

DISCLAIMER

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

July 9, 2008

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, taken on July 9, 2008, 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.

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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554TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

+ + + + +

WEDNESDAY,

JULY 9, 2008

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The Advisory Committee met at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B3, 11545 Rockville Pike, Rockville, Maryland, at
8:30 a.m., WILLIAM J. SHACK, Ph.D., Chair, presiding.

MEMBERS PRESENT:

WILLIAM J. SHACK, Chair

MARIO V. BONACA, Vice Chair

SAID ABDEL-KHALIK, Member-at-Large

GEORGE E. APOSTOLAKIS

J. SAM ARMIJO

SANJOY BANERJEE

DENNIS C. BLEY

CHARLES H. BROWN, JR.

MICHAEL L. CORRADINI

OTTO L. MAYNARD

DANA A. POWERS

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MEMBERS PRESENT (Continued):

HAROLD B. RAY

MICHAEL T. RYAN

JOHN D. SIEBER

JOHN W. STETKAR

I-N-D-E-X

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I-N-D-E-X (Continued)

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

14) OPENING REMARKS BY THE ACRS CHAIRMAN

1.1) OPENING STATEMENT

CHAIRMAN SHACK: The meeting will now come to order. And it's a minute early. It's actually three minutes early. This is the first day of the 554th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following: stretch power uprate application for Millstone Power Station, Unit 3, selected chapters of the safety evaluation report associated with the ESBWR design certification application, some safeguards and security matters, and preparation of ACRS reports.

Portions of the sessions related to the stretch power uprate application for Millstone unit 3 and ESBWR design certification application may be closed to protect proprietary information applicable to these matters pursuant to 5 USC 552b(c)(4).

Also, a portion of the session on safeguards and security matters will be closed to protect information classified as national security information as well as safeguards information pursuant to 5 USC 552b(c)(1) and (3).

This meeting is being conducted in

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1 accordance with the provisions of the Federal Advisory
2 Committee Act. Mr. Sam Duraiswamy is the designated
3 federal official for the initial portion of the
4 meeting.

5 A transcript of the meeting is being kept.
6 And it is requested that speakers use one of the
7 microphones, identify themselves, and speak with
8 sufficient clarity and volume so that they can be
9 readily heard.

10 We have received no written comments from
11 members of the public regarding today's sessions. We
12 have received a request from Ms. Nancy Burton,
13 Connecticut Coalition Against Millstone, for time to
14 make oral statements regarding Millstone unit 3 power
15 uprate. Also, we have received a request from Jim
16 Riccio, Greenpeace, for time to make an oral statement
17 regarding safeguard and security matters.

18 1.2) ITEMS OF CURRENT INTEREST

19 CHAIRMAN SHACK: I will begin with some
20 items of current interest. I point out to the members
21 you might want to look at the items of interest. In
22 particular, there is a speech by Commissioner Lyons,
23 in which he refers to some ACRS letters on digital
24 I&C.

25 We would like to welcome aboard Mr. Harold

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1 Ray and Dr. Michael Ryan. We are now full statutory
2 strength of 15 members of the ACRS. Our new members
3 are official members, and welcome aboard.

4 MEMBER RAY: Thank you.

5 (Applause.)

6 CHAIRMAN SHACK: I would like to welcome
7 some new staff people to the ACRS. Jessica Marsden,
8 a summer intern who came on board recently, is a
9 senior at the University of Delaware studying
10 sociology with a concentration in social welfare. She
11 may understand the dynamics of the Committee.

12 She plans to attend the University of
13 Maryland, Baltimore to work towards a Master's degree
14 in sociology. I think she's --

15 (Applause.)

16 CHAIRMAN SHACK: Michael Lee Benson
17 graduated with a Ph.D. from the University of
18 Tennessee at Knoxville in May 2008. His major was
19 material science and engineering.

20 Michael has performed experimental work in
21 his thesis in the areas of fatigue, fracture, and
22 mechanical behavior of metallic materials. All right.

23 Under the Nuclear Safety Professional
24 Development Program, he has joined the NRC ACRS as a
25 general engineer on July 7th, 2008. Welcome aboard.

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1 (Applause.)

2 CHAIRMAN SHACK: And it is with regret
3 that I also want to make an announcement about the
4 departure of Frank Gillespie. This will be the last
5 ACRS meeting for which Frank is the Executive Director
6 of the ACRS.

7 Frank has been an Executive Director for
8 a relatively short time compared to our usual range of
9 Executive Directors, but I think he has done some
10 important things to get us ready for the onslaught of
11 what we hope will be applications for new reactor
12 licenses. And I think he has left us well-prepared.

13 He has had a long and illustrious history
14 at the NRC. Just in the time I have been on the ACRS,
15 I have seen him here wearing so many hats it's hard to
16 keep track of. But Frank has been a pioneer in
17 risk-informed regulation and license renewal work.
18 And, as I say, I think he has done an excellent job in
19 the time that he has been with the ACRS.

20 And I know we wish him well in his new job
21 with a vendor, Mitsubishi, working on the APWR
22 reactor.

23 (Applause.)

24 CHAIRMAN SHACK: He will be back on the
25 other side of the table.

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1 Our first topic this morning is a stretch
2 power uprate application for the Millstone Power
3 Station Unit 3. And Jack Sieber will be leading us
4 through that.

5 MEMBER SIEBER: Thank you, Mr. Chairman.

6 2) STRETCH POWER UPRATE APPLICATION FOR

7 MILLSTONE POWER STATION, UNIT 3

8 2.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

9 MEMBER SIEBER: Yesterday, we had the
10 subcommittee meeting on the Millstone 3 stretch power
11 uprate, at which ten members were present. So this
12 will be a review for those ten, and five members were
13 not here. So these will be new presentations for
14 them.

15 At yesterday's meeting, we decided that we
16 would concentrate our efforts today on the stretch
17 power uprate overview, fuel and safety analysis, and
18 the containment analysis due to the limited time that
19 we have.

20 What I would like to do is to introduce
21 Joseph Gitter, who is Director of the Division of
22 Operator Reactor Licensing in NRR, to introduce the
23 topics and the speakers this morning.

24 MR. GIITTER: Thank you, Dr. Sieber.

25 2.2) BRIEFING BY AND DISCUSSIONS WITH

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1 REPRESENTATIVES OF THE NRC STAFF, DOMINION
2 NUCLEAR CONNECTICUT, INC. AND ITS CONTRACTOR

3 MR. GIITTER: Good morning. I'm Joe
4 Giitter. I've only been in my job for about a week,
5 so you are going to have to pardon me. I can tell you
6 based on my interaction with the staff that this is an
7 area where the staff has been working very hard.

8 The staff has focused on providing
9 products that are technically excellent. And today
10 you're going to hear in a little more detail what the
11 staff has done in their review of the stretch power
12 uprate for the Dominion Nuclear Connecticut
13 application.

14 The licensee submitted a license amendment
15 request for an approximately seven percent stretch
16 power uprate on June 13th, 2007 for Millstone Power
17 Station Unit 3 and the proposed SPU would increase the
18 maximum authorized power level of Millstone 3 from
19 3,411 megawatts-thermal to 3,650 megawatts-thermal.

20 By memorandum from Frank Gillespie,
21 Executive Director of the ACRS, to Luis Reyes, then
22 the Executive Director for Operations, it was -- the
23 memo was dated April 23rd, 2008, the ACRS decided to
24 review the proposed SPU for Millstone 3.

25 As I said earlier, I believe you are going

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1 to hear the results of a thorough NRC staff review of
2 the application submitted by DNC. One thing I will
3 add is that we had frequent communications with the
4 licensee that involved conference calls, letters,
5 meetings, and we believe that substantially
6 facilitated an effective and efficient review.

7 Finally, there were several rounds of
8 requests for additional information, or RAIs, issued
9 to the licensee. The RAIs were submitted as they were
10 developed, allowing the licensee as much time as
11 possible to review and respond to the RAIs in
12 different technical areas.

13 The most challenging review area that you
14 are going to hear about in the next couple of hours is
15 the fuel and core design analysis. As presented in
16 the safety evaluation, which was provided to the ACRS
17 in June 11th, 2008, there are no current technical
18 issues open in the staff's, NRC staff's, review of
19 DNC's proposed SPU.

20 In summary, I am pleased with the
21 thoroughness of the review conducted by the NRC staff.
22 And I am also very pleased with the effective and
23 extensive interactions with DNC on a number of diverse
24 technical issues.

25 At this point I would like to turn the

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1 discussions over to our NRR Senior Project Manager to
2 my left, John Lamb, who will introduce the
3 discussions.

4 MR. LAMB: Good morning. My name is John
5 Lamb. I am the Senior Project Manager in NRR assigned
6 to the Millstone 3 stretch power uprate.

7 The staff's primary concern is safety.
8 Our purpose is to convince you over the course of the
9 next couple of hours that the staff's safety
10 evaluation, or SE, for the Millstone Power Station
11 Unit 3 SPU provides reasonable assurance that the
12 health and safety of the public will not be endangered
13 by operation of the proposed SPU. We hope that you
14 agree with this and reflect this in your letter
15 report.

16 Before I go over the agenda, I would like
17 to present some background information related to the
18 staff's review of the proposed Millstone 3's SPU.

19 Millstone 3 is a Westinghouse four-loop
20 pressurized water reactor, or PWR. The proposed SPU
21 would increase the maximum authorized thermal power
22 level from the current licensed power level of 3,411
23 megawatts-thermal to 3,650 megawatts-thermal. This
24 represents an approximate seven percent increase from
25 the current licensed thermal power. On January 31st,

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1 1986, the NRC licensed Millstone 3 for full power
2 operation at 3,411 megawatts-thermal.

3 Millstone 3 has a renewed license. The
4 ACRS reviewed the Millstone license renewal during the
5 525th meeting and wrote a letter report dated
6 September 22nd, 2005 recommending that the license
7 renewal be approved.

8 Millstone 3 license renewal was approved
9 in October 2005 under NUREG-1838, titled, Safety
10 Evaluation Report related to the license renewal of
11 the Millstone power station units 2 and 3. The
12 Millstone 3 renewed operating license now expires
13 November 25th, 2045.

14 Per the Millstone 3 SPU, the staff used
15 RS-001, which is the renewed standard for extended
16 power uprates, as guidance along with an internal
17 document titled Power Uprate Guidance, provided by
18 memorandum from Christopher P. Jackson to the NRC to
19 the Special Projects Branch of the NRC dated February
20 6th, 2006 as well as the experience gained from
21 previously approved Westinghouse SPUs, such as Indian
22 Point 2 and 3 and Seabrook.

23 The review standard includes a safety
24 evaluation template as well as matrices that
25 correspond to the maintenance areas that are to be

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1 reviewed by the staff as well as specific guidance and
2 the acceptance criteria that apply to those review
3 areas.

4 Provided ACRS writes a letter report that
5 states that Millstone 3 SPU should be issued, DNC has
6 requested that the staff issue the proposed SPU
7 amendment by August 15th, 2008. DNC plans to
8 implement the proposed approximately 10 percent
9 Millstone SPU after completing the Fall 2008
10 refueling.

11 Basically DNC's application followed the
12 guidelines of the review standard for extended power
13 uprates. DNC applied for an SPU amendment by letter
14 dated July 13th, 2007. There were 33 supplements.
15 The majority of these dealt with responses to the 107
16 requests for additional information, the staff
17 questions.

18 The staff spent a great deal of time
19 reviewing the fuel and safety analysis. After I
20 conclude my remarks, DNC will provide an overview of
21 their licensing approach as well as their
22 modifications required and their implementation
23 schedule. This will be followed by presentations from
24 the licensee and the staff on the fuel and safety
25 analysis and containment analysis.

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1 This concludes my presentation as far as
2 an introduction. I would like to turn it over to Mr.
3 J. Alan Price, DNC site Vice President for Millstone
4 Power Station. This is a position Mr. Price has held
5 since January 2002. Mr. Price has approximately 29
6 years of experience in commercial nuclear power
7 operations. Here is Mr. Price.

8 MR. PRICE: Good morning. Mr. Chairman
9 and Committee members, I appreciate the opportunity to
10 come before the full ACRS Committee today and discuss
11 the proposed power uprate for the Millstone unit
12 number 3.

13 Just by way of background for how Dominion
14 has approached our power uprate project on unit number
15 3, we opted to not outsource this to a third party.
16 We maintain responsibility in-house.

17 So we put together a specific project team
18 comprised of a significant number of Dominion
19 personnel. And then we engaged some 15 to 20 outside
20 vendors to help us, including a number of our original
21 equipment manufacturers, including Westinghouse as
22 well as General Electric.

23 Early in the process, we established an
24 executive oversight committee to provide oversight for
25 the project monitoring major milestones, expected

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1 project deliverables, as well as a margin management
2 and the different potential modifications that we
3 would have to make to our facility. I generally chair
4 that executive oversight committee in my capacity as
5 a site vice president.

6 Just in way of background for myself, I
7 did hold a senior reactor operator's license at Surry
8 for about five years. That's where I began my career.
9 I've held a number of positions, including Director of
10 Nuclear Safety and Licensing at Surry, held Director
11 of Nuclear Engineering for Virginia's plants, the
12 Surry and the North Anna plants. I was plant manager
13 for Millstone unit number 2. And I have been in my
14 current capacity for the last six and a half years.

15 Some of the other members of our project
16 team include Mike O'Connor, who will be talking later
17 today. Mike previously was a shift manager on unit
18 number 3, held a senior reactor operator's license for
19 about five years, currently holds the position of
20 engineering manager.

21 Paul Russell, currently one of our
22 operating experts on a power uprate project, the unit
23 supervisor on unit 3, also holds a senior reactor
24 operator's license.

25 Mike Kai, who will be one of our principal

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1 speakers today, holds a position of a principal
2 engineer within our company. Mike is the recognized
3 expert across the Dominion fleet in the areas of
4 safety analysis and fuel performance.

5 And another member that I would like to
6 bring attention to is Mr. Dave Bucheit. Dave is our
7 recognized expert in the area of PRA. He is also
8 recognized in Region I, Region II, and Region III,
9 where our reactors reside.

10 Yesterday we covered in detail with the
11 subcommittee comparisons and analyses for pre-power
12 uprate and post-power uprate for Millstone unit number
13 3. Through the discussions and questions and answers
14 with the subcommittee, we discussed the areas of
15 performance for fuel, safety analysis, radiation
16 effluents, radiation doses, containment performance,
17 environmental qualification, and other areas.

18 The discussions led to a number of
19 comparisons and deltas between Millstone unit 3,
20 Millstone unit 2, Beaver Valley, Indian Point, Zion,
21 and a number of other power stations.

22 What became clear, at least to me, is
23 while there were differences in licensing bases and
24 design bases for a number of the plants that we
25 discussed yesterday, ultimately we all have a

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1 responsibility to meet the statutory regulations.

2 Today our focus is going to be on the
3 analyses that we did and the conclusions that we have
4 reached with regard to unit number 3 power uprate and
5 do we meet regulatory requirements, whether there are
6 margins that remain, and how will we maintain those
7 margins.

8 We will maintain those margins through a
9 variety of ways. One way is we are doing physical
10 plant modifications. One of the physical
11 modifications that we will be performing is a
12 replacement of the steam turbines for our main feed
13 pumps. We could have done a weld overlay for the
14 first stage turbine blades. That would have given us
15 adequate margins. We have elected, instead, to
16 replace the turbines to give us additional margins,
17 additional conservatism.

18 Another way that we will go about
19 maintaining margin and enhancing margin on the units
20 is through setpoint changes and through scaling
21 changes. These will be hard wire, logic changes.

22 Another way that we will maintain margin
23 or gain margin is by making hard-wired logic changes
24 in our Emergency Core Cooling System. We call that
25 permissive P19. It is a new permissive for Millstone

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1 unit number 3.

2 We think it significantly enhances the
3 safety of the unit. And we would have pursued this
4 change, whether we pursue the power uprate or not.
5 And Mike Kai and Mike O'Connor will be happy to talk
6 about this in detail during their presentation.

7 The other way that we are gaining margin
8 and managing margin is through incorporation of new,
9 recognized and more modern analysis, analytical tools
10 and analysis techniques. So you will hear about that
11 in some of the other presentations also.

12 Feedback from yesterday, as the Chairman
13 has already indicated, is that we should focus on
14 fuel, safety analysis, and containment.

15 We did take some time last evening. We
16 restructured some of our overheads. You should have
17 copies of those in front of you. And that will help
18 us focus on the topics of interest today.

19 If you kept notes, those of you who
20 attended yesterday, those presentation slides still
21 remain valid. And if you would like to refer to
22 those, we will just direct you to the correct slide to
23 help us through our discussion today.

24 We are prepared to talk about any of the
25 other areas of interest that the full Committee may

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1 have. And that completes my prepared remarks. Do you
2 have questions for me before I turn it over?

3 (No audible response.)

4 MR. PRICE: Okay. Thank you very much.

5 PARTICIPANT: Good morning. I'll start
6 off by saying thank you for giving me the opportunity
7 to present the work that we have done on fuel and
8 safety analysis. We had a full and a frank discussion
9 yesterday and addressed a number of issues.

10 As Alan said, we are going to focus on the
11 areas of meeting our regulatory requirements and what
12 we have done to maintain margin, safety margins, in
13 our plant. We'll start with the fuel.

14 The key factor in our evaluations and
15 analysis is that the we are not making any fuel design
16 changes. We are using exactly the same fuel that is
17 in our core today. When we do the uprate, implement
18 the uprate, we will have a core that is 100 percent,
19 17 by 17 RFA2 fuel assembly, fuel type. We have the
20 advantage of not having to address any mixed core
21 issues in our analysis.

22 We will achieve the uprate by increasing
23 the feed size. Things like burnup will remain.
24 Limits will be the same. Boron concentration limits
25 will be the same. No changes in that, those areas.

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1 We are reducing the peaking factor design
2 limits to increase the NBR margins.

3 MEMBER CORRADINI: Can I ask you a
4 question there? So if I were to see how you operate
5 the fuel under the extended power, the shape of the
6 flux will change? I'm looking at your last bullet and
7 interpreting that to mean that you are lowering, you
8 are taking from some shape like this and flattening
9 the core shape a bit.

10 MR. KAI: Keep in mind we're talking about
11 limits and not the actual -- I mean, obviously the
12 actual power distribution when we designed the core
13 will be below that limit. So what we are doing is --
14 yes.

15 And there will obviously be some minor
16 changes. I don't expect very major changes in terms
17 of the power distribution. We are reducing the design
18 limits our core designers have to live with, a lower
19 limit in design limits in power distribution.

20 So I think -- I mean, obviously you are
21 right; we are putting more feed in there that the
22 power should be somewhat flatter.

23 MEMBER CORRADINI: Okay. All right.
24 That's what I get by the fourth bullet. I wanted to
25 make sure I understood that. Thank you.

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1 MR. KAI: This slide just gives you some
2 information about what the --

3 MEMBER BROWN: Let me -- I missed
4 something, maybe yesterday, that I don't understand.
5 You are putting the same fuel design back in. You've
6 got that. You've got more burnup. And you've got a
7 higher power level.

8 So intuitively, I would think you have to
9 put more fuel in. Is that right? And I thought I
10 heard yesterday that you were going to put more
11 clusters or something like that, more --

12 MR. GUERCI: I'm John Guerci, Manager.

13 I think I can answer that question. The
14 batch fraction is increased by approximately eight
15 fuel assemblies. So we are going from a feed batch of
16 76 to approximately a feed batch of 84 assemblies.

17 MEMBER BROWN: So that is what you put in
18 when you refuel?

19 MR. GUERCI: Correct. And that is how we
20 will take on the additional energy. Our burnup
21 limits, our boron limits, and everything else are
22 essentially the same.

23 MEMBER BROWN: But there is volume there
24 to do that? I just think there's --

25 MR. GUERCI: Well, we are placing --

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1 MEMBER BROWN: We've got space in the
2 reactor vessel.

3 MR. GUERCI: Our normal feed would be 72
4 to 76 assemblies, fresh assemblies. Normal feed will
5 be increasing to 80 to 84 assemblies. So we will feed
6 more fresh assemblies during --

7 MEMBER BROWN: You take more old stuff
8 out?

9 MR. GUERCI: That is correct.

10 MEMBER BROWN: So did you have dry fuel
11 storage?

12 MR. GUERCI: At Millstone 3, we do not.
13 Right now our pool is large enough to accommodate our
14 storage capacity.

15 Okay? Any other questions?

16 (No audible response.)

17 MR. KAI: This slide just reemphasizes and
18 actually provides some more detailed information about
19 our fuel. Like I said, we have 17 by 17 RFA-2 that
20 will be going forward in the SPU design, our entire
21 core, integral fuel, burnable poison IFTHA. We will
22 be adding more IFTHAs to offset the increased
23 reactivity of the additional fuel.

24 We do have annular pellets in axial
25 blankets. That's unchanged.

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1 MEMBER CORRADINI: Are we allowed to ask in
2 an open session? Is this gadolinium? Or add coating
3 onto the pellets?

4 MR. KAI: That is correct. It is a
5 standard Westinghouse product.

6 And the maximum enrichment is unchanged.

7 We will talk a little bit about initial
8 conditions. That's a key factor when you do uprates.
9 We currently are analyzed for a single nominal
10 temperature at 100 percent power. And we do not have
11 any analysis that allows us to do a temperature
12 close-down at the end of the cycle.

13 When we went into this uprate, we wanted
14 to give ourselves some more operational flexibility.
15 So we have done the SPU analysis with an 8 degree
16 nominal temperature bound at 100 percent power. And
17 we have also done the analysis, including a 10-degree
18 coast-down capability, temperature coast-down
19 capability.

20 So, really, if you look at our safety
21 analysis that's done over a much wider range of
22 temperatures, we use both extremes. And we find the
23 limiting condition for all of the transient analysis
24 at either end of the temperature bound. This allows
25 us to have fully analyzed anywhere within this bound

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1 to give operational flexibility.

2 We have decided, however, to operate with
3 the same nominal temperature as current. And
4 obviously when you do uprates, one of the concerns is
5 issues such as stress corrosion cracking, which can be
6 caused by higher temperatures.

7 So by maintaining the same nominal
8 temperature, we minimize the increase in hot leg
9 temperature and the temperature that we see. We show
10 -- if you think about this when you operate with the
11 same T-ave with a higher power level, that the hot leg
12 temperature will increase, modest temperature
13 increase.

14 We have shown some small impact on the
15 life of tubes and Alloy 600 components on the hot
16 side. On the cold side, with the same T-ave, we will
17 have a slightly lower T-cold and, therefore, perhaps
18 get some minor benefit. And those Alloy 600
19 components include bar-mounted instrument tubes and
20 the upper head penetrations.

21 The other key factor in initial conditions
22 is pressurizer level. And this is a balance between
23 what we need for operational margin and what we need
24 for design basis transients.

25 Obviously as you raise the pressurizer

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1 level, at which pressurizer level you will reduce your
2 margin to pressurizer overfill for transients that we
3 analyze, and most notably the inadvertent ECCS
4 actuation.

5 On the other hand, you need to also
6 maintain, take into account that you will get more
7 shrinkage from a normal reactor trip, and so you need
8 to maintain operational margin so that the low and
9 routine reactor trip may not result in such actions as
10 let-down isolation and heat.

11 So we had to make a compromise. We are
12 raising the pressurizer level slightly. It's going
13 from 61 and a half to 64 percent at 100 percent power.

14 MEMBER BROWN: Well, on the subject of
15 margins, you talked about margin management. At some
16 point -- and I don't want to get off on a tangent here
17 now.

18 But the margin available during
19 transients, like loss of feed bar, to overfill came up
20 yesterday, but it really wasn't discussed
21 significantly. If we have time, I would like to
22 revisit that.

23 MR. KAI: Okay.

24 MEMBER BROWN: Let me add one note to
25 that. In the context of this request, since that one

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1 was tight and I brought the subject up, it would be
2 nice if we could get just a couple of statements as to
3 what it would take to open that up again, instead of
4 having the plant modifications or the operational
5 procedures, whatever it is, such that under the loss
6 of feed, instead of hitting 1,731 out of 1,800 cubic
7 feet, you can push that back down.

8 That was a major change going from 1,000
9 to 1,700 cubic feet of volume, over 1,700.

10 MR. KAI: I understand that. Next couple
11 of slides.

12 We will talk about the safety analysis in
13 general first. And then we will talk about the slight
14 pressurizer overflow.

15 One thing I would like to point out is
16 that when we went into this uprate, we decided to
17 essentially redo all of the accident analyses from
18 scratch, even those that were not necessarily affected
19 by uprate.

20 We went through, and we revalidated every
21 input into the analyses to make sure that they are
22 current and applicable at the uprate conditions. So
23 we did an extensive effort to essentially establish
24 brand new calculations for all of our accident
25 analyses.

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1 Obviously when you do uprate, margins are
2 a key factor. We wanted to make sure that when we
3 came out of the uprate, that we would still have
4 substantial margins for operation.

5 As you can see in a short listing of the
6 margins that we have, I believe that we have achieved
7 that. We have maintained about 12 percent DNBR
8 margin. The LOCA PCT calculations are quite low. And
9 we have margins on containment pressure.

10 MEMBER CORRADINI: I wasn't here
11 yesterday, but I think I understand. I just want to
12 make sure I understand that besides the stretch power,
13 you also changed the method of analysis.

14 So two things changed. One, you went up
15 seven percent. And then your method of analysis went
16 from I'll call it Appendix K traditional to your best
17 estimate with uncertainty?

18 If you are going to come to that later,
19 that's fine. I just want to make sure I understand
20 the two pieces.

21 MR. KAI: Yes. We have done that,
22 correct. But in general, what we're relying on for
23 margins is the modifications and not analysis methods.
24 And luckily on most event trees, it's not really
25 LOCA-limited in terms of being close, currently, to

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1 the limits.

2 You know, in my opinion, I'm pretty sure
3 that we could have shown acceptable results with the
4 old methods. It's just that when we're talking about
5 redoing everything at uprate, we want to go posture
6 ourselves to go forward into the future. So we really
7 just said, okay, what is the best technology
8 available? We weren't looking necessarily for
9 margins.

10 MEMBER CORRADINI: So you're not
11 LOCA-limited? Are you store heat-limited for the
12 DNBR?

13 MR. KAI: Yes. DNBR was one of the areas
14 that we need to look at. There are two major areas of
15 concern. There was one: DNBR. And the other was the
16 margins of overflowing pressurizer.

17 MEMBER BANERJEE: Well, I have a remark.
18 If they had stayed with appendix K for the large break
19 LOCA, they had come up fairly close to the limit.

20 MEMBER SIEBER: Yes.

21 MR. KAI: Yes, right.

22 MEMBER BANERJEE: So the best estimate
23 plus uncertainty, which they did 124 runs or
24 something, with the 95-95 is combine them.

25 MR. KAI: The arcing margin, you're

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1 correct. We probably -- you are right. We would
2 probably be close to the limit.

3 MEMBER BANERJEE: It would become a
4 LOCA-limited plant with appendix K.

5 MEMBER SIEBER: No. You're --

6 MEMBER BANERJEE: It's pretty close.
7 Pretty close. I can do it by hand more or less
8 looking at the --

9 MEMBER CORRADINI: I understand, but I
10 guess the way this listed out and the way you answered
11 it, you're still now, or were and now still, CHF or
12 DNBR-limited.

13 MR. KAI: You are correct that if we had
14 not done that, that you're right. We probably would
15 be pretty close and may, in fact, have been limited.
16 But, like I said --

17 MEMBER BANERJEE: It's fine what you did.
18 I mean, I have no issues with that.

19 MR. BUCHEIT: This is Dave Bucheit,
20 Manager of Safety Engineering.

21 Just to emphasize that the older, large
22 break LOCA methods are not phenomenologically based as
23 the ASTRUM is. There are a number of issues with --

24 MR. KAI: Okay. And the last thing I will
25 do, obviously the bottom line is that we have -- we

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1 are assuring the health and safety public. we meet
2 all of the dose requirements for all of the trends.
3 All the calcs were redone at the SPU conditions.

4 The SPU actually has a very small impact
5 on the radiological analysis for the currently
6 licensed radiological analysis.

7 As we stated yesterday, we have a margin
8 management program. We have had that for a number of
9 years. And it was the focus of our SPU program to
10 look at margin. And we identified early on in
11 sensitivity studies to determine where we would need
12 to increase margins. DNBR was one of the areas.

13 As we stated yesterday, we currently have
14 very little DNBR margin in terms of analysis because
15 we put the available margin into operational
16 flexibility, raising the OPD TLT set points to address
17 potential spurious trip alarms due to spiking that we
18 occasionally see at the beginning of the cycle.

19 Currently we have very little DNBR margin.
20 We could not obviously live with that situation going
21 forward. And, really, to me the solution is not
22 methods. Action makes some modifications to correct
23 the situation where the instrumentation is susceptible
24 to these spikes.

25 MEMBER CORRADINI: The spiking is noise?

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1 The spiking? I didn't understand. Maybe you said it
2 in detail and I didn't --

3 MR. KAI: It's called an upward trend
4 anomaly. And we had a long discussion about this
5 yesterday.

6 It is an interesting issue. And obviously
7 so our solution in this case is not to use methodology
8 changes but to actually make a hardware modification.

9 Our limiting DNBR event is a steam line
10 break with coincident rod withdrawal because we have
11 to postulate in a steam line break, the rods in the
12 withdrawal because of rod control system is not
13 EQ-qualified or category one.

14 So we assume currently that the rods will
15 withdraw in the steam line break exacerbating the
16 power increase. That's our limiting DNBR event. We
17 have also met a mod there and changed the control
18 system to eliminate the capability for the rod control
19 system to automatically withdraw the control rods.

20 So, like I said, our goal here was to de-
21 establish the integral knowledge not by methodology
22 changes per se, but to actually look at the hardware
23 changes that will give us margin going that will be
24 effective for many years to come.

25 These hardware mods in the end, that were

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1 based on some preliminary studies that we did early on
2 in our margin management program in SPU and the final
3 analysis shows that, really, we have restored our
4 margins, as you can see on the previous slide, with
5 these changes.

6 MEMBER BANERJEE: What's the second
7 limiting after that?

8 MR. KAI: Well, we did discuss this
9 briefly, but there really are three DNBR events that
10 tend to be limiting. At 100 percent power, it is the
11 loss of flow. The fill pump goes down. That's the
12 next limiting.

13 We do also have the rod withdrawal from
14 subcritical. That is a limiting transient that is
15 looked at that we looked at in our sensitivity
16 studies.

17 One of the things that we showed yesterday
18 was that the SPU conditions, we can actually show
19 except for the results with two pumps. Shutdown
20 conditions, our current limit is three. We still
21 maintain the requirement for three. That's how we
22 maintain margin for that transient.

23 MEMBER BANERJEE: And the cold stone, the
24 100 percent?

25 MR. KAI: Loss of flow? That is the basis

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1 for this number that is given in here as well as the
2 -- the other -- right. Yes. Thank you.

3 For loss of flow, a current DNBR, I mean,
4 is about 1.7. These numbers, they're about 1.7 that
5 affect the limit, where we have significant margin for
6 loss of flow.

7 The other event that is limiting at
8 partial power is the rod withdrawal at power. That is
9 the limiting event if you consider the full power
10 range.

11 And that, if you remember yesterday, we
12 are using some generic margin of our margin management
13 program to assure that we meet the safety analysis
14 limit.

15 MEMBER BANERJEE: Yes. We couldn't see
16 those numbers because there were -- some numbers were
17 proprietary yesterday I remember. At some point it
18 would be interesting to see the real numbers.

19 I don't know what you do about it right
20 now. You don't want to close the session now, but we
21 would like to see those numbers.

22 MR. KAI: The results are not proprietary.
23 The margin part is. And that's the --

24 MEMBER CORRADINI: So just to repeat so I
25 get it right, there is a number of different

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1 transients that bring you about to the same place.
2 You mentioned one, and then you gave us the other
3 three. But they're all in the same ballpark that as
4 you -- things may reorder themselves, but they're
5 still in the same ballpark.

6 MR. KAI: Right. And we did the studies
7 almost a year, two years ago. Those were the four
8 events that we looked at to make sure that we had
9 margin. And, in fact, the analysis, in fact, showed
10 about what we expected.

11 MEMBER CORRADINI: So let me ask you a
12 different question about that. So, since you are
13 slightly changing the power shape, that's, therefore,
14 the location of where this is occurring, this
15 changing. Is it occurring at more locations
16 simultaneously? Are you still moving the hot rod
17 location that's occurring at a spot and the spot has
18 migrated?

19 MR. KAI: No. It has not changed. I
20 mean, keep in mind we are changing the limit. Okay?
21 Everything when we do analysis, we do it at the limits
22 so the actual core design --

23 MEMBER CORRADINI: Where I could hit the
24 limit is changing, though, I guess.

25 MR. PRICE: We lowered the F-delta-H

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1 slightly to gain margin. We lowered the peak F-delta-
2 H requirement for the core design to gain some margin.
3 The core design is still relatively similar. I mean,
4 the batch track is a little larger, but in general our
5 core design strategy, you know, hasn't changed a whole
6 heck of a lot.

7 MEMBER CORRADINI: Okay. Thank you.

8 MEMBER BANERJEE: It's just a flatter
9 core.

10 MEMBER CORRADINI: Yes. But if you do
11 that, though, that means you are going to get close to
12 wherever your factor -- let's just use factor of
13 safety since that's general. Whatever your factor of
14 safety is, that minimal factor of safety is moving
15 about. That's what I'm trying to understand.

16 MR. PRICE: It's a possible option since
17 if you think of the shape of that, the roll-off of
18 that could be slightly different.

19 MEMBER CORRADINI: Okay. Fine. Thank
20 you.

21 MEMBER BANERJEE: The minimum flow
22 requirement is going up. They have to.

23 MR. KAI: Okay. We'll get pressurizer
24 overfill. As I said before, given initial pressurizer
25 load, that's a balance. Raising the level will make

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1 events, like, as you mentioned, loss of feed. The
2 results would be closer to pressurizer overfill. One
3 thing to keep in mind is that on Millstone 3, we do
4 have large PRAs that are qualified for water as well
5 as steam.

6 For the loss of feed, obviously we were
7 concerned. We did initial studies with loss of feed.
8 And we believe that with our current capacity, we
9 would show acceptable results. And we do.

10 This is probably the one area where we
11 need the -- it's already included in our margin
12 management and will be an area to look forward to as
13 you pointed out, that this is probably the biggest
14 change in margin.

15 Why this occurs is because if you think of
16 this as a pressurizer overfill in a loss-of-feed
17 event, the key factor is, how long does it take you to
18 match decay heat with the loss of feed that you had.

19 When you raise the power level, obviously
20 that time will be extended. And decay heat, once you
21 get past the first 10 or 15 minutes, it still changes
22 very slowly. So that the time to match at the
23 extended power level can be significantly longer.

24 And, as you showed yesterday, it results
25 in a slowly increasing pressurized load over a much

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1 longer time period and results in, like you said, an
2 area of concern in terms of making sure that, going
3 forward, we manage margins.

4 Now, the limiting case is loss of
5 feedwater with off-site power available because we
6 assume -- with off-site power available.

7 So we assume that the reactor coolant
8 pumps continue to run throughout the whole transient.
9 And, if you remember, what I said is that we have a
10 very conservative amount of assumption from pump heat.
11 It's actually comparable, even more at the end, to the
12 decay heat. So that is another key factor of why
13 these results are so conservative.

14 One obvious, if you're talking about
15 operational thing, action that had been taken, is to
16 reduce the number of RCP running where we assume all
17 four are running.

18 MEMBER BROWN: Just to reduce the heat?

19 MR. KAI: Just to reduce the heat.

20 MEMBER BROWN: You commented there were
21 like 16 megawatts or something inside one of your
22 pages that is a reactor coolant pump.

23 PARTICIPANT: If you were to do two of the
24 four, you have a tremendous savings in pressurizer
25 level. Well, we don't credit any of these types of

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1 operator actions.

2 MEMBER BROWN: But you don't have those in
3 your procedures, per se, for that circumstance? See,
4 the concern here, obviously, is that we'll have --

5 MR. RUSSELL: My name is Paul Russell. I
6 am a unit supervisor at the Millstone 3.

7 In regards to our procedures for loss of
8 feedwater, we do have in there procedures to secure
9 the reactor coolant pumps. So we do have procedure
10 guidance in that respect.

11 MEMBER BROWN: And how much time into it?

12 MR. RUSSELL: I believe it's step four
13 into that procedure. We would be into that within ten
14 minutes, five to ten minutes. It's very early into
15 the event.

16 MEMBER BROWN: Well, so you're almost down
17 to the step, kind of that slower decay after the
18 initial --

19 MR. RUSSELL: Right. And that's a huge
20 impact on this analysis. Now, we decided we're not
21 going to take credit for that. So those again are --

22 MEMBER BROWN: If you turn off the pumps,
23 how much would it reduce?

24 MR. KAI: We didn't quantify that.

25 MEMBER BROWN: Is it possible to do that?

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1 I mean, obviously it's possible to do that. I mean,
2 does it go from 1,731 to 1,650 or does it go from
3 1,731 to 1,200, just a ballpark number? I mean,
4 that's --

5 MR. RUSSELL: That would be --

6 MEMBER BROWN: It's like getting close to
7 -- I mean, why initiate a loss of coolant potential,
8 you know, when you're that close to being filled? It
9 just doesn't make -- it just looks uncomfortable.
10 That's all.

11 MEMBER BLEY: I was looking for that.
12 Maybe I can ask the gentleman over here. What is the
13 indication range on the pressurizer? In other words,
14 are you off-scale? High at what volume?

15 MR. KAI: That's for the top indicating
16 range. It is before 1,800 cubic feet. Our percentage
17 is zero to 100 percent. I'm not sure exactly what the
18 top of the range is. I'll have to get back to you.

19 MR. O'CONNOR: Good morning. I'm Michael
20 O'Connor.

21 The 100 percent level, there's
22 approximately 900 gallons of water space available
23 after you hit the 100 percent mark to fill the
24 pressurizer.

25 MEMBER BROWN: Okay. Well, it's 1,731

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1 cubic feet. I realize we're going back and forth
2 here. It's a little confusing. I'm just trying to
3 get an idea of what the operator sees as this
4 transient takes place.

5 You lose indication and the level in the
6 pressurizer at what point, do you know, relative to
7 where you go on this loss of feedwater transient?

8 MR. O'CONNOR: That will just take a
9 minute.

10 MEMBER CORRADINI: What you just said is
11 there are about 120 cubic feet of delta remaining,
12 right? Nine hundred divided by 7.8 is 120?

13 MR. O'CONNOR: Correct, yes, roughly.

14 MEMBER BROWN: 7.8 is not --

15 MEMBER CORRADINI: Well, he gave us a
16 delta in gallons.

17 MR. O'CONNOR: Yes. It's approximately
18 900 gallons.

19 MEMBER BROWN: But it's not cold water.

20 MEMBER CORRADINI: I mean, it's 122 feet.
21 It's 7.8 gallons.

22 MR. O'CONNOR: So what an operator would
23 see is the level approaching 100 percent and then
24 above the 100 percent range would see whatever
25 indications in pressure or PORV cycle time after that.

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1 MEMBER BROWN: Okay. I understand your
2 answer to be that he would still have a level
3 indication in the pressurizer at the peak of this
4 transient I think is what you're saying.

5 MR. KAI: I'm not sure about that.

6 MR. O'CONNOR: I think the peak has about
7 500 gallons left in the space. So I think you would
8 be above.

9 MEMBER BROWN: You would be above the
10 indication range.

11 MR. O'CONNOR: I believe you would be --

12 MEMBER BROWN: Okay. What do the
13 procedures call for the operator to do when you go off
14 scale high?

15 MR. KAI: From a procedure standpoint,
16 we're geared toward restoring feedwater. Pressurizer
17 level goes off scale high. We understand we have lost
18 the indication. We're watching the cycling of our
19 pressurizer PORVs.

