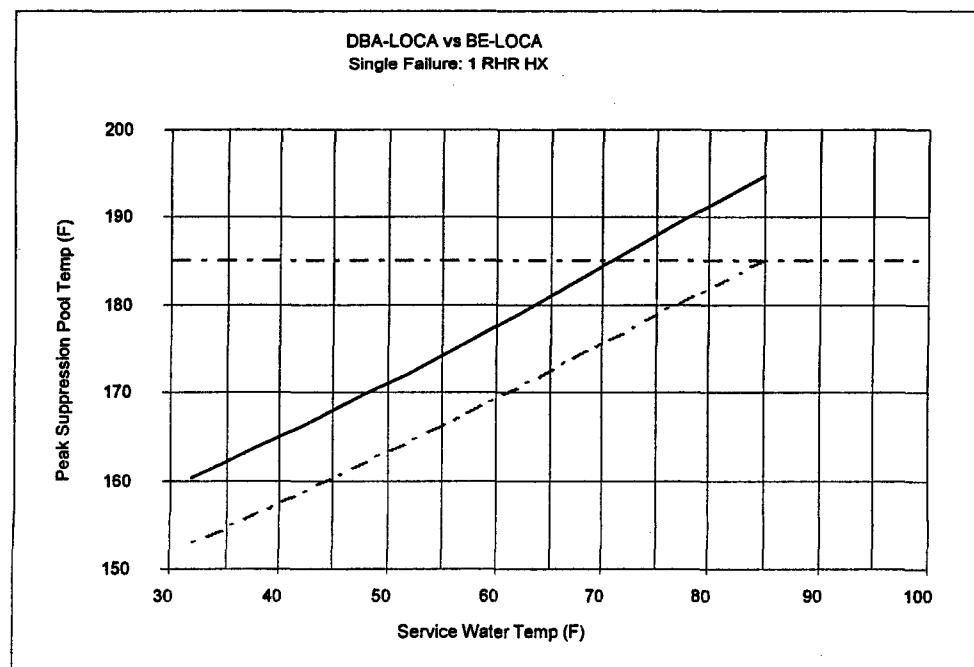
22

VY Sensitivity Study (continued)



23

VY Sensitivity Study (continued)



24

Summary

- NRC staff finds that credit for containment accident pressure for VY is acceptable and is based on conservative calculations:
 - ▶ These calculations result in the need to credit containment accident pressure
 - ▶ A more realistic, but still conservative, calculation would show that credit is not needed
- Single failure resulting in a loss of containment integrity will not result in a loss of NPSH margin.