20 MEMBER BROWN: By then, you --

21 MR. O'CONNOR: For the particular
22 procedure set that we have to use for loss of aux
23 feed, increasing pressurizer level due to core
24 temperature increases would cause us to immediately
25 shift over and go to the feed-and bleed-method to

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1 initiate once-through cooling to the core.

2 MEMBER BLEY: Even if you have aux
3 feedwater?

4 MR. O'CONNOR: If you don't have aux
5 feedwater, that is what is causing this.

6 MEMBER BLEY: Okay.

7 MR. O'CONNOR: If you do have aux
8 feedwater, that's correct.

9 MEMBER BROWN: How much time does it take
10 to get to solid under that transient? So you gave
11 that for the ECCS operations.

12 MR. O'CONNOR: Two to three thousand
13 seconds.

14 MEMBER CORRADINI: Less than an hour.

15 MR. KAI: Two thousand, three minutes.

16 MEMBER BLEY: Can I add? We've gotten you
17 off track here, I realize. I think you'd better pick
18 up again. I guess the question still remains, just
19 trying to think through the transient as it unfolds
20 viewed from the operator and what actions he is taking
21 when the noise is level. That is what I am trying to
22 do.

23 MR. O'CONNOR: Well, I guess what I could
24 tell you is this happens in the two to three
25 thousand-second time frame. So as level is increasing

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1 in the pressurizer, we are already shifting to a mode
2 to take the other actions I have described, which are
3 not accounted for in this transient analysis.

4 MEMBER BROWN: Okay. I hear that. I'm
5 just trying to process it all. And I'll just leave it
6 for now.

7 MR. O'CONNOR: Okay.

8 MEMBER SIEBER: Why don't we go forward?

9 MR. KAI: the limiting overflow event is
10 the inadvertent ECCS actuation at power. Currently in
11 this event, we show that we will fill the pressurizer
12 on the order of ten minutes.

13 And, like I said up here, these are
14 qualified for water relief. So in that situation, the
15 PRVs will be cycling on the water relief until the
16 operator can terminate the event.

17 The PRVs are qualified as well as the
18 downstream piping. Analysis has been done currently
19 to show that that is acceptable. That is our current
20 licensing basis.

21 As Alan mentioned, this has been an issue
22 that we have been looking for solutions for a number
23 of years. This is a challenging event for the
24 operators. And we want to use this opportunity to try
25 and eliminate any operator burns that we can.

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1 We have come up with a modification to the
2 ECCS system. It's called a permissive. It's P19.
3 What that does is it uses the reactor trip signal on
4 low pressurizer pressure as a permissive to open the
5 charging injection valves and the charging injection
6 valves only.

7 So if you have an ECCS signal, what would
8 happen -- and you have an event like this where you
9 have inadvertent SI -- what would happen is that you
10 get all the other ECCS actuations to start, you get
11 all the pumps to start, and then you hit the low
12 pressure safety injection and charging in the ECCS
13 mode, but the charging injection valves would not open
14 if the pressure is above the RPS low pressure set
15 point.

16 We actually had an event like this in
17 2005. And if we had the system in place, it would
18 have prevented the pressurizer overfill.

19 MEMBER CORRADINI: Is this permissive P19
20 in other Westinghouse plants and it just wasn't here
21 historically or is this a permissive that's unusual?

22 MR. KAI: This is not in anybody else's
23 plant, no.

24 MEMBER SIEBER: It's new, right?

25 MR. KAI: It's new. It's a brand new

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1 concept that we're putting in.

2 MR. BUCHEIT: Yes. This is Dave Bucheit.

3 As we discussed yesterday, we're very
4 committed to risk management throughout the Dominion
5 fleet. And we do take an active role in trying to see
6 where we can use PRA techniques to reduce risk in the
7 plant.

8 We believe this was an excellent example
9 of an opportunity to reduce risk for effectively
10 eliminating a real transient by putting this
11 permissive in.

12 The only down side is a slight increase in
13 the failure probability because of the additional
14 logic path.

15 MEMBER CORRADINI: So the next logical
16 question is, are you going to investigate this for
17 Surry and North Anna?

18 MR. BUCHEIT: Yes, sir.

19 MEMBER CORRADINI: Okay. And then the
20 delta probability of failure for ECCS is what you are
21 comparing to?

22 MR. BUCHEIT: Yes.

23 PARTICIPANT: Are we going to hear --
24 well, maybe we won't hear anything. So what is the
25 change in that probability because of this permissive?

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1 MR. BUCHEIT: We did a qualitative
2 assessment and compared essentially eliminating an
3 increase in transient frequency, reducing the
4 frequency of general transients with a small increase
5 in failure probability of a logic path, which is 10^{-3}
6 is kind of the number. And that washes out when
7 compared with the hardware failures that are already
8 accounted for in the failure analysis.

9 PARTICIPANT: Okay.

10 MR. BUCHEIT: But we believe this is
11 accurate.

12 PARTICIPANT: Okay. Thank you.

13 PARTICIPANT: I believe I heard you say
14 yesterday that the charging pumps are still available.
15 That signal can be overridden if the operators really
16 need to charge?

17 PARTICIPANT: It's a manual action now,
18 manual.

19 PARTICIPANT: You can always manually open
20 the valves.

21 PARTICIPANT: Okay. Thank you.

22 PARTICIPANT: By "manual," you mean
23 remotely?

24 PARTICIPANT: It won't matter.

25 PARTICIPANT: Remote? That means you're

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1 not going to --

2 PARTICIPANT: You're not going to --
3 manually by pushing it.

4 PARTICIPANT: Okay. And it's
5 failure-proof. It meets all of the regulations in
6 terms of design. Now, we think it's a significant
7 improvement.

8 PARTICIPANT: Next is the feedwater --
9 loss of feedwater transients. What is the capacity of
10 your aux feedwater pumps?

11 MR. O'CONNOR: Mike O'Connor.

12 About 300 gallons per minute per
13 generator. So that's 1,200 gallons per minute total.

14 PARTICIPANT: Okay. And what is the value
15 of the aux feedwater flow that was used in that
16 analysis?

17 MR. O'CONNOR: Pardon?

18 PARTICIPANT: What is the value of the aux
19 feedwater flow that was used in that analysis?

20 MR. O'CONNOR: We're checking.

21 PARTICIPANT: The number he gave you is
22 slowly at one point.

23 PARTICIPANT: Right. I understand. I
24 fully understand.

25 MR. O'CONNOR: He's checking. He's

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1 checking that.

2 PARTICIPANT: I'm trying to assess whether
3 or not that scenario is real.

4 MR. O'CONNOR: Right. And, like I said,
5 and what we are assuming obviously on the secondary
6 side is that the steam generator pressure is at the
7 sinking of set point with three percent currently.

8 PARTICIPANT: Please continue.

9 MR. BUCHEIT: In terms of all the other
10 design basis events, they were all redone, as we said.
11 In general, SPU has a small impact on the results, as
12 was pointed out in terms of LOCA, we did gain margin
13 by going to ASTRUM.

14 But in general for the other transients,
15 like rod injection, et cetera, the safety analysis
16 margins are essentially the same with so many things,
17 significant margins to all of the regulatory limits.

18 In terms of radiological consequences, one
19 fact to note is that we submitted alternate source and
20 got it approved in 2006. When we did that, we tried
21 to anticipate what hierarchy we would go to.

22 We have done those analyses at six and a
23 half percent and came out to seven. So unfortunately,
24 we're half a percent off. And then subsequently we
25 did all of the calculations for the increased source

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1 term associated with that half a percent power
2 increase.

3 As a result, as you can see, there would
4 be a very small change in terms of radiological
5 consequences.

6 MEMBER POWERS: Can you explain to me
7 again how you recalculated your gap inventories?

8 MEMBER SIEBER: State your name, please.

9 MR. AKIN: Bill Akin from Dominion.

10 The new core inventories were calculated
11 based upon an analysis that considered both high and
12 low burnups and high and low enrichments. As far as
13 gap fractions, we used the suggested values from the
14 regulatory guides.

15 And for fuel handling, like we discussed
16 yesterday, where we exceed the footnote criteria for
17 burnup, we proposed new gap fractions for the
18 fuel-handling accident.

19 MEMBER POWERS: And are you going to tell
20 us what those are?

21 PARTICIPANT: They would like to know what
22 you do in a fuel-handling accident.

23 MR. AKIN: Oh. For the fuel-handling
24 accident, we determined that no more than 66 percent
25 of the rods exceed the criteria of the burnup as

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1 specified in the reg guide.

2 And for the alternative gap fraction
3 assumption, we proposed and have been accepted, as it
4 has been done in the industry, to use the Reg. Guide
5 1.25 assumption of the 12 percent iodine?

6 MEMBER POWERS: That's pretty
7 conservative.

8 MR. KAI: What I've got, to answer your
9 question about aux feed, what I have is current margin
10 for aux feed from our nominally calculated aux feed
11 flow rate.

12 So we are assuming aux feed that's 12
13 percent lower than the number that Mike O'Connor gave
14 you in terms of the -- at that point. Obviously that
15 is a curve. So it's all 12 percent lower.

16 Okay. I think what we have done, I have
17 tried to summarize in as brief a time as possible the
18 extent of analysis that we have done to demonstrate
19 that our plant is safe and meets all of the
20 requirements, regulatory requirements.

21 So if there is anything else I can answer?

22 MEMBER SIEBER: Are there any questions?

23 (No response.)

24 MEMBER SIEBER: If not, thank you very
25 much.

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1 And we'll ask the staff now to go through
2 their review of the applicant's submittals. Good
3 morning.

4 MR. PARKS: Good morning. My name is
5 Benjamin Parks. I am with the Reactor Systems Branch
6 in the Office of Nuclear Reactor Regulation.

7 I am joined this morning by Sam Miranda,
8 who is also in the Reactor Systems Branch and helps me
9 out with the transient analyses. He's on the side if
10 we get into any questions that affect his area of
11 review.

12 Basically the scope of our review included
13 those things listed in our purview in RS001, the
14 review standard for extended power uprates, which is
15 how we reviewed this. So it included the fuel system
16 nuclear design, thermal hydraulic design, transients
17 analysis, over-pressure protection LOCA ATWS. And we
18 also added a review of the implementation of RETRAN
19 and VIPRE.

20 As I said, we followed the guidelines for
21 the EPU standard. We also considered our past
22 experience with stretch power uprates. And we looked
23 at the licensee's report, which is based on
24 NRC-approved methods, methodologies, and computer
25 codes.

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1 The licensing report itself in terms of
2 the fuel system and nuclear design presented several
3 different types of evaluations and considered
4 different types of fuel assemblies.

5 The licensee is putting in RFA2 fuel. And
6 the most, I would say the majority of the analyses,
7 were based on the RFA and RFA2 fuel assemblies. So
8 that's how we did our review, based on that.

9 The effects of the uprate will be a slight
10 increase to the linear heat rate and a slightly less
11 heat core design to speed this up.

12 PARTICIPANT: Just on that point, now, the
13 application included analyses for the old vantage
14 fuel. Maybe some of that is in their pool.

15 MR. PARKS: That's correct.

16 PARTICIPANT: Would they be limited or
17 prevented from using that fuel in the future if they
18 had some --

19 MR. PARKS: Basically --

20 PARTICIPANT: -- because you didn't
21 analyze?

22 MR. PARKS: -- in terms of my review, I
23 accepted that they used RFA and RFA2 fuel. And what
24 I'm talking about here is the appropriateness of the
25 thermal hydraulic methods.

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1 I did not evaluate whether that would
2 apply to the vantage five. They're DNB correlations,
3 and whether that would apply to the vantage five fuel.
4 That may be the case.

5 If they were to reinsert vantage five
6 fuel, they would have to use, I guess, the 50.59
7 process to make sure that their analyses actually
8 cover that fuel.

9 PARTICIPANT: And submit that in a reload
10 licensing?

11 MR. PARKS: Right. And that's the caveat
12 that I was trying to make on this evaluation.

13 PARTICIPANT: Okay.

14 MEMBER SIEBER: And there would be a
15 reload safety analysis report that accompanied that,
16 which the staff would review for an anomaly such as
17 you're talking about.

18 MR. PARKS: I'm glad that you asked that
19 question. That was the point that I was trying to
20 make here. Thank you.

21 Basically, there are evaluations, as is
22 typical for a power uprate, on reference core design
23 that's not necessarily the design that they are going
24 to use when they go uprate. I mean, we're not
25 planning out core designs 20 years into the future

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1 here.

2 So what we're doing, as Mr. Sieber just
3 said, was we're reviewing the reference core design.
4 And they're going to use their NRC-approved reload
5 process to confirm that they're within that footprint
6 core, reanalyze or reevaluate as necessary.

7 So for accidents and transients, we
8 followed those topics covered in matrix 8 of RS001.
9 That is our section. In yesterday's presentation, to
10 give you a sense of the review that we performed, I
11 covered three of the interesting transients that we
12 covered. I'm going to step through those quickly at
13 this point to save time and invite your questions if
14 we need to move slower.

15 So basically we reviewed over-pressure
16 protection. And we asked them some questions about
17 what trips they were analyzing. We then reviewed the
18 implementation of the P19 permissive, which is
19 associated with the inadvertent ECCS actuation. The
20 staff's opinion in that regard is that the P19 is a
21 prudent implementation. We agree with it. And so we
22 were satisfied with that.

23 And then, finally, we looked at the rod
24 withdrawal at power. We had some questions over how
25 they dispositioned some potential for low-power

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1 events. But after our questioning and some further
2 sensitivity studies on the part of the licensee, we
3 were satisfied.

4 This is the type of approach we took for
5 our review. You know, we find anomalous things in the
6 licensing report, we ask questions about it.

7 PARTICIPANT: Okay. Well, you got too far
8 before I had a chance to ask.

9 MR. PARKS: Okay. I'm sorry. He was
10 trying to move slow, and I --

11 PARTICIPANT: Yes.

12 MR. PARKS: So let's go back.

13 PARTICIPANT: Well, the issue here
14 continues to be the observation that you make here
15 about basically if you lift a primary relief valve,
16 there is a small break LOCA potential. It's on one of
17 your slides here. Inadvertent actuation ECCS can
18 develop into small break LOCA, top of the pressurizer
19 of a PORV sticks open.

20 MR. PARKS: Right.

21 PARTICIPANT: That's the traditional --

22 MR. PARKS: I guess the assumption --

23 PARTICIPANT: Sure, yes. And we're
24 relying on the PORVs, the power operated relief
25 valves, being qualified for water relief and

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1 therefore, that they won't stick open.

2 MR. PARKS: Right. That's the idea.

3 MEMBER SIEBER: And there's a block valve.

4 MR. PARKS: There's a procedure to make
5 sure that the block valves are open.

6 PARTICIPANT: Is the actuation circuitry
7 for these things fully safety grade?

8 MR. PARKS: I'm going to defer the
9 question to Sam behind you.

10 MR. MIRANDA: Yes. The actuation
11 circuitry is qualified. It's part of qualifying the
12 porous water relief, can't predict equipment to
13 mitigate an accident almost at safety grade. And this
14 is part of making it safety grade.

15 PARTICIPANT: And you do have block
16 valves, do you not, for your PORVs?

17 MR. MIRANDA: Yes, sir.

18 MEMBER SIEBER: Actually, the pressure
19 protection only --

20 MR. MIRANDA: It sticks open when you shut
21 it and terminate the loss-of-coolant accidents.

22 MR. PARKS: Okay.

23 PARTICIPANT: It's a block valve.

24 PARTICIPANT: Yes. I understand that.

25 MR. PARKS: I'm sure I'm not moving too

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1 fast.

2 PARTICIPANT: Yes. I'm trying to
3 understand what would be an unacceptable transient
4 from your standpoint relative to overfilling the
5 pressure. What would qualify as a too small margin in
6 the pressurizer? This is ECCS but on a loss of
7 feedwater flow accident? Are there --

8 MR. MIRANDA: I have some thoughts on
9 that. The criterion of not filling the pressurizer is
10 an easy way to demonstrate that they -- AOO, such as
11 the loss of feedwater or an inadvertent actuation of
12 ECCS, will not develop into a more serious accident
13 because you will not be in a position of relieving
14 water to the PORVs.

15 This plant and five other plants in the
16 U.S. have water-qualified PORVs. So that criterion
17 does not strictly apply. They can -- as long as they
18 have the PORVs available, as long as the block valves
19 are open, they can credit the action of those PORVs to
20 relieve water.

21 So they don't have to rely on this
22 shorthand method of showing that the more serious
23 accident does not develop by filling the pressurizer.

24 PARTICIPANT: So there isn't really -- I
25 don't want to put words in your mouth. But there

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1 really isn't any unacceptable margin for pressurizer
2 level?

3 MR. MIRANDA: For this plant, I don't
4 think so.

5 PARTICIPANT: Excuse me. Did you say only
6 five plants in the U.S. are what are called --

7 PARTICIPANT: That's what I'm asking.

8 MR. MIRANDA: There are six in total.
9 There is Millstone. There is Salem, Diablo Canyon.
10 I think those are the six, yes.

11 PARTICIPANT: Yes. Wolf Creek.

12 MR. MIRANDA: No, not Wolf Creek.

13 (Laughter.)

14 MR. PARKS: All right. The third
15 transient that we discussed yesterday was the rod
16 withdrawal at -- I'll skip that entirely if nobody is
17 interested. Okay.

18 Finally, of high interest to the ACRS and
19 the staff as well is the loss-of-coolant accident
20 analysis. As the licensee stated, they implemented
21 the ASTRUM method, which would be a change from the
22 BART/BASH appendix A method.

23 They evaluated small breaks using NOTRUMP,
24 which was no change from the previous. The small
25 break LOCA results that should be noted had

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1 significant margin to the regulatory limit. The
2 limiting break size was four inches. And these are
3 the results that we looked at in terms of small break
4 and large break LOCAs.

5 MEMBER SIEBER: Now, there is a topical
6 report for each of those codes that --

7 MR. PARKS: NOTRUMP is. That's correct.

8 MEMBER SIEBER: -- where the staff
9 approves the code and the limits on the methods of
10 use. Is that correct?

11 MR. PARKS: That is correct. NOTRUMP is
12 --

13 MEMBER SIEBER: So we're not blazing new
14 ground here?

15 MR. PARKS: No. And we have reviewed the
16 ASTRUM method. We have reviewed WCOBRA/TRAC, which is
17 the modeling tool on which ASTRUM was based. And we
18 have also reviewed a predecessor to ASTRUM, the code
19 qualification document methodology. ASTRUM is from
20 1999. So as you can see, they met the acceptance
21 criteria.

22 And so, in summary, we reviewed the
23 transient and accident analyses. They demonstrated
24 acceptable results. Where we weren't reasonably
25 assured that they demonstrate acceptable results, we

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1 asked questions to make sure that we could assure
2 ourselves or requested further analysis.

3 We saw that the fuel design remains
4 acceptable to support the uprate. And we concluded
5 that the methods were implemented acceptably.

6 PARTICIPANT: Is the 2,200 number a number
7 identified by Westinghouse for that fuel design or is
8 that generated, that --

9 MR. PARKS: That's our regulation.

10 PARTICIPANT: Okay. So that's your
11 baseline material and all the other type of stuff that
12 goes into --

13 MEMBER SIEBER: On the acceptance criteria
14 1.73.

15 MR. PARKS: Forty-six.

16 PARTICIPANT: Okay.

17 MEMBER SIEBER: Okay. Is that it?

18 MR. PARKS: That concludes the staff's
19 presentation. Are there any questions?

20 PARTICIPANT: I'll ask one thing. You are
21 going to talk about containment analysis in a few
22 minutes. But I noticed this is -- we didn't quite
23 discuss it yesterday. I just had a curiosity. The
24 SER makes -- it's clear that this is not a
25 risk-informed application.

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1 MEMBER SIEBER: Right.

2 PARTICIPANT: And the SER is very careful
3 in a few places to emphasize that fact, that you
4 didn't base your review on any types of risk
5 information presented by the applicant.

6 The SER also makes absolutely no comment
7 regarding the PRA or the risk information provided in
8 the application.

9 And that's fine. I mean, it's not in
10 there. I guess there's no requirement to do that.
11 There was one area where there were some qualitative
12 conclusions drawn that were -- I reread some of the
13 stuff last night and that the applicant made a few
14 semi-qualitative, semi-quantitative risk-informed
15 arguments.

16 And you very, very carefully said your
17 decisions were based solely on licensing deterministic
18 defense-in-depth types of issues. That, in
19 particular, was the reduced margins in the available
20 volume of the DWST and the CST for auxiliary feedwater
21 for makeup to the steam generators.

22 Under SPU conditions, the volume of water
23 required in the tanks is going to be the same, but
24 because the decay heat is a lot higher, the relative
25 volume for the time to steam generator dryout or time

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1 to drain the tanks is reduced substantially.

2 And you basically accepted the reduction
3 on the argument that diverse methods of makeup to the
4 tanks were available from some portable diesel-driven
5 pumps because the licensee and I guess Westinghouse
6 has agreed that they don't want to put service water
7 in the steam generators.

8 It's a long introduction to what is the
9 source of that makeup water for the little portable
10 diesel-driven pumps?

11 MR. PARKS: I believe you are referring to
12 sections of the safety evaluation that reactor systems
13 didn't compose. I don't think that I am qualified to
14 answer your question.

15 PARTICIPANT: Somebody should.

16 PARTICIPANT: Is anybody here who can or
17 can licensee answer the question about where does the
18 water come from or what is the source of the suction
19 for those low diesel-driven pumps?

20 MR. RUSSELL: Yes, I can answer that
21 question for you. My name again is Paul Russell from
22 Dominion.

23 It's going to be from a firewater system.
24 We have our firewater storage tanks.

25 PARTICIPANT: Is that basically service

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1 water?

2 MR. RUSSELL: No, it is not service water.
3 It comes from New London. It is domestic water.

4 PARTICIPANT: Okay. So it's city water.

5 MR. RUSSELL: Yes.

6 PARTICIPANT: Okay. Thanks. Thank you.
7 I was hoping that was the case. Never mind.

8 MEMBER SIEBER: Well, it's not dirty
9 water.

10 MR. PARKS: Any other questions?

11 PARTICIPANT: I didn't mean to blindside
12 anybody from --

13 MR. PARKS: I understand that.
14 Notwithstanding, thank you very much for your time.

15 MEMBER SIEBER: Thank you very much for
16 your presentation.

17 I would like to call on Dominion now to
18 begin their containment analysis.

19 MR. KAI: I would like to talk about what
20 we did in containment analysis. We have the
21 containment methodology for current standards. By
22 "current standards," I mean the most recently approved
23 methodologies are available. We are using, actually,
24 our in-house methodology that got recently approved
25 using GOTHIC.

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1 As I said before, particularly in
2 containment analysis, we haven't done this for margin.
3 We have done it because we want to posture ourselves
4 going forward with the best methods that we have
5 available today that are approved for doing these
6 types of analyses. That includes not just the
7 containment analysis but the mass energies that feed
8 into the containment analysis.

9 As I said before, we have significant
10 margin. And remaining from SPU we have approximately
11 3.6 psi containment margin. Our profiles are
12 essentially unchanged. There is no impact on the
13 current NPSH analysis.

14 As we stated yesterday, the minimum
15 containment pressure calculations are unaffected by
16 SPU. And we have shown there is some compartment
17 analysis that remains down on the compartment
18 structure will remain within the design limits.

19 We have made a couple of modifications to
20 the RS pipe supports to assure that we meet our
21 required stress and ASME code allowables.

22 PARTICIPANT: What's the design pressure?

23 MR. KAI: Forty-five psig.

24 PARTICIPANT: Okay. Thank you.

25 MR. KAI: Past energy releases have been

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1 redone since the initial licensing. And since that
2 time, there have been enhancements made to those
3 methodologies. They are improved methods.

4 We went looking for margins and methods.
5 We thought we used the up-to-date methods now for
6 calculating mass energy releases. That was all
7 redone. We use in-house containment methodologies.

8 And as such, we repeated every sensitivity
9 study that was originally done and then expanded to a
10 lot more sensitivity space. We did a very extensive
11 containment analysis to assure that all of the issues
12 that we have to address for containment analysis,
13 these requirements are met.

14 We have actually expanded the range under
15 assumed initial conditions to give some operational
16 flexibility. So actually, we are using a broader
17 range of conditions. And we are selecting the
18 limiting from things like initial containment
19 pressure, temperature, humidity. And for each of the
20 different concerns, obviously we have the different
21 and that would be limiting.

22 So we did an extensive sensitivity study
23 to combine to determine the limiting conditions over
24 this wider range of initial conditions. There are a
25 number of different things that are looked at in

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1 containment analysis: minimum, maximum design
2 pressure; the containment liner temperature, which we
3 discussed yesterday; maximum pressure and temperature
4 profiles here; equipment qualification; sump
5 temperature for the recirculation pumps or NPSH calcs;
6 and various combinations of minimum and maximum
7 temperature for the pipe stress evaluation done for
8 containment spray, recirc spray, and ECCS.

9 We have selected the bounding assumption.

10 MEMBER CORRADINI: Is this the right place
11 to ask? I wasn't here yesterday, but I have some
12 numbers in front of me. You went up for your LOCA and
13 small break LOCA by two or three psi. Is that more of
14 the input energy and flow rate that changed it? Is it
15 the stored energy that went in with it or is it the
16 way the containment was modeled or is this an itty
17 bitty bit of all of those?

18 MR. KAI: We'll ask Albert Gharakhanian.
19 Albert actually did most of the containment analysis.

20 MR. GHARAKHANIAN: Yes. What we did is,
21 like Mike mentioned, we changed our methodology to
22 GOTHIC. GOTHIC topical report was submitted. I
23 believe it was approved in '96. And its first
24 application was Surry and North Anna. So the bottom
25 line is, to answer your question, the changing

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1 pressure. I say approximately a two psi change in the
2 pressure came because of the methodology change alone.

3 MEMBER CORRADINI: So you went from
4 something to CONTEMPT to GOTHIC?

5 MR. GHARAKHANIAN: Actually, it was
6 LOCTIC. It's a containment analysis tool.

7 MEMBER CORRADINI: Okay. Fine. And then
8 GOTHIC you use in distributor parameter mode or lump
9 parameter mode?

10 MR. GHARAKHANIAN: Lump parameter
11 modeling.

12 MEMBER CORRADINI: And what is used in the
13 break calculation for the heat transfer to the cold
14 surfaces? Is it Uchida?

15 MR. GHARAKHANIAN: The original analysis
16 used Tagami-Uchida. That was done by LOCTIC. In the
17 transition to GOTHIC, our methodology that was
18 approved by NRC was based on the DLM, diffusion layer
19 model, condensation option, which is in GOTHIC.

20 MEMBER CORRADINI: Okay. All right. So
21 two psi is that alone?

22 MR. GHARAKHANIAN: Two psi alone was the
23 penalty of going to GOTHIC and using DLM.

24 MEMBER SIEBER: Right.

25 MEMBER CORRADINI: All right. Thank you.

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1 MR. KAI: Now, as we said before, there's
2 a number of concerns and issues addressed in the
3 containment analysis. The bounding condition changes
4 depending on what we are looking at. We made sure by
5 covering both ends of the spectrum for all the
6 parameters that we have fully bounded each of the
7 different concerns.

8 In terms of subcompartment, probably the
9 biggest impact is that the cold leg temperature
10 actually drops, which results in, actually, a higher
11 flow rate at the break. That is probably the biggest
12 impact on the subcompartment analysis. And that's
13 been evaluated.

14 So as I said before, in terms of
15 containment analysis, fully bounded, the analysis
16 results are the same as before. In terms of
17 subcompartment analysis, we have taken credit of the
18 fact that we are qualified and approved for leak
19 before break.

20 Now, we did not take advantage of that
21 completely when we originally licensed and in order to
22 avoid and to not have to do those calculations and
23 limit our work, we are crediting for leak before break
24 for, for example, in the steam generator compartment,
25 where we have the big hot leg and cold leg piping.

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1 We have reevaluated because of the higher
2 mass and energy rates. The other compartments, our
3 original analysis had built in a ten percent margin
4 already into the mass energy. Is it arbitrary that it
5 was done at initial licensing? We used that margin to
6 offset the seven percent increase in the uprate.

7 And in some instances, we have actually
8 looked at new analyses done, for example, for the
9 service line break in the pressurizer cubicle and
10 showing that all of the structural requirements are
11 met.

12 PARTICIPANT: And you do not take credit
13 for the leakage of the pressurizer sewage line,
14 though, do you, or do you?

15 MR. KAI: Correct. We do not. That
16 applies to the GOTHIC piping.

17 PARTICIPANT: I heard your discussion, but
18 I want to make sure I get it right. So you
19 selectively used it where you -- you could have used
20 it in a number of locations, but you chose to use it
21 mainly in the subcompartment analysis for the steam
22 generator and only there. Is that correct? I just
23 want to make sure I got it right.

24 MR. KAI: We are approved to use the leak
25 before break where it's used. And it's primarily for

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1 piping interactions. Okay?

2 PARTICIPANT: Okay.

3 MR. KAI: That's the limit of the GEC.

4 PARTICIPANT: Okay. Thank you.

5 MEMBER SIEBER: Now, you've analyzed a lot
6 of accident conditions. What is the peak pressure
7 that you achieved in containment for the worst
8 accident?

9 MR. GHARAKHANIAN: That was presented
10 yesterday. For the LOCA, our peak pressure is 41.4.
11 For steam line break, it was 38.15.

12 MEMBER SIEBER: Okay.

13 MR. GHARAKHANIAN: And those are psi
14 gauge.

15 MEMBER SIEBER: Okay. And that's all
16 below the design pressure?

17 MR. GHARAKHANIAN: Below design pressure,
18 45 psi gauge.

19 MEMBER SIEBER: Now, is design pressure
20 the containment relies on the operation of cont. spray
21 and recirculation spray?

22 MR. GHARAKHANIAN: For loss-of-coolant
23 accident, we do take credit for cont. spray and
24 recirculation spray or obviously for steam line break,
25 we only credit the cont. spray, actually.

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1 PARTICIPANT: Just to expand upon that,
2 these pressures are early in time before sprays are
3 on. You're getting a double spike. You're getting a
4 spike and then another spike, And the sprays take you
5 and help on the second level, where this one is
6 strictly by loss of energy addition, right?

7 MR. GHARAKHANIAN: For the LOCA, that is
8 correct.

9 PARTICIPANT: Okay. Okay.

10 MR. GHARAKHANIAN: Peak occurs first 20
11 seconds or so.

12 PARTICIPANT: Right. That's what I was
13 trying to understand.

14 MR. GHARAKHANIAN: That is a true
15 statement for loss-of-coolant accidents.

16 PARTICIPANT: I'm still --

17 MEMBER SIEBER: The important thing is to
18 stay below the code limit at all times.

19 PARTICIPANT: Right. And I think the
20 plots shown here yesterday are available overlaid on
21 topics of the number of accidents we analyzed for, the
22 number of runs that were done for different, as Mike
23 said, initial conditions and other system
24 interactions. So they all were bounded by the
25 pressure.

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1 MEMBER SIEBER: Okay.

2 MR. KAI: So, in conclusion, I think we
3 have done a very comprehensive container analysis to
4 assure the containment design requirements are all
5 met. Any other questions about containment?

6 PARTICIPANT: I have a quick one.

7 MR. KAI: Yes?

8 PARTICIPANT: I recognize that you are
9 meeting your containment requirements. In your
10 summary, you state you have 3.6 psi pressure margin.
11 I guess that's for your most limiting accidents. What
12 is it right now? Even using the old methods, what's
13 that number, just for comparison?

14 MR. GHARAKHANIAN: Our previous analysis
15 of record, the design pressure for LOCA analysis is
16 38.3.

17 PARTICIPANT: Compared to the SPU, what
18 would it be?

19 MR. GHARAKHANIAN: SPU we went to 41.4.
20 I don't know whether you have yesterday's --

21 PARTICIPANT: Yes, I have it. I just
22 didn't remember it quite. So you have lost some
23 margin?

24 MR. GHARAKHANIAN: Right.

25 PARTICIPANT: But then, those were the old

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1 methods? And if you used comparable methods for
2 comparable accidents, you believe that is about the
3 same or --

4 MR. GHARAKHANIAN: About a psi. You would
5 have seen probably about a psi increasing pressure
6 because of an outbreak. Because of the methodology
7 change, you lost more.

8 PARTICIPANT: As I understand what you
9 said, this is a case where actually going into a
10 different methodology, you took a penalty as opposed
11 to a --

12 MR. GHARARAKHANIAN: That is correct.
13 About two psi.

14 PARTICIPANT: One is a result of SPU, and
15 two is a result of a methods change.

16 MEMBER CORRADINI: So I guess nobody asked
17 the question. Maybe they did yesterday and I wasn't
18 here. So your temperature went down in the liner?

19 MR. GHARAKHANIAN: Correct.

20 MEMBER CORRADINI: Why?

21 MR. GHARAKHANIAN: I can explain why. The
22 original method that was used by Dexter used a LOCTIC
23 methodology. They applied the -- well, they did an
24 independent calculation using the LOCTIC code. And
25 they used four times Uchida as the heat.

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1 MEMBER CORRADINI: So they did an
2 inconsistent calculation. They added more energy to
3 the liner --

4 MR. GHARAKHANIAN: That is correct.

5 MEMBER CORRADINI: -- for the heating than
6 they did for the condensation?

7 MR. GHARAKHANIAN: That is correct. And
8 so what we did, then, then we used GOTHIC. Our
9 approved methodology that we licensed within RCM96 had
10 indicated that we would be using the diffusion layer
11 model, DLM, 1.2 multiplier. So that is really the
12 difference between the liner.

13 MEMBER CORRADINI: So what is the
14 thickness of your liner? Half an inch?

15 MEMBER SIEBER: Not quite.

16 MR. GHARAKHANIAN: I think it's probably
17 less than that. We can look that up.

18 MEMBER CORRADINI: That's fine.

19 MEMBER SIEBER: Three-eighths.

20 MEMBER CORRADINI: So in the modeling of
21 GOTHIC, just one last question, I am intrigued by this
22 two psi. This has got me interested. So in this for
23 this less than half an inch, have you investigated?
24 I mean, that's a five percent uncertainty. So that's
25 not really very much, but it comes close to your

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1 limit. Have you investigated sources of that or you
2 have kind of left it as it is?

3 MR. GHARAKHANIAN: You are talking about
4 the difference?

5 MEMBER CORRADINI: Yes.

6 MR. GHARAKHANIAN: Why we lost the
7 methodology? Like I said, the methodology was
8 developed originally in '96. And when we were
9 developing the methodology, we found some scoping
10 studies. My first application was for Surry. And
11 when we applied that to Surry, we noticed that we were
12 gaining margin.

13 And so bottom line is that the reason we
14 lost margin is that every time you transition, I mean,
15 I think everybody has seen this before. Every time
16 you transition from a Tagami-Uchida to DLM, you end up
17 losing margin. You also end up gaining by the
18 petitioning of the energy at the break.

19 As you know, GOTHIC has a droplet field
20 model. So you really don't use this pressure flash or
21 temperature flash that was used in the old codes. So
22 that's where the credit was originally coming from.

23 Then we went for the analysis on Millstone
24 3 because Millstone 3 containment is a lot larger and
25 we have more surface areas that hit from the DLM with

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1 substantially higher than the benefit that we got on
2 the petitioning of the energy.

3 MEMBER CORRADINI: Right. But one last
4 point, and then I will stop. The petitioning of the
5 energy I don't think is it. The Tagami model has a
6 varied velocity. And the DLM method has no velocity.
7 It is a natural convection.

8 MR. GHARAKHANIAN: That is correct.

9 MEMBER CORRADINI: That is the key
10 difference. You are essentially assuming a staying in
11 volume when you are blowing stuff down to 20 seconds.
12 That is the fundamental difference is you have
13 essentially a convective flow that you have ignored.

14 MR. GHARAKHANIAN: Right. That is
15 correct. And what we have done is once we notice that
16 we obviously should do a lot of investigation, we do
17 a white paper. And, if you like, I have that white
18 paper. I'll be more than happy to pass it --

19 MEMBER CORRADINI: I just was wondering
20 when the industry is going to talk to the staff about
21 considering the fact that convective flows in the
22 first minute are real and have major margin.

23 MR. GHARAKHANIAN: That is correct. That
24 is a true statement.

25 PARTICIPANT: So the new code is more

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1 conservative --

2 MR. GHARAKHANIAN: Yes, yes.

3 PARTICIPANT: Yes. I understand that from
4 that standpoint, how you treat one of their factors.

5 MR. GHARAKHANIAN: That is correct.

6 PARTICIPANT: Okay. Thank you.

7 MEMBER SIEBER: Now, the free volume of
8 containment is about two million cubic feet?

9 MR. GHARAKHANIAN: 2.26 is the minimum.

10 PARTICIPANT: And that's a lower bound?

11 MR. GHARAKHANIAN: That is the lower
12 bound. That's like ten percent lower.

13 PARTICIPANT: Are there any other
14 questions?

15 MR. BUCHEIT: Let me just make a quick
16 comment. This is Dave Bucheit, Manager of Safety
17 Engineering.

18 I think you have seen from the interchange
19 between Mr. Gharakhanian and Dr. Corradini the wisdom
20 of the decision of our senior management to do this
21 work primarily in-house and to update all of our
22 methods to new and improved methods.

23 It certainly wasn't the low-cost approach,
24 but it did allow us to do a lot of extra work that
25 we're able to do in-house and gain a lot of

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1 understanding about how our plants operate.

2 Thank you.

3 MEMBER SIEBER: Do you have anything else?

4 MR. KAI: I thought I would have Mike
5 O'Connor wrap up and give a concluding statement.

6 MR. O'CONNOR: I hope we were able to
7 answer your questions this morning. If there are any
8 others, we are certainly available to answer them. We
9 have spent a considerable amount of effort in gaining
10 that understanding that Dave just talked about to make
11 sure that we know what our power station is going to
12 look like at an increased power level.

13 And we specifically aimed at the beginning
14 of this project to maintain operating margin and to
15 have a better plant operate at 107 percent power than
16 we do right now today. So that was our goal. I think
17 we've met that.

18 We appreciate your time here today. Thank
19 you very much.

20 MEMBER SIEBER: Thank you very much.

21 PARTICIPANT: Can I ask --

22 MR. O'CONNOR: Yes, sir?

23 PARTICIPANT: Do you think you will be
24 able to get an answer to if you take credit for the
25 pumps going off from the loss of feed?

1 MR. O'CONNOR: Yes. We will get the
2 information for you.

3 PARTICIPANT: That number goes from 1,730.
4 How far down does that go?

5 MR. O'CONNOR: Absolutely.

6 MEMBER SIEBER: I ask the staff now to
7 present their review of the containment analysis.

8 MR. ELBEL*: My name is Richard Elbel.
9 I'm a senior reactor systems engineer in the
10 Containment and Ventilation Branch.

11 I was not the reviewer for this stretch
12 power. And I confess I haven't even read the SER.
13 The reviewer is out getting his knee repaired today.

14 PARTICIPANT: He was here yesterday.

15 MR. ELBEL: Yesterday.

16 PARTICIPANT: We give him that hard a
17 time?

18 MR. ELBEL: So I'm going to try to just go
19 through things and answer general questions.
20 Hopefully you got the details, the numbers and things,
21 from the licensee and I can just --

22 MEMBER SIEBER: Okay, guys. Go get him.

23 MR. ELBEL: -- talk about how we do the
24 review.

25 So, starting, the first side is just a

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1 list of the things that are normally reviewed from the
2 standard review plan and RS001. Primary containment
3 functional design includes the calculational methods.

4 And the licensee did use approved methods.
5 The application of GOTHIC was just recently approved
6 by the NRC for Dominion plants.

7 The subcompartment analysis is something
8 that we look at. The increase in the mass release
9 that the licensee was talking about is typical of
10 power uprates.

11 Mass and energy release methods already
12 input to the containment analysis. And the licensee
13 used approved methods for that. And we look at that
14 in some detail during the reviews. Combustible gas
15 control. The licensee is meeting the requirements of
16 the new regulations, the new 50.44.

17 Containment heat removal covers several
18 areas, but the one of most interest, I guess, here is
19 the fact that they didn't take credit for containment
20 accident pressure for NPSH.

21 We also look at the position in the
22 standard review plan that the pressure containment,
23 accident pressure, is reduced by half in 24 hours.
24 And that's of use to the people who reviewed the dose
25 analyses because there's a reduction in the leakage

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1 that's assumed if the pressure is reduced in half.

2 Let me just go on. I think I pretty much
3 covered all this. Summary of staff review. All the
4 analysis methods were approved. We asked a
5 considerable amount of questions and got satisfactory
6 responses back from the licensee.

7 The amount of questions isn't necessarily
8 an indication of the quality of the licensee's
9 submittal but more in some cases of just the way
10 things are written and what the particular reviewer is
11 looking for.

12 All the GDCs were satisfied. We list the
13 GDCs that we look at in the SER going through the
14 regulations. It's usually GDCs 4, 16, 38, and 50 are
15 the ones that apply to containment.

16 The functional design, like I say,
17 includes a review of the analysis methods. The
18 licensee used all approved methods. And we would look
19 at the values that are calculated to see that they are
20 less than the design values for pressure temperature,
21 liner temperature, EQ envelope, and those kinds of
22 things. And they were all satisfactory for this
23 review.

24 Subcompartment analysis. Like I say, a
25 cooler cold leg temperature is typical. That results

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1 in more mass release, and we would look at that.
2 Licensees typically invoke leak before a break for
3 power uprates and -- because they do have more mass
4 coming out. So a leak before break is applied only
5 for subcompartment analysis. I'm not sure that was
6 clear from the last presentation.

7 The only place in containment analysis
8 that leak before break is used is for the
9 subcompartment analysis. And that's described in the
10 statement of considerations for the change to GDC4
11 that was made to include a leak before break.

12 It's allowed for all compartments that are
13 not adjacent to the containment wall. You're allowed
14 to use leak before break. And the licensee's margins
15 -- I'm just stating what's here in this slide were
16 satisfactory. Like I say, I didn't do the review.

17 The mass and energy methods for the
18 primary and secondary were the usual Westinghouse mass
19 and energy-approved methods that have been used for
20 years or the Dominion methods for the post-reflood.

21 What that means is after the Westinghouse
22 methods are used for the blowdown and the reflood
23 portion, the GOTHIC code is used to calculate the mass
24 and energy release post-reflood. And that was
25 approved in this topical report.

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1 That is getting to be a more and more
2 usual application of GOTHIC by the industry to use
3 GOTHIC to calculate the post-blowdown and reflood when
4 dynamic effects aren't significant and the power is
5 only the decay heat and residual heat, residual stored
6 energy, which is well within the capabilities of
7 GOTHIC.

8 Let's see. Impossible gas control. Like
9 I say, the licensee's analysis was consistent with the
10 new rule, 50.44, or the new revision to the rule.

11 The containment analysis for heat removal
12 was acceptable, met GDC38. The GOTHIC code was used
13 for that. The available NPSH requirements were met
14 without taking credit for containment accident
15 pressure.

16 I am not sure that this came across
17 either, but I think there were some questions at one
18 time. So let me just mention Millstone considers
19 themselves -- they still call themselves a
20 subatmospheric containment. But the criteria that
21 they meet aren't the subatmospheric containment
22 criteria anymore. They're the criteria for a large
23 dry containment.

24 The criteria for a subatmospheric, they
25 would have to reduce the pressure down below

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1 atmospheric pressure within an hour and stay below
2 that for the rest of the transient.

3 And the subatmospheric containments are
4 allowed to take credit for containment accident
5 pressure for the injection phase of the accident. But
6 even though they're still called the subatmospheric
7 containment and they operate at some vacuum, they're
8 meeting the criteria of a large dry containment.

9 And one of the things that we normally
10 look at on the slide, Generic Letter 96-06, since the
11 conditions in the containment atmosphere can be more
12 limiting, closer to limits, for temperature, we always
13 ask licensees about compliance with Generic Letter 96-
14 06, which is the fact that when you isolate the
15 containment and close the containment isolation
16 valves, in some cases, you can have liquid caught in
17 between the two valves.

18 And one of the things generic letter 90.06
19 asked licensees to look at was over-pressurization of
20 that piping between the closed isolation valves. And
21 that is a standard question that we ask in the
22 extended power and stretch power reviews is to make
23 sure that the analysis that was done is still
24 applicable under increased power conditions.

25 And in general the licensees analyzed this

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1 in such a conservative way that usually doesn't take
2 any changes when licensees go to stretch power,
3 extended power.

4 So the licensee used approved methods,
5 followed the regulatory guidance, and satisfied all of
6 the design licensing criteria.

7 MEMBER SIEBER: Any questions for Mr.
8 Elbel?

9 CHAIR SHACK: The question yesterday that
10 sort of came up with, you know, how does the staff
11 choose to do or not to do a confirmatory calculation?
12 You know, you didn't do a confirmatory calculation for
13 the containment that you did for some of the fuel
14 systems? Are there criteria?

15 MR. ELBEL: Well, there are sort of
16 criteria. They aren't written down, but basically --
17 well, it has to do with the capabilities of the staff,
18 too, and they're improving.

19 We've obtained the GOTHIC code. We have
20 the CONTAIN code, which is an NRC code, which
21 practically nobody in my branch uses if we need a
22 containment -- a contained calculation done, we ask
23 the research people to do that.

24 And they have done that. In fact, for
25 another review, we did do an independent calculation.

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1 And we found a major error in the way the vendor was
2 modeling things in the GOTHIC code.

3 So in that case -- well, let me back up to
4 state we look at things like are they using all
5 approved methods.

6 CHAIR SHACK: Well, I mean, that's a
7 no-brainer.

8 MR. ELBEL: That's right. That would be
9 the first thing. And then if they're using all
10 approved methods, is there something that looks
11 strange in what they're doing? If maybe they're very,
12 very close to a limit, you know, the limit is 45 and
13 they calculate 44.9 or something, that might --

14 CHAIR SHACK: Trigger.

15 MR. ELBEL: -- tell us to either ask a
16 question or do an independent analysis.

17 MEMBER SIEBER: You reviewed the inputs
18 and the outputs?

19 MR. ELBEL: We reviewed the inputs always.
20 And we look to see that they are conservative. Yes.
21 That might be another indication if a licensee used an
22 input that wasn't as conservative as what other people
23 use or what is used in the past.

24 A lot of what we do is kind of a build-up
25 of knowledge from one licensee to another if everybody

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1 assumes that in a certain analysis, they have to
2 maximize the service water temperature and this
3 licensee didn't maximize the service water
4 temperature. That would prompt a question and maybe
5 an independent analysis.

6 It's sort of difficult for us to do an
7 independent analysis. It takes time. We're not
8 really set up to do it. The other thing you have to
9 realize, too, for containment, which isn't as true in
10 the reactor systems area, is that we don't have the
11 capability. We're trying to get the capability now of
12 doing the mass and energy release part.

13 So when we do a containment analysis,
14 we're taking the licensee's mass and energy. So
15 that's a big part of the analysis that isn't in the
16 audit. When we do a so-called independent analysis,
17 we're using the licensee's mass and energy input
18 almost always.

19 MEMBER SIEBER: And you can compare that
20 to other plants, where you have a similar --

21 MR. ELBEL: We can do that, but that is
22 hard to do because other plants could have different
23 power levels or other assumptions. And so, anyway, we
24 look at the input. We look for trends. We look to
25 see if -- you know, it's really the judgment of the

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1 reviewer. If a reviewer is used to seeing two peaks
2 and the licensee has one peak or licensee has three
3 peaks, you know, that will prompt the question.

4 We are going to try to do more independent
5 analysis. And we are going to try to get the
6 capability to do the mass and energy inputs ourselves.

7 The other thing you have to realize --

8 MEMBER BANERJEE: What would you need to
9 get the capability to get the mass and energy input?

10 MR. ELBEL: Well, a couple of things. It
11 is having somebody who is knowledgeable enough to do
12 it and we are doing that. We have got that now to a
13 point.

14 The other thing I didn't mention, too, for
15 mass and energy is we have lead responsibility, but if
16 there is a real question in the mass and energy part
17 that we have trouble with, we go to the reactor
18 systems people. And they're the people who do more of
19 the LOCA and steam line break analysis. And they help
20 us out if we have a question or a new type of analysis
21 or something, too.

22 But we are getting the capability to do
23 mass and energy. We have the capability with GOTHIC
24 and with research to use CONTAIN to do the
25 calculations. So the other thing is having the --

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1 MEMBER BANERJEE: You have to run a
2 systems code, right, --

3 MR. ELBEL: Right.

4 MEMBER BANERJEE: -- to get that?

5 MR. ELBEL: Right, right. And we're going
6 to try to use RELAP now within our own group to do
7 that. But, then, you have to understand, too, that
8 we're not the licensee. We don't have all the
9 detailed information the licensee does. So we have to
10 get this information from somewhere. And the
11 somewhere is the licensee.

12 MEMBER SIEBER: Right.

13 MR. ELBEL: So that's another area where,
14 you know, we can say we're doing an independent or an
15 audit calculation, but a lot of the input is coming
16 from the licensee.

17 So, really, we're not doing so much
18 independent analysis as what we look at mostly is
19 sensitivities. The licensee used such and such a
20 model. For example, the licensee used the -- in
21 GOTHIC, the licensee calculated revaporization of the
22 condensate into the vapor atmosphere. He used the
23 GOTHIC way of doing that, which is more of a
24 physically based approach, mass and heat transfer, as
25 opposed to the staff has a NUREG that says, use a

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1 fraction of eight percent.

2 Well, if the licensee says, you know,
3 they're going to use the GOTHIC approach, we may do a
4 calculation with the eight percent just to see what
5 the difference is between what the licensee did and
6 what would happen if they used the staff approach.

7 On another review, we just did the --

8 MEMBER SIEBER: Can we just sum up?

9 MR. ELBEL: Yes. Well, yes. I could go
10 on forever. Okay. I hope that gives you some idea of
11 --

12 MEMBER BANERJEE: Can you please comment
13 on one thing that was raised yesterday that this plant
14 has a small volume-to-power ratio? Is that true that
15 it has a small volume-to-power ratio?

16 MR. ELBEL: I don't know offhand.

17 MEMBER BANERJEE: Okay.

18 MEMBER SIEBER: 2,200,000 cubic feet
19 containment?

20 MR. ELBEL: The licensee can probably
21 answer that. I don't know offhand.

22 MEMBER SIEBER: And the highest accident
23 pressure is less than the design pressure. That's
24 what you look at to determine whether the containment
25 is too small or not.

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1 MEMBER MAYNARD: Plus, you can't just say
2 contains the volume versus power because each of the
3 containment systems are different. You can have very
4 small containments with certain systems or you can
5 have a very large dry containment that you don't have
6 to have some of the various spray systems, hot
7 condensers, stuff like that.

8 So you have to look at the entire
9 containment system to really draw a comparison.

10 MEMBER SIEBER: Okay. Thank you very
11 much.

12 And I just wanted to -- There's one item
13 from Mr. Brown that he asked the Licensee and I think
14 the Licensee needs to clarify what they're going to be
15 able to clarify --

16 MR. O'CONNOR: Yes, Mr. Chairman. I'm
17 Michael O'Connor. If I might take a minute to try to
18 give you some insight on Dr. Brown's question
19 regarding the --

20 MEMBER BROWN: I appreciate you upgrading
21 my academic credentials. I'm just a little Masters'
22 degree. Okay.

23 MR. O'CONNOR: You work for a living.

24 MEMBER BROWN: Small "m."

25 (Laughter.)

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1 MR. O'CONNOR: We can't provide you the
2 exact cubic feet, but what Westinghouse has done this
3 study for other utilities and it's about 100 cubic
4 foot credit.

5 PARTICIPANT: It goes from 1731. If I use
6 that instead of -- you would be 1631.

7 MR. O'CONNOR: Correct.

8 PARTICIPANT: Still off-scale.

9 MR. O'CONNOR: Near the top of the
10 indicating range.

11 (Simultaneous conversation.)

12 PARTICIPANT: Is that reactor coolant pump
13 or what's -- Four down to --

14 MR. O'CONNOR: Four reactor coolant pump.
15 Four down to zero.

16 PARTICIPANT: Okay, and that is part of
17 your procedures. Is that correct? It's part of this.

18 MR. O'CONNOR: Our procedure is set for a
19 loss of feed.

20 PARTICIPANT: Okay. Casual loss of feed.
21 One of the operator actions is to -- and whatever the
22 process is, it's to stop --

23 MR. O'CONNOR: Stop reactor coolant pumps.

24 PARTICIPANT: -- reactor coolant pumps.

25 MR. O'CONNOR: Right.

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1 PARTICIPANT: Somebody said it take ten
2 minutes to do that. The plants I'm familiar with, it
3 took about 30 seconds.

4 MR. O'CONNOR: No, to actually be in that
5 procedure, you probably land there in under two
6 minutes.

7 PARTICIPANT: Okay.

8 MR. O'CONNOR: For a normal reactor trip
9 in transition to the loss of heat sync pressure.

10 PARTICIPANT: Okay. Thank you.

11 MEMBER SIEBER: Thank you. Any other
12 questions?

13 PARTICIPANT: No, that's it for me. Thank
14 you.

15 MEMBER SIEBER: Okay. We've had a request
16 for public input and the time allotted for that is ten
17 minutes and the representative is Ms. Nancy Burton of
18 the Connecticut Coalition Against Millstone. So if
19 you could ask Ms. Burton to --

20 CHAIRMAN SHACK: Mr. Gundersen is going to
21 do it.

22 MEMBER SIEBER: Who is?

23 CHAIRMAN SHACK: Mr. Gunderson.

24 MEMBER SIEBER: Okay.

25 CHAIRMAN SHACK: Ms. Burton couldn't be

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1 here today.

2 MR. GUNDERSEN: Thank you. Ms. Burton
3 could not make it. She asked me to speak. Ms. Burton
4 presented earlier comments by Dr. Thurnglass and
5 members of the community -- and I don't pretend either
6 support or not support any of that. I just don't
7 know.

8 CHAIRMAN SHACK: Could you state your
9 name?

10 MR. GUNDERSEN: My name is Arnold
11 Gundersen with an S-E-N. I was hired by Citizens
12 Against Millstone to take a look at the containment.
13 And thank you for your probing questions of the staff
14 today based on information I provided yesterday. I
15 appreciate that.

16 We learned yesterday that there are 24
17 other Westinghouse reactors -- reactors, and we heard
18 staff say that even though Dominion applied for a
19 stretch it was treated as an extended power uprate.
20 Mr. Solomon said that there was no independent
21 confirmatory analysis by the NRC yesterday and I think
22 I heard that confirmed today.

23 I looked at RS-0001 and I found -- I
24 looked up the calculations and I found 45 hits
25 requiring that the NRC do calculations. So my concern

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1 remains that on the issue of this containment because
2 it is so small and if you go on the NRC's web pages,
3 it's the only reactor, only four-loop Westinghouse
4 reactor in the country with a subatmospheric
5 containment. The volume stated in the initial
6 licensing report was 2.38 million cubic feet and today
7 or yesterday it went down, it went on a diet I guess,
8 lost about 100,000 cubic feet. It's down at 2.26
9 million cubic feet compared to other Westinghouse
10 four-loops of 2.5 to 2.9 million cubic feet.

11 MEMBER SIEBER: But they are not
12 subatmospheric.

13 MR. GUNDERSEN: They are not
14 subatmospheric. Correct.

15 MEMBER SIEBER: Right.

16 MR. GUNDERSEN: So when you compare to the
17 large dry containments that are out there which it
18 really is considered because it doesn't go
19 subatmospheric immediately after an accident. In
20 fact, its energy to volume ratio is at the extreme.
21 I would agree on the comment about mitigating systems
22 having to be taken into account but not for that
23 initial 20 seconds to a minute which is my concern.

24 Specifically in the area of subcompartment
25 pressurizations, this is very small containment and

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1 I'll go back to the Dominion side. It was No. 5
2 before and they said for most scenarios the stretch
3 power uprate mass and energy release is abounded by
4 the ten percent margin provided in the current
5 analysis. If I pump seven percent more energy, now I
6 have a three percent margin.

7 But I think you also have to look at the
8 operating history of Millstone last year. They had a
9 power surge while they were doing a test. The two
10 minute average for that power surge was a couple
11 percent, two percent, but within that was a four
12 percent peak. So if you take the seven percent for
13 the power uprate and the operating surge that's real,
14 we're not talking about a theoretical margin here,
15 we're talking about an operating surge of four
16 percent. Well seven plus four is eleven and at a ten
17 percent margin. It tells me that there is little or
18 no margin on the subcompartment pressurizations.

19 And I guess really what I'm asking for is
20 it appears because this is treated as a stretch not an
21 EPU, the staff didn't have the time it would have if
22 it had done an EPU. I know that this group only had
23 26 days to review the application because Dominion
24 would like an answer in August so that they can
25 perform an outage in October. But what's the rush?

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1 And let me just refer to one comment in
2 RS-001. I was able to pull down last night the
3 December '03 revisions. I'm sure these words may not
4 be exact, but the staff is required, this is step
5 three paragraph six of the Technical Review Guidance
6 in RS-0003 and it's page 15, to do audits or
7 independent calculations and they should consider the
8 following and there are a series of bullets. One of
9 those bullets is "to compare the available margin
10 versus the level of uncertainty in the analysis" and
11 to me if you had a ten percent margin and that's
12 pretty cool, I wouldn't be here if there's a ten
13 percent margin, but the ten got eroded to three with
14 the seven percent uprate and the three really based on
15 operating experience with this two percent spike is
16 less than one and even maybe a negative one.

17 So I guess what I'm asking you is to ask
18 the staff to do a confirmatory analysis not of the
19 long-term for the whole containment. I think the
20 mitigating systems are probably more than adequate to
21 drop the containment pressure. But in the area of
22 subcompartment pressures on containment that's
23 incredibly small, I ask that the staff do a more
24 thorough independent analysis of those calculations.
25 Thank you.

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1 MEMBER SIEBER: Thank you very much.
2 Any questions or comments by the members?
3 (No verbal response.)
4 If not, Mr. Chairman, I turn it back to
5 you.

6 CHAIRMAN SHACK: Thank you. I thank the
7 staff and the Licensee for their presentations and I
8 think it's time for a break until ten of. Off the
9 record.

10 (Whereupon, a short recess was taken.)

11 CHAIRMAN SHACK: On the record. It's time
12 to come back into session. Our next topic is the
13 selected chapters of the Safety Evaluation Report
14 associated with the ESBWR design certification and Dr.
15 Corradini, if he stands up so I can see him, will lead
16 us through that.

17 MEMBER CORRADINI: Right.

18 (Off the record comments and laughter.)

19 GEH PRESENTATION OF CHAPTER 2 OF DCD

20 MEMBER CORRADINI: Thank you, Mr.
21 Chairman.

22 So, for the members just to remind
23 everyone, we are going through on a chapter-by-chapter
24 or group chapter-by-chapter basis of the ESBWR design
25 certification document and the staff's SER, the

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1 evaluation of it. We're going to discuss today
2 Chapter 3 which is a very big group of topics on
3 Design and Structures, Components, Equipment and
4 Systems. I'll turn it over to Amy Cabbage to kind of
5 kick us off and then she'll introduce our speakers
6 from GE.

7 MS. CUBBAGE: I'm Amy Cabbage. I'm a Lead
8 Project Manager for the ESBWR Design Certification.
9 We've briefed the subcommittee for two days or I
10 should say a day and a half in June on this chapter,
11 a lot of topics coming out of that discussion. There
12 were a few topics that the subcommittee felt that
13 would be good to elaborate on here for the full
14 committee.

15 First will be GE this morning and we're
16 going to be discussing selected topics including
17 seismic classification and quality group
18 classification, seismic design issues and also EQ and
19 I'll introduce Jeff Waal from GE Hitachi to begin the
20 GE presentation.

21 MR. WAAL: Thank you. Good morning. My
22 name is Jeff Waal from the Regulatory Affairs staff of
23 ESBWR project GE Hitachi in Wilmington, North
24 Carolina. As Ms. Cabbage said, we're here to discuss
25 selected topics on Chapter 3 of the ESBWR DCD.

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1 With me today, I have Mr. Jerry Dever who
2 is the Lead Chapter Engineer for Chapter 3 of DCD and
3 also Tech Lead for the ESBWR Engineering Team, Ai-Shen
4 Liu and David Hammond who are with the Engineering
5 Staff at GE Hitachi.

6 Two weeks ago, we presented a detailed
7 presentation to the ACRS Subcommittee on Chapter 3
8 which, has already has been mentioned, is a pretty
9 detailed list of items that were discussed in that
10 and, as a result, they asked us to come back and talk
11 about some selected topics to the full Committee.
12 Chapter 3 covers a wide range of issues relating the
13 qualification of systems, structures, components and
14 equipment and they include the classification of
15 equipment, wind and tornado warnings, flooding,
16 seismic design, environmental and seismic
17 qualification of equipment, the ASME Code
18 classification, the ASME Code analyses --

19 The first subject that we were asked to
20 provide additional details on was Section 3.2
21 Classification of SSEs and for that I'm going to turn
22 the discussion over to Mr. David Hammond.

23 MR. HAMMOND: Okay. When it comes to
24 classification of equipment, at GEH we start out first
25 by looking at the 10 CFR 50.2 which defines safety-

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1 related and what constitutes a safety-related
2 structure, system and component. So it's basically
3 those components that are needed to ensure the
4 integrity of reactor coolant pressure boundaries,
5 components that give you the capability to shut down
6 the reactor and maintain it in a safe shutdown
7 condition and then components that you rely on to
8 prevent or mitigate the consequences of accidents such
9 that you limit the total offsite releases. From that
10 we go through each of the components and assign them
11 to either safety related or non-safety related.

12 We then have a safety classification where
13 we take the safety related components and break those
14 into three subclasses based on the type of function
15 that they perform. Those components that are involved
16 in the reactor coolant pressure boundary integrity are
17 assigned to Safety Class I. Safety Class II is for
18 mechanical components that are primarily involved in
19 functions like containment isolation functions that
20 aren't part of the reactor coolant pressure boundary
21 isolation and also functions such as ECCS and residual
22 heat removal functions. And then Safety Class III is
23 for all other safety related structures, systems and
24 components and it also includes all the electrical and
25 safety related components. The non-safety related

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1 components we assign a Safety Class N to those and
2 then the safety class is then very closely related to
3 the quality groups A through C that I'll discuss in a
4 few minutes here.

5 Once we get the safety classification
6 defined, that establishes a minimum set of
7 requirements that apply to each of these structures,
8 systems and components. If it's a Safety Class I
9 component, it gets assigned to Quality Group A and has
10 to be Seismic Category I. If it's Safety Class II, it
11 has to be a minimum of Quality Group B and it's
12 assigned to Seismic Category I and, similarly, if it's
13 Safety Class III, it's assigned as a minimum to
14 Quality Group C and also the safety classification is
15 used as an entry point to our Quality Assurance
16 Program under 10 CFR 50 Appendix B.

17 Okay. Having done that, we now look at
18 seismic qualification or seismic classification. This
19 is based on -- This is from the DCD Section 321 and
20 it's based on Reg Guide 1.29 and also on the SRP
21 3.2.1. All safety related SSCs are required to be
22 Seismic Cat I. That's consistent with the definition
23 in 10 CFR 50 Appendix S for equipment that has to be
24 designed to withstand an SSE. We assign Seismic
25 Category II to those structures, systems and

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1 components whose failure could degrade the performance
2 of safety related SSEs and, also from the PRA
3 analysis, there's a certain set of SSEs that are non-
4 safety related but follow what's called Criterion B
5 which means they're used for long term heat removal
6 after 72 hours after the pass of safety systems that
7 perform the front line work and for those we apply
8 Seismic Category II to anything that falls within that
9 category if it's not already Seismic Category II or
10 above.

11 There are also some situations where
12 specific regulations, reg guide, SRPs, etc., say that
13 certain non-safety related SSEs have to be Seismic
14 Category I. One example of that is on the makeup
15 sources of water for the spent fuel pool. There are
16 requirements in the Reg Guide 1.13 and the associated
17 SRP that says that needs to be Seismic Category I.

18 And then once we'd gone through all those
19 requirements and decided what needed to be upgraded
20 the remaining SSEs are assigned to what we call
21 Seismic Category NS which basically means there's no
22 additional seismic requirements over and above what's
23 in the standard building codes that apply to the
24 design.

25 And then there's also Reg Guide 1.143 that

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1 applies special seismic requirements to radioactive
2 waste handling systems. So those are taken into
3 account as well in the seismic classification.

4 CHAIRMAN SHACK: Why isn't there fire
5 protection?

6 MR. HAMMOND: Well, that's part of --
7 Anything that's needed for fire protection falls into
8 the definition of safety related. So that's covered
9 through that. If it's fire protection -- Fire
10 protection is one of our design events for figuring
11 out what's safety related or non-safety related to
12 begin with. So anything that's needed to ensure core
13 cooling and then functions like that for fire
14 protection is already going to be classified safety
15 related and therefore it would be Seismic Cat I.

16 MEMBER APOSTOLAKIS: If we go back to the
17 previous slide. I guess what this means there is that
18 the PRA is used to add the seismic category to this.

19 MR. HAMMOND: Yes, as it turned out, I
20 think there are only about two or three components
21 that got upgraded because of that. Most of them were
22 already Seismic Category I or II for other reasons.

23 MEMBER APOSTOLAKIS: Why? Maybe the staff
24 can answer this. We have passed this risk informed
25 classification SSEs. Why can't that be useful? I

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1 mean when South Texas finds that more than 90 percent
2 of the safety related SSEs are of low risk
3 significance, it seems to me that's a pretty serious
4 finding and yet we keep doing the traditional stuff.
5 Is the Licensee -- I mean, the future buyers of the
6 ESBWR expected to come back to us and request that the
7 classification be risk informed later? Why can't it
8 be done now?

9 MR. COLE: This is Bob Cole for the staff.
10 I'm involved in the review of Chapter 19 of the ESPWR
11 design certification. I guess let me say two things.
12 One is it's not this particular classification here of
13 where he said additional SSEs were brought to Seismic
14 Category II. It's not the PRA that's bringing that
15 in.

16 MEMBER APOSTOLAKIS: That's what it says.

17 MR. COLE: Well, it's not the PRA. It is
18 a criterion from witness, but the criterion has to do
19 with equipment, SSEs, that are required to ensure a
20 certain set of safety functions in the period between
21 72 hours and after the safety systems are no longer,
22 well, in the period between 72 hours and seven days
23 and it's not falling out of the PRA. It's simply
24 falling out of what is equipment that's needed during
25 that period.

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1 And something I would say in answer to
2 your question why aren't we using the risk-informed
3 categorization process that's applied for maintenance
4 rule and for special treatment, I believe, and this is
5 my opinion, that I think it's a regulatory issue. I
6 don't think we're there yet in terms of risk informing
7 the regulations.

8 MEMBER APOSTOLAKIS: But there is a --

9 MR. COLE: Except there is a definition of
10 safety related in the regulations and there's a
11 history on how you decide what goes in there. It's
12 still basically within the design basis criterion,
13 what's in the design basis and what's required for
14 design basis accidents. It's not usually in the PRA.
15 The regulations are not quite there yet, I believe,
16 for making these determinations and what's safety
17 related and not safety related.

18 MEMBER APOSTOLAKIS: But 50.69 is a
19 regulation.

20 MR. COLE: But it's not a requirement.
21 It's a voluntary regulation.

22 CHAIRMAN SHACK: But it says they may
23 voluntarily require with the requirements in this
24 section as an alternative.

25 MEMBER APOSTOLAKIS: So they could do it.

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1 They just chose not to do it. Is that what you're
2 saying?

3 CHAIRMAN SHACK: As I'm reading the
4 regulation, it appears -- "An applicant for a
5 construction permit, operating license or an applicant
6 for design approval, a combined license or
7 manufacturing license under Part 52 may voluntarily
8 comply with the requirements in this section."

9 MEMBER CORRADINI: Sure. They just chose
10 not to.

11 CHAIRMAN SHACK: They chose not to. Now
12 I think it's probably less of a problem for them
13 because they have their passive safety system, and so
14 their number of safety system components is a lot less
15 in many ways than it is -- I mean, that's the reason
16 you have a passive safety system among others is to
17 get down the number of safety related components.

18 MEMBER APOSTOLAKIS: I thought the answer
19 was going to be that you really need the complete PRA,
20 not the design certification.

21 CHAIRMAN SHACK: That may be, too.

22 MEMBER APOSTOLAKIS: It's pretty
23 significant. I mean, we're not talking about removing
24 a few. Now, admittedly, you know, it's a different
25 design. But having more than 90 percent of the safety

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1 related SSEs declared as being of low risk
2 significance --

3 MEMBER POWERS: It seems to me the more
4 troublesome finding is that they found systems that
5 did not fall in the safety related category that were
6 less significant.

7 MEMBER CORRADINI: Exactly.

8 MEMBER APOSTOLAKIS: Yes. They also found
9 about 650 at one point that were elevated.

10 MEMBER CORRADINI: That's right. That's
11 the problem.

12 MEMBER APOSTOLAKIS: So that would --
13 Well, it's not a problem now.

14 (Laughter.)

15 MEMBER CORRADINI: Well, it can be a
16 problem, George.

17 MEMBER ARMIJO: It depends on what they
18 are.

19 MEMBER APOSTOLAKIS: It depends what they
20 are, but I think the overall finding was that what we
21 declare safety related SSEs may not be the wisest.
22 But if you chose not to do it, that's fine. But I
23 thought the answer would be PRAs -- I mean, you really
24 have to wait until you get the plant and to have the -
25 - and all that stuff.

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1 MEMBER ARMIJO: For the uneducated,
2 finding a whole bunch of stuff that had previously
3 been considered higher risk, I guess, and now being
4 considered --

5 MEMBER APOSTOLAKIS: Safety related.

6 MEMBER ARMIJO: -- safety related/high
7 risk, now being safety related but low risk which
8 changes the effort, I guess, that you have to apply to
9 them or does it safety related --

10 MEMBER APOSTOLAKIS: Yes.

11 MEMBER ARMIJO: Well, I don't -- He's
12 shaking his head no.

13 MEMBER CORRADINI: Not when you go into
14 the maintenance rules standpoint.

15 MEMBER APOSTOLAKIS: They go to risk free
16 which is a new category --

17 MEMBER ARMIJO: They go to what?

18 MEMBER APOSTOLAKIS: It's a new category.

19 MEMBER CORRADINI: Risk free.

20 STAFF BOB: You guys just keep making this
21 stuff up.

22 (Laughter.)

23 MEMBER APOSTOLAKIS: Category IV is safety
24 related and risk significant.

25 (Simultaneous conversation.)

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1 For those, all the requirements that are
2 mentioned here remain intact. For safety significant
3 but of low risk, there's a new category called Risk
4 Free.

5 STAFF BOB: Okay.

6 MEMBER APOSTOLAKIS: And for that one, the
7 requirements are reduced and there is a --

8 (Simultaneous speakers.)

9 MEMBER CORRADINI: -- in terms it's kind
10 of like the --

11 CHAIRMAN SHACK: -- is a lot like --
12 Conceptually, it's like --

13 MR. HAMMOND: There's like five different
14 categories under -- and we're only picking the
15 Criterion B one here to upgrade the seismic on because
16 those are the more significant ones that come out of
17 it.

18 PARTICIPANT: So you contrasted that now
19 with those. I guess Harold did.

20 PARTICIPANT: Yes, you upgrade some.

21 PARTICIPANT: You don't upgrade others.

22 PARTICIPANT: There's a bunch that were
23 upgraded.

24 MEMBER CORRADINI: Yes, you can't --
25 There's are two sides to it.

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1 MEMBER APOSTOLAKIS: There are two sides
2 but the first side wins.

3 MEMBER ARMIJO: You mean the low risk
4 wins.

5 PARTICIPANT: Why does that win when the
6 other --

7 (Simultaneous speakers.)

8 PARTICIPANT: I'm trying to work on that
9 one.

10 MEMBER APOSTOLAKIS: There may be few of
11 the other ones.

12 PARTICIPANT: I think there's 600.

13 PARTICIPANT: I think the witness --

14 MEMBER APOSTOLAKIS: -- 22,000 to be
15 categorized.

16 MEMBER CORRADINI: I think we're going to
17 have this as a lunch discussion, he and I.

18 (Off the record comments.)

19 MEMBER APOSTOLAKIS: Lunch is a priority.

20 (Laughter.)

21 MS. CUBBAGE: I would just like to offer
22 that --

23 MEMBER CORRADINI: Let them get back on
24 track.

25 MEMBER APOSTOLAKIS: I got my answer.

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1 They chose not to do it.

2 MS. CUBBAGE: They chose not to do it, but
3 if there are any concerns about non-safety systems
4 that should have been elevated the RTNSS process for
5 passive plant I think addresses that. They did a
6 thorough evaluation of all the non-safety equipment
7 and elevated any that were risk significant through
8 the focus PRA process and that as far as any systems
9 that are safety related that are not risk significant
10 as Dr. Shack mentioned there with passive plant, they
11 don't have any safety related pumps. There are not a
12 lot of components in this plant that you could
13 consider downgrading.

14 MEMBER APOSTOLAKIS: It doesn't seem to me
15 obvious that one safety risk significant component is
16 going to be picked up.

17 CHAIRMAN SHACK: Well, C and D and RTNSS
18 won't get you.

19 MEMBER APOSTOLAKIS: I don't know.

20 (Simultaneous conversations.)

21 CHAIRMAN SHACK: C and D are related to
22 under power operating shutdown conditions to meet
23 safety goals of CDF and LERF and functions needed to
24 meet containment performance goals.

25 MEMBER APOSTOLAKIS: I'm sure it makes up

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1 most of it.

2 MEMBER MAYNARD: Do COL applicants have to
3 comply or conform with the classification used in the
4 DCD or can they revise the classification at that
5 time?

6 MEMBER APOSTOLAKIS: That's a good
7 question.

8 MR. COLE: As of right now, the ones that
9 have been submitted have just incorporated the DCD by
10 reference, although they do have the option to declare
11 a deviation and ask for that to be reviewed.

12 CHAIRMAN SHACK: So you're making the
13 declaration and then they -- let me make sure I
14 understand. It's not impossible upon them -- a plant.
15 They can come and say we're not going to do this and
16 we don't accept that --

17 STAFF BOB: Well, they can ask the staff
18 to review --

19 (Simultaneous conversations.)

20 MS. CUBBAGE: I could speak to that.
21 Ultimately, when a combined license, should it be
22 issued for any ESBWR it will incorporating by
23 reference the ESBWR design certification which will be
24 a regulation. The design certification becomes a rule
25 as an appendix to Part 52 and any combined license

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1 applicant or holder that wants to deviate from
2 anything in DCD has to follow a change process ranging
3 from a 50.59 like process all the way up to an
4 exemption depending on whether it's Tier 1, Tier 2
5 star, Tier 2, tech specs, etc.

6 CHAIRMAN SHACK: It's not undertaken
7 lightly.

8 CHAIRMAN SHACK: I'm just trying to get a
9 handle on what --

10 (Simultaneous conversation.)

11 MR. HAMMOND: They don't make that
12 decision. NRC does. Because that's what I'm saying.
13 You all set the standard.

14 CHAIRMAN SHACK: Right.

15 STAFF BOB: It's accepted by NRC. I mean,
16 we may be consulted by the license or by the --
17 afterwards of what they're doing. But it's ultimately
18 their choice and the NRC's test it, review it and
19 approve it or decide whether to approve it or not.

20 MR. HAMMOND: Okay. The other part of the
21 classification is quality group classifications which
22 are in DCD Section 3.22. These are based on Reg Guide
23 1.26 and SRP 3.2.2 and they're used to -- basically,
24 the quality group is then used to define what design
25 codes have to be used to design the pipes and valves

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1 and various types of components.

2 The Quality Groups A, B and C here, in
3 general, the definitions line up almost identical to
4 what we used for safety classification earlier. The
5 main difference is that the quality groups put in some
6 extra words that say these are pressure retaining
7 portions of systems and also there are some words in
8 there that say they're for water and steam containing
9 systems. So if a system doesn't contain water or
10 steam or it doesn't retain pressure, it really
11 technically doesn't have a quality group designation.

12 Quality Group A is for the reactor coolant
13 pressure boundary pressure retaining portion. So
14 that's like your reactor pressure vessel and your
15 attached systems out to the isolation valves. Quality
16 Group B is for pressure retaining portions that are
17 not part of Quality Group A that perform safety
18 related contained isolation, ECCS and residual heat
19 removal functions. And then Quality Group C picks up
20 the other safety related functions that aren't
21 included in Quality Groups A and B. And then there is
22 a special Quality Group D that's for systems or
23 components that may contain or that contain or may
24 contain radioactive materials. So this can be some
25 portions, the non-safety part of the systems, that

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1 actually handle some of these radioactive material and
2 they get a Quality Group D designation and apply
3 special rules for design based on that.

4 Okay. Just as a summary or conclusion of
5 our classification, our classification system is
6 consistent with previously license designs. We are
7 basically using the same system we did for the ABWRD
8 DCD and an earlier BWR designs. We determined safety
9 related structures, systems and components.

10 MEMBER ARMIJO: Can we go back for a
11 minute?

12 MR. HAMMOND: Yes.

13 MEMBER ARMIJO: What's the difference
14 between a B and C? B is pressure related, pressure
15 retaining portions and sometimes not include a safety
16 related containment isolation, ECCS, residual heat
17 removal and then C is pressure retaining portion, the
18 same words, and supports, same words.

19 MR. HAMMOND: Yes.

20 MEMBER ARMIJO: For other safety related
21 functions not included.

22 MR. HAMMOND: Right.

23 MEMBER ARMIJO: Why aren't they all of
24 equal importance relative to how you treat them
25 between them? It seems like a very thin line.

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1 MR. HAMMOND: Part of where this comes --
2 Part of where this is divided is somewhat by the type
3 of pressures that these things are exposed to during
4 the life. The reactor coolant pressure boundary sees
5 the largest pressures and therefore is designed to
6 face that. When you get down into ECCS and RHR
7 systems, they typically operate at maybe 20, 25
8 percent or less of the full reactor pressure and so --

9 MEMBER: Is is magnitude?

10 MR. HAMMOND: Yes, it's really magnitude
11 of pressure they have to retain plays a big role in
12 that.

13 MEMBER ARMIJO: How you divided that.

14 MR. HAMMOND: Yes.

15 MEMBER ARMIJO: So C would be even less --

16 MR. HAMMOND: C are things that are barely
17 marginal above atmospheric pressure typically.
18 They're not usually very --

19 MEMBER ARMIJO: That's like faucets in
20 your bathrooms and things like that.

21 MR. HAMMOND: Yes.

22 MEMBER ARMIJO: I'm being facetious.

23 MR. HAMMOND: Yes, I can understand that.

24 MEMBER CORRADINI: So, for example, for C
25 can you give us an example of C?

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1 MR. HAMMOND: Let's see. One I'm familiar
2 with is the discharge lines for the safety relief
3 valves. They're in containment, but they're normally
4 not pressurized. They only become pressurized when a
5 safety relief valve would operate.