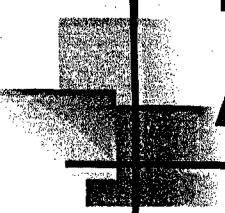


ACRS Full Committee

Vermont Yankee Extended Power Uprate
Containment Overpressure Credit

December 7, 2005

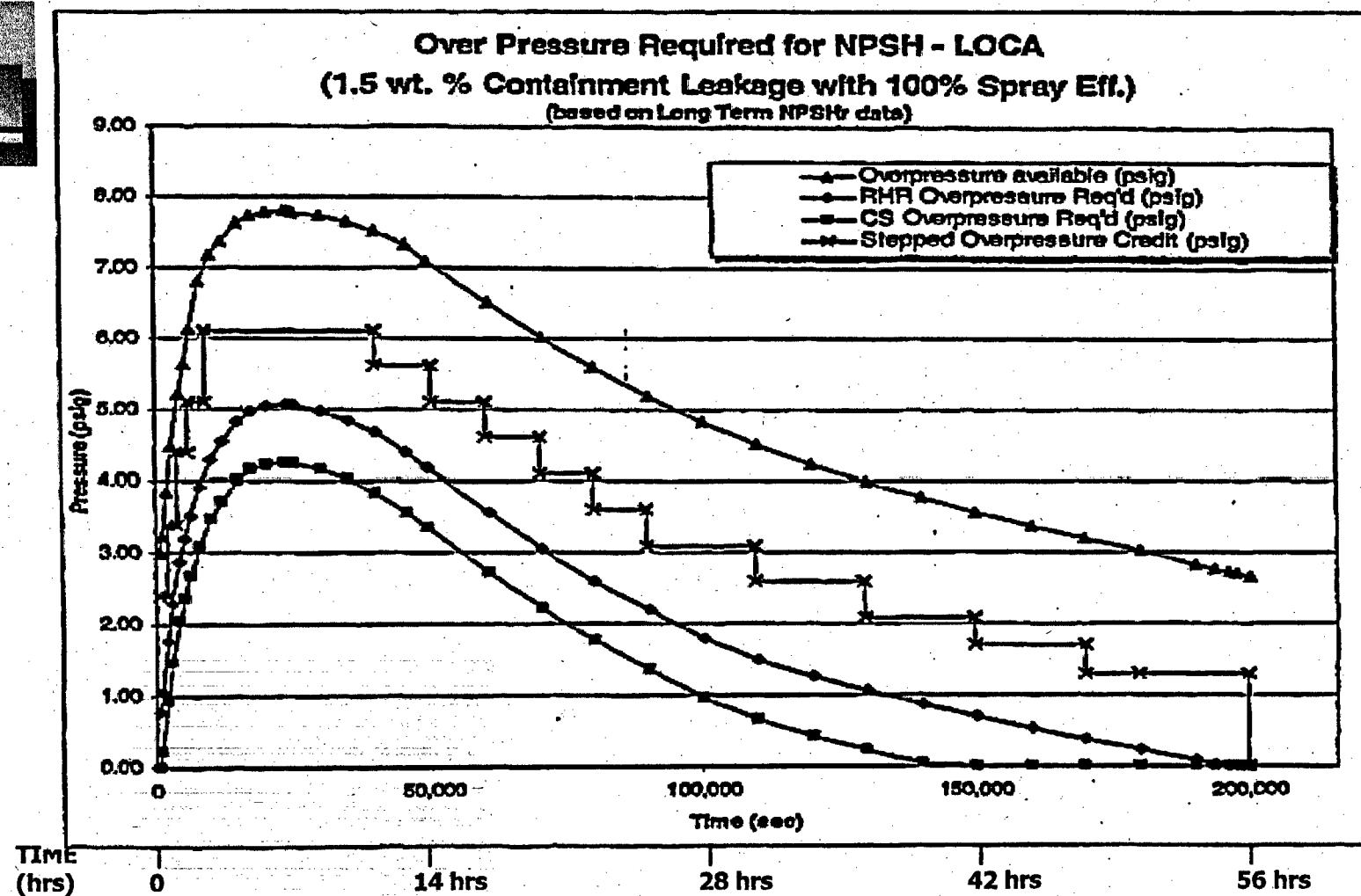
Bill Sherman – VT Dept of Public Service

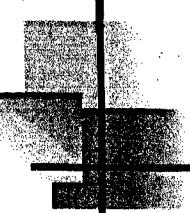


Proposal Does Not Appear to Meet ACRS Letter September 20, 2005

- Longer than a few hours
- There are practical alternatives
- There is not full positive indication of containment integrity
- Containment integrity has not been demonstrated for the credited time period

Figure 4.2 LOCA – Long Term (1.5 wt. % Containment Leakage & 100% Spray Efficiency)