6 MEMBER CORRADINI: Okay. So down the
7 stream of a valve.

8 MR. HAMMOND: Yes.

9 MEMBER CORRADINI: But they are still
10 probably -- They're still a very low pressure.

11 MR. HAMMOND: Okay. So like I said, this
12 classification system is nothing new that we invented
13 for ESBWR. It's essentially the same as we've done in
14 the past with just a few tweaks for the RTNSS type
15 category.

16 Safety related structures, systems and
17 components are determined based on the definition
18 that's in CFR 50.2. We then use safety classification
19 to establish minimum requirements, further
20 classifications, and this also serves as our entry
21 point to our QA program. These minimum seismic and
22 quality group classifications are then upgraded as
23 required by SRPs, reg guides and design practices from
24 the past. So there are situations where there are
25 non-safety related components that have higher quality

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1 groups than they would ordinarily have just due to the
2 function they perform and requirements in various reg
3 guides and SRPs.

4 The PRA analysis to some extent we're
5 involved in determining SSES are required upgraded
6 seismic design requirements in terms of figuring out
7 what components are important for long-term heat
8 removal from the system. And these seismic and
9 quality reclassifications establish the primary basis
10 for the NRC review under SRP 3.21 and 3.22. It's not
11 essential in the NRC's review that they endorse our
12 safety classification because it's not covered by any
13 of the regulations specifically. But it's a starting
14 point to get us into the seismic and quality
15 reclassifications and we only build on increasing the
16 requirements as we go rather than subtract anything at
17 that point. So they can concentrate their review on
18 the seismic and quality groups and perhaps our QA
19 program.

20 Any other questions?

21 MEMBER CORRADINI: If I might just
22 interject for the Members, by your direction and
23 comments of the Subcommittee Meeting, they're going to
24 now move on and pass through as I see here your next
25 set of slides directly to 3.7 for seismic. So we're

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1 not going to discuss here anything to do with wind,
2 water, missile, etc.

3 MEMBER MAYNARD: Floods.

4 MEMBER CORRADINI: Right. Based on us
5 wanting to take the time to talk about that. Sorry.

6 MEMBER APOSTOLAKIS: So does that mean the
7 Subcommittee was happy?

8 MEMBER CORRADINI: We're never happy.

9 (Laughter.)

10 MEMBER CORRADINI: We were adequately
11 pleased.

12 MR. HAMMOND: Now I would like to turn it
13 over to Dr. Liu to discuss --

14 MEMBER BANERJEE: So you didn't have to
15 consider tornadoes.

16 MEMBER MAYNARD: Yes, they considered it.

17 MR. HAMMOND: We do but not specifically
18 the classification. That goes into how you design
19 after you've classified the stuff.

20 MR. LIU: Okay. The CDC Section I would
21 like to discuss today 3.7 for seismic design. The
22 specific topics I would like to cover is the design of
23 the -- we have to use for the ESBWR standard plant.

24 The so-called CSDRS which stands for
25 certifies seismic design response -- will follow Reg

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1 Guide 160 spectra and the North Anna ESP -- specific
2 spectra at high frequencies. North Anna spectra is
3 representative of most severe rock site in the U.S. in
4 the Eastern U.S. and we also noted that low recorded
5 seismic event contains simultaneously very high/low
6 frequency and a high frequency motion. Therefore, the
7 CSPRS we have considered for early -- is very
8 conservative.

9 As we define the spectra --

10 MEMBER POWERS: A low recorded seismic
11 event, most of the seismologists thought that there
12 were not high frequency components and feared
13 recorders didn't support them. That doesn't mean they
14 weren't there.

15 MR. LIU: Based on all the available
16 records, we have not really seen the particular record
17 to show that particular --

18 MEMBER POWERS: But if they recorded a
19 thing up to beyond about 50 Hz, then it doesn't mean
20 it wasn't there. I mean, I agree with you. I --

21 MR. LIU: At least on the previous
22 knowledge, you know.

23 MEMBER POWERS: Yes, there is very, very
24 little high frequency data out there.

25 MR. LIU: Right.

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1 MEMBER POWERS: But that's only because
2 they didn't bother to record it.

3 MR. LIU: Then the high frequency did
4 really affect the design compared to low frequency,
5 it's true. For some more stiff structures which have
6 a higher frequencies, yes, higher frequency will
7 effect the response of the structure. Therefore, for
8 some massive concrete structures, no. It tends to
9 respond in the low frequency range. So that lower
10 frequency -- is very important.

11 CHAIRMAN SHACK: Will effect relays and
12 stuff like that, little stuff. Relays and things like
13 that.

14 MR. LIU: Yes. Some electric equipment.

15 MEMBER BANERJEE: So the high frequency,
16 yes.

17 MR. LIU: Yes.

18 MEMBER BANERJEE: Because the very severe
19 earthquakes like in Japan and all have a very high low
20 frequency.

21 MR. LIU: Right.

22 So once we've determined the spectra
23 itself, then for the purpose of -- we have generated
24 the artificial time history which we meet the NUREG CR
25 67.28 criteria which is the most current requirement.

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1 The next few slides I would like to get
2 into more details on how we derive this CSDRS. Like
3 I mentioned earlier that the low frequency component
4 will follow Reg Guide 160. The time history of that
5 spectra is shown in the figure below which has a 0.3G
6 peak --

7 This slides shows that that the high
8 frequency ground motion of North Anna looks like
9 that's represented by this right curve. As you can
10 see, that above 10 Hz really has a higher peak, you
11 know, much higher than the Reg Guide 160, you know,
12 should. And an associate time history for this high
13 frequency ground motion is also shown below which has
14 a 0.492 peak --

15 Then we merged the two and -- the two for
16 design consideration. So we rounded off that 0.492
17 PGA of North Anna slightly to this 0.5 value for RDR.
18 The chart shows below is the associated condition.

19 This chart shows how our design compared
20 with the recent Japan earthquake, you know, records.
21 What I have shown here is that the blue curve is the
22 response backdrop at the reactor -- baseline elevation
23 calculated from the soil structure interactions with -
24 - motion I mentioned earlier so the ground motion,
25 double hump ground motion movement. You can see not

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1 only we have this low frequency peak which is
2 controlled by the Reg Guide 1.60 low frequency input.
3 We also have high frequency content which is
4 controlled by the North Anna high frequency.

5 But in comparison the two top of the line,
6 the dash line, those are the recorded motion at the
7 Kashiwazaki site. That is Unit 1 and Unit 2.

8 (Off the record comments.)

9 As you can see that this particular Japan
10 earthquake is very rich in low frequency as you
11 mentioned earlier and the high frequency there is
12 really not much input at all.

13 MEMBER POWERS: But that depends on what
14 it's transmitting through.

15 MR. LIU: That particular site is a soil
16 site.

17 MEMBER POWERS: Well, from the epicenter
18 to the site is what's controlling the high frequency
19 part and if that's broken up ground, it gets
20 dissipated. But if it's in solid shield and it was on
21 the East Coast of the United States, then you get much
22 more transmission of the high frequency part.

23 MR. LIU: Right.

24 MEMBER BANERJEE: Was this epicenter out
25 in the sea?

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1 MEMBER CORRADINI: Off the coast, yes.

2 MEMBER BANERJEE: Yes, it was off the
3 coast and they got that.

4 MR. LIU: This is recorded motion at the
5 basement.

6 MEMBER BANERJEE: At the basement.

7 MR. LIU: It's not in the ground. It's in
8 the structure at the basement level.

9 MEMBER: At the basement though.

10 MEMBER SIEBER: So there are adjacent
11 units.

12 MR. LIU: Just two, I guess. The total is
13 seven units at that site. This particular comparison
14 we showed to you --

15 MEMBER BANERJEE: Just a question or a
16 curiosity. This was beyond the SSC, wasn't it?

17 MR. LIU: Beyond their design basis.

18 MEMBER BANERJEE: Yes, right.

19 MR. LIU: Much higher. But it's low
20 frequency. It's very low frequency which really has
21 no significance as to the structural response itself.

22 MEMBER ARMIJO: Structures normally have
23 frequencies that are much higher. Therefore they
24 don't get excited by the low frequencies.

25 MEMBER BANERJEE: There is no resonance.

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1 MEMBER ARMIJO: That might explain why
2 there wasn't more impact --

3 MEMBER MAYNARD: Little damage.

4 MEMBER ARMIJO: -- or damage at these
5 sites.

6 MR. LIU: This slide shows a somewhat
7 different curve which I would like to briefly discuss
8 because this is one of the -- discuss, plus we
9 released it at the Subcommittee meeting --

10 MEMBER CORRADINI: This is Chapter 3 or is
11 this --

12 MR. LIU: This is related to Chapter 19
13 PRA.

14 MEMBER CORRADINI: I was afraid of that.
15 Okay.

16 (Laughter.)

17 MEMBER CORRADINI: It's interesting.

18 MR. LIU: A question was raised that, you
19 know, we had considered this double hump in our
20 spectra in the design and that's the spectra we should
21 consider in the model evaluation and this slide
22 provides that illustration hopefully.

23 But the black curve shown in the chart is
24 double hump design. The blue curve is intended to
25 represent a bounding spectra for soil sites among the

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1 28 sites considered in EPRI study excluding -- so
2 those are intended to be represented of bounding
3 spectra for soil sites. As you can see, the
4 amplitudes, you know, how much lower than what we
5 would consider in our design. The green curve, it is
6 the part all the way up to about 9 Hz, really is the
7 North Anna rock site curve and above 9 Hz we follow
8 the same curve, what we have considered in the design,
9 because in the design that high frequency hump was
10 derived from this curve.

11 MEMBER BANERJEE: So now suppose that for
12 a specific site, they find, let's say, the low
13 frequency part is higher than what you have due to
14 various studies that they do and, let's say, the high
15 frequency part is lower, just as an example. Now
16 would they handle that since this certification --
17 suppose this wasn't a bounding -- this -- was not
18 bounding in some region, then the --

19 MR. LIU: Then there has to be a site
20 specific analysis, seismic response analysis, to show
21 that, at least. But the responses in the structure in
22 the formal response spectra are still below the design
23 spectra we have considered in the standard design.

24 MEMBER BANERJEE: But this is not the --
25 the black curve is not the design.

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1 MR. LIU: The black curve is the design.

2 MEMBER BANERJEE: But suppose it's
3 exceeded in a site at some frequency, what would they
4 have to do to -- I mean, they are trying to reference
5 your design and --

6 MEMBER CORRADINI: That would be a
7 departure.

8 MR. LIU: That would be a departure. Then
9 they have to provide the separate -- calculation to
10 show why that accedence has no consequences under the
11 design of the standard plan.

12 MEMBER BANERJEE: But suppose it has
13 consequences. You have to deviate from your standard
14 design.

15 MR. LIU: Then I have to look at it by a
16 case-by-case basis.

17 MEMBER ARMIJO: Well, could you build an
18 ESBWR with this spectra at the Kashiwazaki site? Go
19 back to page 16.

20 MEMBER CORRADINI: What would you have to
21 do to build it at that site? That's what Sam is
22 asking.

23 MEMBER ARMIJO: Which I think is what
24 Sanjoy was asking.

25 MR. LIU: I don't think that --

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1 MEMBER CORRADINI: -- slow moving --

2 MR. LIU: Let me put it this way. I don't
3 think that -- I think for this one we -- you know, we
4 --

5 MEMBER BANERJEE: It might be okay for
6 this one because --

7 MR. LIU: The calculation is to be
8 performed.

9 MEMBER CORRADINI: Sure.

10 MEMBER ARMIJO: But if you would be at
11 this low frequency, at least, you could get through
12 it.

13 MEMBER CORRADINI: Right.

14 MR. LIU: I don't think you affect the
15 design at all.

16 PARTICIPANT: We're asking a lot of what
17 if questions. The bottom line is if they don't meet
18 the design spectra then it's a deviation of -- go back
19 for NRC --

20 MS. CUBBAGE: Right, and specifically the
21 curve is a Tier 1 requirement. So it would be an
22 exemption. It would be a pretty heavy issue.

23 MEMBER POWERS: But, in fact, it's better
24 that a licensee has to look and see if the seismic it
25 has matches up with the design spectra.

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1 MR. LIU: Right.

2 MEMBER POWERS: And when there are
3 deviations, he's going to do something about that.

4 MR. LIU: Right.

5 MEMBER POWERS: Say something about it.

6 MR. LIU: Yes.

7 MEMBER POWERS: Plead his case big. But
8 he's going to do something and there is no reason to
9 think a spectra design done on the basis of U.S.
10 earthquakes is going to match very well to one in
11 Japan. It's different.

12 MS. CUBBAGE: Right.

13 MEMBER POWERS: It's a different seismic
14 center.

15 MS. CUBBAGE: And the staff reviews their
16 proposed spectra to make sure it's reasonably
17 representative of sites in the U.S. and then GE
18 Hitachi would strive to make their curve as bounding
19 as possible for any of their potential clients.

20 MEMBER CORRADINI: Keep on going.

21 MEMBER BANERJEE: Well, let me ask one
22 more question. Would Diablo Canyon fall under that
23 black curve?

24 MEMBER CORRADINI: No is the answer.

25 MR. LIU: I'm not really familiar with

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1 Diablo Canyon.

2 MEMBER CORRADINI: That's a good answer
3 for now.

4 CHAIRMAN SHACK: No is the answer. It's
5 two-thirds -- three-quarters at some point.

6 MR. LIU: We didn't really consider
7 California.

8 MEMBER BANERJEE: But GE doesn't think
9 anybody will ever build a plant in California again.

10 MEMBER SIEBER: I hope we don't have to
11 address potential site.

12 MS. CUBBAGE: Not every potential site
13 and, you know, if --

14 CHAIRMAN SHACK: The answer is if it
15 doesn't match this you have a problem and we can move
16 on.

17 MR. WAAL: Yes. We basically have to go
18 back and relook at the building design and reassess a
19 whole bunch of stuff.

20 MR. LIU: In order to use this kind of
21 stuff -- using the design and analyze the soil site -
22 - so we decided to do this margin curve on an analog
23 basis as well. So as a result, we have this blue
24 curve -- below collecting up to the -- at a higher
25 frequency and we use this lower curve for the second

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1 margin evaluation regarding --

2 MEMBER CORRADINI: Which is a different
3 discussion.

4 MR. LIU: Right.

5 MEMBER CORRADINI: Let's move on.

6 MR. LIU: Okay. The next topic I would
7 like to discuss is assessment and design of a proposed
8 structure -- pools -- this chart shows -- core and --
9 pools in the reactor -- located -- the green areas are
10 the upper pools, you know, the ICCS, isolation
11 condenser pools. Then the blue pools in the middle
12 are the GDCS pools. Then the blue pools near the
13 bottom is a suppression pool. So those are the major
14 pools we have in our design.

15 In terms -- pool water for seismic
16 consideration, we follow the standard practice by
17 considering the water or fluid in the pool into two
18 components. One is the -- or sometimes known as the
19 sloshing which is shown as the upper circle in the
20 sketch below. That is represented by a mass, a screen
21 system, showed to account for the vibration of the
22 water near the surface of the pool.

23 Another component of the pool water is so-
24 called the impassive, sometimes called the rigid
25 component, which is represented by a lower mass in the

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1 sketch which basically they follow the motion of the
2 pool structure. It's rigidly attached.

3 MEMBER CORRADINI: Is WC and WI a function
4 of the shape of the pool?

5 MR. LIU: Yes. It's the mass of the pool
6 that is a function of the geometry of the pool.

7 MEMBER CORRADINI: So the L/D of the pool
8 as well as the mass of the pool goes into choosing the
9 WC and WI?

10 MR. LIU: Yes.

11 MEMBER CORRADINI: But yet 1,000 metric
12 tons of water and it's a shallow pool, it's a
13 different WI and WC than if I have 1,000 metric tons
14 and it's a tall beer can.

15 MR. LIU: You're correct and also the
16 associated high would be different, the HC and the HI.

17 MEMBER CORRADINI: I understand the high
18 part. But I wanted to understand the fraction that is
19 rigid and the fraction that's removable. Does that
20 change?

21 MR. LIU: Yes. In general, the taller the
22 pool is the more contributions from the rigid part.

23 MEMBER BANERJEE: Right, the free surface
24 will be less. Right?

25 MEMBER SIEBER: Right.

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1 MEMBER ARMIJO: How do you handle
2 interconnected pools?

3 MR. LIU: Interconnected pools?

4 MEMBER MAYNARD: Where they're connected.

5 MR. LIU: You know, we consider -- we
6 calculate the mass of each pool. Then we added this
7 mass to the pool --

8 MEMBER ARMIJO: If the pools are
9 interconnected through smaller openings than the cross
10 section of the pool itself, how do you handle that?

11 MR. LIU: At the smaller openings, I don't
12 think it would have any effect on the global response
13 of the pool. We account for the overall response of
14 the pool structure due to the presence of water.

15 PARTICIPANT: Typically, our
16 interconnecting pools are connected by piping.
17 They're not openings and walls -- A lot of them are
18 closed in operation.

19 PARTICIPANT: Some of your cartoons on the
20 suppression pools look like they had openings.

21 PARTICIPANT: Well, the suppression pool
22 is one continuous pool.

23 MR. LIU: It's a continuous pool. It's a
24 circular pool because --

25 PARTICIPANT: The ones that are

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1 interconnected are up at the top, the PCCS and IC
2 pools. I don't know how big they are but I would
3 think there would be very little transfer of water
4 between one and the other during a seismic event.

5 MR. LIU: No.

6 MEMBER CORRADINI: So back to my question.
7 So let's just take my example. So I have 1,000 metric
8 tons and I have a shallow one and I have -- so you're
9 telling me that if in the shallow one it would be
10 50/50 and the beer can it might be 25/75.

11 MR. LIU: Right.

12 MEMBER CORRADINI: And there is -- And you
13 quoted from, I can't remember, the Corps of Engineers
14 that there's a series of empirical design rules on how
15 this splits out.

16 MR. LIU: Also ASC has, you know.

17 MEMBER CORRADINI: And it's also a
18 function of the height of above ground.

19 MR. LIU: Yes. The water -- the depth of
20 the pool.

21 MEMBER CORRADINI: Okay.

22 MR. LIU: The dimension of the pool.

23 MEMBER BANERJEE: But is eight C roughly
24 the height to the free surface?

25 MR. LIU: It's slightly less.

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1 VICE CHAIR BONACA: Slightly less, yes.

2 MEMBER ARMIJO: How is this information
3 generated? Is it empirical?

4 MR. LIU: Well, this is -- This is kind of
5 -- it dates back to -- this was first delivered by Dr.
6 Hausler in the early '50s.

7 MEMBER APOSTOLAKIS: Hausler.

8 MR. LIU: Right.

9 MEMBER APOSTOLAKIS: It must be right.

10 (Laughter.)

11 MR. LIU: He came out with this simply
12 kind of mechanical in the one mass, screen mass,
13 mechanical simulation. And then after that there are
14 so many testing and additional studies by various
15 researchers, you know.

16 MEMBER CORRADINI: I guess the reason I'm
17 asking all these questions is I guess I was left at
18 the Subcommittee that the fraction was fixed
19 independent. So maybe I misheard. So it is variable.

20 MR. LIU: Variable. It depends on size.

21 So the sloshing component which is upper
22 most in the sketch action typically did respond in
23 very low frequency and that's 0.5 Hz. It did not have
24 a structure -- if vibration exists. So very
25 localized.

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1 Impassive components on the other hand,
2 they responded in unison with pool structure and its
3 effect is treated as added mass. The total mass is
4 maintained. There is a sum of the dose convective
5 mass and the impassive mass.

6 MEMBER CORRADINI: So can I ask one other
7 question since I'm on a roll here. So I'm going to
8 put the PCCS heat exchanger in the middle of a pool.
9 Does that change the WC and WI?

10 MR. LIU: For the mass calculation, we
11 ignored the -- exchanger. So --

12 MEMBER CORRADINI: But I'm asking the
13 question -- I'm trying to understand --

14 MEMBER BANERJEE: Does it effect the
15 sloshing you're asking?

16 MEMBER CORRADINI: Well, I'm trying to
17 understand where the damage would result if you did
18 this. Where you would miscalculate if you did this
19 incorrectly from the empirical design rule? But the
20 empirical design rule as I understood it was for a
21 pool without anything in it.

22 MR. LIU: Yes.

23 MEMBER CORRADINI: So I'm asking how do
24 you modify the design rule when I put a PCCS heat
25 exchanger in the middle of the pool and that's the

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1 most elevated pool for the isolation condenser and the
2 PCCS and it starts wiggling. I have something in the
3 middle of it.

4 MR. LIU: But for the structure --

5 MEMBER CORRADINI: How do I expect it to
6 be deviating from the design rule?

7 MR. LIU: Okay. The bottom line is
8 associated mass of evaporated water. Okay. For the
9 design of the pool structures, okay, in the --
10 ignoring the presence of the heat exchanger, it's
11 conservative because we capture the additional mass
12 which is occupied by the space of the heat exchanger.
13 But for the exchanger design itself, we still consider
14 the added mass of the surrounding pool of the
15 surrounding water.

16 MEMBER BANERJEE: But the added mass would
17 only be there at relatively high accelerations.
18 Right? The added mass term, it's a function of the
19 acceleration rather than the velocity. So the added
20 effect would show up in the higher frequencies,
21 whereas what I think he's asking is now you have this
22 structure in the middle. I don't want to paraphrase
23 you but --

24 MEMBER CORRADINI: You're doing fine.
25 Keep on going.

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1 MEMBER BANERJEE: You have sloshing going
2 on. The sloshing is not a added mass effect. The
3 sloshing is a free surface motion.

4 MR. LIU: Right.

5 MEMBER BANERJEE: I mean, the added mass
6 has nothing to do with that.

7 MEMBER CORRADINI: Where I'm going with
8 all of this is that I understand now. I misunderstood
9 what you said a few weeks ago. So I got that right.
10 But now the next thing that was going through my mind
11 is I am putting essentially a steel structure in the
12 middle of a pool and I'm using it a design rule that
13 doesn't have it there and I'm trying to decide does
14 that underestimate the effect, overestimate the
15 effect. I'm still struggling.

16 MEMBER BANERJEE: It was. I mean, this
17 wave load on the structure, we see this in North Sea
18 all the time and the wave load on the structure can be
19 enormous. So how do you calculate that wave load?
20 Now you have a structure stuck in the pool. Right?
21 It's like --

22 MR. LIU: Yes, like I said. The motion
23 near the surface is a sloshing component. It's a
24 wave. It's very low frequency.

25 MEMBER BANERJEE: And it's hitting the

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1 structure. Right? The wave?

2 MR. LIU: Right.

3 MEMBER BANERJEE: How do you calculate
4 that structural load?

5 MR. LIU: So for the purpose of seismic
6 modeling, we considered a mass effect. Because
7 sloshing, even though it's very low in response in
8 frequency, still has associated mass. The impassive
9 mode which responds in a high frequency together with
10 the structure has its function its own share of mass.

11 MEMBER BANERJEE: Yes, we understand that.

12 CHAIRMAN SHACK: He's worried about the
13 dynamic load of the slosh on the components.

14 MR. LIU: Yes.

15 MEMBER CORRADINI: So let me --

16 MR. LIU: We have which I will get into in
17 the next slide. We did compute the hydrodynamic
18 pressures on the wall from both sloshing component and
19 the impassive component as a local load effect on the
20 pool for the stress calculation.

21 MEMBER BANERJEE: Let's then move onto --

22 MEMBER CORRADINI: Sorry. Okay. At
23 least, we're communicating as to what we're thinking
24 about.

25 MR. LIU: So like I said, the total mass

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1 is still maintained by summation of the two
2 components. So given that, you know, for our
3 calculations we considered the entire water mass of
4 the pool as impassive mass originally attached to the
5 structure to maximize the inertia effect under seismic
6 citation.

7 MEMBER BANERJEE: But it's not very easy
8 to calculate the added mass for complex structures, is
9 it?

10 MR. LIU: Our geometry really basically is
11 still rectangular, a rectangular pool. So geometry,
12 geometric wise, it's still not that complicated. The
13 equations are available to compute those quantities.

14 MEMBER BANERJEE: Is it also available if
15 you have a structure in the middle? Well, I guess you
16 would model as a cylindrical structure or something?

17 MR. LIU: Right.

18 So we considered all the pools in the
19 models. Therefore, the effect of the pools
20 interaction is automatically accounted for.

21 MEMBER BANERJEE: Has somebody actually
22 looked at what you've done here in any detail to
23 figure out -- I mean, an independent?

24 MEMBER CORRADINI: You're going to ask
25 that question of the staff obviously.

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1 (Laughter.)

2 MEMBER BANERJEE: Has somebody actually
3 looked at this?

4 MEMBER APOSTOLAKIS: Yes.

5 MS. CUBBAGE: We'll be presenting this
6 afternoon.

7 MEMBER CORRADINI: They'll be ready for us
8 after lunch.

9 (Laughter.)

10 They'll be poised.

11 MEMBER MAYNARD: I didn't really hear an
12 answer though to what you, Sanjoy, asked.

13 MEMBER CORRADINI: No, we haven't heard it
14 yet. But we're going to get there.

15 MEMBER MAYNARD: Two different questions
16 about the same thing. One is the effect of the
17 sloshing on the heat exchangers you put in there. The
18 other is the effect of the heat exchanger effecting
19 the sloshing and basically putting --

20 MEMBER CORRADINI: Yes, what I guess I'm -
21 - since I'm not a structural sort of guy, but I view
22 this as a multi-load problem. So you have this thing
23 wiggling and you have something inside wiggling. You
24 have something inside of that wiggling and I'm asking
25 the question by the way you've modeled it have you

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1 missed some point where they all resonate together and
2 you get a bigger load than you would calculate and I'm
3 hearing that you thought about it. But I'm not
4 hearing that you have analyzed it.

5 MEMBER BANERJEE: Well, he was saying that
6 he was going to show us in the next slide.

7 MEMBER CORRADINI: Okay. Sorry.

8 MR. LIU: So this is the model we have for
9 the stress analysis of the pool. It's a three
10 dimensional model. So in the model we included each
11 structure, pool structure, exclusively.

12 MEMBER MAYNARD: So how would you --

13 MEMBER BANERJEE: What's happening to the
14 pool itself is part of a model.

15 MR. LIU: It's part of a model.

16 MEMBER BANERJEE: So the pool is within
17 this model.

18 MR. LIU: Right.

19 MEMBER BANERJEE: The water.

20 MR. LIU: Right. The pool -- not water.
21 The water is not experienced in the model as water.
22 Okay. Water is a model as a pressure load. Okay.
23 This only included the pool walls and pool slaps, the
24 boundary of the wall.

25 MEMBER CORRADINI: So what do you do with

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1 WI and WC? I think that's what he's asking.

2 MEMBER BANERJEE: Yes.

3 MEMBER CORRADINI: Is it there?

4 MR. LIU: They are there in the form of a
5 pressure loading.

6 MEMBER CORRADINI: On the wall.

7 MR. LIU: On the wall. On the walls.

8 MEMBER CORRADINI: That's just hydrostatic
9 pressure.

10 MR. LIU: No, hydro --

11 CHAIRMAN SHACK: Frequency dependent.

12 MR. LIU: The dynamics. The maximum
13 dynamic pressure.

14 MEMBER CORRADINI: I'm sorry. Okay.
15 Excuse me.

16 MEMBER BANERJEE: But you calculate the
17 dynamic pressure separately.

18 MR. LIU: Yes, separately.

19 MEMBER BANERJEE: You do the mass -- thing
20 or whatever.

21 MR. LIU: This has a closed form equation.
22 You know, those are equations -- Again, this is -
23 Professor Haulser did.

24 MEMBER BANERJEE: So you have the dynamic
25 pressure separately or inputting it into the --

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1 element and all.

2 MR. LIU: Yes. As a boundary condition.

3 MEMBER BANERJEE: As a boundary condition.

4 Time dependent boundary condition.

5 MR. LIU: So maximum value. There's a
6 maximum value.

7 MEMBER ARMIJO: What do you mean?

8 MEMBER BANERJEE: Well, that's strange.

9 Then you can't get resonances. Right?

10 MR. LIU: No. The resonances effect are
11 already accounted for in the certain response, dynamic
12 response calculation, which I described earlier. So
13 this part of the discussion is for was with the
14 mechanical loads from the seismic analysis, how we
15 apply those loads into the final item of the building
16 to calculate the stresses in the structure. This as
17 a two step calculation in our structure design. Okay.

18 MEMBER BANERJEE: So you don't take a time
19 varying load and fit it into this. You just put some
20 sort of an upper bound load.

21 MR. LIU: In the maximum load.

22 MEMBER BANERJEE: So there is not a
23 transient finite element analysis.

24 MR. LIU: This is not a transient finite
25 element analysis because like I indicated earlier is

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1 that we performed this transient finite element
2 analysis for seismic -- using the seismic model first.

3 MEMBER BANERJEE: So then Mike's question
4 holds. He's asking you whether you can excite
5 resonances based on the dynamics on the sloshing and
6 things like that.

7 MR. LIU: But the dynamic effect are
8 really accounted before in the first step, seismic
9 calculation, which is a dynamic event.

10 MEMBER BANERJEE: And just how do you do
11 that because the -- I guess let's start from the
12 beginning. You've run an earthquake spectrum using
13 this fluctuation and you have some horizontal
14 acceleration on the ground. This doesn't enter
15 directly into this finite element.

16 MR. LIU: Not directly.

17 MEMBER BANERJEE: Okay. So that would be
18 the first step.

19 MEMBER CORRADINI: And you account for it
20 -- and can you just repeat for our edification? You
21 accounted for it how? How did you account for it to
22 get rid of the time variation that Sanjoy was asking?
23 You said you accounted for it. Remind us how you did.
24 I guess I should have --

25 MR. LIU: Okay. There was an earlier

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1 slide.

2 MEMBER BANERJEE: We probably missed this.

3 MR. LIU: This slide shows how we consider
4 pool water in the seismic response calculation. This
5 is the first step before we do the finite element
6 stress calculation.

7 CHAIRMAN SHACK: No, but he's missing your
8 seismic stick model to get the whole dynamic response
9 of the structure before you go to the finite element
10 model.

11 MR. LIU: Right.

12 MEMBER BANERJEE: Yes, we're missing
13 something.

14 CHAIRMAN SHACK: It's in that fourth
15 bullet. He has a mass, but he also has a whole
16 seismic stick model of the whole structure.

17 MEMBER BANERJEE: Okay.

18 CHAIRMAN SHACK: Which is all dynamically
19 loaded.

20 MEMBER CORRADINI: But just so you can see
21 where our question is and then we move on so that --
22 What we're going to ask the staff --

23 MEMBER APOSTOLAKIS: What is the problem?
24 You have modeled the pool.

25 MR. LIU: The problem I have with this

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1 calculation is there global response backdrop by
2 equipment design, the forces and moments,
3 accelerations, we use for the structure design itself.

4 MEMBER CORRADINI: So let me just
5 interject. So then that is the thing. The reason
6 we're asking the question is I'm worried thinking on
7 how the water interacts with the heat exchangers and
8 the pool supports. If you're telling me the empirical
9 design rules have taken care of the pool supports, my
10 next question goes back to the structure of the heat
11 exchangers that are in the middle of this little sea
12 that's wiggling about and I want to make sure that
13 they're not going to -- they're properly accounted
14 for.

15 MR. LIU: Yes. For the heat exchanger
16 design, we do consider the surrounding -- the water,
17 the effect of water on --

18 MEMBER CORRADINI: But you see where our
19 question is coming from. I'm sorry.

20 MEMBER APOSTOLAKIS: So the way I
21 understand it is you do this calculation first and
22 then you go the finite element model.

23 MR. LIU: Yes.

24 MEMBER APOSTOLAKIS: So what is the
25 product of this analysis that is input into the finite

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1 analysis?

2 MR. LIU: That the maximum -- and the
3 maximum moments at each elevation of the --

4 MEMBER CORRADINI: So you do this as you
5 call it, stick model, and you get something like this
6 and you take exactly --

7 MR. LIU: The maximum value.

8 MEMBER CORRADINI: You take the maximum
9 value and then watch the bending and the deformation.

10 MR. LIU: Right.

11 MEMBER APOSTOLAKIS: But then that's a
12 varied question. The finite element model is static.

13 MR. LIU: It's static analysis.

14 MEMBER MAYNARD: But is there anything
15 different about this analysis methodology than what
16 was used for, let's say, the ABWR design.

17 MR. LIU: No.

18 MEMBER CORRADINI: Right. The reason I'm
19 asking all this though is that that the one difference
20 is I have elevated pools with structures inside of it
21 which have to perform after the event. That's my
22 problem here.

23 MEMBER MAYNARD: Other structures in pools
24 with slosh have been analyzed before.

25 MEMBER APOSTOLAKIS: Right.

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1 MEMBER CORRADINI: But you're right. The
2 wet well, all of that, this is standard operating
3 procedure.

4 MEMBER APOSTOLAKIS: All that.

5 MEMBER ARMIJO: How is it intuitively
6 obvious that when you take the peak loading values
7 from a transient load and apply them in a steady state
8 mode that that's conservative?

9 MR. LIU: We take all the peak value and
10 we apply all the peaks values simultaneously, so it
11 has to be conservative.

12 MEMBER BANERJEE: Let me give it back to
13 you the way I understand it. The frequency of the
14 sloshing which is the primary dynamic load in the
15 system is much lower than the natural frequency of the
16 structures. So this applying sort of extreme loads
17 gives you, you know, they decouple the problem.
18 That's how I understand it. I may be wrong, but the
19 sloshing frequencies are very low. That's what
20 they're saying.

21 MEMBER CORRADINI: That's correct.

22 MEMBER BANERJEE: And whatever is the high
23 frequency stuff is added mass terms and all that are
24 taking care of it and it's just transmitting and that
25 they keep, the solid part. But the sloshing part is

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1 low frequency and they decouple it. That's how I
2 understand it. Correct me if I'm wrong.

3 MR. LIU: No, sir. That's basically what
4 I said. The first bullet, basically keeping the
5 sloshing mode really is insignificant. But we still -
6 -

7 MEMBER BANERJEE: But you take the
8 extremes though.

9 MR. LIU: Yes, we still did not discount
10 the mass. We still considered the associated mass as
11 a total mass.

12 MEMBER CORRADINI: So you have to move on.
13 I understand that, but just to make you see --

14 MEMBER BANERJEE: But I think Mike's
15 question still stands.

16 MEMBER CORRADINI: Yes.

17 MEMBER BANERJEE: Don't forget that
18 question.

19 MEMBER CORRADINI: And the one thing you
20 said that I thought was intriguing. You must have
21 done it with and without sloshing because you said the
22 sloshing effect is insignificant. I thought you just
23 said that.

24 MEMBER APOSTOLAKIS: Because of its
25 frequency.

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1 MEMBER CORRADINI: Is it because of its
2 frequency or because of the magnitude what's sloshing?

3 MR. LIU: The frequency.

4 MEMBER CORRADINI: The frequency. Okay.
5 So what Sanjoy said. Excuse me.

6 MR. LIU: Yes, frequency.

7 MEMBER CORRADINI: Okay.

8 MEMBER BANERJEE: You don't necessarily
9 have to buy into it.

10 (Laughter.)

11 MEMBER CORRADINI: But I understand at
12 least. Okay. Sorry.

13 MR. LIU: This slide pretty much I have
14 discussed somehow earlier.

15 MEMBER APOSTOLAKIS: So what does it mean?
16 Twenty-two, let's go back to 22.

17 MEMBER CORRADINI: They just showed you
18 what they have.

19 MEMBER APOSTOLAKIS: It just shows what
20 you analyzed?

21 MR. LIU: Right. That's the model we
22 have.

23 MEMBER BANERJEE: Tell me how difficult is
24 this to do a transient analysis. Is it just a lot
25 more time consuming or once you've set it all up like

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1 this? I mean, you set it all up. Right?

2 MEMBER CORRADINI: I don't think it's
3 easy.

4 MEMBER BANERJEE: Well, I'm asking.

5 MR. LIU: The computation is extensive,
6 particularly that one.

7 MEMBER BANERJEE: If you converge to some
8 sort of steady state, you have to go through iterative
9 process. Right? I mean it's like --

10 MR. LIU: Like I said, when we developed
11 the stick model, we recognized is stick model is
12 approximation. So we compered the stick model to the
13 finite element model to make sure --

14 MEMBER BANERJEE: This is an elliptic
15 problem you have. Right? This boundary condition?
16 So I mean you can't solve an elliptic problem directly
17 especially if you have any non-linearities in there.
18 Why is it so much more expensive to do a transient
19 analysis of this?

20 You have many cycles of elliptic process,
21 which I think is the answer to the question.

22 MEMBER BANERJEE : No, but to convert to
23 solution, you have to go through it anyway. I don't
24 know. Anyway, that's all.

25 MEMBER APOSTOLAKIS: So whatever you

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1 decide from this model, the thing is safe. What is
2 the output and you compare it to what?

3 MR. LIU: The output possessing over here.
4 So the output really serves as an input to this finite
5 element amount.

6 MEMBER APOSTOLAKIS: Right, and the output
7 of the finite element model is what?

8 MR. LIU: Stresses.

9 MEMBER APOSTOLAKIS: Okay. All right.

10 MR. LIU: Then we compare the stresses
11 with current levels.

12 MEMBER BANERJEE: If it doesn't break,
13 it's okay.

14 MEMBER APOSTOLAKIS: Where in the picture
15 on 22, where do you expect the maximum stress? Where
16 does it occur?

17 MR. LIU: From a stagnant point of view,
18 the highest stress areas are the base.

19 MEMBER APOSTOLAKIS: The base.

20 MR. LIU: The base, yes.

21 MEMBER APOSTOLAKIS: Good. Thank you.

22 MEMBER BANERJEE: So new buildings
23 basically break at the base in earthquake?

24 MEMBER SIEBER: Yes, from shaking.

25 MEMBER BANERJEE: If you observe the

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1 buildings, do they break at the base or does the top
2 fall off or what happens?

3 MR. LIU: We want to make sure they won't
4 operate.

5 (Laughter.)

6 MEMBER BANERJEE: When they do break, I
7 mean, a building, does it break --

8 MEMBER SIEBER: The first floor
9 disappeared and the rest came down.

10 MR. LIU: So a kind of self-story for the
11 typical commercial building, self-story, big openings.
12 There is a soft spot.

13 MEMBER APOSTOLAKIS: So the base is the
14 problem?

15 MR. LIU: Right, the base. That's all I
16 have.

17 MEMBER CORRADINI: So are we all set? So
18 let me go back to my question because we're going to
19 ask the staff next. So just so you understand our
20 question, our question is not so much -- I think
21 finally you or at least I finally got it. I had
22 missed it in the subcommittee on how you put this
23 together. I guess I'm just still open in my mind
24 about the interaction between the pool, the heat
25 exchanger, and the associated structure, and if you

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1 captured in your fourth bullet of slide something or
2 other, your Slide 21, if you've captured since you're
3 taking the peaks, if you've captured the peaks and all
4 of the peaks. That's what I guess I'm -- still
5 ruminating about.

6 Okay. Other questions from the
7 subcommittee members or from the Committee?

8 MEMBER BANERJEE: I think we need to
9 revisit at some point your point, which is --

10 MEMBER CORRADINI: Well, the staff will
11 fill us in. Okay. Mr. Chairman, we're in good shape.
12 Can I bank this for later on when I'm in trouble?

13 CHAIRMAN SHACK: No, no.

14 MEMBER APOSTOLAKIS: That is a principle
15 of conservation, I believe.

16 MEMBER POWERS: But you could have a
17 longer lunch. You're now a gentleman of leisure. You
18 can go to Addie's for lunch.

19 (Laughter.)

20 MEMBER CORRADINI: Mr. Chairman, are we on
21 break?

22 CHAIRMAN SHACK: We're on break.

23 (Whereupon, at 12:00 p.m., the meeting was
24 recessed for lunch, to reconvene at 1:15 p.m., the
25 same day.)

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AFTERNOON SESSION

(1:15 p.m.)

1
2
3 CHAIRMAN SHACK: If we could come back
4 into session, I think we're going to resume our
5 discussion of the ESBWR, and Dr. Corradini is in
6 charge.

7 DR. CORRADINI: Thank you, Mr. Chair.

8 So we'll turn it over to Mr. Patel, Dr.
9 Patel, as the one who will lead us off this afternoon.

10 MR. PATEL: Thank you very much.

11 MEMBER CORRADINI: There's enough of us
12 here. Just keep on going.

13 MR. PATEL: All right. Good afternoon.
14 My name is Chandu Patel. I'm the lead project manager
15 for FFE review. I have Richard McNally. He will make
16 a presentation on 3.2, and Dave Jeng, he will make
17 presentation on the seismic issues.

18 Before we go into the details, let me set
19 the stage and give you some general idea about Chapter
20 3. As you know by now, there are so many sections of
21 Chapter 3 covering very, very diverse issues, and
22 there are about 20 reviewers for reviewing this
23 chapter. I have the names just to give you some idea
24 of the number of people in all, and plus the
25 contractors.

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1 We issued a lot of RAIs, and I understand
2 our numbers don't mean so much, but I think this will
3 give you some idea of the scope and how much we were
4 involved in.

5 We saw about 583 RAIs, and as of now there
6 are about 57 open, and when they are open in like
7 structural areas as we have been discussing lately,
8 and the second highest is the vehicle internals and
9 the steam drier issues, and then the five per week for
10 protection area. That's it.

11 Now, before we go into detail, I would
12 like to give you a little bit more background. There
13 are a couple of general questions from the
14 subcommittee, and I would like to discuss this in a
15 little bit more detail.

16 The first question is how does Chapter 3
17 fit into the rest of the chapters? You know, what's
18 the relation between the other chapters and Chapter 3?
19 And my understanding is, okay, Chapter 3 is really the
20 meat -- they say, "Where's the beef?" -- for all of
21 the plant design considerations. If you look at
22 Chapter 3, they start with what are the GDC criteria
23 and then goes to the classification of each system and
24 component, and then it goes to all the issues which
25 are like protection of the plant from outside, you

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1 know, I would say, tsunami, outside events, like
2 hurricanes, tornadoes, all the protection for whole
3 plant from outside sources.

4 And then it goes into the seismic design,
5 capture design, and then it goes into the internal
6 components, and then in-service inspection and testing
7 area, and then equipment qualifications.

8 So if you look at -- and also piping
9 design considerations. So basically like I
10 generalize, how can we disable? If it doesn't fit
11 anywhere else, they put it in Chapter 3.

12 (Laughter.)

13 MR. PATEL: Actually, it really very, very
14 good information. If you want to know about any
15 system, look at Chapter 3.2 and you will know how it
16 is classified, what criteria, what kind of modes they
17 have used, you know. That was in Chapter 3.

18 So in general, it's really the main meat
19 of the whole plant design description.

20 Last, the other question, in general, how
21 much detail did you guys review this chapter's design?

22 And I'll characterize this thing as I think we really
23 reviewed in fairly good details, and just to give you
24 the idea, as I said, there were 483 RAIs, but in
25 addition to that, we really had so many audits in

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1 different areas, and we also made confirmatory
2 analysis, just to give you a few examples, in like
3 Chapter 3.7. We had confirmatory analysis for the
4 source chapter interactions. We did use the GE
5 methodology.

6 The same thing for piping design. They
7 picked one system and tried to verify how GE has done
8 the analysis, and the same thing for the structure
9 area.

10 So we really tried to verify, you know, to
11 the extent possible in certain areas, and I would like
12 to say we have made some really a little impact on the
13 design consideration, and I will give you some
14 examples, but these are not the average building that
15 GE wanted to design for something like 300 hour-feet,
16 and then we noticed they really wanted to 330 miles
17 per feet for tornado loading. We had to make them
18 change if they want to classify. Otherwise it becomes
19 an issue, and so they did change it.

20 The same thing in IST, in-service testing
21 program. We asked about 50 question before we got the
22 things which we really wanted in the CD. You know,
23 I'm finally there on all open items.

24 So, in short, we have really looked at in
25 quite a bit of detail, and in that, you know, if there

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1 are no questions, we would like to go into the details
2 with you.

3 So, Rich.

4 MR. McNALLY: Okay. I'm Richard McNally
5 with Division of Engineering, Engineering Mechanics
6 Branch, and this is a follow-up, I guess of the brief
7 presentation given to the subcommittee.

8 From what I understand there are questions
9 from the ACRS regarding how RTNSS was applied and the
10 risk informed process to classification process.

11 So briefly, this is an overview of the
12 staff's Section 3.2 review, and this summarizes the
13 regulatory basis for our review and briefly describes
14 how the classification process considers risk
15 insights. This topics is interrelated to DCD Section
16 17 on quality assurance and Section 19 on the PRA, and
17 Chapter 22 of the FSER for regulatory treatment of
18 non-safety systems, or RTNSS.

19 The classification structure systems and
20 components is important in order to define the quality
21 standards that insure the integrity and reliability of
22 importance to safety SSCs. For pressure boundary
23 items and their supports, the ASME code has always
24 applied a graded approach to quality. It is necessary
25 to define ASME code classes since the ASME code and 10

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1 CFR 50 regulations do not entirely do this.

2 Part 50.55(a) specifically defines the
3 code class that applies to Quality Group A for reactor
4 coolant pressure boundary, whereas code classes of
5 other quality groups are defined once those quality
6 groups are defined based on their safety function.

7 GDC-1 and GDC-2 that you see here are
8 really the foundation for establishing quality
9 standards and seismic requirements for important
10 structures, systems and components. I don't expect
11 you to read the fine print, but I have underlined some
12 of the important aspects of this relevant to the
13 classification process.

14 One of the things I wanted to point out is
15 in regard to a common term that is sometimes
16 misunderstood, is that important to safety that is
17 used in the GDC is broadly defined as SSCs that
18 provide reasonable assurance that the facility can be
19 operated without undue risk of the safety of the
20 public.

21 Safety related is a more limited
22 definition that applies to three specific important
23 safety functions.

24 Next slide.

25 This slide summarizes the classification

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1 process. Deterministic approaches apply NRC guidance,
2 industry practices, and judgment, such as the expert
3 panel. The classification approach for safety related
4 SSCs is based on this approach rather than the
5 optional risk informed approach, the categorization
6 process that's defined in Reg Guide 1.201 that was
7 issued for trial use, and that was brought up at this
8 morning's presentation.

9 This approach applies to defining both
10 safety related --

11 MEMBER APOSTOLAKIS: I thought it was a
12 rule. It's not just a relation.

13 MR. McNALLY: It's 50.69, a rule, but the
14 Reg Guide 1.201 is a method of characterization for
15 risk one, two, three, and four. That's issued for
16 trial use. It's been used for operating plants, and
17 I think we're waiting for feedback before we'd be
18 ready to apply it to new reactors.

19 But in any case, all of the applications
20 have come in using basically a deterministic approach.

21 MEMBER APOSTOLAKIS: If there is a rule
22 and somebody follows the rule, you have to accept it.
23 You review the method. What the department guide is
24 for prior use is an inconvenience, but it's not
25 something that discourages people from doing it.

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1 So they chose not to do it. We accepted
2 that.

3 MR. McNALLY: It's certainly optional.

4 Okay. Risk informed approaches consider
5 the PRA to define the risk significance of a
6 particular component or system. This also applies to
7 both safety related and non-safety related SSCs, but
8 for ESBWRs primarily used for identifying RTNSS SSCs.
9 RTNSS is the process by which we consider the relative
10 risk and includes special treatment for non-safety
11 related SSCs that are important to safety.

12 Although the ESBWR application is, in
13 general, consistent with the Reg guides, there are a
14 number of open items to be resolved, including seismic
15 classification of the turbine building, seismic
16 qualification of non-safety related SSCs, quality
17 standards for RTNSS SSCs, and design changes affecting
18 equipment needed post 72 hours.

19 The PRA and RTNSS process established the
20 scope of risk significance and also treatment of those
21 important, non-safety related SSCs. Scope of the
22 RTNSS SSCs is being addressed under DCD Section 19 and
23 Chapter 22 of the FSER. There are a number of open
24 items regard scope that need to be resolved and
25 reconciled in various documents.

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1 MEMBER BLEY: Excuse me. Depending on who
2 has been talking over the last couple of months, I
3 think, I've heard -- and maybe it's just the way I
4 heard -- the PRA identifies RTNSS events. The PRA has
5 absolutely nothing to do with them.

6 Can you be a little definitive on what the
7 role is and how it's used?

8 MR. McNALLY: Well, I'm no the PRA
9 specialist, but I can give you my perception of what
10 it does, is that it helps define what systems are
11 important, and that's used in the RTNSS process.
12 Probably Mark can fill you in more on the details, but
13 primarily up until the recent revisions, the list of
14 risk significant SSCs were identified in Chapter 19 as
15 part of the RTNSS process, and although this can
16 quantify the relative risk for each system or even
17 each component, it's still up to a classification
18 process in order to put that into an appropriate
19 category.

20 But Mark can certainly answer any specific
21 questions you have on the RTNSS process and how that
22 is qualified in relation to the risk significance.

23 MARK CARUSO: I'll try and be brief and to
24 the point. There are five criteria that are used to
25 determine which of the non-safety SSCs should be

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1 covered under the RTNSS process or given some sort of
2 regulatory treatment, and some of those criteria
3 involve using the PRA and some don't. Criteria A has
4 to do with looking at are there any safety SSCs that
5 are used to mitigate an ATWS. Are there any things
6 that are used to mitigate station blackout?

7 If the answer to those questions is yes,
8 those systems, those SSCs are in scope for RTNSS.

9 Category B has to do with providing long-
10 term safety. In the period between the 72 hours and
11 the seven days it identifies safety functions
12 including core cooling, heat removal, decay heat
13 removal, post accident monitoring, controlling
14 habitability, and looks at what SSCs are required to
15 achieve their safety functions in that period.

16 And those SSCs are then within the scope
17 of RTNSS. There's no looking at their risk
18 significance or calculating their worth. It's just
19 they're relied upon for those functions therein.

20 There's also some additional design
21 requirements for that equipment that are imposed, the
22 most significant of which is seismic requirement that
23 they be Seismic Class 2.

24 The third category does involve the PRA.
25 The third category says let me look at how important

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1 the non-safety systems are with respect to risk, and
2 it does a focused PRA where it takes all of the non-
3 safety systems that have been modeled in the PRA and
4 assembled in the PRA out. It says they're not there
5 and looks at what happens to core damage frequency,
6 what happens to large release frequency.

7 And then it starts adding them back in
8 looking at how important is this particular non-safety
9 system with respect to changing core damage frequency
10 and looks primarily at is there anything in there that
11 can really cause you to -- you know, is very
12 significant with respect to the safety goals.

13 In fact, the way they do it is they put
14 the non-safety stuff in backwards, look at what they
15 get for core damage frequency, and then see if they
16 take something out would it take you below the ten to
17 the minus four, below the ten to the minus six, and
18 there are a few functions in each BWR, which that was
19 the case, which have to do with digital control system
20 functions.

21 There are redundant safety actuations in
22 the non-safety digital control system for a number of
23 key safety functions, and because of the treatment,
24 the way digital control systems were treated with PRA,
25 it shows up as a very significant complement, the

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1 digital instrumentation system.

2 So do you arrange redundant functions
3 which are non-safety functions, in the non-safety
4 digital control system? They show up as very
5 important. So they're included.

6 MEMBER BLEY: With the analog control
7 systems?

8 MARK CARUSO: Sure.

9 MEMBER BLEY: Not digital.

10 MARK CARUSO: No, it could be analog,
11 sure. Whatever non-safety you look at how it plays
12 out.

13 MEMBER BLEY: Full system. It's
14 electrical control system.

15 MARK CARUSO: Right.

16 MS. CUBBAGE: It just happens that in the
17 case of ESBWR when they did this exercise what became
18 significant was the diverse protection system, which
19 is a digital system.

20 MEMBER BROWN: Just because it is, but it
21 could have been analog, the first system, and you
22 would have had --

23 MS. CUBBAGE: If it had been in the plant
24 and been significant and came out of the process, yes.

25 MARK CARUSO: Right. If you had an analog

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1 system that was providing the diverse, non-safety
2 backup for the main system, and in this particular
3 case the safety grade digital control instrumentation
4 system is showing up as very significant because a
5 common mode failure in software, these additional
6 redundant functions can become very important.

7 In addition, we also look at this
8 particular part of the criteria. They look at thermal
9 hydraulic uncertainty and consideration, thermal
10 hydraulic uncertainty. They look at different systems
11 that can provide backup, and in this particular case,
12 they identified FAC. This is very important because
13 it provides a backup for the cooling system. So that
14 was included under this category.

15 Category D has to do with containment
16 performance, and similarly, it looks at the
17 containment performance goals, you know, conditional
18 containment failure probability of less than .1 and
19 large early risk frequency, and looks at anything that
20 could significantly impact those and identifies that
21 go in scope.

22 And the last criterion is E, which looks
23 at any non-safety systems that are important in or
24 provide a function to prevent system interactions,
25 interactions between non-safety active systems that

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1 perform safety functions and the passive systems. So
2 it looks for any systems that have been added to
3 specifically prevent any interaction between the
4 active systems and the passive systems. It's really
5 geared towards the active system/passive system
6 interface.

7 MEMBER BLEY: Okay. Thanks, Mark.

8 Would it be fair to say that even for
9 Categories A and B and maybe E that the PRA provides
10 a systematic way to identify some of those or are
11 there other systematic ways to identify the things
12 that fit in those categories?

13 MARK CARUSO: Well, the ATWS analysis, the
14 analysis of the ATWS events and the analysis of the
15 station blackout events are covered in other chapters,
16 Chapter 8 and Chapter 15, and it's really looking at,
17 you know, what it takes to mitigate the ATWS. It's
18 not looking at the failures to get the ATWS. I'm sure
19 there are insights from the PRA because it's modeling
20 the PRA, but there is a specific ATWS analysis that's
21 done by the applicant that postulates I have
22 transients. I don't have any shutdown. Do I have
23 enough safety valve? You know, do I meet these
24 criteria -- I forget -- Criteria D or whatever it is
25 from the code?

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1 So it's almost like a Chapter 15 analysis,
2 but it goes beyond that, and it looks at what's been
3 designed into the plant to satisfy the criteria.

4 MEMBER BLEY: Thanks.

5 MEMBER APOSTOLAKIS: So is it also fair to
6 believe that in this context PRA is only to add to the
7 safety related group?

8 MARK CARUSO: Yes.

9 MEMBER APOSTOLAKIS: Thank you.
10 You will see my comments.

11 MR. McNALLY: Okay. In regard to risk
12 considerations that we've applied to the
13 classification process in regard to RTNSS SSCs, this
14 summarizes briefly what we've done here. The risk
15 significance of a safety function is important in the
16 identification of RTNSS SSCs. The staff review
17 considers risk significance by applying risk insights
18 documents that risk inform the SRP process. Some of
19 these documents were issued after we began the initial
20 review of the ESBWR, but we do consider it in the
21 review of components.

22 MEMBER STETKAR: Excuse me. Those right
23 insights documents, since they're called risk
24 insights, must be derived from available PRAs that
25 have been performed for currently operating plants; is

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1 that correct?

2 MR. McNALLY: They're derived from PRAs.
3 Whether it's operating plants or new reactors I'm not
4 sure.

5 Mark, can you add?

6 MARK CARUSO: What was the specific
7 question again?

8 MEMBER STETKAR: The reference is made to
9 risk insights documents that were used, I guess, as
10 some input for this decision process. My question was
11 since they're characterized as risk insights
12 documents, are those insights derived from PRAs that
13 have been performed for currently operating plants,
14 currently operating plant designs?

15 The question is: what is the relevance of
16 risk insights from evaluating a currently operating
17 plant design relative to potential risk or
18 contributors to the risk from a rather different plant
19 design that relies very heavily on systems that
20 haven't been modeled before, like digital INC and
21 passive design features that basically don't come into
22 play in any existing plant?

23 MARK CARUSO: Well, I'm a little confused.
24 The risk insights that were used in the RTNSS process
25 for ESBWR come from the ESBWR design PRA. Now, the

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1 existing code plants that I know passive --

2 MEMBER STETKAR: That's correct, but I
3 just heard that --

4 MARK CARUSO: There's no RTNSS process for
5 current plants.

6 MEMBER STETKAR: I understand, but I just
7 heard that there are a set of, quote, I believe you
8 called them risk insights documents.

9 MARK CARUSO: Correct.

10 MEMBER STETKAR: Which lead me to believe
11 that there is some sort of written guidance or written
12 information that you can go look up and say, "Oh, this
13 is important. So I should pay attention to this," or,
14 "This is not important. So I should not pay attention
15 to that," based on all of our accumulated insights and
16 experience from all of these risk assessments. And
17 I'm trying to understand what those risk insights
18 documents are and where do they come from and really
19 how are they used since they've been mentioned as
20 something that's apparently used in the process.

21 And if they're not used, why are we
22 talking about them?

23 MEMBER APOSTOLAKIS: Clarification. This
24 reference to this document, the RTNSS sites, is in the
25 context of the ESBWR or is it a broader?

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1 MR. McNALLY: It's in context with ESBWR.
2 We have them for each type of new reactor.

3 MEMBER ABDEL-KHALIK: So it's part of the
4 PRA?

5 MARK CARUSO: Oh, I know what he's talking
6 about.

7 (Laughter.)

8 MARK CARUSO: Now I know what he's talking
9 about. The NRC staff has taken upon themselves to
10 examine for the new designs, whether or not they be
11 passive or not, what risk insights can we identify for
12 this design that would be important for other
13 reviewers to have when they're doing their review to
14 help them focus their review and identify appropriate
15 scope and depth, to do smart reviews and risk informed
16 reviews.

17 We have a document. I would assume -- I
18 can't say for sure, but I believe -- it's been
19 discussed with you, but it's a process document on how
20 you identify these insights and how you map them to
21 the various sections of the SRP.

22 The identification process is really
23 related to the design PRA for the particular design.
24 So we've taken information from the ESBWR PRA, from
25 the AP-1000 PRA, and looked at those PRA documents

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1 and many PRA documents and identified from them risk
2 insights. We've had obviously tremendous help from
3 the designer because it's their PRA, and they've done
4 a lot to identify insights in the PRA.

5 We then take that set of insights. These
6 systems are very important, these systems are very
7 important, these are not, and then tried to map that
8 information, and where does it apply in the rest of
9 the staff's review of the design? Can it help you
10 figure out in SRP 5., 6.-whatever that says look at
11 all of this stuff? Can it help you say here's the
12 stuff that's really important, and maybe you should
13 really focus your review or your limited review
14 resources here as opposed to here.

15 We've generated risk insight documents for
16 each of the designs and published them for the staff
17 to use and they're available in the NRC Web so that
18 you can go look at them if you like. You can look at
19 the process document that describes how we do it and
20 how we map the various insights to the different SRPs
21 and how we treated -- you know, there are a number of
22 SRPs and sections in the plant that have equipment
23 that's not modeled. How do you deal with that?

24 So I'm sorry. I didn't think I knew what
25 you were talking about, but that's what we're talking

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1 about.

2 MEMBER BLEY: That helps, but if somebody
3 would make sure we get the process document. Maybe we
4 already do, but I don't remember seeing it.

5 MS. CUBBAGE: That was not something you
6 would have received as part of this review.

7 MEMBER BLEY: But if you could get a URL
8 for it.

9 MS. CUBBAGE: Yes, we absolutely can do
10 that.

11 MEMBER BLEY: Thank you.

12 CHAIRMAN SHACK: Thanks.

13 Let's move on. They're running out of
14 time.

15 MR. McNALLY: Okay. Non-safety SSCs with
16 high risk significance are identified in Section 19,
17 but on other design certifications, such as AP-1000
18 can be included in Chapter 17 under the reliability
19 assurance program.

20 Right now Appendix 19(a) for ESBWR has
21 undergone extensive revision. So I'm not positive the
22 list of written SSCs still resides there. It may also
23 be in a NIDA report that is being reviewed
24 independently.

25 Section 3.2 does not currently identify

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1 which items are special class, and this is an open
2 item, until each item that is classified as special
3 class is so designated. RTNSS SSCs will receive
4 special treatment beyond commercial codes and
5 standards in terms of seismic and quality requirements
6 so that GDC-1 and GDC-2 are satisfied. These SSCs are
7 expected to have supplemental requirements in the
8 design and operational phases that are intended to
9 insure the reliability assumed in the PRA. These
10 include design considerations, as well as inclusion in
11 the design reliability assurance program, or DRAP,
12 maintenance program and QA program.

13 As previously identified in regard to
14 RTNSS, there are open items that relate to defining
15 the scope and special treatment of RTNSS SSCs. You
16 may refer to last month's subcommittee meeting on the
17 topic, and Mark has offered some insights today.

18 So if there are any questions, I'd be
19 happy to address them.

20 MEMBER STETKAR: Just a quick one because
21 things are still quite obviously in a state of flux,
22 especially with respect to the status of the PRA and
23 in some cases the status of the design. I mean, we
24 heard about, you know, a new building that popped up
25 between Rev. 4 and Rev. 5 of the DCD. What is the

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1 plan or what is the schedule to kind of come to
2 closure on a stable list of RTNSS equipment and the
3 agreement on the criteria that were used to select
4 that? Is Rev. 5 of the DCD that point or --

5 MS. CUBBAGE: The list of criteria as to
6 what gets into RTNSS and whatnot, that's established
7 by Commission policy. That's not something that's up
8 for debate on this review. There's an established
9 process and policy that's being followed in this
10 review.

11 As far as the list, I mean, there are
12 still some open RAIs, but I think the list is stable
13 as far as DCD Rev. 5 goes. It's possible through the
14 review process something could change, but I don't
15 expect that GE will be making any changes to that
16 unless it's in order to resolve an RAI.

17 MEMBER STETKAR: Okay.

18 MS. CUBBAGE: But I am not aware of any
19 significant open RAIs at this point in the RTNSS
20 review that would impact that list. It's more of some
21 specific clarifications on the treatment of any
22 particular SSC that has been scoped into RTNSS.

23 MARK CARUSO: I think in Rev. 5 they
24 actually addressed, I think, most, if not all, of the
25 major concerns that we had with the RTNSS in Rev. 4,

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1 and we're doing that right now, and we're anticipating
2 if we have anymore RAIs, which I would doubt but I
3 can't say for sure, if we get those out in August and
4 we get answers back in 45 days from GE, I think we've
5 committed to try and finish up Chapter 22 by November.

6 MS. CUBBAGE: In other words, we're on the
7 home stretch in this particular area.

8 And you know, you referred to the building
9 that was added. The addition of that building was to
10 house new diesels, and those two additions addressed
11 a lot of the open RAIs.

12 MEMBER CORRADINI: Move on.

13 MR. PATEL: Okay. The next topic is your
14 topic. David Jeng is going to make a presentation on
15 seismic design issues, but before he starts, I'd just
16 like to point out some administrative things, please.

17 I guess we have to have three more pages
18 from the package, what you have before following the
19 questions in the morning. So out of that you have
20 three pages extra beyond the package you got.
21 Everybody should have a copy of three pages.

22 But the thing is two of the pages are
23 numbered 21. So the one with the table is 21 and the
24 one with the write-up is 23. The other one is 23.
25 When they discover, I point it out which one is which.

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1 MR. JENG: I am David Jeng, and I'm the
2 staff full review of the Section 3.7.

3 Today I would like to address the two
4 topics which you indicated you were interested by this
5 Committee, and I try my best to clarify and help you
6 address them more thoroughly. And as a result of this
7 morning's discussion, I list here several questions
8 which are sort of not totally answered, and I will try
9 to answer these three questions.

10 How does the effect of the impulse
11 transfer into the complete analysis model and how does
12 it meet the final design of the buildings that revise
13 in the thickness of the liners and so on?

14 The second item is what about the
15 equivalence that's been in the pool the U.S. consider
16 the effect of that interaction between the equivalent
17 and the surrounding water, so forth, root subsequent
18 action, and how does the applicant and the staff
19 address this kind of stuff? That's the second item.

20 And third item, I would like to explain
21 the process from the seismic analysis, so the first
22 microscopic analysis through the finite analysis, and
23 work with design level.

24 Dimensioning of the rebar size, number of
25 rebars, that's the third page, 23. I just put this up

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1 after the meeting so I could help you make it more
2 clear.

3 Go to the next one.

4 Okay. On the two issues, the first issue
5 is the design grand motion using seismic design of
6 ESBWR plants. I think this issue was almost clearly
7 addressed quite right by the GE presentation this
8 morning, but I just want to go through quickly the
9 staff perspective regarding this one.

10 The bottom line is the double hump curve,
11 GE has mentioned, was very conservative, one, and
12 which includes two segments of our knowledge, and in
13 the low frequency range, which is the copy of Reg.
14 Guide 1.60 spectrum anchored at .30g, and this is
15 really the major area of concern because the
16 structures, the way they are designs and constructed,
17 are going to respond very sensitively to this range of
18 motion input.

19 Lately, because of our knowledge
20 enhancement in the seismology areas, the seismologist
21 has determined that in the eastern U.S. there are new
22 information that high frequency motion would be of
23 importance. And in addition to this concern, we have
24 also requested to consider what are we going to do
25 about this new knowledge.

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1 And in response to that request, the
2 industry has proposed to develop that portion of the
3 knowledge, and that is shown in the most site specific
4 ESP, that one response specter, and in my slides
5 Figure 1 is the regular 1.60 low range, and the Figure
6 2 -- this is Figure 1, in which shows our convention
7 of very important range of input and structure
8 response to aspect notion.

9 But Figure 2 --

10 MEMBER CORRADINI: Before you go to Figure
11 2, yesterday somebody asked if we had a tutorial. You
12 may have been there, but you don't need to be tutored.
13 I'm trying to understand how I take a velocity
14 frequency and transfer it back to an acceleration. I
15 want to understand that.

16 So can you briefly?

17 MR. JENG: Yes, yes. This is several
18 tripartite, you know, diagram which covers the given
19 points or gives us the information, acceleration,
20 velocity, and displacement. Okay? And we used this
21 one for ES, but the way we are doing the analysis,
22 these three countries are rated by omega, by the
23 frequency omega. So it's a simple linear
24 relationship.

25 So you can pick up at one point and go to

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1 the appropriate axis to determine the number.

2 Does it help you? Does it answer your
3 question?

4 MEMBER CORRADINI: Given that we're
5 running behind, it helps.

6 CHAIRMAN SHACK: It's just a mass spring
7 oscillator. So you can relate the velocity to the
8 acceleration with Omega.

9 MR. JENG: This was Figure 2. Figure 2
10 is, again, different way of presentation of that high
11 frequency spectrum which is part of included in the
12 application DCD, and this shows the sequence 110 Herz
13 to 100 Herz. That's for the spectra radial far
14 exceeds dose observed in 1.60 growth between spectra.
15 That's why we are going to include that in our overall
16 design consideration.

17 Let's go to Figure 3. This is a sort of
18 double hump design response spectra, certifies seismic
19 design with the spectra. This is a reference design
20 for which they are designed and they exert our
21 standard plan in the scope such as are able to take
22 whatever motion whose spectra stays in this bundled
23 envelope.

24 So this is a reference spectra. If any
25 applicant cannot demonstrate their structure can

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1 reduce the motion, whose spectra exceeds any point of
2 this one, then they have to take exception or
3 departure approach in the four of the rules in the
4 radiations to demonstrate that they are properly
5 taking a look after and taken care of.

6 But in general, this is very conservative
7 one and in all situations, we expect this to be
8 conservative to cover all the potential sites.

9 Bottom line, the double hump spectra is
10 very, very conservative, and we have review authority,
11 and we consider GE's application is adequate and in
12 ample margins.

13 I will next go to the next subject. There
14 is interest in the last meeting of the subcommittee
15 that they want to know more about how the pool effect
16 is accounted for in the seismic analysis, and this
17 morning GE presented some of it, and I'm going to
18 supplement their presentation with the following.

19 Basically the design in two concepts. One
20 is to assume rigid bundling of the tank. Another one
21 is to consider the flexibility of the tank, but basic
22 approach is assuming those portions, water mass, which
23 is going to move in unison with the containment tank
24 and the other part is those which doesn't, you know,
25 fluctuate.

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1 But the sum of the full masses is where
2 the total mass is. Okay. That's one concept.

3 And then we also had to consider the
4 upward motion of the earthquake component, as well as
5 that gentle components, and in GE's application they
6 have taken the conservative approach where they
7 apportion more, that portion that move together with
8 the tank. They are saying we are going to apply 100
9 percent of the mass and apply conservative to get the
10 maximum response.

11 So that's one approach, too, and we
12 together looked at that one, and we consider that is
13 acceptable for the first microscopic analysis.

14 The third point is design water tanks and
15 fuel pools are consistent with Section 3.7 and 3.8 of
16 SRP, which this other acceptance criteria and
17 guidance, and just guidance is based on the body of
18 information in engineering technologies, interim
19 testing, interim analysis of, you know, derivations.
20 So I would further enhance data.

21 Okay. Let's go to the next one.

22 Okay. This is a copy of the GE suggested
23 quality. There are 3 water tanks in their design. It
24 means that water tanks in this particular design. The
25 most important one, the higher you go the effect is

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1 more. So on the upper level tanks, I'm showing the
2 green and second level tank is the gravity driven
3 cooling system tanks. I think they are A, B, C, three
4 tanks, I guess, quite huge ones, very massive. Okay?
5 That's the second level.

6 And the third level is the blue one, is
7 the separation pool. So these are basic concepts
8 where the masses are, and I want you to have a good
9 impression. There are quite a few heavy masses in the
10 different floors.

11 Let's go to the next one.

12 Okay. I'm presenting a conceptual
13 modeling, which is a bit more detailed than GE's this
14 morning. I am on the top one in the case of a tank
15 that is rigid, very much rigid wall, and I think we
16 have two more. One is the impulsive mode at the lower
17 level mass, Mi. Okay?

18 And which is connected to the other
19 direct with the rigid bar. That's why it's called the
20 rigid approach. The top mass --

21 MS. CUBBAGE: Do you want to point to
22 that? You can only get up if you use this though.

23 MR. JENG: I see. Okay.

24 CHAIRMAN SHACK: You have to be
25 electrified, amplified.

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1 MR. JENG: Okay. Again, this is the rigid
2 model conceptualization. This is the effective model.
3 Now, our approach, we divide the mass into two parts.
4 One is M_c , and this is 13 more mass, and this is M_i
5 imparting more mass. The sum of M_c and M_i should be
6 called the total mass. Okay?

7 And then the technology exists that we
8 have learned how to determine the ratio of these
9 masses, and then when they have configuration and
10 material of the tank and foundation type and we can
11 also define what kind of spring ought to be and what
12 fractions of this and this between them. Okay?

13 And also, when we come to the case of the
14 GE application, we are using this approach. So they
15 figure total mass of water and dump into the adjacent
16 points on the stick model. I will show you later the
17 model.

18 But in another approach, if you have the
19 tank which is made of thin steel shell like three-
20 quarter inch, they are quite flexible compared to the
21 concrete tank having five foot thick. Okay? In this
22 case, this kind of approach, insulation is justified
23 and may be needed. Okay? This just give you the
24 general idea of how that engineering science approach
25 this issue.

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1 Next one.

2 Okay. Again, this is the stick model
3 which GE used to represent reactor --

4 MEMBER CORRADINI: Is this your last
5 slide?

6 So when I have the heat exchanger in the
7 middle of the pool, how does that --

8 MR. JENG: I will come to.

9 MEMBER CORRADINI: Okay.

10 MR. JENG: So this one is the very
11 complicated picture. Each line doesn't mean just
12 simple one line. It could mean three locations and
13 three specimens. So for six-by-six metrics, okay,
14 each line in general mean that kind of situation.
15 Okay?

16 And then this is the stick model which
17 represents from the basement to the reactor building,
18 the roof, okay, and this is another one representing
19 the reactor vessel and there is the support, and this
20 is the sump water tank model, and this is the fuel
21 tank.

22 So it's very complicated, just to show you
23 for your general impression. Any one of these nodes
24 could imply many original oscillators like is shown
25 here, this is needed to --

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1 MEMBER APOSTOLAKIS: Excuse me. Did the
2 agency develop its own model for these things?

3 MR. JENG: No.

4 MEMBER APOSTOLAKIS: Just reviewed what
5 GEH put up?

6 MR. JENG: It set the guideline, SRP, how
7 the minimum level detail modeling has to be done under
8 the acceptance criteria shown in the SRP. Industry
9 experts following our guidance understand our level of
10 detail needs have developed another method, approach,
11 bundling review, and we'll be turning their other
12 questions. The detail level is adequate and we desire
13 to accept the level and going to enhance and modify.

14 MEMBER CORRADINI: So that instead of
15 doing a separate model to check, you reviewed and
16 audited.

17 MR. JENG: We did in this case.

18 MEMBER CORRADINI: Did you do spot checks?

19 MR. JENG: Yes. Since this is the ESB
20 that was standard of design, in the last presentation
21 I indicated we made a point to do a comparative
22 analysis of selected items, and I reported earlier
23 that we did in the case of control building.

24 MEMBER CORRADINI: I see. Okay. Thank
25 you.

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1 MR. JENG: Okay.

2 MEMBER APOSTOLAKIS: And you didn't find
3 that?

4 MR. JENG: We did find general agreement.
5 That's important in the adjustments, telling about we
6 are convinced they're adequate within - they did a
7 safe job.

8 MEMBER APOSTOLAKIS: Good.

9 MR. JENG: Okay. Let's go to the next
10 slide.

11 This is the stick model which covers the
12 control -- the reason I wanted to show this one is
13 that this is system where there's a building in the
14 center and both sides there's a huge water tank.
15 Okay? And this water tank is the type of water tank
16 calls for use of what I call flexible model, and
17 specifically, this particular representation that was
18 a soil spring. This is the impulsive mode. We talk
19 about impulsion. And this 60 is the convective mode,
20 and in this particular model they are specifically
21 represented through 100, to that effect. Okay?

22 Let's go to the next one.

23 Okay, and the following two pages are just
24 a statement of what we have shown in the SRP, Section
25 37.15, our acceptance criteria. What is the minimum

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1 standard thou shall follow and achieve in doing this
2 kind of analysis, and I do not want to spend time to
3 go through this. This is part of SRP exception. Tell
4 them in detail how we shall conceal a certain analysis
5 modeling, et cetera. Okay?

6 So let's go to next please.

7 MEMBER ABDEL-KHALIK: There was a
8 torsional spring on the previous document?

9 MR. JENG: Yes, torsional spring, yes.

10 MEMBER ABDEL-KHALIK: Where do the
11 constants for that come from?

12 MR. JENG: Okay, and then you go to the
13 next table to show you. Okay?

14 Could you go to 21? Yes. Yes, 21 table,
15 okay, okay.

16 Earlier this morning I think some of the
17 members indicated, how do you convert this convective
18 mode into numbers which you're getting to complete
19 your analysis. My answer is that is large volume of
20 information, knowledge, still surviving. Academic
21 peoples over the last 30 years, and they have
22 condensed this information, how to, into a, quote,
23 representation and the most popular report our U.S.
24 application is the ACRS 350.3 in a table, Case 21, and
25 that gives you detailed guidance of water tank, how

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1 you should really determine the mass ratio, the
2 damping, and how to complete source detect for input
3 in the computer.

4 So I do not intend to spend your time any
5 way in the detail both of these codes, and I can
6 provide these codes to anyone who are interested, you
7 know, but these two details is too much engineering.
8 Okay? But they are by the knowledge, which is very
9 competent, tested, time tested. Okay? So I think we
10 can trust this practical approach.

11 MEMBER CORRADINI: Somewhere in there
12 there's an empirical design tool, that tells me when
13 I have a structure in a water pool with a wall how to
14 do it?

15 MR. JENG: How come, yes, of course, but
16 I have been providing you a certain item, yes.

17 MEMBER CORRADINI: I am single minded.

18 MR. JENG: I will come out there. Besides
19 our main codes, there are other codes.

20 CHAIRMAN SHACK: Don't point up to that
21 screen.

22 (Laughter.)

23 MR. JENG: Besides our main code here,
24 other quotes, this is our main time code, main time
25 American Waterworks Association. They are more

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1 commercial type people. So this is more rigorous.
2 Okay?

3 MEMBER CORRADINI: ACI stands for what,
4 just so I remember?

5 MR. JENG: American Concrete Institute.

6 MEMBER CORRADINI: American Concrete.

7 MR. JENG: Yes, that's the number one.

8 Okay, and I want to point out the European
9 Community, they have issued the Eurocode 8, and this
10 I didn't mention is available, but we believe our
11 codes are superior.

12 Okay. Let's go to the next page.

13 And just for interest, there was concern
14 about how do you figure the sloshing height, the water
15 up and down with that wave of that water shoots the
16 cover off the tank and cause some trouble, and the
17 answer is, yes, that has been considered. It's part
18 of the analysis

19 And then I'm listing just the codes and
20 how they tell you how to figure the sloshing wave
21 height, and this is expression here which gives you
22 guidance how it should be, how much water would come
23 up, okay, given the dimension. Okay.

24 MEMBER CORRADINI: Just so I understand
25 since you showed us this, I want to understand it.

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1 MR. JENG: Okay.

2 MEMBER CORRADINI: So Ac times R is units
3 of meters squared or seconds squared. So how do I get
4 the sloshing wave height?

5 MR. JENG: Okay. You know, out of the
6 radius of tank.

7 MEMBER CORRADINI: Yes, that figures.

8 MR. JENG: The tank is in feet. Then you
9 apply fraction. Ac is the fraction. Okay? So we
10 give you the height.

11 MEMBER CORRADINI: Yes, it says at the
12 bottom it's the convective acceleration. So meters
13 per second squared. I just want to -- you just simply
14 showed it to me. So now I want to understand it. So
15 I've got meters squared per seconds squared. How do
16 I get a height out of that?

17 MR. JENG: In the --

18 MEMBER CORRADINI: Is there a table
19 somewhere that says --

20 MR. JENG: There must be some conversion
21 factor.

22 (Laughter.)

23 MR. SHUAIBI: You've got to divide by G or
24 something. It's a ratio of the exploration of
25 gravity.

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1 MR. JENG: Oh, it's a ratio. It is the
2 ratio. Okay. It is a fraction.

3 MEMBER CORRADINI: So this is not
4 conventional. Thank you.

5 MR. JENG: Yes.

6 MEMBER CORRADINI: Thank you.

7 MR. JENG: Okay.

8 MS. CUBBAGE: For the record, that was
9 Mohammed Shuaibi of the staff.

10 MR. JENG: The next one is the third point
11 I'd like try to answer the question, but this is the
12 last slide, 23. I would like to answer Dr.
13 Corradini's main question, very important question.

14 Okay. When we do the seismic analysis,
15 of the building and the fuel building, we call that
16 the primary consideration. We're talking about the
17 water over hundred of tons. Okay?