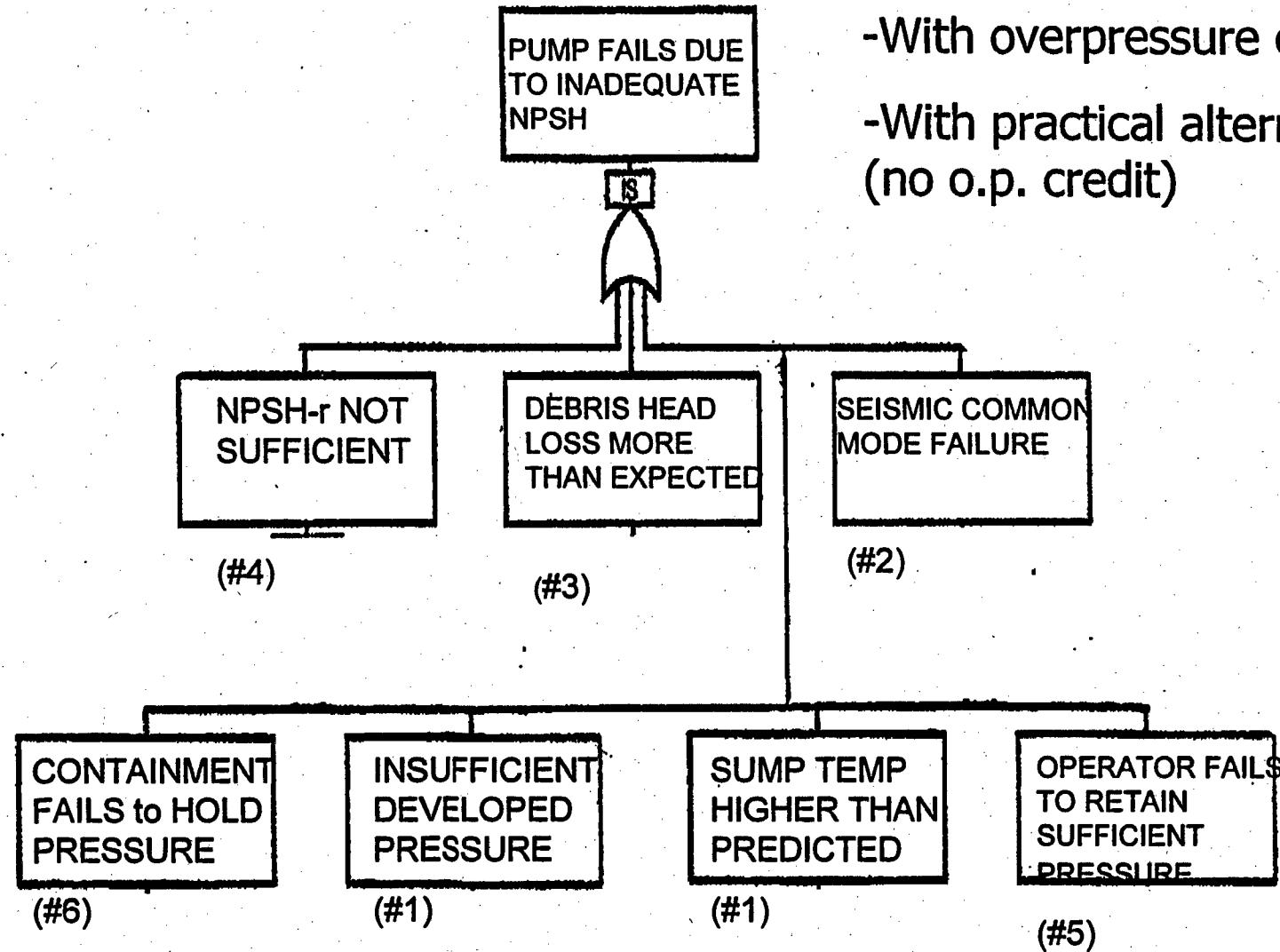




Staff Response to ACRS Letter

- 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 analyzed part of the problem, but not the whole problem. An analysis of the whole problem would shed light on the risk of the overpressure proposal

NEW TOP EVENT



Two Cases:

- With overpressure credit
- With practical alternative (no o.p. credit)