18 So in our modeling we see this first order
19 consideration. So with the modeling we explain to you
20 how to deal with the lump mass stuff and going to get
21 the response that each mass point acceleration,
22 displacement, rotation. Okay?

23 This is what I call the first order of
24 magnitude analysis. Compared to that, given heat
25 exchanger, maybe one ton, two ton, somewhat in this

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1 huge 50 by 150 pool. Okay? It's to me the second
2 tier consideration. Okay. After we are done with my
3 cross-analysis, we will know how the equipment this
4 morning because of the first analysis through the
5 acceleration is a function of time, displacement, and
6 this is becoming small time equipment. It's maybe ten
7 by ten, ten tons. Okay? Submerged in water.

8 And there it looks bad in dimension with
9 experiments, and tell people, engineers, competent
10 ones, how to use this information to figure out what
11 kind of forces that equipment is going to be subjected
12 to, knowing the equipment is supported by a floor
13 moving at a certain functional time. Okay? Knowing
14 that input and knowing that water surrounding that
15 equipment, then there's a way to determine what type
16 of force that equipment has to be desired, yes, to
17 retain that centrifugal support and function.

18 Okay. So this is basically conceptual,
19 first order, second order consideration. Once you
20 have resolved first order basic information, applicant
21 information work with second localized analysis, and
22 that where it quotes and experience to tell people how
23 to do adequate job to design that one.

24 MEMBER CORRADINI: And that was done and
25 you reviewed it. Let me say --

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1 MR. JENG: Okay.

2 MEMBER CORRADINI: So I didn't sense that
3 what I asked was done.

4 MR. JENG: It was done in other people's
5 section, not my section.

6 MEMBER CORRADINI: Oh.

7 MR. JENG: We provide a motion on the
8 floor supporting that equipment and 3.10 people fix
9 up, yes.

10 MR. LIU: We have done that calculation
11 for the heat exchanger.

12 MR. JENG: Yes, we did.

13 MEMBER CORRADINI: Where did that come
14 from?

15 MR. LIU: Three, point, eight, 3.8.

16 MEMBER CORRADINI: And so the fact of
17 coupling it because there's water movement doesn't
18 affect it?

19 MR. LIU: We were saying that the first
20 order of effect in the form of floor acceleration and
21 the displacement.

22 MEMBER CORRADINI: Right.

23 MR. LIU: So those are traded as the
24 motion to the heat exchanger model.

25 MEMBER CORRADINI: Okay.

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1 MR. LIU: Due to the fact of the heat
2 exchanger is emerged in the water, so we consider
3 additional mass, of displaced mass as added mass to
4 the heat exchanger.

5 MR. JENG: And the idea is to imagine some
6 type of a water right next to equipment. This is
7 mostly defined by the support of the equipment because
8 we know that, the time function which is --

9 MEMBER CORRADINI: But the point, just so
10 we're clear, and then I'm going to stop and think some
11 more. We won't want to beat this to death just yet.
12 What I guess I'm saying is if you're saying it's
13 totally in phase, there's three ways to think about
14 it. One is there's air between them. So I have low
15 density fluid. So I wiggle the outside. I wiggle the
16 inside. They're totally decoupled.

17 The other one is I put in arrow gel or --
18 I don't know, something rigid enough that they're
19 totally in phase, and I wiggle them, and so now
20 they're in phase. But water is in between the two,
21 and part of it is in phase because it's deep, and part
22 of it is out of phase because it's sloshing, and I'm
23 asking by the very fact that it's sloshing, sometimes
24 it's in phase and sometimes it's out of phase so it
25 can amplify. And I'm asking where can I look for the

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1 analysis so I feel comfortable that this is a small
2 effect.

3 MR. LIU: In our design, the heat
4 exchanger is, you know, totally immersed in the water.

5 MEMBER CORRADINI: That I got, but the
6 other part --

7 MR. LIU: But sloshing mainly is a service
8 effect.

9 MR. JENG: So you'll never see this.

10 MEMBER BANERJEE: How deep is it? How
11 deep is it with all this stuff?

12 MEMBER CORRADINI: So let's just play the
13 game. I've got a 1G acceleration. So 1G over 1G is
14 one. The radius is five meters. That means according
15 to your model I should down five meters deep. So, I
16 mean, that's what I just heard is the design rule of
17 how to break it up.

18 So if I take a 1G acceleration at low
19 frequency, 1G is somewhere on your curve, half a G,
20 something of that order. So I've got half a G divided
21 by one is .5 times the radius of the pool, which is a
22 few meters, means I go down significantly into the
23 pool.

24 Am I off base somewhere here?

25 So that means that thing is wiggling, and

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1 that essentially could be out of phase with the heat
2 exchanger motion. According to the design rule I
3 think I did it right.

4 MR. LIU: But please keep in mind, you
5 know, that the contribution from sloshing really is
6 not as significant. The basic mass, the impulsive
7 mass really, you know, is controlling it.

8 MEMBER CORRADINI: But I'm happy that I
9 understand what you did.

10 MEMBER BANERJEE: How deep is the heat
11 exchanger below the surface?

12 MR. JENG: We can find out from the scale
13 of that. It's probably --

14 MR. DEAVER: This is Jerry Deaver, in
15 Electric GEH.

16 Let me clarify that the PCCS pool, it is
17 fully immersed, but the IC pool, the water only goes
18 up to a certain level, but top piping is actually
19 exposed.

20 MEMBER ARMIJO: So that will be impacted
21 by the slosh.

22 MEMBER BANERJEE: But in the PCCS pool,
23 again, how deep is it?

24 MR. DEAVER: It's at least 20 feet.

25 MEMBER CORRADINI: Let's just look at the

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1 size so I understand.

2 MR. DEAVER: I don't know that exactly.

3 MEMBER ARMIJO: But you know that you're
4 going to have to deal with it.

5 MEMBER CORRADINI: You've helped me
6 understand. I don't know if I'm in phase with you,
7 but I understand. The only reason I'm focusing here
8 is it's the one piece of new equipment with an
9 interesting interaction that I want to make sure is --

10 MR. JENG: There's a system. We're trying
11 to do the analysis in the system requirement here. So
12 we should trust with this group and stop with the
13 group reviewing the analysis.

14 MEMBER CORRADINI: I'm happy. I
15 understand.

16 MR. JENG: And also I want to discuss I
17 think this gentleman asked given the seismic analysis,
18 how do you bring on to the point of the total design?
19 So I want to know. I tell you, first, my first
20 seismic analysis, and each mass point inflict the
21 impact and influence of the mass in the adjacent
22 label.

23 So when do you get out of it from the
24 seismic analysis? Acceleration is function of time.
25 Sheer forces, the spring shut forces, and even the

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1 fission, then you talk all these things will be
2 available as a function of time in the given mass
3 location.

4 And we mentioned earlier how about that
5 transient time aspect? My answer is that first class
6 time dependent analysis is accounting for the
7 transient consideration.

8 MEMBER BANERJEE: What you are doing there
9 is a sort of a modal analysis.

10 MR. JENG: Right, right. Modal is one way.
11 That could be done out of scope as well. The model
12 must come down. Okay?

13 MEMBER BANERJEE: Right.

14 MR. JENG: But the point is the tangential
15 consideration is a conflict in the first microscopic
16 seismic analysis.

17 MEMBER BANERJEE: Yes, it's in the
18 frequency domain.

19 MR. JENG: It is.

20 MEMBER BANERJEE: But it's not a finite --
21 I mean, when you have finite amplitude effects, it's
22 very hard to do modal analysis.

23 MR. JENG: Modal analysis, there are modal
24 analysis. There are direct time integration
25 approaches. That's two approaches generally speaking.

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1 Okay?

2 MEMBER BANERJEE: But I was asking because
3 the amplitudes are fairly large. Therefore, one would
4 expect that you'd have to integrate the equations.

5 MR. JENG: Yes, we do integrated the
6 equations, yes.

7 MEMBER BANERJEE: The reason I was asking
8 it is the whole system. You know you can integrate
9 the equations using finite element techniques, you
10 know. But how do you get the spatial resolution?

11 MR. JENG: Okay. Let me answer the
12 question that the codes used in this particular case
13 is Sashi and also VACC and Core.

14 MEMBER BANERJEE: Is that approved by the
15 NRC?

16 MR. JENG: The NRC do have these standards
17 of how to review proposed core analysis and how to
18 verify their veracity and how -- maybe I'll get -- but
19 we live in a system with very fine -- the codes
20 produced by the applicant.

21 MEMBER BANERJEE: Well, we have a process
22 here.

23 MR. JENG: Yes, we do.

24 MEMBER BANERJEE: You can submit a topical
25 or whatever.

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1 MR. JENG: Yes, yes, that --

2 MEMBER BANERJEE: And that has been done.

3 MR. JENG: Right. That's the process.

4 MEMBER BANERJEE: These are approved or
5 accepted codes.

6 MR. JENG: Yes. This is all core
7 registration standards requirements in 3.7, 3.8, which
8 tells that a given four perforce has to be examined
9 any time there are course 1 solution comparisons.
10 There are test verification and there's documentation,
11 and there's a process requiring a viewer to review
12 when they first come in and come to conclusion. They
13 like our standards before they can accept it.

14 Once they accept it, they will be accepted
15 thereafter, but the answer is yes. It's their
16 interest to review, accept or reject codes proposed by
17 applicant.

18 MEMBER BANERJEE: And I know that, and
19 it's simply asking whether the codes used have been
20 approved. They have been, I admit.

21 MR. JENG: But they make 202(c) standards.
22 By that revision, we are approved, yes.

23 MEMBER BANERJEE: Well, you aren't
24 answering my question.

25 MS. CUBBAGE: I think you're thinking of

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1 the thermal hydraulics world where we get a topical
2 report and we approve it. This is a different forum.
3 This is a different world. Basically there are SRP
4 criteria that the codes need to be validated and, you
5 know, I don't know if --

6 MR. JENG: I'm talking about how to review
7 codes and determining whether they are definable and
8 they are reliable and they are acceptable.

9 MEMBER CORRADINI: Fine. Other questions
10 by the members?

11 (No response.)

12 MEMBER CORRADINI: Okay. Thank you very
13 much.

14 MR. JENG: Thank you.

15 MEMBER CORRADINI: All right. Mr.
16 Chairman, you can have back your 15 minutes you gave
17 me earlier.

18 (Laughter.)

19 CHAIRMAN SHACK: Okay. We're going to
20 take a break for ten minutes.

21 (Whereupon, the foregoing matter went off
22 the record at 2:32 p.m. and went back on
23 the record at 2:43 p.m.)

24 CHAIRMAN SHACK: If we can come back into
25 session.

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1 Our next topic is the meeting on the
2 aircraft impact rulemaking, and Mario will be leading
3 us through that.

4 MEETING ON AIRCRAFT IMPACT RULEMAKING

5 VICE CHAIRMAN BONACA: Okay. Mario Bonaca,
6 chairman of the ACRS security and cyber-safeguards
7 subcommittee. Ms. Maitri Banerjee is the designated
8 federal officer for this time of the meeting.

9 The purpose of the meeting is to hear
10 representation from the staff regarding the draft
11 primary rules for security safeguard areas and
12 aircraft impact assessment.

13 The ACRS today is not formally reviewing
14 the draft guides at this meeting. We will be
15 reviewing the guidance documents at a later time when
16 everybody becomes available.

17 We will provide you a copy of the draft
18 rules, final rules, from a few days ago, and so if
19 there are significant changes, in accordance with the
20 time, I would appreciate it if you would let us know
21 at the end of the presentation.

22 We expect that there will be no changes.

23 MEMBER APOSTOLAKIS: So we are going to
24 comment but it's not final.

25 MR. BANERJEE: Are we going to write a

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1 letter?

2 VICE CHAIRMAN BONACA: Yes, we do have a
3 letter. It would be nice, the letter, that - but I
4 believe that the rule right now are final from what I
5 heard.

6 MS. SCHNETZLER: Actually, the EDO's office
7 just signed it today, and so it is going to the
8 commission today.

9 VICE CHAIRMAN BONACA: And we have verified
10 that the later addresses the final rules.

11 Now the ACRS interest is mainly in four
12 areas of rulemaking: contingency mitigative measures
13 for security events; cybersecurity; safety and
14 security interface, and I believe that those are the
15 areas you'll cover under the general rule.

16 And finally, aircraft impact rulemaking,
17 which is separate rulemaking, but this happens to be
18 occurring at the same time.

19 The first part of this meeting is open to
20 the public, and is being transcribed. It includes the
21 staff presentation. And then we allocated 10 minutes
22 to allow Mr. Riccio of Greenpeace to make a statement
23 upon his request.

24 After Mr. Riccio's statement we will take
25 a 15-minute break and reconvene in the Room T8E8

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1 upstairs in a closed session to allow discussion of
2 security-related information that needs to be
3 protected from public disclosure.

4 For this reason I ask the members to hold
5 such questions to the later session, and the staff to
6 not discuss and identify the issues that cannot
7 really be discussed here. I think you are more
8 informed than we are about the sensitivity of the
9 issues, so you if get a question that is not proper at
10 this time, please hold the answer we do not want to --

11 As the first part of the meeting is being
12 transcribed, I request that participants in this
13 meeting use the microphones located throughout the
14 meeting room when addressing the subcommittee. And
15 participants should first identify themselves and
16 speak with sufficient clarity and volume so that they
17 can be readily heard.

18 As I said before, we will plan to review
19 guidance documents as they become available to us,
20 either as part of the subcommittee work or as part of
21 other committees, for example, cybersecurity may be
22 under the Digital I&C committee.

23 With that, I'll turn to Ms. Holohan.

24 MS. HOLOHAN: Okay.

25 Thank you very much. I'll introduce

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1 myself first. I'm Patricia Holohan. I'm the division
2 director of the Division of Security Policy, for those
3 of you who don't me, in the Office of Nuclear Security
4 and Incident Response Response.

5 With me at the table is Mr. Tim Reed from
6 the Office of Nuclear Reactor Regulation, and Ms.
7 Bonnie Schnetzler, sorry, from my office. She's
8 actually from the Division of Security Policy. And
9 they are going to be doing the presentations.

10 But I'd like to open it up by saying that
11 we appreciate the opportunity. We appreciate the ACRS
12 working with us and - because this rule has been
13 expedited as you know. They came in and briefed to us
14 once on the status of it, and we appreciate all the
15 efforts you have put into it so far, and we hope you
16 - as we are going to talk about the final rule
17 requirements for Section 50.54(hh), which is the
18 mitigative strategies and enemy attack.

19 And then 73.54, which is cybersecurity,
20 and then 73.58, which is safety security interface.
21 As Bonnie said, the EDO signed it today and it's
22 heading up to the Commission as we speak, for the
23 Commission to consider it.

24 So we'd like you to provide a letter to
25 the Commission with any recommendations on the draft

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1 rule language this month, and the opinion on the
2 acceptability on the final rule language.

3 VICE CHAIRMAN BONACA: I'd just like to
4 interject one thing, for those members who have been
5 here a short time, this rulemaking includes a number
6 of endorsement in the regulations of reviews that we
7 have performed already, significantly over the past
8 six years. The committee has been engaged in most of
9 the steps that went into the incorporation of these
10 rules. So we although we have seen the four month
11 framing of the rule recently. We are quite familiar
12 with what went into them. So that's an important
13 communication, and we have been involved very much.

14 MS. HOLOHAN: Yes, as Dr. Bonaca said,
15 we'll talk about the guidance as it's developed, and
16 the - we are working to continue to finalize the
17 guidance. So we are not looking for guidance on the
18 guidance. But we'll come back to you for that, and
19 we'll expect further interaction with the ACRS on the
20 guidance as it's developed.

21 So with that I'd like to turn it over to
22 Bonnie for the presentation - oh, before she starts,
23 as Dr. Bonaca said, we're not addressing the aircraft
24 impact rule. That is going to be a separate group
25 coming up afterwards.

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1 So we are only going to talk about the
2 power reactor security rule.

3 MEMBER APOSTOLAKIS: Afterwards today,
4 tomorrow, next year?

5 MS. HOLOHAN: Yes, today, yes.

6 MS. SCHNETZLER: Thank you, and good
7 afternoon. We are here to discussion sections of the
8 power reactor security rulemaking.

9 As Trish delineated, we have three parts
10 of our rulemaking that need ACRS review: mitigated
11 strategies and response procedures; digital equipment
12 and communication systems and networks; and safety
13 security interface requirements for nuclear power
14 reactors.

15 We - although we have provided some of the
16 guidance that has been published in draft form, we are
17 not here today to discuss that guidance specifically,
18 and we would, as the Doctor said, be prepared to come
19 back at a later date when the guidance is finalized
20 and we have our comments incorporated so that we can
21 have a good dialogue on that part of this rulemaking,
22 the guidance part.

23 And the part is, the first part of this is
24 50.54(hh) mitigated strategies and response procedures
25 for potential or actual aircraft attacks.

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1 MR. REED: Okay, this is Tim Reed from NRR
2 through 50.54(hh) first. It reflects for those of you
3 familiar with the ICM order of 2002, sections B.5.a
4 and B.5.b of that order, B.5.a being - called aircraft
5 is on the way, B.5.b the aircraft has hit large areas
6 are lost due to explosions and fires.

7 The staff believes in fact that 50.54(hh)
8 is implementing the rule requirements although of
9 course it's implementing - it's reflective of what
10 we've learned since 2002, so it certainly goes beyond
11 the explicit language in B.5.a and B.5.b, but in fact
12 in our view, consistent with the intent the Commission
13 had in those, so we think we were in line with the
14 order requirements.

15 This was in the proposed power reactor
16 security rule it was actually in Appendix C, which
17 contains the response measures, and that was an
18 inappropriate place for it to be since these really
19 aren't security requirements, these are global fault
20 response requirements, operations, fire-fighting,
21 emergency requirements and those types of actions.

22 So we removed that comment; we moved it to
23 Part 50. We re-noticed it as a supplemental proposed
24 rule for 30 days. We did all that. Got all those
25 comments. We rolled it back in, and now they are in

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1 the final rule stage, and it's just signed two hours
2 ago.

3 So the first paragraph of this line again
4 is B.5.a portion. It is what you do in terms of
5 preparing for - preparatory actions in the event that
6 you have a potential aircraft attack. At a high level
7 if you have the rule language, the rule language I do
8 believe is exactly the same. We've made no changes in
9 the rule language I think you will still find.

10 In fact, I think in all the areas before
11 the committee there's been no changes in the language.
12 There's been changes in other areas, but they don't
13 concern this committee, in these particular pieces.

14 These I think it's seven detailed actions
15 you will find in 50.54(hh) --

16 VICE CHAIRMAN BONACA: You moved that
17 slide. Can you go back?

18 MR. REED: Sure.

19 VICE CHAIRMAN BONACA: At the bottom you
20 talk about exposure from beyond-design basis events.

21 MR. REED: Right.

22 VICE CHAIRMAN BONACA: Okay, that's an
23 understanding I had of this function. And yet how
24 does that go with the fact that these actions are
25 necessary for adequate protection? Could you explain

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1 that? I'm confused.

2 MR. REED: We - and this is why I closely
3 link it to the the order, the order was issued under
4 adequate protection. The Commission judged that
5 these, B.5.a and B.5.b were adequate - required for
6 adequate protection, and it's why when I was saying in
7 the very first part of this slide that we believe
8 we're consistent with that order, and we're saying
9 that consistent with the adequate protection, the
10 justification the Commission placed on the order, we
11 believe it's still adequate protection even moving
12 into Part 50.54(hh).

13 So that's basically where we stand on that
14 issue.

15 MEMBER-AT-LARGE BROWN: I didn't understand
16 that at all. I mean this is - it's already hit, the
17 place is up in flames, and we are now beyond - there
18 is no protection. I mean you are there. It's toast.
19 Did I say that wrong?

20 VICE CHAIRMAN BONACA: The reason why I'm
21 asking these questions for the simulation, all the
22 needs. So we are making very clear, for example, in
23 the aircraft impact rule that this is beyond design-
24 basis events, and I believe that the committee
25 probably would deliver that.

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1 But when it comes down to mitigating
2 actions we are talking about, it is necessary for all
3 plants for reasonable and adequate protection. And
4 that seems to be an inconsistency to me.

5 MS. SCHNETZLER: Let me defer to Jason Zorn
6 for a minute while I collect my thoughts, and he's our
7 legal counsel that has guided us through this
8 rulemaking.

9 MR. ZORN: I'll do my best to add a little
10 bit of explanation to this, the way I understand that
11 to work.

12 Again, my name is Jason Zorn. I'm an
13 attorney at the Office of General Counsel, and I
14 advise the staff on this rulemaking.

15 The concept I believe is for the
16 mitigating strategies measure is, it was intended to
17 be an adequate protection measure. The way that
18 interrelates with the aircraft impact assessment is,
19 they are supposed to work together. So as far as
20 adequate protection is concerned, if the facility has
21 been hit by, or is subject to a large fire or
22 explosion, the concept of the mitigating strategies is
23 to prevent any release and to mitigate those effects.

24 That's where the adequacy - the adequate
25 protection of public health and safety comes in.

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1 VICE CHAIRMAN BONACA: Okay, I understand
2 now.

3 MEMBER APOSTOLAKIS: Adequate protection is
4 defined by design basis, is it not? If you meet the
5 design basis, then there is adequate protection by
6 definition.

7 MS. SCHNETZLER: Right, but you still have
8 the design basis threat also, which is applicable to
9 Part 73.

10 MEMBER SIEBER: This is beyond design
11 basis.

12 MEMBER APOSTOLAKIS: What is beyond the
13 design basis?

14 VICE CHAIRMAN BONACA: The aircraft impact.

15 MEMBER APOSTOLAKIS: And then you said -
16 and I saw it too - that it addresses adequate
17 protection issues, even though it's beyond design
18 basis.

19 MR. ZORN: Dr. Apostolakis I will add
20 something here that is not going to address your
21 technical issue. But I will say that in terms of
22 current licensees, okay, this is not a back fit,
23 because it's already in place. It's a forward fit for
24 new reactors, and of course, 50.101 doesn't apply.

25 So in terms of back fit space, we in fact

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1 believe we are consistent with the orders. Now that
2 doesn't address reasonable and adequate protection,
3 and I understand that. I understand exactly what you
4 are saying.

5 MEMBER MAYNARD: Well, I think that would
6 be fair in the legal perspective. But we're I think
7 mixing some things up here.

8 When we talk about design basis, we are
9 talking about what rules and what you get prepped for.
10 When you go beyond design basis, that doesn't mean the
11 world falls apart and you can't provide adequate
12 protection. You have some different rules applicable
13 to you as to what you could use, what to take credit
14 for, what mitigation you might do, and stuff like
15 that.

16 VICE CHAIRMAN BONACA: I think Otto is
17 right. I mean this entails today is that mitigative
18 action which can mean as orders or the Commission are
19 required for adequate protection.

20 MEMBER BROWN: I mean if you put a hole, if
21 something comes and puts a hole in the reactor
22 building -

23 VICE CHAIRMAN BONACA: But the event must
24 be beyond design basis.

25 MEMBER BROWN: That's beyond design basis.

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1 What mitigation would take place, would you throw a
2 tarp over it. I mean if you put a hole, if something
3 comes in and puts a hole in the reactor building -

4 (Simultaneous speaking)

5 MEMBER SHACK: First of all, we need to be
6 careful when you start talking about the mitigating
7 strategies and what we can do and can not do.

8 MEMBER BROWN: I'm just trying to get a -

9 (Simultaneous speaking)

10 MEMBER POWERS: - analyses done that you
11 are not going to be able to discuss the results of
12 those analyses in the meeting.

13 (Simultaneous speaking)

14 VICE CHAIRMAN BONACA: The work that you
15 have done, you have done work that sets expectations
16 for impact preparation for response.

17 CHAIRMAN SHACK: But to answer George, if
18 you meet all the design basis things, clearly you have
19 adequate protection. If you go beyond the design
20 basis, at present meaning that you don't have adequate
21 protection.

22 MEMBER APOSTOLAKIS: I thought you were
23 going to say - yes, if you meet the design basis, the
24 licensing basis, not design basis, the licensing
25 basis, then you have adequate protection.

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1 I guess what we are doing now is that we
2 are utilizing some bases. There is a design basis
3 envelope, plus other things. And we are adding to the
4 other things; that's really what we are adding.

5 MR. ZORN: I think we should proceed.

6 MEMBER APOSTOLAKIS: But what is the legal
7 distinction, though?

8 MR. ZORN: Well, it -

9 MEMBER APOSTOLAKIS: It was beyond design
10 basis. What does that mean? That what? If it's
11 initial adequate protection.

12 MR. ZORN: I think that the conflict here
13 is whether or not the licensee would be required to
14 provide adequate protection against a particular
15 threat.

16 MEMBER MAYNARD: Licensees, for the design
17 basis event, you have to be able to take those
18 considering only your safety related equipment
19 basically and they can save single failures and such,
20 and not taking credit for other equipment, other
21 procedures, other things that you may or may not have
22 available to you to take care of -

23 MEMBER APOSTOLAKIS: It's like the station
24 blackout rule.

25 VICE CHAIRMAN BONACA: Yes, and here

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1 particularly there is the direction that says you
2 should - if you have an issue with respect to a
3 certain issue then you should take care of it. And
4 there are certain indications on what expectations
5 are. In the old bill that was sent through, I think
6 it was debated by the industry. The old bill comes
7 under adequate protection requirement. And whatever,
8 you know, that may be beyond design basis, as far as
9 reaction. That falls under adequate protection.

10 MEMBER APOSTOLAKIS: I think the difference
11 is that if you declare something as related to
12 adequate protection. We don't need to go back to the
13 cost-benefit.

14 VICE CHAIRMAN BONACA: That's right.

15 MR. REED: From a regulatory analysis
16 standpoint, there were no costs associated, because
17 this was already imposed. So based on our regulatory
18 analysis was the old one.

19 MEMBER APOSTOLAKIS: Very good. It took us
20 15 minutes.

21 MR. REED: Okay, getting on to the next
22 slide, to the first paragraph which are the actions
23 you take when you have a potential aircraft threat.
24 It's broken down into seven subitems there in terms of
25 what you are required to do, and the procedures. That

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1 basically requires you to develop procedures to do
2 these things, authenticate threat sources, maintain
3 communication with those threat sources, contact your
4 on-site groups as necessary and off-site response
5 organizations; take actions that you hope will in fact
6 mitigate, will be helpful in mitigating an impact
7 should it occur; reduce your visual discrimination of
8 your facility as appropriate; and disperse equipment
9 and personnel, then recall the personnel that are key,
10 taking actions after the event.

11 So I can go into more detail. Actually I
12 probably wouldn't go into more detail; I'd have my guy
13 over here that might go into more detail. But that's
14 at a high level.

15 MS. SCHNETZLER: This is a kind of a good
16 place to say that in the original proposed rule, this
17 part particularly wasn't fleshed out as well, and so
18 this was one of the major reasons that it was
19 renoticed this year in April, I think it was April
20 10th, this part of the regulation was renoticed for a
21 couple of reasons. One is that we thought it would
22 better fit 50.54 as we've said instead of Appendix
23 Charley of Part 73.

24 The - what the licensees have done
25 currently is already a part of their condition of

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1 license, so we thought this was a better fit for it.
2 That's one reason for renoticing, and that fell in
3 line with the comments that we had received from the
4 public and the stakeholders on the proposed rule.

5 And the second part was that we thought
6 this needed clarification. It wasn't clearly
7 delineated in Appendix Charley in the proposed rule.
8 So this was an opportunity to clearly lay out our
9 expectations, and then receive comment on it.

10 And I think it's noteworthy that the
11 comments that we received were indeed on this part,
12 Part, you know, number one, and really we received I
13 think more comments on the second part.

14 MEMBER POWERS: You use in this some terms
15 of art that perhaps deserve some explanation. For
16 instance you say authenticate source and maintain
17 communication with source, a word that needs
18 clarification.

19 You also say, reduce visual
20 discrimination. Again, a term of art. Is there some
21 explanation?

22 MS. SCHNETZLER: I need to make sure we are
23 not stepping into sensitive information.

24 MR. CUBELLIS: Page 106 of the FRN should
25 have some more clarification on the visual

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1 discrimination piece. This is Lou Cubellis insert.
2 And then if you look on pages 103, 104 -- there are
3 actually open source clarifications for this. The
4 slide is a little misleading. Actually the first and
5 second bullets should read, authenticate threat
6 notification source. Actually, authenticate the
7 threat notification itself, and there is a security
8 advisory 07 -

9 MEMBER POWERS: This is not going to step
10 on anybody's security requirements by writing things
11 in English.

12 It is against most classification rules to
13 try to obfuscate via language.

14 MR. CUBELLIS: Agreed. I think it's fairly
15 clear in the actual FRN. We do - we do authenticate
16 - you asked the power reactor licensees to continue
17 what they are doing with regard to Security Advisory
18 07-01 Rev. 1. It is a publicly available document,
19 and in one of the comment responses we actually gave
20 the ML number so the public can actually pull that
21 security advisory and see the three pages. It
22 outlines the process by which power reactors
23 authenticate threat notifications.

24 MEMBER APOSTOLAKIS: So if you put the
25 word, authentication -

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1 (Simultaneous speaking)

2 MR. CABELAS: And then you don't maintain
3 communication with the source of the threat.

4 (Simultaneous speaking)

5 The communication with the source is not
6 the actual threat source, is the notification source.

7 (Simultaneous speaking)

8 MR. CUBELLIS: Correct. And again, there
9 is detailed language in the FRN that will discuss that
10 for further clarification. But it's not the actual
11 source of a threat. It's the notification source.

12 MEMBER APOSTOLAKIS: How about visual
13 discrimination.

14 MR. CUBELLIS: Visual discrimination refers
15 to making it harder to target particular locations
16 inside the protected areas, and we go into some
17 discussion. It's essentially extinguishing lights, or
18 in some cases, dependent on ambient lighting, actually
19 illuminating different parts of the site to blend
20 better with their surroundings.

21 Because for instance Waterford is in a
22 heavily industrialized area. If they would turn off
23 some lights, they could actually highlight the areas
24 based on darkness. They'd be the only dark spot on
25 the horizon.

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1 So depending on how - and I can't really
2 go much more into detail on that particular piece
3 here, but it's essentially lighting actions that the
4 sites take so that they try to blend in with their
5 surrounding environment.

6 MS. SCHNETZLER: There are times during
7 their - there are times when a site, depending upon
8 its locality, locally, that it may be prudent for them
9 to turn off their lights, or turn off certain lights.
10 And there may be times when it's prudent for them to
11 turn all their lights on, just to blend in to the
12 specific physical area that it resides in.

13 MR. CUBELLIS: One example, a comment we
14 got from an outside source was that planes can be
15 equipped with GPS units. I mean is this really
16 necessary. And the response that we wrote was, yes,
17 we concede there can be GPS units on board, or you
18 could bring a portable one. But that only gets you so
19 close; I mean it gets you to the actual site. But
20 what it cannot do is let you discriminate where within
21 the site, within the protected area, that you need to
22 strike.

23 Even with the technical knowledge that we
24 assume the adversaries have, they still need to be
25 able to discriminate where within the protected area,

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1 and this addresses that particular circumstance.

2 MEMBER APOSTOLAKIS: I'm also curious about
3 an earlier slide.

4 MS. SCHNETZLER: Okay.

5 MEMBER APOSTOLAKIS: How - you are
6 addressing that digital stuff and the safety and
7 security interface.

8 MS. SCHNETZLER: Right.

9 MEMBER APOSTOLAKIS: Is there some
10 overarching model somewhere else that says these are
11 the threats one has to worry about when we are talking
12 about security and this rulemaking addresses these
13 three?

14 MR. REED: No, actually, those are the
15 three pieces of the power reactor security rulemaking
16 that have some nexus with normal - anything that is
17 non-security. In other words, cyber involves digital
18 equipment, okay. Safety and security obviously
19 involves safety, and aircraft, this is not really
20 security, this is can I operate as a whole, for
21 aircraft. So the rest of it exterior to the
22 rulemaking is entirely security in terms of physical
23 security, training qualifications, contingency
24 response, it's all security.

25 So this community doesn't involve itself

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1 with early security. So these are the three pieces
2 where we have a - we touch upon safety, and that is
3 this committee's purview to address that.

4 MS. SCHNETZLER: But there is - there are
5 security regulations, their underpinning basis is
6 73.1, which delineates a design basis threat. And
7 that gives the baseline for the security program and
8 the protective strategy and what it's geared up to do
9 and what requirements it needs to meet.

10 MR. REED: But this is kind of what goes
11 out -

12 MEMBER APOSTOLAKIS: Well, Tim just said
13 that we are looking at - I mean there is a bigger
14 security rule. They are bringing to us only the stuff
15 that is related to safety and my question is, is an
16 aircraft attack the only threat that is related to
17 safety?

18 VICE CHAIRMAN BONACA: Yes, that's why I
19 had all of these rules that specifically addresses
20 large fires and explosions whatever the source may be.

21 MS. SCHNETZLER: I'd say one thing that
22 would maybe answer that is that 73.1 clearly
23 delineates a cyber threat as it reflects to everybody.
24 It's also, you know, we bring it here because it also
25 touches on operational parts of the facility. But we

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1 need to look at that part of the safety picture, as
2 well as the security picture. So they overlap one
3 another.

4 MEMBER APOSTOLAKIS: How about the inside
5 of the plant.

6 MS. BANERJEE: Can I interrupt, please?
7 Maitri Banerjee. They are discussing 50.54(hh)(1),
8 which is potential or actual aircraft attack. When
9 they go into 50.54(hh)(1), they are going to be
10 talking about whatever the source is, source of attack
11 is. How you are going to mitigate a large fire?

12 MR. REED: That's actually the second
13 paragraph.

14 VICE CHAIRMAN BONACA: We already provided
15 recommendations there in that area. Okay, let's move
16 on.

17 MEMBER APOSTOLAKIS: So somebody has the
18 real big picture.

19 VICE CHAIRMAN BONACA: And I will tell you
20 one thing, to look at all the paper we got and to try
21 to sort out some logic it was a real challenge,
22 because we have seen pieces, and we haven't seen other
23 pieces and we need to know, so we can't just see the
24 boundary between all these things is confusing. Let's
25 move on.

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1 MR. REED: Any more questions on
2 50.54(hh)(1) requirements specific to --

3 Like I said, in all cases, Dr. Powers, I
4 took the rule language and I truncated, went to
5 something - slide language. So they will see that
6 across the board.

7 (Simultaneous speaking)

8 MEMBER ARMIJO: When the draft guide
9 becomes - will that be a public document?

10 MS. SCHNETZLER: No, sir, that will be
11 security related. It will not be safeguards, which is
12 a different requirement. It will be security related.

13 MEMBER ARMIJO: Well, just for -- please
14 note this, I'm not particularly comfortable that this
15 isn't a closed meeting right now even at this level,
16 because I don't know why we have to - I'm guarded
17 about what I feel I can ask, and I don't see any need
18 for this to be in a public forum. But with that said
19 -

20 MEMBER APOSTOLAKIS: And I don't see any
21 need to actually be classified.

22 MEMBER ARMIJO: Recall personnel. If I was
23 a terrorist I'd find out exactly who your key
24 personnel was and I'd interfere with that. I mean
25 there are all sorts of -

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1 (Simultaneous speaking)

2 MEMBER APOSTOLAKIS: I mean they cannot
3 figure it out without the slide.

4 (Simultaneous speaking)

5 MEMBER APOSTOLAKIS: I think we are over-
6 classifying, but that is not my business.

7 MEMBER ARMIJO: I made my point. Let's
8 move on.

9 MS. SCHNETZLER: And if there are questions
10 that we can answer in a closed session, we'd be happy
11 to do so.

12 MEMBER APOSTOLAKIS: Yes, we will do that.

13 MR. REED: So the second slide is a bit of
14 what Dr. Apostolakis was going into in terms of the
15 B.5.b and the mitigating measures requirements. This
16 is the requirements to develop guidance and strategies
17 principally to maintain and restore, quote, cooling,
18 maintain and restore containment, maintain and restore
19 spent fuel pool cooling. Okay, and you are looking at
20 the loss of a large area of your facility due to
21 explosions and fires. And we don't say aircraft here.
22 This obviously came from Section B5 of the ICM order,
23 but aircraft is not in there anymore. So go broader
24 than that. The Commission's opinion is that these
25 mitigating measures, which I think are typically

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1 reaction mitigation guidelines or extreme damage
2 mitigation guidelines, would work, and they would.
3 They would work for loss of any - no matter how you
4 got to that end state, there would tend to be good
5 things to apply.

6 So that was the idea. They fall into
7 three general areas in terms of fire-fighting.
8 Obviously you are trying to put out the fire. At the
9 same time you are trying to put out the fire, you are
10 trying to do things to limit ultimately the release of
11 fission products. And that's always, you know, core
12 cooling back, it is because your product barriers are
13 in place, and those kinds of things, okay, and that's
14 what this goes to, fire-fighting operations to
15 mitigate fuel damage and actions to minimize releases.

16 B.5.b, okay, contained a license condition
17 that is in everybody's license today, every operating
18 licensee has 14 strategies specifically in their
19 license, as a license condition they are required to
20 meet. So those 14 strategies map exactly into these
21 three. And we go - we explicitly say in the SOC that
22 supports 50.54(hh)(2) that they are in full
23 compliance.

24 MEMBER-AT-LARGE ABDEL-KHALIK: Are these
25 mitigating measures, which in a big picture, like

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1 functional restoration guides?

2 MR. REED: The mitigating measures, Dave.
3 Dave Nelson from NRR, he's our B.5.b expert.

4 MEMBER-AT-LARGE ABDEL-KHALIK: Are these
5 provided in the formal function restoration
6 guidelines?

7 MR. NELSON: I don't know that I'd use that
8 term. They are in the form of trying to achieve
9 functions for things like spent fuel cooling, core
10 cooling.

11 (Simultaneous speaking)

12 MEMBER-AT-LARGE ABDEL-KHALIK: To achieve
13 functional objectives that have to be maintained with
14 available means.

15 (Simultaneous speaking)

16 MR. NELSON: It could be we are getting
17 hung up on the semantics. The mitigating strategies
18 at the existing power plants cover things like spent
19 fuel pool cooling, reactor core cooling and
20 containment cooling.

21 MEMBER-AT-LARGE ABDEL-KHALIK: Bill, what
22 I'm getting at is that if you give people big picture
23 functional restoration guides without being overly
24 prescriptive, there are a lot of ways to restore the
25 functions.

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1 MR. NELSON: That may be true. These
2 mitigating strategies assume that all those installed
3 systems may not be available. That's consistent with
4 functional restoration.

5 MS. SCHNETZLER: Right, and one of the
6 reasons to put this into regulation now is that when
7 the orders were issued, the orders are issued
8 individually to each licensee. So going forward for
9 us to be able to apply that to new reactors, we'd have
10 to individually issue them licenses, an order for that
11 particular license.

12 So this is a good way to -

13 VICE CHAIRMAN BONACA: To put this into
14 application.

15 MS. SCHNETZLER: Yes, precisely.

16 VICE CHAIRMAN BONACA: The way I understand
17 it from what we have seen. Because we have reviewed
18 these orders before we had commented on early steps.
19 Really, as I have said before the main benefit is that
20 you have a requirement in a rule, and that rule there
21 is consistent application.

22 MS. SCHNETZLER: Right. For new reactors
23 this lays out what we think is - are reasonable steps
24 to make a licensee think about some things that they
25 should do in extreme circumstances ahead of time.

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1 MEMBER BROWN: So if somebody hits the
2 spent fuel cooling, fuel, whatever, then they would
3 have had some thought process go in on that,
4 recognizing it's a nasty situation, but what can you
5 do, and that the damage may be far enough apart that
6 you may have stuff stored off site in a warehouse -
7 you made a comment about somebody - all the resources
8 may not -

9 MS. SCHNETZLER: That's exactly right.

10 MEMBER BROWN: So is that the kind of
11 thought process --

12 MS. SCHNETZLER: Exactly. It's really to
13 get your licensee to think ahead of time about extreme
14 situations, and think about things that could be done,
15 think about how you might evacuate people that are on
16 site if you have enough time to do so; think about how
17 you are going to bring in the people you may need or
18 the resources you may need.

19 VICE CHAIRMAN BONACA: Identifying
20 equipment.

21 MS. SCHNETZLER: Exactly.

22 (Simultaneous speaking)

23 MR. REED: I think it's fair to say, Dave,
24 correct me if I'm wrong, that licensees would say they
25 have implemented this. I think we are still in the

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1 process of inspecting do we have the specific
2 strategies and procedures.

3 MEMBER MAYNARD: But it's not a one-size-
4 fits-all.

5 MS. SCHNETZLER: That's right.

6 MR. REED: Each plant may have unique
7 issues, items. They have all been done individually.
8 All of them are being inspected, and their individual
9 strategies, what equipment they had, or may have
10 added, whatever, it's all been reviewed on a plant-by-
11 plant basis.

12 MR. NELSON: Curt, when you do those
13 various audits and sections, when you review 20 of
14 them, you see these 15, gee, they really did a nice
15 job, and these other guys did a - what you call a
16 world level job, but how do you - is there an
17 enforcement version to this?

18 MR. REED: Absolutely.

19 MEMBER MAYNARD: You don't get it approved
20 until you -

21 (Simultaneous speaking)

22 MEMBER BROWN: She said existing plants
23 supposedly have gotten this this order.

24 MS. SCHNETZLER: Right. Existing plants
25 have it as a condition of their license, so if you are

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1 not meeting that, you are not meeting that.

2 MEMBER BROWN: Yes, but you haven't set -
3 you have not set specific requirements or procedures
4 or mitigating actions with which they can apply, or
5 reg guides, so therefore they are kind of subject to
6 the whim.

7 MR. REED: Dave Nelson is actually involved
8 with those inspections. He can tell you exactly.

9 MR. NELSON: There are - there has - there
10 was guidance developed by the industry for existing
11 plants that laid out the mitigating strategies, and
12 NRR endorsed that guidance. It effectively is the reg
13 guide for the existing plants.

14 MEMBER BROWN: So this was a licensee-
15 developed kind of potential things they could do, and
16 they kind of agreed universally?

17 MR. NELSON: There are a lot of - there are
18 many commonalities among the PWRs, the BWRs have
19 different strategies in part. All the spent fuel
20 pools have basically the same sorts of strategies,
21 because they are basically the same.

22 But it's not a willy-nilly let's figure
23 out what we are going to do on a plant by plant basis.

24 (Simultaneous speaking)

25 MS. BANERJEE: Maitrie Banerjee again. If

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1 I may add, staff had like phase one, phase two and
2 phase three inspections and review. And in order to
3 make sure that the licensees are following the orders,
4 they are complying with the orders. Am I correct,
5 Dave?

6 MR. NELSON: That's correct.

7 MS. BANERJEE: So through those efforts the
8 staff had made sure that the licensees were meeting
9 the orders, there was that issued to them, regulatory
10 guidance that you may or may not be required to meet.

11 MR. NELSON: The process of determining
12 what the mitigating strategies ought to be was quite
13 lengthy. We went out and did assessments, two
14 assessments at every plant, every existing plant, one
15 specifically for spent fuel pools, and then one for
16 the reactor core and containment. And from that the
17 industry developed recommended operational mitigating
18 strategies that we reviewed, made comments on and
19 ultimately endorsed. And that is what the existing -

20 MEMBER-AT-LARGE ABDEL-KHALIK: What
21 criteria did you use to evaluate the adequacy of these
22 mitigating strategies?

23 MR. NELSON: I'm sorry, I didn't hear the
24 first part of your question.

25 MEMBER-AT-LARGE ABDEL-KHALIK: What

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1 criteria did you use to assess the adequacy of plant-
2 specific mitigating strategies?

3 MR. NELSON: We had to work within the
4 confines of the text of the order, which limited
5 licensees to using readily available means.

6 From that starting point we determined
7 what was readily available. In some cases, well in
8 the end in all cases, the licensees actually provided
9 beyond readily available equipment, and basically we
10 determined what was available and used it to the
11 maximum extent, not knowing at any time what the
12 initiating event actually was.

13 VICE CHAIRMAN BONACA: And the other way
14 was like a severe accident, beyond design basis.

15 MS. SCHNETZLER: Okay, other questions on
16 two?

17 All right, let's move right into cyber.
18 Cyber threat was introduced, included as part of the
19 design basis threat. It was issued actually in March
20 of 2007, not 2008, from the requirements were
21 initially proposed in the proposed rule in 73.55(m),
22 but after we received comments back and reviewed it we
23 decided it would be better placed in a stand-alone
24 section in Part 73.

25 73.55 is kind of globally physical

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1 security, and we recognize that cyber security is kind
2 of new to the security portion, and it's probably not
3 implemented by the same people that might implement
4 the rest of the security program.

5 So in another place if we keep this in a
6 separate section and the Commission or staff
7 determines going forward that it should be applicable
8 to other licensees besides power reactors, then it
9 would be already in the right place of the Part.

10 MEMBER BROWN: What's DBT?

11 MS. SCHNETZLER: Design basis threat.

12 MEMBER BROWN: Oh, okay. I missed that.

13 MS. SCHNETZLER: Sorry. We are requiring
14 the licensees to sit down and think about the - do an
15 assessment. Think about the equipment that needs -
16 you know, identify the equipment that needs to be
17 protected, and develop a plan which will be very
18 similar to the security plans. It will be under the
19 umbrella of security plans. Right now the security
20 plans include a physical security plan, a training and
21 qualification plan, a contingency plan, and now it
22 would also include a cyber plan. That plan would come
23 to the agency for review and approval, and delineate
24 the methodology that the site will use to protect
25 their cyber assets, and what they will do in instances

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1 of an attack, and how they will restore the equipment
2 back to its function.

3 It is basically focused on safety related
4 equipment, security equipment, emergency equipment,
5 and communications equipment.

6 And as I - I've kind of given you the
7 global picture, but it's - digital equipment for
8 security functions, EP functions, and support systems.

9 MEMBER BROWN: Analog systems they don't
10 care about?

11 MS. SCHNETZLER: Not this part of the
12 regulation.

13 MEMBER BROWN: So there are other parts of
14 the regulation that cover analog?

15 MS. SCHNETZLER: This part of the
16 regulation focuses really on digital. I'm not saying
17 it doesn't -

18 (Simultaneous speaking)

19 MS. SCHNETZLER: But this is focused on
20 digital.

21 Like I said, it requires an analysis to
22 identify the assets you want to protect, and that you
23 have the program, and that you have defense in depth.
24 You'd be able to mitigate adverse effects of attacks,
25 be able to provide training, risk management, change

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1 control requirements, so that if you make changes to
2 the system that you think about it before you do that
3 and the impacts that it may have. And that like I say
4 you have a plan. The plan will be submitted to us.
5 You would have procedures, reviews, and records.

6 The guidance has been drafted. It has
7 been issued. And we are having a public meeting
8 actually next Friday, and have invited stakeholders to
9 attend.

10 The guidance is security related, and is
11 pretty thorough in methodologies that you can use to
12 meet the regulation.

13 VICE CHAIRMAN BONACA: Now the guidance is
14 the DG52?

15 MS. SCHNETZLER: Yes, sir.

16 VICE CHAIRMAN BONACA: That came out of
17 NEI-0404?

18 MS. SCHNETZLER: Yes, it id.

19 VICE CHAIRMAN BONACA: My understanding is
20 that there is a debate right now between the industry
21 and the staff.

22 MS. SCHNETZLER: That would be correct.

23 MR. REED: I think it's fair to say that
24 NEI 0404 is the what, and we are telling them how.
25 This is what you got to do. And then we come out with

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1 a reg guide that is pretty substantial. We are
2 saying, we want you to do it. This is how we want you
3 to do it. Industry has not seen it that same way. So
4 I think that is what we are going to find.

5 VICE CHAIRMAN BONACA: But they are
6 converging the two.

7 MS. SCHNETZLER: I would not say they are
8 different so much as I think 5022 uses NEI 0404 as a
9 basis, and expands on that and says, okay, this is
10 what's - this is what is in 0404, but here is how we
11 think you can do that.

12 MR. REED: Okay, I think that will line up
13 programmatically.

14 VICE CHAIRMAN BONACA: So we will have to
15 plan a review of this document?

16 MS. SCHNETZLER: Yes, sir.

17 MEMBER BROWN: We're still in the comment
18 period on the documents?

19 MS. SCHNETZLER: Right. The comment period
20 closes at the end of July. So we will have to have a
21 meeting with the stakeholders to understand their
22 thoughts about the guidance, but give them time to
23 also put those thoughts on paper and submit them as
24 part of the comment response.

25 MEMBER-AT-LARGE ABDEL-KHALIK: If I may go

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1 back to slide #6. Sorry, slide #5.

2 How do we define success?

3 MS. SCHNETZLER: For?

4 MEMBER-AT-LARGE ABDEL-KHALIK: To assess
5 the adequacy of mitigating measures?

6 MS. SCHNETZLER: I would define success I
7 think if licensees are doing the current expectations
8 and meeting those.

9 MR. REED: I guess I'll go back to what
10 Dave said. Dave is saying, I think, correct me if I'm
11 wrong, Dave, but when he said they are successful, is
12 to make sure - they maximally used these readily
13 available and beyond readily available resources. In
14 other words they used them to the best of their
15 ability; we call that success.

16 MEMBER-AT-LARGE ABDEL-KHALIK: But if you
17 use everything you have, still available, that may not
18 still be success. And that's why I'm asking, you have
19 to define success.

20 VICE CHAIRMAN BONACA: I think we should
21 talk about this when we go upstairs.

22 MS. SCHNETZLER: We're focused on the
23 regulatory requirements, if you are meeting the
24 conditions of your license as they are laid out.

25 MEMBER-AT-LARGE ABDEL-KHALIK: I'm not

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1 disagreeing with you on that.

2 MR. REED: We are looking at success of
3 using these means in terms of, that's where I focused
4 in my answer as to what the ultimate end result is.

5 MS. BANERJEE: Maitri Banerjee again.
6 Aren't we trying to protect those three things that
7 they talk about: core cooling, containment?

8 MR. REED: That's right.

9 MS. BANERJEE: And spent fuel integrity.

10 VICE CHAIRMAN BONACA: I am not
11 specifically clear the have to be met.

12 (Simultaneous speaking)

13 MR. REED: Pretty tough to put something
14 specifically down.

15 VICE CHAIRMAN BONACA: That's why you do
16 what you can and then - design basis.

17 MS. SCHNETZLER: Okay, questions on cyber
18 security? Okay.

19 VICE CHAIRMAN BONACA: I think that from
20 what I've seen the rule is comprehensive. I think the
21 devil is in the details, so we'll have to look at the
22 regulatory guidance and the comments you are
23 receiving. Do you have any feedback right now
24 regarding comments received as of today? You must
25 have them, because you have upcoming meetings.

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1 MS. SCHNETZLER: The initial feedback from
2 people at the implementing level is somewhat
3 favorable.

4 VICE CHAIRMAN BONACA: Somewhat?

5 MS. SCHNETZLER: I'm being guarded. Cyber
6 security people and our technical people they like the
7 specificity of the guidance.

8 MR. REED: It does very well to protect
9 against cyber attacks. They are different than the
10 airline attacks.

11 (Simultaneous speaking)

12 MEMBER POWERS: That is moderately
13 confusing supposing it's okay to train the people to
14 hold up and let's do things. There is not another
15 that's says well in the event that you have been
16 attacked, and in the event that you in fact are
17 impacted, here's the concept. Recovery. I wondered
18 why you -- there may be a reason that you chose to
19 leave that out.

20 MS. SCHNETZLER: Actually the text language
21 actually does cover that, sir.

22 MR. REED: Yes, if you go -

23 MS. SCHNETZLER: The specific language.

24 MR. REED: Yes, we require that to be
25 described in the cyber security plan. I'll just cite

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1 you exactly what we require out of this.

2 The cyber security plan must describe how
3 the licensee will maintain the capability to timely
4 detection and response to cyber attacks, mitigate the
5 consequences of cyber attacks, correct exploited
6 vulnerabilities, and restore affected system networks
7 and other equipment that were affected by the cyber
8 attacks.

9 So we require that in the cyber security
10 plan description, okay. And that is something that is
11 coming to us and we review it and approve it. So
12 that's our regulatory control.

13 MR. SHUKLA: Hi, I'm Girija Shukla from the
14 ACRS. What I heard so far is that for mitigation you
15 say anything in the rule about prevention of cyber
16 attacks. You design your system in such a way that
17 they just cannot happen.

18 MR. REED: That's an interesting concept.
19 In fact I think one version, as we talked about
20 preventing it, and I frankly went to the cyber people
21 and said, I don't like to put in place a regulation
22 that is impossible to comply with. I can't stop
23 hackers from attacking my plants. I can't prevent
24 attacks. But I can put in place defense in depth
25 methodologies, okay, that are very good in protecting

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1 against such attacks. I can see them coming. I can
2 stop the way they're coming. And I can restore the
3 systems, okay. I can manage my cyber risk, and assess
4 the risk, understand what that is, okay. I can make
5 sure that my digital assets that I'm protecting, there
6 are things I'm doing to change them that I am not
7 losing my performance objectives on the cyber.

8 VICE CHAIRMAN BONACA: But the fact that
9 you are building strategically, lack of access for the
10 outside in.

11 MR. REED: Exactly, it is very much like
12 the defense in depth approach.

13 (Simultaneous speaking)

14 MS. SCHNETZLER: And that term is actually
15 used, defense in depth. And we struggled with that,
16 you know, from a regulatory perspective. We really
17 did struggle about prevention versus recognizing that
18 your system is probably always being attacked in some
19 way.

20 MR. REED: There's things we can do in the
21 plan, and describing the plan, at a rule - rule level
22 language level, that put in place some of these words.
23 It actually becomes impossible for the licensee to
24 comply with it. So I tried to structure this rule so
25 he's not legally out of compliance but he's doing the

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1 right thing.

2 MEMBER BROWN: If you don't talk to the
3 outside world you don't have to protect yourself other
4 than internally.

5 (Simultaneous speaking)

6 MEMBER APOSTOLAKIS: The NEI document that
7 we reviewed and commented upon, the rule ultimately
8 dropped into a regulatory guide, is that the idea?

9 MS. SCHNETZLER: Our hope is that the
10 regulatory guide takes NEI 0404, makes it better, and
11 adds more information to it.

12 MEMBER APOSTOLAKIS: So it's regulatory
13 guidance.

14 MS. SCHNETZLER: Yes.

15 MR. REED: I think the reg guide - I think
16 it's fair to say it's written very generally. It's
17 not just for power reactors. It's a very general reg
18 guide, where NEI 0404 Reg 1 is specifically for power
19 reactors in these situations.

20 So there's a little bit of a reach right
21 here.

22 MR. ZORN: Tim, maybe you should also point
23 out that one of the underlying rulemaking issues was,
24 the long term vision was to have this regulation be
25 capable of being applied to other licensees, not just

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1 power reactors.

2 So that was part of the reason why it was
3 put into a separate piece, and that's where the
4 guidance is written to kind of keep that into account.

5 MR. REED: I think we - yes, we may have
6 mentioned in the beginning, we made a separate
7 section, Part 73, just for that reason.

8 (Simultaneous speaking)

9 MR. SHUKLA: I have one more question.

10 MS. SCHNETZLER: Oh, sure.

11 MR. SHUKLA: Is it still either/or 0404 and
12 the reg guide? Or what choice does the licensee have?

13 MS. SCHNETZLER: The licensee always has a
14 choice. Because at the end of the guidance it says
15 specifically that this is a guide, and you could
16 follow - you could do something else, but our
17 expectation would that you would provide an
18 equivalency of what the guide points are.

19 MR. SHUKLA: To vigorously follow 0404, not
20 the reg guide, they have the choice?

21 MS. HOLOHAN: They'd have to modify NEI
22 0404 to match -

23 MS. SCHNETZLER: They would have to do a
24 little more from 0404.

25 (Simultaneous speaking)

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1 VICE CHAIRMAN BONACA: All right, let's
2 move on to safety and security interface.

3 (Simultaneous speaking)

4 SAFETY SECURITY INTERFACE

5 MS. SCHNETZLER: We are now on safety
6 security interface.

7 Safety security interface addresses in
8 part a petition that we received asking us to consider
9 the interface between operations and security and make
10 sure there were no conflicts.

11 Overall it's explicit what is already
12 implicit required by regulation. I mean there are
13 several regulations that talk about managing changes
14 at your facility, performing changes -- configuration
15 management, that's the term I'm looking for.

16 MR. REED: On the safety side, as this
17 committee definitely is well aware, this has been
18 addressed extensively.

19 (Simultaneous speaking)

20 VICE CHAIRMAN BONACA: The industry is
21 taking the position, and correctly so I think, the
22 fact that there are so many programs already in
23 configuration that should take care of this interface.

24 And I would agree 100 percent with that,
25 except that making the point that given the complexity

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1 of all the added requirements because of security, it
2 may be appropriate to have some kind of focus around
3 the rule, it says you had to make an interface.

4 (Simultaneous speaking)

5 MR. REED: The only thing I would say, that
6 this rule captures that those other programs don't.
7 And the only thing that circulates on the safety side,
8 50.59, and everything else is going to get, and there
9 is no doubt your normal plant modification process is
10 going to get procedure change modifications are going
11 to get. But this was capturing things that really
12 were not in that, okay. You can have things wrong in
13 the inner controlled area. You could have activities
14 going on in areas that aren't involved in safety
15 related equipment or even equipment safety equipment,
16 okay. That affects security, okay. This is going to
17 capture that for sure.

18 There is a potential, I guess, you could
19 do things in security that affect safety that the
20 systems may miss, but I personally am - I agree with
21 you, I doubt that will happen at all. So this is a
22 little bit more broader, if you will, and you should
23 be doing this today. You shouldn't be doing things
24 that affect - if you are doing something at some
25 barrier that is sitting in ACI, you are probably

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1 violating Part - 73.55 in fact, okay. So that's why
2 she started off saying it's implicit in the
3 regulations you have to do this. Well, we were just
4 making it explicit.

5 (Simultaneous speaking)

6 VICE CHAIRMAN BONACA: The other thing is,
7 I think we will have to review the guidance. Because
8 the guidance proposals and then there are questions a
9 la 50.59.

10 MR. REED: Yes, it does.

11 VICE CHAIRMAN BONACA: 50.59 was a well
12 organized, consider regulation in a way. I mean you
13 had several questions there, and you had to - and it
14 was closed until it was set. You couldn't go beyond
15 that. The guidance that we have now has I don't know
16 how many. I'm almost believing there was a brainstorm
17 session I guess by which you got all of these
18 questions.

19 MR. REED: Yes, I think 50.59 of course, as
20 I think you know, is really focused only on systems,
21 structures and competences as described in the FSAR.
22 Now -

23 (Simultaneous speaking)

24 MR. REED: It really kind of goes to that.

25 VICE CHAIRMAN BONACA: Well, I can see how

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1 for licensees it's going to be an issue of how many
2 questions are you going to ask. So that, again, we
3 will review these guidance when it comes.

4 MEMBER BROWN: A comment on this in
5 general, and you don't need to even respond to it.
6 This is all written as though the licensee is
7 generating these changes, and they have to make all
8 these considerations and stuff, when in fact a lot of
9 the changes are coming from new requirements or new
10 things that can happen.

11 I think that the NRC has an obligation to
12 be taking a look, as they are putting new requirements
13 out that could create a safety-security interface.
14 But they need to make sure - we need to make sure we
15 are not putting out rules or requirements that in fact
16 create the problem.

17 So it is kind of like saying, hey, we are
18 going to toss up all this, it is to you to sort it
19 out.

20 (Simultaneous speaking)

21 MR. REED: As a general rule we try not to
22 put rules in place to make things worse.

23 (Simultaneous speaking)

24 MEMBER APOSTOLAKIS: The rules apply to the
25 NRC.

1 (Simultaneous speaking)

2 MEMBER BROWN: Where's A? There's a B, C
3 and D up there. Is there an A that we are missing?

4 MR. REED: It's probably just an -- We
5 can pull that out.

6 MEMBER BROWN: Each operating nuclear
7 power licensee or the licensee shall comply with the
8 requirements of this section. Shall comply. It
9 doesn't say consider; it says, shall comply.

10 MS. SCHNETZLER: And that is pretty
11 standard language. And yes, it does say, shall
12 comply.

13 MR. REED: We all put shalls in the
14 regulation. Again, that's the scope saying who the
15 rule applies to.

16 (Simultaneous speaking)

17 MS. SCHNETZLER: Any other questions on
18 73.71? Okay.

19 (Simultaneous speaking)

20 MS. SCHNETZLER: Talked a little bit about
21 the guidance. It's been published. We've had a
22 public meeting on it, and we are in the course of
23 resolving the comments. And when we get to draft
24 final - final draft, then we'll be bringing that here
25 for review for consideration.

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1 So basically we are here today. We've
2 talked about three different parts of our regulation.
3 But this as it's complete and with the EDO, but since
4 this was finalized this morning it has moved from the
5 EDO to the Commission office.

6 Draft guidance is developed. Work
7 continues to finalize the guidance for 50.54(hh). We
8 expect to be back here to in detail talk to you about
9 the guidance when we get it at a final draft stage.

10 MEMBER BROWN: Which part do the
11 Commissioners have? I lost the bubble between 72.58,
12 50.54, 73.54 -

13 (Simultaneous speaking)

14 MS. SCHNETZLER: They have the whole FRN
15 for the rulemaking -

16 (Simultaneous speaking)

17 MS. SCHNETZLER: I'm sorry, the Federal
18 Registry Notice that is complete with the proposed
19 final draft text.

20 MEMBER BROWN: But it's just a draft? So
21 they sign it, and print it in the Federal Register.

22 MR. REED: They give us an SRM. But I'm
23 sure that will cause us to change some things and then
24 we will go through --

25 MEMBER BROWN: Then there's public comment

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1 again?

2 (Simultaneous speaking)

3 MS. SCHNETZLER: That's final final.

4 MEMBER BROWN: So then why do we need to
5 look at it?

6 (Simultaneous speaking)

7 MS. SCHNETZLER: It's a process, and we're
8 at the process where the Commission is considering
9 this final rule, and they are awaiting -

10 MEMBER BROWN: But the EDO has signed it?

11 MS. SCHNETZLER: Yes.

12 (Simultaneous speaking)

13 MEMBER APOSTOLAKIS: We've reviewed. We
14 have not decided.

15 VICE CHAIRMAN BONACA: We really accepted
16 a process that we normally don't accept, because we
17 had - we had the paper coming in for review and more
18 of a nightmare for most of the month of June. But
19 because this material is coming, and it's changing
20 too. And right now I'm confident that the last,
21 number three was filed.

22 MS. SCHNETZLER: I am confident of that
23 also.

24 VICE CHAIRMAN BONACA: The parallel action
25 actually has many more pieces of this thing. It is

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1 all over the place, it's complex.

2 Okay, well, if there are no further
3 questions, we thank you.

4 MS. SCHNETZLER: Thank you.

5 VICE CHAIRMAN BONACA: You make the second
6 presentation? Consideration of aircraft impact on
7 nuclear power reactor designs.

8 MR. RECKLEY: If we can switch gears a
9 little bit, but it's related as we'll see as we go
10 through the presentation.

11 My name is Bill Reckley, I'm Branch Chief
12 of Rulemaking Guidance and Advanced Reactors in the
13 Office of New Reactors and our group participated in
14 the development of this rule after receipt of the SRM
15 from the Commission in April of 2007. George Tartal
16 will be giving most of the presentation. Nan Gilles
17 and NRO did a lion's share of the work. She's away
18 this week.

19 Our legal counsel, Gary Mizuno, NRR,
20 helping us coordinate the rulemaking and getting
21 through the process; Stu Schneider, and Syed Ali from
22 the Office of Research were all participants.

23 The aircraft impact assessment has a
24 history, obviously, following 9/11 up to the point of
25 the SRM to do this rule. George hit on the history a

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1 little bit.

2 We believe in this public session, we'll
3 be able to address any questions about the rule
4 itself.

5 Now preceding the rule, there was a fair
6 amount of work by both industry and the Office of
7 Research. Most of that, you would have to talk about
8 in closed session following this if you have questions
9 on a particular design.

10 VICE CHAIRMAN BONACA: We've reviewed that
11 a bit.

12 MR. RECKLEY: You've had briefings on that
13 over time. And at the same time, NEI is taking the
14 lead to develop the guidance document and we're
15 currently reviewing that guide and most of that is
16 also at an official use only security-related
17 information level that we could address in the closed
18 session.

19 MR. TARTAL: Thanks, Bill. In 2006, the
20 staff provided a proposed rule to the Commission under
21 SECY 06-0204 on security assessment requirements for
22 new reactor designs. The staff's intent in that
23 proposed rule was to make future power reactors more
24 secure through security design features that reduced
25 the need for operational security programs and that

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1 could prevent the loss of safety systems and
2 functions, perhaps reducing the need for mitigative
3 strategies.

4 In its SRM --

5 MEMBER APOSTOLAKIS: If this is successful
6 maybe some of what the gentlemen presented a few
7 minutes ago will not be necessary.

8 MR. TARTAL: Part of that, yes. This role
9 is essentially the B5B part of what actually became,
10 what 50.54(hh)(2).

11 MEMBER-AT-LARGE ABDEL-KHALIK: And it
12 would be part of the design basis.

13 MR. RECKLEY: We'll go there with this
14 history.

15 MR. TARTAL: So in the SRM that the
16 Commission gave us, they directed the staff to
17 determine the security assessment rulemaking and their
18 reasoning was the adequate protection requirements
19 were going to be set in the Part 73 rulemaking which
20 you just heard about.

21 Instead, the Commission directed the staff
22 to revise the rule, to include aircraft impact
23 assessment requirements in Part 52 to encourage
24 reactor designers to incorporate practical measures at
25 an early stage in the design process.

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1 MEMBER APOSTOLAKIS: When did this happen?

2 MR. RECKLEY: The SRM was in April of
3 2007.

4 MEMBER APOSTOLAKIS: '07.

5 VICE CHAIRMAN BONACA: We recommended that
6 for new reactors this be done and in fact, we
7 recommended that this be part of the certification
8 process which would imply the threat design basis.
9 Not necessarily, however, we never stated that.

10 At the beginning, we had the response from
11 the EDO that that would not be considered and then
12 later on there was a change through the SRM whether to
13 do it. So Lou is pretty much in tune with activities
14 that we have been involved with. You remember that.

15 MEMBER APOSTOLAKIS: We should know not to
16 contradict ourselves.

17 (Laughter.)

18 VICE CHAIRMAN BONACA: That's fine.

19 MR. TARTAL: So in the SRM, the Commission
20 also specified the proposed rule language that was to
21 be used.

22 The staff implemented the Commission's
23 specified proposed rule language from the SRM and also
24 developed a technical and legal rationale for the
25 rulemaking. That proposed rule was published on

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1 October 3, 2007 for public comment and the public
2 comment period for that rulemaking ended on December
3 17, 2007.

4 The NRC received 32 comment letters from
5 the public, including 10 from industry, 2 from
6 government organizations, 12 from non-government
7 organizations, and 8 from private citizens. And of
8 those comment letters, 31 of them were in favor of
9 requiring -- or the idea of requiring aircraft impact
10 assessments on nuclear power plants, although one of
11 them -- excuse me, none of them supported it exactly
12 as we proposed it.

13 MEMBER APOSTOLAKIS: So there were only 32
14 or 33 who were in favor?

15 MR. TARTAL: Thirty-one were in favor of
16 the idea --

17 MEMBER APOSTOLAKIS: What did the 32nd
18 say?

19 MR. TARTAL: The 32nd said basically that
20 it was too difficult to fly a major aircraft into the
21 low profile of a nuclear power plant, but we should
22 trust the military and Homeland Security to protect
23 critical infrastructure.

24 MEMBER APOSTOLAKIS: And you can tell us
25 whether it was a private citizen who said that? Who

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1 said that?

2 MR. TARTAL: That was a private citizen,
3 yes.

4 In the proposed rule, we included eight
5 specific requests for comments which I've listed here
6 on the slide and of those eight requests for comments,
7 the second one on acceptance criteria was the only one
8 that was directed by the Commission and the SRM, so
9 I'll be focusing on that one.

10 The others either had very little
11 influence on the final rule or are addressed in slides
12 on the final rule's requirements, which you can see in
13 a little bit.

14 So on the acceptance criteria, the SRM for
15 the SECY paper directed the staff to request comment
16 on the desirability or lack thereof of adding an
17 additional acceptance criterion in the final rule
18 beyond the proposed rule's practicability criterion.
19 The additional acceptance criterion would have read
20 the application shall also describe how such design
21 features, functional capabilities, and strategies,
22 will provide reasonable assurance that any release of
23 radioactive materials to the environment will not
24 produce public exposures exceeding 10 CFR Part 100
25 guidelines.

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1 So with that, the responses that we got
2 were negative to using Part 100 since the NRC uses
3 those limits for judging compliance with design basis
4 requirements.

5 Instead, NEI suggested an alternative to
6 that, based on key safety functions and more
7 specifically, they recommended that we either require
8 that they maintain either core cooling or containment
9 integrity and maintain either spent fuel cooling or
10 spent fuel pool integrity. That was their comment.

11 The resolution to that was that NRC agreed
12 to not use the Part 100 limits for the reasons that
13 they delineated, but did not agree to include the
14 absolute acceptance criteria. Instead, the
15 practicality criteria remains to be the acceptance
16 criterion in the rule and we clarify in the final rule
17 that the assessment must address core cooling,
18 containment integrity, spent fuel pool cooling and
19 spent fuel pool integrity.

20 VICE CHAIRMAN BONACA: The rule says that
21 NRC will assess what you have to do with it to
22 implement.

23 MR. TARTAL: Yes.

24 MR. RECKLEY: You have to implement what
25 you've found to be practical.

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1 VICE CHAIRMAN BONACA: We'll talk about
2 that. Practicality is an important issue.

3 MEMBER APOSTOLAKIS: If you meet Part 100?
4 I'm missing something. If you have coolable geometry.
5 If your containment is -- what's the word? The
6 containment should be what?

7 MR. TARTAL: Containment integrity.

8 MEMBER APOSTOLAKIS: The integrity is --
9 I assume you meet 100, no?

10 MR. TARTAL: We're focusing on a beyond
11 design basis event here and the implication here is
12 that if we tie Part 100 requirements to this rule,
13 then that implies that the as-built impact might be a
14 design basis event.

15 MEMBER APOSTOLAKIS: So it is just a legal
16 thing?

17 MR. TARTAL: Again, this is a beyond
18 design basis event. We don't want an implication that
19 this is within the design basis.

20 MR. RECKLEY: You could go around to meet
21 Part 100. You can also think of scenarios where you
22 could maintain, for instance, containment integrity,
23 but maybe they wouldn't be at tech spec leakage rates.
24 And so you could conceivably with core damage exceed
25 Part 100 limits. I mean -- but it's very possible

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1 that you would meet them, but again, the decision was
2 made not to make it such that you needed to do the
3 analyses to actually show the same degree of
4 confidence that we use for design basis accidents,
5 Chapter 15 kind of accidents, that that is confirmed.

6 MEMBER-AT-LARGE ABDEL-KHALIK: The rules
7 say consider. They don't say assure. Is that
8 correct?

9 VICE CHAIRMAN BONACA: In fact, let's
10 start with the comments and it would be nice to see
11 the rule. And the rule clearly says -- the rule will
12 require applicants identify and incorporate into the
13 design the design features of functional capabilities
14 that avoid or mitigate to the extent practical and
15 will reduce the reliance on operator action, the
16 effects of the aircraft impact on core cooling, and
17 containment in spent fuel cooling. Now this
18 specifically speaks of identifying and incorporate
19 into the design. Yes, okay. So there's an
20 expectation of incorporating the design, design
21 features.

22 MR. TARTAL: Those that are found to be
23 practical.

24 VICE CHAIRMAN BONACA: I understand that,
25 but in the Statement of Consideration, for example,

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1 there's a few pages, explaining that practical doesn't
2 mean effective. It speaks of efficiency,
3 effectiveness, et cetera.

4 You seem to imply that practical means
5 something that I don't understand.

6 MEMBER ARMIJO: They had the word
7 practicable at one point and it was a big discussion
8 whether that's open-ended. It means infinite
9 expenses.

10 MR. RECKLEY: What we're trying to make
11 clear here is that the importance of the word
12 practical is to separate it from design basis events
13 that would leave out the word practical and simply say
14 demonstrate that you've maintained these functions.
15 And this rule, the word practical is of some
16 importance that it's there, just as when we were
17 discussing in the B5B discussions it was rather
18 accessible that there were limits to have far we would
19 expect a designer to go in this case or a licensee to
20 go in that case to respond to this particular rule.

21 MEMBER ARMIJO: The Agency makes a
22 decision of what -- if it's ultimately satisfactory.
23 A licensee says this is what's practical and you guys
24 decide no way, it's not good enough. That's the end
25 of it, isn't it?

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1 MEMBER APOSTOLAKIS: It's not just the
2 word practical. It seems to me there is a lot of
3 latitude in the words avoid or mitigate without
4 specific criteria.

5 Again, it's up to the judgment of the
6 staff whether they have done enough to avoid or
7 mitigate. That's the difference between design basis
8 events where we actually have criteria that you must
9 obey. It's intentionally vague.

10 MEMBER ARMIJO: It has to be.

11 MEMBER APOSTOLAKIS: Why are we
12 discussing this?

13 VICE CHAIRMAN BONACA: I think it's an
14 important issue, but do we agree with the connotation
15 that it is beyond design basis. Maybe we do, and so -
16 - in the context we need simply to clarify what the
17 words mean. The words there that were in once and
18 were taken out and then were put back in. So I don't
19 understand what you are attempting to achieve to
20 achieve.

21 MR. MIZUNO: This is Geary Mizuno in OGC.
22 To be clear, you're kind of confusing a lot of
23 different things and so I just wanted to clarify a
24 couple of things. One is that the importance of not
25 tying part 100 to the rule as a design basis event,

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1 obviously, you're saying the Part 100 limits as a
2 specific criterion, but apart from that, you have to
3 remember that from the NRC's regulatory standpoint
4 calling something a design basis event means that,
5 one, the analyses and the descriptions of that event
6 and how the plant deals with that are subject to what
7 we call special treatment requirements and the most
8 important being 10 CFR Part 50 Appendix B. And we do
9 not intend for these analyses or evaluations that
10 aren't going to be accomplished under this rule to be
11 subject to Appendix B. Okay, that's the first thing.

12 Second of all, to the extent that a design
13 feature or a functional capability is now going to be
14 part of the design we're also indicating that
15 particular feature or design capability is one that
16 may not meet special treatment requirements whatever
17 they may be, EQ, procurement, those kinds of things;
18 okay? That's a very important thing.

19 And again, the reason why is because the
20 Commission views the aircraft impact as beyond the
21 design basis event and the design for it and to the
22 extent that a feature or a capability is found to be
23 practical it's going to be incorporated into the
24 design, but it doesn't have to meet the highest levels
25 of proof, if you want to call it, a quality that will

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1 be required for design basis events.

2 The second thing I wanted to point out was
3 the practical limitation there was intended to ensure
4 that we do not adopt the concept that you must in
5 every case, in order to satisfy this rule, assure that
6 you've met the success criteria of providing
7 containment integrity or -- the four things that we're
8 talking about which I can't immediately recall, let's
9 call them the four goals, if you want to call them
10 that. Right, the key safety functions.

11 We achieve them to the extent practical.
12 They are not absolute requirements that you must
13 achieve those objectives. Okay? And practical was
14 used as a term of art consistent with its dictionary
15 recognition to allow the staff -- and for the
16 applicant to decide that some things which are perhaps
17 conceivable that are entirely cost-unjustified or are
18 technically conceivable, but when you try and
19 implement them, they are simply not something that an
20 engineer would choose in the ordinary course of
21 business to adopt. Okay?

22 It was intended to bring some reality. I
23 mean practicability, if you read the dictionary
24 definition would say if you can conceive of it and if
25 it's possible to actually do it, then no matter how

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1 much cost and no matter how technically Rube Goldberg
2 you might have to achieve, okay, that is a practicable
3 solution and that is not what the Commission was
4 looking for.

5 VICE CHAIRMAN BONACA: I think the
6 direction is very clear on that.

7 MR. MIZUNO: Okay.

8 VICE CHAIRMAN BONACA: And that was that
9 the guidance would be as clear. The other question I
10 had was in the text, not in the rule, but in the
11 consideration, there was often a reference to a
12 rigorous assessment. The word rigorous is all over
13 the place except in the rule. Can you comment on
14 that?

15 MR. MIZUNO: I think that we're trying to
16 stick to the Commission's language that was set forth
17 in the additional SRM as much as possible unless we
18 felt that there was a clear need from the standpoint
19 of ensuring enforce-ability or achieving the
20 Commission's goal. This is not -- this rule's
21 evolution was not your typical rule evolution that the
22 Commission says yes, here's a problem. NRC staff, you
23 go and solve it. The five Commissioners, I think
24 there were five at the time sat around in a room and
25 a great deal of discussion from what I gather was

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1 heated. I was not at those things. There was an OGC
2 experience, OGC management attorney advising these
3 five Commissioners and they produced an SRM which said
4 here is the language that we want and here are the
5 concepts that we want. And go out and publish a
6 proposed rule and then come back and tell us what you
7 think.

8 Now they didn't specifically say hey, you
9 have a lot of latitude, feel free to completely junk
10 our language at the final rule stage and come back
11 with something else. But certainly, I think it was
12 the view of the working group as well as the steering
13 committee that the staff used to guide this rulemaking
14 effort, that we would not depart from the Commission's
15 language unless we felt that there was a clear need
16 for doing so, either from a legal standpoint or from
17 achieving a goal necessary to make something clear.

18 VICE CHAIRMAN BONACA: Can you explain to
19 me why this departure from Commission language? I
20 don't understand. I just asked the question about the
21 use of the word rigorous.

22 MR. MIZUNO: Right, so --

23 VICE CHAIRMAN BONACA: When I read the
24 word rigorous in the same consideration, I was just
25 trying to think in my mind what is meant by that.

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1 Does it mean that you have pedigree computer codes or
2 do you have some latitude in that? I'm not
3 disagreeing, but the issue that this is beyond a
4 design basis event is what you can consider. I'm
5 trying to understand by the word rigorous.

6 MR. MIZUNO: Right, I think that it was
7 just the general view of the working group as well as
8 the steering committee that we clearly did not want to
9 set forth a level of quality that was equivalent to
10 Appendix B, otherwise you would just call it a design
11 basis accident or event. That is something that at
12 the same time, this couldn't be, and I think this was
13 a concern certainly by OGC at the proposed rule stage,
14 that we cannot have a rule which I call the window
15 dressing rule which is basically a licensee just says
16 I did something and when you actually go out there to
17 see what it is, it is either a paper scribble or, you
18 know, something that, you know, clearly shows a lack
19 of technical review and clear considered reasoning as
20 to why something is or is not practical or practicable
21 in an imposed rule.