| U.S. NUCLEAR REGULATORY COMMISSION | | | | | | | | APPROVED BY OMB: NO. 3150-0104 EXPIRE: 06/30/2007 | | | | | | |
|--|--------|-----------|---|--|---|---|--|---|---|---|--|--|--|---|
| LICENSEE EVENT REPORT (LER) | | | | | | | | Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F-2), LLB, Nuclear Regulatory Commission, Washington, DC 20585-0001, or by internet e-mail to Records@NRC.gov , or to the Data Officer, Office of Information and Resource Affairs (NEOB-10209), (3150-0104), Office of Management and Budget, Washington, DC 20583. If a person is required to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection. | | | | | | |
| 1. FACILITY NAME VERMONT YANKEE NUCLEAR POWER STATION (VY) | | | | 2. DOCKET NUMBER 05000 271 | | | 3. PAGE 1 OF 3 | | | | | | | |
| 4. TITLE Primary Containment Leak Rate Testing Program Second Barrier Isolation Valve Found Mis-Positioned | | | | | | | | | | | | | | |
| 5. EVENT DATE 10 04 2005 | | | 6. LER NUMBER 2005 - 002 - 00 | | | 7. REPORT DATE 12 01 2005 | | 8. OTHER FACILITIES INVOLVED | | | | | | |
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REV NO. | MONTH | DAY | YEAR | FACILITY NAME N/A | DOCKET NUMBER | | | | |
| 10 | 04 | 2005 | 2005 | - 002 | - 00 | 12 | 01 | 2005 | FACILITY NAME N/A | DOCKET NUMBER | | | | |
| 9. OPERATING MODE N | | | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check all that apply) | | | | | | | | | | | |
| | | | <input type="checkbox"/> 20.2201(b) | <input type="checkbox"/> 20.2203(a)(3)(i) | <input type="checkbox"/> 50.73(a)(2)(ii)(C) | <input type="checkbox"/> 50.73(a)(2)(iv) | <input type="checkbox"/> 20.2201(g) | <input type="checkbox"/> 20.2203(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 20.2203(a)(1) | <input type="checkbox"/> 20.2203(a)(4) | <input type="checkbox"/> 50.73(a)(2)(ii)(B) | <input type="checkbox"/> 50.73(a)(2)(iv)(B) |
| | | | <input type="checkbox"/> 20.2203(a)(2)(i) | <input type="checkbox"/> 50.30(c)(1)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(ii)(D) | <input type="checkbox"/> 50.73(a)(2)(iv)(D) | <input type="checkbox"/> 20.2203(a)(2)(ii) | <input type="checkbox"/> 50.30(c)(1)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(iii) | <input type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.30(c)(2) | <input type="checkbox"/> 50.73(a)(2)(v)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(B) |
| | | | <input type="checkbox"/> 20.2203(a)(2)(iv) | <input type="checkbox"/> 50.40(a)(3)(i) | <input type="checkbox"/> 50.73(a)(2)(v)(C) | <input type="checkbox"/> 73.71(a)(4) | <input type="checkbox"/> 20.2203(a)(2)(v) | <input type="checkbox"/> 50.73(a)(2)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(D) | <input type="checkbox"/> OTHER | <input type="checkbox"/> 20.2203(a)(2)(vi) | <input type="checkbox"/> 50.73(a)(2)(v)(B) | <input type="checkbox"/> Specify in Abstract below or in NRC Form 368A | |
| 12. LICENSEE CONTACT FOR THIS LER CONTACT NAME William F. Maguire, General Manager Plant Operations | | | | | | | | | | | TELEPHONE NUMBER (Include Area Code) (802) 257-7711 | | | |
| 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT | | | | | | | | | | | | | | |
| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIC | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIC | | | | | |
| N/A | | | | | N/A | | | | | | | | | |
| 14. SUPPLEMENTAL REPORT EXPECTED <input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO | | | | | 15. EXPECTED SUBMISSION DATE | | | MONTH | DAY | YEAR | | | | |
| | | | | | MONTH | DAY | YEAR | | | | | | | |
| ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) | | | | | | | | | | | | | | |
| <p>On 10/04/05, with the reactor at full power, a sample line isolation valve, V10-198A on the Residual Heat Removal (RHR) "A" Loop was found open. V10-198A is a second barrier that supports Primary Containment Integrity and is required to be closed per the Primary Containment Leakage Rate Testing Program (PCLRTP). Upon discovery, Operators closed V10-198A and placed it under administrative control. This condition was identified while reviewing a Safety Classification Worksheet for a different valve in the RHR system sample line. The RHR System procedure valve line-up listed V10-198A as "open" and the RHR System Piping and Instrumentation Diagram (P&ID) displayed it as "closed". The open valve provided a potential flow path of water from Primary Containment to Secondary Containment. Two air operated valves and a manual sample valve located downstream of V10-198A provided reasonable assurance that effective isolation for this flow path was maintained during plant operation. The cause of this condition was the application of an insufficient change process in 1998 during implementation of the Qualified Closed Loop Outside Primary Containment modification that lacked sufficient documentation and reviews to effectively implement the change. There was no significant increase in radiological risk to plant workers or the public as a result of this condition.</p> | | | | | | | | | | | | | | |

Example this week of a containment isolation valve left open for 10 years

LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

| | | | | | | | | | | |
|--|--------|-----------|---|---|---|---|-----------|--------------|-------------------------------|-------------------|
| 1. FACILITY NAME VERMONT YANKEE NUCLEAR POWER STATION (VY) | | | | | | | | | 2. DOCKET NUMBER 05000 271 | 3. PAGE 1 OF 3 |
| 4. TITLE Primary Containment Leak Rate Testing Program Second Barrier Isolation Valve Found Miss-Positioned | | | | | | | | | | |
| 5. EVENT DATE MONTH DAY YEAR | | | 6. LER NUMBER YEAR SEQUENTIAL NUMBER REV NO. | | | 7. REPORT DATE MONTH DAY YEAR | | | 8. OTHER FACILITIES INVOLVED | |
| 10 | 04 | 2005 | 2005 | - 002 - | 00 | 12 | 01 | 2005 | FACILITY NAME N/A | DOCKET NUMBER |
| 9. OPERATING MODE N | | | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) | | | | | | | |
| | | | <input type="checkbox"/> 20.2201(b) | <input type="checkbox"/> 20.2203(a)(3)(i) | <input type="checkbox"/> 50.73(a)(2)(i)(C) | <input type="checkbox"/> 50.73(a)(2)(vii) | | | | |
| | | | <input type="checkbox"/> 20.2201(d) | <input type="checkbox"/> 20.2203(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(viii)(A) | | | | |
| | | | <input type="checkbox"/> 20.2203(a)(1) | <input type="checkbox"/> 20.2203(a)(4) | <input type="checkbox"/> 50.73(a)(2)(ii)(B) | <input type="checkbox"/> 50.73(a)(2)(viii)(B) | | | | |
| | | | <input type="checkbox"/> 20.2203(a)(2)(i) | <input type="checkbox"/> 50.36(c)(1)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(iii) | <input type="checkbox"/> 50.73(a)(2)(x)(A) | | | | |
| | | | <input type="checkbox"/> 20.2203(a)(2)(ii) | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x) | | | | |
| | | | <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.36(c)(2) | <input type="checkbox"/> 50.73(a)(2)(v)(A) | <input type="checkbox"/> 73.71(a)(4) | | | | |
| | | | <input type="checkbox"/> 20.2203(a)(2)(iv) | <input type="checkbox"/> 50.46(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(v)(B) | <input type="checkbox"/> 73.71(a)(5) | | | | |
| | | | <input type="checkbox"/> 20.2203(a)(2)(v) | <input type="checkbox"/> 50.73(a)(2)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(C) | <input type="checkbox"/> OTHER | | | | |
| | | | <input checked="" type="checkbox"/> 20.2203(a)(2)(vi) | <input checked="" type="checkbox"/> 50.73(a)(2)(i)(B) | <input type="checkbox"/> 50.73(a)(2)(v)(D) | Specify in Abstract below or in NRC Form 366A | | | | |
| 12. LICENSEE CONTACT FOR THIS LER CONTACT NAME William F. Maguire, General Manager Plant Operations | | | | | | | | | | |
| TELEPHONE NUMBER (Include Area Code) (802) 257-7711 | | | | | | | | | | |
| 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT | | | | | | | | | | |
| CAUSE N/A | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX | CAUSE N/A | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX | |
| 14. SUPPLEMENTAL REPORT EXPECTED <input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO | | | | | 15. EXPECTED SUBMISSION DATE | | | MONTH | DAY | YEAR |
| ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) | | | | | | | | | | |
| <p>On 10/04/05, with the reactor at full power, a sample line isolation valve, V10-198A on the Residual Heat Removal (RHR) "A" Loop was found open. V10-198A is a second barrier that supports Primary Containment integrity and is required to be closed per the Primary Containment Leakage Rate Testing Program (PCLRTP). Upon discovery, Operators closed V10-198A and placed it under administrative control. This condition was identified while reviewing a Safety Classification Worksheet for a different valve in the RHR system sample line. The RHR System procedure valve line-up listed V10-198A as "open" and the RHR System Piping and Instrumentation Diagram (P&ID) displayed it as "closed". The open valve provided a potential flow path of water from Primary Containment to Secondary Containment. Two air operated valves and a manual sample valve located downstream of V10-198A provided reasonable assurance that effective isolation for this flow path was maintained during plant operation. The cause of this condition was the application of an insufficient change process in 1996 during implementation of the Qualified Closed Loop Outside Primary Containment modification that lacked sufficient documentation and reviews to effectively implement the change. There was no significant increase in radiological risk to plant workers or the public as a result of this condition.</p> | | | | | | | | | | |

LICENSEE EVENT REPORT (LER)

| 1. FACILITY NAME | 2. DOCKET | 6. LER NUMBER | | | 3. PAGE |
|--|-----------|---------------|----------------------|--------------------|---------|
| VERMONT YANKEE NUCLEAR POWER STATION (VY) | 05000 271 | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | 2 OF 3 |
| | | 2005 | 002 | 00 | |

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

DESCRIPTION

On 10/04/05, with the reactor at full power, a 3/4" manual globe valve for the Residual Heat Removal (RHR) "A" Loop sample line (V10-198A) was found open. V10-198A is a second barrier to Primary Containment and is required to be closed as necessary to maintain the RHR system water seal during plant operation per the Primary Containment Leakage Rate Testing Program (PCLRTP). This condition was discovered while reviewing a Safety Classification Worksheet for a different valve in the RHR sample line. The RHR System procedure valve line-up listed V10-198A as "open" and the RHR System Piping and Instrumentation Diagram (P&ID) displayed the valve as "closed". The open valve provided a potential flow path of water from Primary Containment to Secondary Containment for the water seal that serves as part of the second barrier for Primary Containment, during a Design Basis Loss of Coolant Accident with a concurrent seismic event.

Upon discovery of this condition, Operators closed V10-198A and placed it under administrative control by tagging the valve "SHUT". Two normally closed air operated valves (AOV) and a normally closed manual sample valve located downstream of V10-198A provided reasonable assurance that effective isolation for this flow path was maintained during plant operation. The RHR "keep fill" line maintains system pressure during normal operation to continuously demonstrate that Primary Containment Integrity is maintained. Any leakage through the series of closed valves would have been into the Reactor Building Sample Sink which is within the envelope of Secondary Containment and would be detected by Operations or Chemistry personnel.

The three valves located downstream of V10-198A are not credited as Primary Containment Isolation valves within the Program Procedure for the PCLRTP. However, both of the in-line AOVs close on a Primary Containment Isolation System (PCIS) signal and are designed with a fail-safe feature to close on a loss of instrument air. The manual sample valve located downstream of the PCIS valves is also maintained in the closed position. Additionally, the first AOV in the series, FCV10-160, is designed to perform during and after a design bases seismic event.

This condition was determined to be reportable to the NRC as a Condition Prohibited by Technical Specifications in accordance with 10CFR50.73(a)(2)(i)(B). VY Technical Specification 3.7.A.2 states that Primary Containment integrity shall be maintained at all times when the reactor is critical. Technical Specification 4.7.A.2 provides a surveillance requirement to ensure that this is accomplished by stating that Primary Containment integrity shall be demonstrated by the PCLRTP. Also, Technical Specification Definition 1.0.N. for Primary Containment Integrity states that all manual containment isolation valves that are not required to be open during accident conditions, are closed, and may be opened intermittently under administrative controls. V10-198A was not in the required closed position prior to discovery of this condition and was not administratively controlled open by a dedicated operator.

CAUSE

The root cause of this condition was determined to be the application of an insufficient change process (Job Order File process) that was utilized in October of 1996 during implementation of the Qualified Closed Loop Outside Primary Containment modification. The process that was used lacked sufficient documentation and reviews to effectively implement the change.

Contributing Causes included the following:

- 1) The inter-relationships between P&ID valve position, operating procedure valve position, and locked valve criteria were not well understood when the event occurred.
- 2) Thirty five successive revisions up to 1989 to the subject P&ID reduced the sharpness of the image quality for V10-198A causing the valve's normal "open" position to appear as "closed".

LICENSEE EVENT REPORT (LER)

| 1. FACILITY NAME | 2. DOCKET | 6. LER NUMBER | | | 3. PAGE |
|--|-----------|---------------|----------------------|--------------------|---------|
| VERMONT YANKEE NUCLEAR POWER STATION (VY) | 05000 271 | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | 3 OF 3 |
| | | 2005 | - 002 - | 00 | |

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

ASSESSMENT OF SAFETY CONSEQUENCES

The subject valve is a second barrier for Primary Containment per the PCLRTP. The first barrier valves remained operable and closed as required. There are two AOVs located downstream of V10-198A that are designed to automatically close on a PCIS signal or on a loss of instrument air. A third manually operated sampling isolation valve located downstream of the two AOVs is maintained in the closed position. Additionally, incidental leakage from the system past these three valves would be detected by Operations or Chemistry personnel at the Reactor Building Sample Sink. Therefore, reasonable assurance existed that Primary Containment Integrity was maintained. This condition did not result in a significant increase in radiological risk or industrial risk to plant workers or the general public in the event of a design bases accident.

CORRECTIVE ACTIONS

The Job Order File process that was used when this condition occurred was superseded by an improved design control process. The procedures that implement the current design control process provide clearer and more concise direction that would likely have prevented this condition from occurring if utilized in 1996.

Immediate Actions

- Upon discovery and confirmation of this condition, V10-198A was closed and administratively tagged "SHUT".

Interim Actions

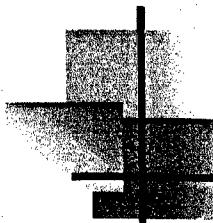
- V10-198A was added to the "Current System Valve and Breaker Line Up and Identification" procedure controlled population.
- A drawing change was submitted for the subject P&ID to indicate V10-198A/B normal positions as locked closed.
- The RHR System procedure's appendix for normal system line up was changed to control V10-198A as closed.
- The RHR and Core Spray system procedures were verified to ensure that the valve line-ups contained within them are in agreement with the procedure for the PCLRTP. No additional discrepancies were noted.
- On November 10, 2005, the Vice President of Engineering distributed a memo to all Vermont Yankee site employees titled "Configuration Control at Vermont Yankee". This correspondence described the event, expectations for configuration control, current design control processes employed within the Entergy Fleet, provided a list reference materials and described the relevant points from the reference materials that need to be reinforced to prevent this type of event from recurring.
- Radiation Protection containment sampling procedures were reviewed to ensure compliance with TS 1.0.N.1 and the PCLRTP Procedure administrative controls for manual containment isolation valves. No discrepancies were noted.

Long Term Actions

- A review of other Job Order File changes from the same time frame will be performed to assess the potential for similar conditions.
- Evaluate the need to review and as necessary correct the image quality and valve positions for the Control Room P&IDs referenced in the PCLRTP procedure.

ADDITIONAL INFORMATION

No similar events have occurred at Vermont Yankee within the past ten years.

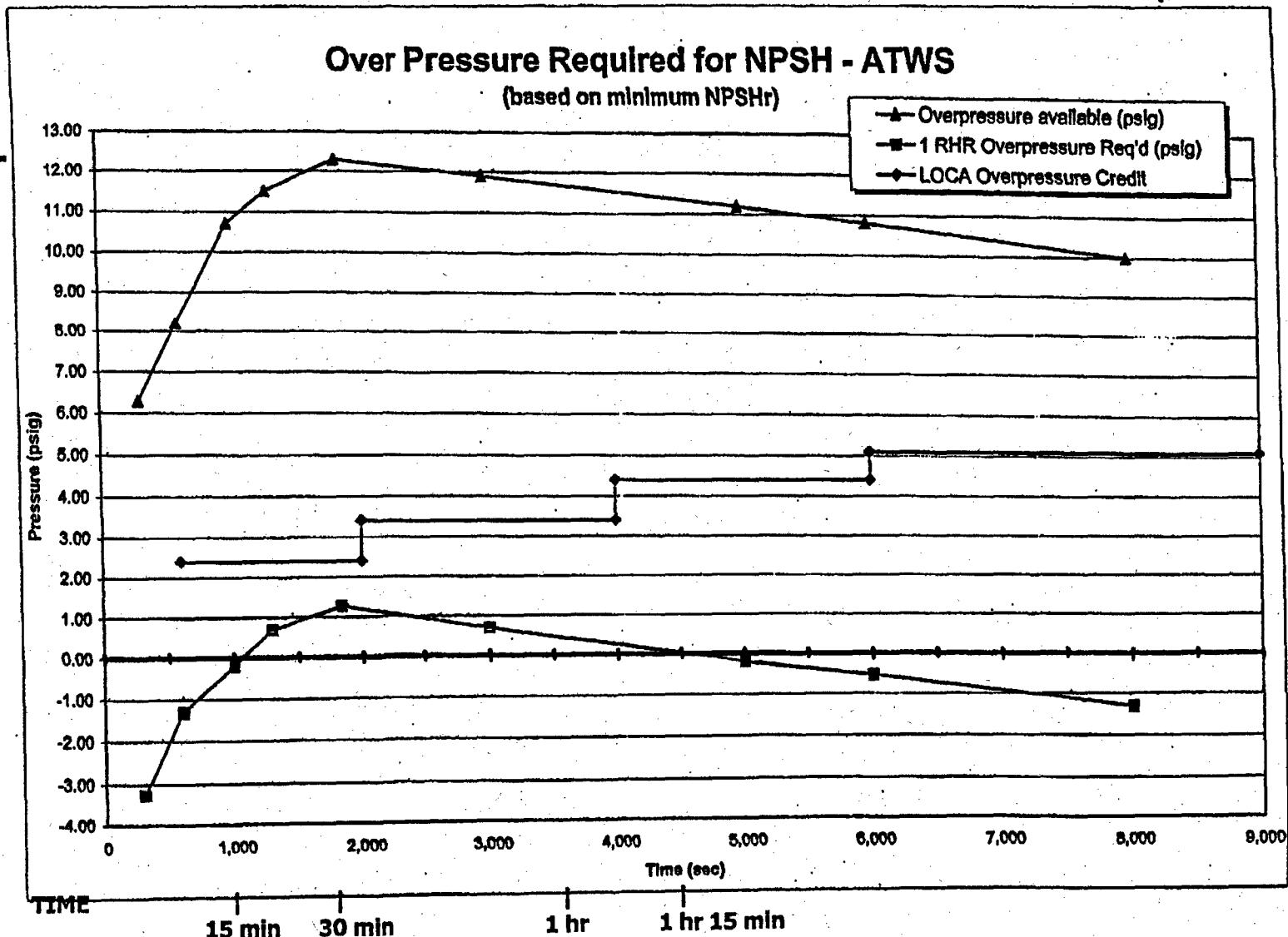


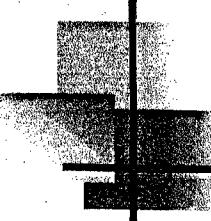
ATWS NPSH Evaluation Deserves More Questions

- Asking overpressure credit for 1.25 hours
- More energy in ATWS than LOCA
- Pressure developed differently
- The type of conservative assumptions used for LOCA are not employed for ATWS

Figure 4.3-1

VYC-0808 Rev 8
Page 53 of 58





SUMMARY

- Under the ACRS Letter of 9-20-05, overpressure credit should not be granted.
- Under Dr. Sheron's proposal:
 1. Modification of the defense-in-depth concept is troublesome
 2. Entergy analyzed part of the problem, but not the whole problem. An analysis of the whole problem would shed light on the risk of the overpressure proposal.

Pilot Engineering and Design Inspection at Vermont Yankee

Raymond Shadis
New England Coalition

BEFORE A MEETING OF THE ADVISORY
COMMITTEE ON REACTOR SAFEGUARDS

December 7, 2005
Rockville, Maryland

COMPARING NRC INSPECTION AND IEA

VPSB REQUESTED IEA

- deep vertical slice of 4 systems
- 2 safety systems
- 2 maintenance rule systems
- implies EOC review
- level of effort – 4 persons/4 weeks/40 hours or 640 dedicated hours
- independent

NRC DID PILOT ETI

- 45 components and operations of high risk/low margin
- eight issues were found
- limited extent of condition review
- 910 hours-500 routine + 410 pilot
- independent (2 yr)

COMPARING GOALS AND RESULTS

VPSB

- INDICATORS OF RELIABILITY**
- ADDRESS PUBLIC CONCERN FOR SAFETY AND CALLS FOR AN ISA**

NRC

- QUALITY OF ENGINEERING**
- CONFIRM DESIGN AND OPERATION**
- FIND AND FIX**
- DID NOT PROBE AREAS WHERE PROBLEMS HAVE OCCURRED AT VY & OTHER EPU PLANTS**

Staff Conclusions – Secy-05-0118

- NRC staff reported- pilot inspection to be improvement over ROP periodic inspection -found 8 issues per 1000 hours , old program found 4.5 per 1000 hours.
- Staff recommends engineering and design basis inspection be added to EPU review
- Staff found eight safety issues in 45 components/actions examined-small sample, large yield
- Staff stated that VY issues would not have been found in routine inspection

Comparing Pilot Inspection and Diagnostic Evaluation Team or ISA

PILOT INSPECTION

- small biased sample- high risk/low margin
- some focus on epu
- team members unfamiliar with epu and/or vy
- limited extent of condition review

DIAGNOSTIC EVAL.

- large sample by system type
- team members experienced in diagnostic evaluation
- large horizontal component- extent of condition/cause

Comparing Pilot Inspection and Diagnostic Evaluation Team or ISA...continued

PILOT INSPECTION

- Independence was marked by 2 year separation from Vermont Yankee and Entergy

DET or ISA

- Maine Yankee ISA excluded NRC personnel from Region I and the Office of Nuclear Reactor Regulation