22 MR. RECKLEY: And the other thing to keep
23 in mind is that by the time we were writing this, we
24 had the experience of the industry doing through EPRI,
25 their analysis, our Office of Research doing our

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1 analysis on operating plants and on advanced reactor
2 designs. It was generally understood by both us and
3 the industry that that was what the expectation was
4 for a rigorous assessment. It was those kind of
5 things that was already being done, not something less
6 than that.

7 MEMBER MAYNARD: Also, the NRC staff
8 really has the final say and approval of whether
9 what's done was enough or whether it was practical or
10 not.

11 MEMBER-AT-LARGE ABDEL-KHALIK: Well, maybe
12 that raised the concern that, you know, you're pushing
13 the NRC staff into a design mode rather than
14 regulatory mode by evaluating connections taken by the
15 designers and the staff would say no, you could have
16 done that, which is no different than what they do
17 today.

18 But in this case, it would be a design
19 role.

20 MR. MIZUNO: Well, let me just say this,
21 okay? Maybe it's been years or decades since the NRC
22 staff really looked at significant design, but
23 certainly when I first started here, we had a lot of
24 people who oversaw the design activities of architect
25 engineers, and I from an enforcement standpoint and

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1 what OGC would expect the staff to be preparing if we
2 felt that someone was not a, an entity was not
3 complying with this rule, would be largely the same
4 kind of oversight and preparation of documentation
5 that we used to show that a designer was not complying
6 with other regulatory plans in the design stage.

7 So I don't see that oversight as being any
8 different in kind. I think Mr. Reckley is correct in
9 that the overall view of the staff was that they were
10 on a success path in development of guidance and
11 looking over the shoulders of the vendors and they
12 could, through guidance, accomplish what was necessary
13 in order to show to the industry what was necessary to
14 meet the staff's expectations as to what would be "a
15 rigorous assessment".

16 Bill, do you want to say anything more
17 about that?

18 VICE CHAIRMAN BONACA: We need to move on.
19 I don't think you need to go through all the comment
20 resolutions, just the most significant.

21 MR. TARTAL: That was the significant one
22 for the request for comment that we put in the
23 proposed rule. I had prepared some notes on the other
24 categories of public comments, but if you think in the
25 interest of time, we'll just skip that unless there is

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1 something in particular that you want to hear about.

2

3 MEMBER MAYNARD: We did get copies of all
4 the comments and resolutions.

5 VICE CHAIRMAN BONACA: I imagine with
6 discussion, pretty much that you're talking about
7 guidance.. Is there going to be a guidance document
8 developed? Good.

9 MEMBER MAYNARD: Okay, so you expect the
10 NEI guidance?

11 MR. RECKLEY: That's the current path that
12 we're on, and it's our hopeful resolution that we
13 reach agreement on their guidance document and they
14 were able to endorse it in a regulatory guide.

15 MEMBER APOSTOLAKIS: When you issue
16 something like this for public comment, is all the
17 information, relevant information, available to the
18 public?

19 MR. TARTAL: I guess I'm not understanding
20 what you mean by relevant information.

21 MEMBER APOSTOLAKIS: Is there anything
22 that is security-related that you don't publish?

23 MR. RECKLEY: Obviously, we don't publish
24 the information in this particular area that involves
25 information that goes all the way from classified to

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1 safeguards to official use only, security-related
2 information which we don't post.

3 But we don't believe that any of the
4 information that was withheld was actually needed to
5 understand what this rule is requiring and in general
6 how it's going to be done. The sensitive information
7 is in the details that a designer would need or an
8 analyst would need that the public would not need.

9 MR. TARTAL: We feel that we've given the
10 public enough information to make meaningful comment
11 on the rule.

12 MEMBER APOSTOLAKIS: By the way, the
13 dictionary definition of practicable and practical are
14 different.

15 MR. RECKLEY: The proposed rule would use
16 the other word.

17 MR. TARTAL: The Commission's SRM used the
18 word practicable and we've changed in the final rule
19 to the word practical.

20 MEMBER APOSTOLAKIS: Seem to me practical
21 --

22 MEMBER BROWN: From my understanding it's
23 reversed.

24 MR. TARTAL: There's an item in the
25 Federal Register notice that describes the legal

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1 differences between the two words.

2 MEMBER APOSTOLAKIS: And these are not
3 necessarily the differences --

4 MR. TARTAL: Right.

5 CHAIR SHACK: Part 52 when we discuss
6 severe accidents, we don't way anything about
7 practical or practicable.

8 MEMBER BLEY: It's practicable to have an
9 ground to air missile to shoot down a plane before it
10 gets -- it's not practical to do it.

11 I'm telling you, as somebody who is there,
12 ground to air missiles was an issue at one point.

13 MEMBER SIEBER: Now that the SECY
14 amendments are confirmed.

15 (Laughter.)

16 MEMBER POWERS: If one were to incorporate
17 design features to mitigate, I would think that this
18 Committee would want to worry a lot about how one
19 makes a trade off between the requirements of this
20 rule and the requirements of the rest of 10 CFR part
21 50.

22 And is there anticipated to be some
23 mechanism for doing that? Presumably within part 50
24 we have a mechanism when we have conflicts that we can
25 use the tools of PRA or something like that. Here

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1 it's not obvious to me that we have a tool for making
2 tradeoffs between how I would evaluate the advantage
3 of avoidance and mitigation here against avoidance and
4 mitigation for more stochastic accidents.

5 Is there something we should be doing
6 here?

7 MR. RECKLEY: Maybe an example would be
8 helpful. The part 50 requirements are required --
9 they are requirements and we will use those in the
10 design certification and licensing requirement.

11 So in the case of, let's say the AP1000
12 design, if they left out aircraft and said we need or
13 desire to make changes to our sheer burden in order to
14 address this concern. Now they did that in the
15 design.

16 Now they now have to go back in part 50
17 and make sure that the addition of the steel plates
18 and the sheer burden doesn't interview with the
19 cooling functions of their passive containment. Now
20 if it did, they would have to consider something else
21 because that would then have to be a practical
22 solution because they're now allowing part 50 hard
23 requirements of -- in order to try to meet the
24 aircraft rules. So the preference is to the part 50
25 requirements that have to meet those and then what

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1 else can they do in order to try to meet this.

2 In most cases, they actually end up in
3 very complicated --

4 MEMBER POWERS: I agree with that, but
5 I'm familiar with at least one condition within DOE
6 facilities where the -- the security requirements led
7 to an impossible situation and with respect to safety
8 and it took heroic amount of explanation to a
9 contractor that we weren't going to cure people in the
10 nature of protecting them against a phantom threat.

11 (Laughter.)

12 I can see that and it seems to me that
13 this Committee ought to be worrying about that a lot
14 more than whether we use practical or practicable in
15 the language here. It is that interface between
16 safety and security that we're being asked to think
17 about here. I know nothing comes promptly to mind.
18 I'm wondering if anything comes to your mind.

19 The only clear example we've seen, and
20 some of the Members haven't done these assessments yet
21 is the AP1000 example which is the clearest example
22 and it's pretty much one that we're currently familiar
23 with.

24 Anything in these rules that would
25 preclude underground siting?

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1 MR. RECKLEY: One thing that I would
2 encourage and for these sites and these designs, I've
3 not heard any discussion to that. As it happens, this
4 branch and NRR has branch reactors and some of the
5 branch reactors being smaller are already talking
6 about that as an option and it would also help address
7 this rule.

8 MEMBER POWERS: When one thinks about
9 underground siting immediately turns to the issue of
10 fire protection and the problems that you have in
11 responding to fire with underground siting. But
12 that's --

13 VICE CHAIRMAN BONACA: I think this is a
14 very, very important question when we look at the
15 guidance because that will get you to these kind of
16 sites as the opportunity.

17 MR. TARTAL: Shall we move on to rule
18 language then?

19 VICE CHAIRMAN BONACA: Yes, please.

20 MR. TARTAL: So based on the public
21 comments that we received, we developed the final rule
22 and the next few slides that I'll go through will
23 highlight those requirements.

24 In this slide we see applicability which
25 is Section 51.50a. It describes who the rule applies

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1 to and you see the list here on the screen.

2 Basically, this does not include current
3 holders of construction permits or operating licenses
4 or to current design certifications, but effectively
5 this will apply to all newly constructed reactors
6 after the effective date of the rule. That's how
7 we've designed the applicability section here.

8 So questions on who it applies to and why
9 --

10 MEMBER ARMIJO: So if someone references
11 a certified design making no changes at all, not even
12 a washer, does this rule apply?

13 MR. TARTAL: Yes, it does. And there are
14 two different cases here. If they're referencing a
15 certified design that has not been amended to address
16 this rule, then the COL applicant must address it in
17 their license. If they're referencing a certified
18 design that has been modified or has been amended to
19 comply with this rule, then that will be done.

20 MEMBER APOSTOLAKIS: So this is both in 50
21 and 52 part.

22 MR. TARTAL: Yes, yes. So this would
23 cover construction permits from part 50 operating
24 licenses from part 50 as well as design certs and COLs
25 from part 52 and I see the others, manufacturing

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1 licenses, design approvals, part 52 as well.

2 MEMBER-AT-LARGE ABDEL-KHALIK:
3 Effectively, this will apply to everyone.

4 MR. TARTAL: Every new reactor.

5 MEMBER BROWN: Regardless of whether it's
6 an already certified design or not.

7 MR. MIZUNO: Right, but I just want to be
8 clear. As long as you're doing it the way that we did
9 it was that it leads to the market as to who is going
10 to bear the cost of complying with this rule.

11 MR. CLARK: This is Ajitra Clark. I have
12 a question. This is Ajitra Clark from ACRS. When we
13 are looking at this rule, do you consider any lessons
14 learned from the NUREGs for design; those have the
15 design feature for aircraft impact?

16 MR. TARTAL: Are you talking about the new
17 active designs that we've just received that are
18 supposed to --

19 MR. CLARK: EPR would have our design for
20 aircraft impact. Are there any lessons learned that
21 will apply to this design to this rule?

22 MR. TARTAL: I'm not sure there's lessons
23 learned. Again, what I stated a few minutes ago was
24 that per applicability, for a design cert like you're
25 describing there, then the COL applicable does not

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1 need to do anything more in their application in terms
2 of complying with 51.50.

3 MR. CLARK: I understand that, but are
4 there any insights gained from those designs that
5 could be included in the rulemaking?

6 MR. TARTAL: This is a procedure. The
7 various designers may have already considered this and
8 so they might be one step ahead when they do the
9 actual assessment using the information that the NRC
10 provided that we did not take a design in mind and
11 change the rule to address one over another.

12 MEMBER ARMIJO: It kind of demonstrated
13 that compliance with the rule is possible. People can
14 design plants to comply with that rule.

15 MR. ALI: This is Syed Ali, the Office of
16 Research. Maybe I can add something to that.

17 I think before we talked about one item
18 where the aircraft characteristics are under debate,
19 but there are further details that are in the
20 safeguard documents that -- these are actual designers
21 and that is something that we have derived from our
22 experience and you can say lessons learned.

23 The other thing, we're going to apply the
24 lessons learned is in lieu of the industry guidance
25 document -- because we have been using those documents

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1 for the last several years, and there was a question
2 of whether to do your own reg. guide or approve their
3 guidance document and that's where we will apply the
4 lessons learned.

5 VICE CHAIRMAN BONACA: Okay, let's move
6 on. We're running out of time.

7 MR. TARTAL: Now for the good part. On
8 assessment, this is Section 51.50(b)(1). It describes
9 the requirements for performing the aircraft impact
10 assessment. Under this paragraph, the applicant must
11 assess the effects of the impact of a large commercial
12 aircraft on the facility and from the results of the
13 assessment the applicant must identify and incorporate
14 those design features and functional capabilities that
15 avoid or mitigate to the extent practical and with
16 reduced reliance on operator actions, the effects of
17 the aircraft impact on the four key safety functions.
18 And those are core cooling, containment integrity,
19 spent fuel cooling and spent fuel pool integrity.

20 So let's, I thought I would break down
21 each of the parts of this sub-bullet here, and maybe
22 generate some more discussion on that. By avoid or
23 mitigate, we really referring to the effects of the
24 aircraft impact, and not to the impact itself. That
25 was some of the public comments we got. They wanted

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1 that distinguishment in the final rule. Some thought
2 we were trying to actually avoid the impact of the
3 aircraft. We're trying to make clear in the final
4 rule that we're avoiding or mitigating the effects of
5 the impact.

6 Design features and functional
7 capabilities. That represents design alternatives
8 that could be included in the facility design and
9 refer to system structures of components, their
10 physical arrangement, and heat characteristics.
11 That's what we mean by that term.

12 To the extent practical, I know we've
13 already talked a little about this, but in the final
14 rule we've clarified that it means what it is
15 realistically and reasonably feasible from a technical
16 engineering perspective. And in this case, the
17 applicant should consider the benefit of potential
18 improvements which are reasonable, efficient, and
19 workable.

20 Reduced reliance on operator actions means
21 active license operator intervention and initiation
22 for response of action to maintain the key safety
23 functions, that should be reduced to the extent
24 practical.

25 And then, on the key safety functions,

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1 three of those four were defined in the Commission's
2 SRM to us and as a result of public comments, we added
3 the fourth, which is spent fuel pool cooling.

4 On the last sub-bullet, NEI, as you have
5 heard, is developing a guidance document to assist the
6 industry in standardizing their approach to the
7 assessment. We at NRC have been reviewing the
8 guidance document and expect to endorse it in a reg.
9 guide and we're also proposing to discuss that
10 guidance with the ACRS in November of 2008.

11 MEMBER BANERJEE: When you say spent fuel
12 cooling capability, does that include dry casks?

13 MR. TARTAL: No.

14 MEMBER BANERJEE: So dry casks are
15 specifically excluded from this.

16 MR. TARTAL: Any other questions?

17 MEMBER CORRADINI: Just to follow up at
18 this point. So are they covered in other roles? Cast
19 or dry cast?

20 MR. TARTAL: I will say that it is outside
21 the scope of this rulemaking, but I can't speak to how
22 it is covered.

23 MR. MIZUNO: I guess my understanding is
24 that there is an effort to look at that issue, but I
25 am not, you know, I'm not sure exactly how, where it

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1 is in the Agency.

2 MEMBER BANERJEE: Since we have them in
3 Salem and some other places, it's an issue, right?

4 MR. RECKLEY: It's been brought up in
5 various issues.

6 (Off the record comments.)

7 MR. TARTAL: So on aircraft impact
8 characteristics, this is Section 51.50(b)(2). These
9 largely are the characteristics that were given to us
10 by the Commission in their SRM and again, it's looking
11 at a large commercial aircraft used for long-distance
12 flights in the United States, with an aviation fuel
13 loading for such flights. Impact speed and angle of
14 impact considering the pilot experience or
15 inexperience and the low altitude of the nuclear power
16 plant. And the more specific aircraft
17 impact parameters that we have talked a little bit
18 about today will be provided in the guidance document
19 as well. Any questions on the characteristics?

20 MEMBER APOSTOLAKIS: The obvious question
21 is how can airlines stop buying the European 580 --

22 MR. TARTAL: I will say that the
23 characteristics have already drawn that line, and the
24 rule states that we won't be considering any further
25 technology improvements in aircraft or anything like

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1 that.

2 MEMBER MAYNARD: I think we're starting to
3 get into closed session stuff when we start talking
4 about the specific nature of the specific point.

5 MS. BANERJEE: The higher gasoline price
6 would do something to it.

7 (Off the record comments.)

8 MR. TARTAL: Let's move to these last
9 couple of slides. On content of application, this is
10 50.150(c) and it requires each applicant to describe
11 its PSR or its FSR the design features and functional
12 capabilities that were identified in the assessment
13 for inclusion in the design, but also requires each
14 applicant to describe in those documents how those
15 included design features and functional capabilities
16 have already been mitigated to the extent practical
17 the rest of the rule language.

18 The description should focus only on those
19 design features and functional capabilities that were
20 selected for inclusion in the plant design to address
21 the aircraft impacts in this rule and should be
22 equivalent in detail to the descriptions of design
23 features and functional capabilities addressing other
24 beyond design basis events or severe accidents that
25 are required to be described in license certification

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1 or approval applications.

2 MEMBER SIEBER: Why aren't they considered
3 safeguards features and therefore subject to
4 nondisclosure?

5 MR. RECKLEY: We had a lot of discussion
6 on that and it is possible that some of the features
7 end up being sensitive information and withheld.
8 Until we get into it, but there's also some very
9 obvious design features that are not going to be
10 sensitive and the containment is going to end up being
11 a design feature and so we thought and we're going to
12 strive to make as much of it public and described in
13 the FSAR as possible, but if we come to that problem,
14 then obviously some of the information could end up be
15 involved.

16 MEMBER SIEBER: A terrorist could be at
17 the local library looking up the FSAR.

18 MR. MIZUNO: We have regulations that
19 require the applicant to segregate the information.
20 Even though it's required to be submitted to us in the
21 application which obviously NRC people with the need
22 to know will have access to it.

23 If there is information which is -- needs
24 to be treated as SGI or something that's protected
25 from the public, they have to segregate it out and so

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1 only the public portion of the application would be
2 made available to the general public and the full
3 application would be available to the NRC staff for
4 review.

5 MR. TARTAL: So in control of changes,
6 this is Section 50.51(d), this paragraph is basically
7 a pointer to other existing regulations on change
8 controls and the objective here is to determine
9 whether the design of the facility as it's been
10 changed or modified avoids or mitigates to the extent
11 practical and with reduced reliance on operator
12 actions, the effects of the aircraft impact.

13 So basically, we're looking to make sure
14 that if they change or modify the facility that it
15 continues to meet this regulation. And in doing that,
16 they would need to redo that portion of the assessment
17 that addresses the changed feature or capability and
18 it's described how as it's modified it continues to do
19 that.

20 MEMBER BROWN: And obtain approval?

21 MR. TARTAL: No.

22 MR. RECKLEY: Informational report to the
23 NRC. So if you don't like it -- if we don't like it,
24 it's like other beyond design basis, reactor kind of
25 features if they were to change it and we don't like

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1 it, then we have a process we don't go in to try to
2 force them to do something else. That's the reality
3 that we're in.

4 MR. TARTAL: This next slide is sort of a
5 tie between the last rulemaking you heard about an
6 hour ago and our rulemaking. Bill is going to --

7 MR. RECKLEY: Well, since the discussion
8 last time I'm not sure if there's a clear
9 understanding of the relationship here.

10 50.54(hh)(2) primarily is what we're
11 talking about here. It is intended to require
12 licensees to come up with largely procedural things.
13 There are some hardware features involved, obviously,
14 but largely procedural things to respond to the loss
15 of large areas due to fire and explosions.

16 That was decided to be needed just like
17 emergency operating procedures and some other things
18 where you can identify -- we want them to have thing
19 in place that would address serious accidents or
20 events.

21 51.50 basically is a rule that says let's
22 not miss an opportunity to consider in the design
23 stages that you might be able to do that would lessen
24 the need to have other procedures in place to respond
25 to such an event.

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1 So 50.54(hh) is the requirement for
2 adequate protection that is there as a backstop and
3 all the discussions we've been having is trying to get
4 the vendors at the most advantageous point to try to
5 consider are there design things we can do to minimize
6 those procedural things that would be in place. So
7 that's basically the relationship and why we consider
8 51.50 to be an enhancement and 50.54(hh) to be an
9 adequate protection requirement.

10 MEMBER BROWN: It 50.54(hh) then
11 applicable to existing plants?

12 MR. RECKLEY: Existing plants and new
13 plants.

14 MEMBER ARMIJO: Is there a credit for a
15 new plant that's designed with really robust features?
16 Is 50.54 the level of planning and strategies? Is
17 there flexibility -- or is this one size fits all?

18 MR. RECKLEY: It's possible that you can
19 look at a new plant design and say separation and
20 redundancy is so good in that design that they don't
21 need to have some let's say portable pumps or other
22 measures that are required for the operating plants
23 and may be required for some of the new plants. That
24 that is what's being done now for the new plants.
25 They've been through the assessments, both the

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1 aircraft assessments and also the 50.54(hh)
2 requirements and guidance to say based on the plant
3 design is there anything I can do to -- well, two
4 things. To do the plant designs, can I not have some
5 of these mitigating strategies because I don't need
6 them and then on the converse, does my plant design
7 introduce anything that I might need a mitigating
8 strategy for that wasn't identified before. And we're
9 going through that exercise now with the various
10 design centers.

11 MR. TARTAL: So my final slide just
12 highlights the rulemaking schedule and as you see,
13 we're due to have this rule up to the EDO in the
14 middle of September and to the Commission at the end
15 of September, so what we ask is that the ACRS do their
16 normal process of preparing the letter to the
17 Commission with your recommendations and we ask that
18 you have it available to us in two weeks so that we
19 can move forward at the end of concurrence and get it
20 to the EDO on schedule.

21 MEMBER CORRADINI: By normal expeditious
22 manner.

23 MR. TARTAL: That's all. Any other
24 questions, commentary?

25 VICE CHAIRMAN BONACA: No questions, then.

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1 Thank you for your presentation. We have one more
2 presentation from Mr. Riccio of Greenpeace.

3 MR. RICCIO: Thank you.

4 MEMBER BANERJEE: Is that upside down?

5 MR. RICCIO: Old software.

6 (Laughter.)

7 MEMBER BANERJEE: Is that a symbol of
8 Greenpeace?

9 MR. RICCIO: It's just the header. We
10 have a lot of ships.

11 MEMBER BANERJEE: Which organization?

12 MR. RICCIO: I beg to differ.

13 (Off the record comments.)

14 MR. RICCIO: Good afternoon. My name is
15 Jim Riccio. I am the nuclear policy analyst for
16 Greenpeace here in the U.S. and I want to thank you
17 for opening up this meeting. I have heard some
18 grievances about being an open session. That's my
19 fault.

20 The public doesn't get many opportunities
21 to get hear where the Agency is heading before they
22 head there and if you had closed the doors, we
23 wouldn't even have known where the Agency was heading
24 with their final rule. And if some of my comments are
25 a little off point it's because we haven't had the

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1 opportunity to review the final version.

2 I always like being here and participating
3 in this panel too because I get a chance to hear
4 things that I don't normally hear when the staff has
5 gotten before the Commission and you guys grilled them
6 and grilled them hard and I hope you'll do it when you
7 get them behind closed doors.

8 Unfortunately, it's taken the Bush
9 Administration's NRC seven years to merely propose
10 regulations to mitigate the consequences of an
11 airliner attack. Rather than address the present
12 danger and reduce the risk --

13 MEMBER POWERS: A question, NRC is an
14 independent agency. We don't belong to the Bush
15 Administration --

16 MEMBER APOSTOLAKIS: In his view.

17 (Laughter.)

18 MR. RICCIO: I would suggest that person
19 that chairs the Committee has a large say in where
20 this Agency is headed, especially when the Commission
21 is writing SRMs that result in proposed rules.

22 MEMBER ARMIJO: I think we should let him
23 make his presentation.

24 MEMBER POWERS: No problem.

25 MR. RICCIO: I expect to be grilled too.

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1 (Laughter.)

2 In addressing the clear and present
3 danger, the Agency and history have both trafficked in
4 half truths about the vulnerability of nuclear power
5 plants. IN the days and weeks that followed the
6 attack on the World Trade Center, the Pentagon, both
7 the NRC and the industry made claims they later had to
8 retract or correct in terms of the vulnerability.

9 One of the only nuclear plants actually
10 designed with airlines in mind was Three Mile Island
11 and those improvements were forced upon the industry
12 and the Agency by citizen intervenors.

13 MEMBER APOSTOLAKIS: Can you go back to
14 the previous slide? The other one.

15 (Off the record comments.)

16 MEMBER APOSTOLAKIS: What is that word
17 there, deceive and the next one?

18 MR. RICCIO: Deceive, inveigle and
19 obfuscate.

20 MEMBER APOSTOLAKIS: Is that the correct
21 spelling?

22 MR. RICCIO: Yes.

23 (Laughter.)

24 MR. RICCIO: I checked it.

25 MEMBER APOSTOLAKIS: I know what it means.

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1 (Off the record comments.)

2 MR. RICCIO: It was 96 percent of 104. I
3 knew that TMI was one of them.

4 MEMBER POWERS: Seabrook is the other.

5 MR. RICCIO: I don't know if those were
6 also forced upon by citizen intervenors but --

7 MEMBER POWERS: Because of the proximity
8 of the airport.

9 MR. RICCIO: Right.

10 MEMBER POWERS: All of the proposed sites
11 we have to look not only at what aircraft flight
12 patterns are now, but where they might be in the next
13 60 years.

14 MR. RICCIO: The industry and their
15 advocates have rolled out the old Sandia tests.
16 They're pretty impressive. There's only one problem.

17 The test didn't do what the industry
18 claimed they were showing and when they were finally
19 confronted by it by The New York Times they had to
20 fess up and again, I want to thank Sandia Labs because
21 in those days after 9/11 with all the propaganda
22 floating around it was great to have someone speak
23 honestly about what reactors could and could not
24 withstand.

25 You can still find these claims on many of

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1 the industry's websites. Now in the past, the NRC has
2 avoid dealing with the terrorist threat to reactors by
3 claiming it was too speculative. After 9/11 the
4 threat is no longer hypothetical. The 9/11 Commission
5 has documented the threat.

6 The lies told by President Bush to bolster
7 his case for the War in Iraq, U.S. Troops never found
8 U.S. power flight designs in the case of Afghanistan.

9 However, we've known since the first World
10 Trade Center bombing trial in '93 --

11 MEMBER ARMIJO: Was that the Clinton
12 Administration -- and I was wondering why you don't
13 mention that and the lack of the --

14 MR. RICCIO: Well, sir, the reason I
15 mention it is that President lied in the State of the
16 Union address saying that nuclear power --

17 MEMBER ARMIJO: I'm talking about --MR.
18 RICCIO: -- in the case of Afghanistan.

19 MEMBER ARMIJO: If it's going to be an
20 editorial, I'd like you to show a little bit of
21 actuality.

22 MR. RICCIO: Sir, bring it on. In fact,
23 that's the --

24 MEMBER ARMIJO: Waste your time, don't
25 waste mine.

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1 MR. RICCIO: I'm not. Those are facts.
2 If you want them documented, I'll be happy to provide
3 the documents.

4 Sir, we've known since '93 that terrorists
5 were targeting nuclear power plants in the U.S. It
6 came out in the bombing trial from the first World
7 Trade Center and I'm just wondering how long it's
8 going to take this Agency to act.

9 It took you ten years to get a truck bomb
10 rule promulgated. You've gone through seven years now
11 and we still don't have a rule in place. We're glad
12 that the Agency is moving in that direction, but still
13 seven years is too long to wait.

14 The next slide may be all points since I
15 haven't seen the new rewrite of the rule. The way it
16 originally had read, this rule would have exempted the
17 ABWR, the AP1000. I'm encouraged to hear that that at
18 least has been addressed.

19 That was such an abdication of the NRC's
20 responsibility that even the nuclear industry said
21 that you were on the money with public confidence. It
22 wasn't Greenpeace. It wasn't USC. It was George
23 Vanderhoff of Unistar.

24 It's truly remarkable that the NRC staff's
25 rule was so devoid of substance and forceful criteria

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1 that they actually created a consensus among two
2 Commissioners, many nuclear corporations, and the
3 environmental groups including Greenpeace.

4 MEMBER APOSTOLAKIS: Jim, you are saying
5 that unless you have the benefit of this meeting, you
6 wouldn't know what the rule was, but didn't they
7 publish it in The Federal Register?

8 MR. RICCIO: The proposed rule. This is
9 the first time I've heard where the Agency is
10 intending to head with the new rewrite of the proposed
11 rule. It's not been published. It's not been made
12 publicly available, unless I can maybe dig it out of
13 the packet that was presented to you guys.

14 In the proposed rule they were going to
15 exempt the ABWR and the AP1000 from review and that
16 was so unconscionable that they've at least made those
17 adjustments before they had to come before you guys.

18 I think it really is remarkable that
19 they're able to find consensus among such a disparate
20 group. Again, it's quite an accomplishment that you
21 can actually bring NEI and Greenpeace together.

22 Don't get me wrong. We don't agree on the
23 substance. We just agree it needs to be criteria.

24 NEI still doesn't want too much regulation
25 of the industry, but the call to incorporate

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1 appropriate acceptance criteria was almost universal
2 in the proposed, in the comments that were submitted.

3 MEMBER POWERS: That's not surprising
4 since this has a great potential to be open ended. I
5 mean --

6 MR. RICCIO: I understand. I understand
7 it cuts both ways, but a rule without criteria isn't
8 much of a rule.

9 MEMBER POWERS: If you're not careful, you
10 can just pose a bigger airplane or a bigger threat.
11 There's got to be some end to this.

12 MEMBER APOSTOLAKIS: As a result of
13 today's information, this has been met. They are
14 going to --

15 MR. RICCIO: They will apply to those
16 reactors. We still don't see and I'm not sure if I'll
17 ever get to see the actual criteria that may be in a
18 guide or in an NEI document.

19 After 9/11 the NRC was challenged and The
20 New York Times op ed by Bennet Ramberg claimed that
21 the NRC had not learned the lessons of 9/11.
22 Unfortunately, the staff's report clearly demonstrates
23 that nearly seven years later the Bush Administration
24 and the NRC still hasn't learned the lessons.

25 The only solace the public can take in

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1 that is that in less than 200 days the U.S. will have
2 a new President and eventually a new NRC Chairman.

3 Hopefully, the next NRC chair will
4 actually learn the lessons of 9/11. If the NRC is
5 going to allow nuclear corporations to build more
6 terrorist targets in America, they damn well better be
7 able to withstand an airliner impact.

8 I thank the Committee for its time and its
9 consideration of our comments and I beg you to hold
10 their feet to the fire and make sure this rule
11 accomplishes what it was supposed to.

12 Waiting a decade for the next terrorist
13 attack to occur really is not adequate.

14 Thanks again.

15 MEMBER BANERJEE: Is that a real picture,
16 the last one?

17 MR. RICCIO: No.

18 (Laughter.)

19 If it was, you would have heard about it
20 by now.

21 MEMBER APOSTOLAKIS: Let me ask you, do
22 you think based on what you heard today, the last hour
23 and a half, that the multiple concerns are being
24 addressed?

25 MR. RICCIO: Again, I still have real

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1 questions as to whether or not there are any
2 enforceable criteria or whether or not -- and
3 actually, some of the things I've heard it can me
4 pause for concern.

5 If you're going to allow either the
6 designer or the licensee to make the decision about
7 making changes, then there goes standardization. And
8 the likelihood that you'll have multiple different
9 design changes at the licensee level rather than by
10 the designers --

11 MEMBER APOSTOLAKIS: Do you agree with the
12 overall approach that --

13 MR. RICCIO: Again, I'm encouraged by the
14 fact that they have at least corrected the most
15 glaring error. Again, I'm going to have to take a
16 look at what the rule actually does to see whether or
17 not there are actually any criteria that would be --
18 that can be applied and enforceable.

19 MEMBER CORRADINI: So let me ask you this
20 question, is it your opinion that the criteria should
21 be public?

22 MR. RICCIO: We have no interest in making
23 it easier for terrorists to attack nuclear plants.

24 MEMBER CORRADINI: Haven't you just
25 invented a Catch-22 by saying --

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1 MR. RICCIO: No, because for instance in
2 this meeting we have people on our side of the fence
3 who actually have security clearances. They are
4 actually the ones that put up the petition for
5 rulemaking that you addressed in the last session.

6 Unfortunately, I asked that they be
7 allowed to participate in the closed session and they
8 were turned down because apparently they didn't have
9 a need to know.

10 They've actually changed some of the rules
11 in a good way. They have commented on this, yet they
12 still don't have a need to know.

13 MEMBER APOSTOLAKIS: Thank you.

14 MR. RICCIO: Thank you.

15 CHAIRMAN SHACK: It's time for a break.

16 (Off the record comments.)

17 CHAIRMAN SHACK: Before you take the
18 break, just hold for a minute.

19 Before we break, I think we want to
20 determine whether we have a need for a closed session.

21 MEMBER APOSTOLAKIS: What are we going to
22 discuss?

23 MEMBER CORRADINI: Can I ask is it a
24 question and answer?

25 VICE CHAIRMAN BONACA: There's a formal

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1 presentation upstairs. There is additional questions
2 on the rule that get into issues as the ones we have
3 been doing for the past two years which is airplane
4 type or --

5 MEMBER APOSTOLAKIS: It seems to me that
6 the real meat will when we see the guidance.

7 MS. BANERJEE: Excuse me. We also have a
8 draft letter that Mario --

9 VICE CHAIRMAN BONACA: Why isn't that
10 letter open?

11 MS. BANERJEE: We may end up going into
12 the closed session.

13 MEMBER CORRADINI: I think -- into closed
14 session.

15 MS. BANERJEE: Yes, that's what we were
16 thinking, that in the closed session we can also
17 discuss the letter.

18 CHAIRMAN SHACK: Okay, do we need to go to
19 the high security room to look at the letter or can we
20 do it as a closed session here?

21 VICE CHAIRMAN BONACA: We can do it as a
22 closed session here.

23 MEMBER APOSTOLAKIS: We have done it
24 before.

25 MEMBER POWERS: It depends on the level.

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1 MS. BANERJEE: If we don't need to go into
2 classified information --

3 CHAIRMAN SHACK: I don't see how we're
4 going to get into classified information in looking at
5 the letter.

6 We're going to finish the transcript now.
7 Go off transcript.

8 (Whereupon, at 5:00 p.m., the meeting was
9 concluded.)

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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on
Reactor Safeguards

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.



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

ACRS 554th Full Committee Meeting

NRC Staff Review of Proposed Stretch Power Uprate
For
Millstone Power Station, Unit 3



July 9, 2008

Opening Remarks

Joseph G. Giitter

Director

Division of Operating Reactor Licensing

Office of Nuclear Reactor Regulation

Opening Remarks

- NRC staff effort
 - Requests for additional information
 - Supplements to application
- Most challenging review area included:
 - Fuel and core design analysis
- Safety evaluation - no open technical issues

Introduction

John G. Lamb

Senior Project Manager

Division of Operating Reactor Licensing

Office of Nuclear Reactor Regulation

Introduction

- Dominion Nuclear Connecticut, Inc. (DNC) is the licensee for Millstone Power Station, Unit 3 (MPS3)
- MPS3 Proposed Stretch Power Uprate (SPU)
 - 3,411 to 3,650 Megawatts Thermal (MWt)
 - Approximately 7% increase (239 MWt)
- Background
 - Licensed January 31, 1986
 - Approved License Renewal – October 2005
 - Operating License expires November 25, 2045
- Method of NRC staff review – RS-001 as guidance
- Schedule and Implementation

Topics for July 9, 2008

- Introduction and Overview of the SPU application
- Fuel & Safety Analysis
- Conclusion

Fuel and Reactor Systems Evaluation MPS3 SPU

Benjamin Parks and Samuel Miranda
Reactor Systems Branch
Leonard Ward, Ph.D.
Nuclear Performance and Code Review Branch
Division of Safety Systems
Office of Nuclear Reactor Regulation

Review Scope

- Staff reviewed the impact of SPU on
 - Fuel system and nuclear design
 - Thermal-hydraulic design
 - Overpressure Protection
 - Accident & Transient analyses
 - LOCA
 - ATWS
 - Westinghouse methods

Review Method

- Scope of EPU evaluations generally followed NRC-accepted, generic SPU guidelines and evaluations
- Analyses and evaluations are based on NRC-approved methodologies, analytical methods, and codes
- Followed the EPU review standard (RS-001)

Fuel System and Nuclear Design

- Evaluations:
 - Mechanical based on multiple fuel types
 - Nuclear/Thermal-hydraulic on RFA/RFA2
- Uprate effects:
 - Slight increase to linear heat rate
 - Slightly less peaked core design
- Licensee's evaluations demonstrate that acceptable core design may be achieved at uprated power level
- Cycle-specific analyses and evaluations will demonstrate compliance in accordance with NRC-approved reload licensing process

Accident & Transient Analyses

- Review included those transients covered in Matrix 8 of RS-001; results were acceptable as noted in staff's SER.
- Several accidents/transients warranted additional staff review:
 - Overpressure Protection
 - Inadvertent ECCS Actuation/P-19 Permissive
 - Rod Withdrawal at Power – Low Power

Overpressure Protection

- Limiting Overpressure event is Loss of Load/Turbine Trip
- Applicable ANSI Condition II Acceptance Criterion:
 - Limit peak pressure to 110% of reactor coolant system design pressure
- Two trips terminate event:
 - High Pressurizer Pressure
 - Overtemperature- ΔT

Overpressure Protection Continued

- Pursuant to staff request for additional information, licensee analyzed event crediting only the second (OTΔT) trip.
- Results of sequence crediting either trip were acceptable
- Peak pressure did not exceed 2750 psi (110% RCS Design Pressure)

Inadvertent ECCS Actuation

- Licensee will implement new permissive, P-19 Cold Leg Injection Permissive

AOO Acceptance Criterion

- “By itself, a Condition II incident cannot generate a more serious incident of the Condition III or IV type without other incidents occurring independently.”
- NRC reminded licensees that this criterion is in the plant licensing bases, and therefore must be met (RIS 2005-29).

AOOs That Add Mass to RCS

- Inadvertent Actuation of ECCS can develop into a small break LOCA at the top of the pressurizer, if a PORV sticks open.
- In analyses, PORVs that are not qualified for water relief are assumed to stick open after they relieve water.

Millstone Unit 3 Operating Experience

- Inadvertent actuation of ECCS incident occurred on April 17, 2005.
- Resulted in water relief through the PORVs

Millstone Unit 3

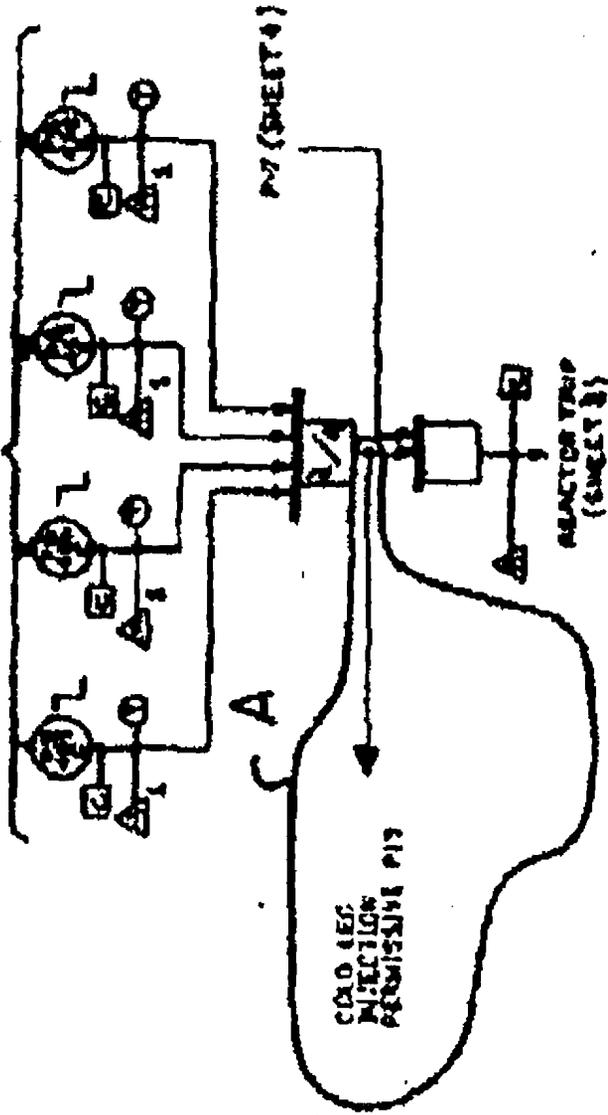
- PORVs are qualified for water relief
- P-19 Permissive interlocks the charging cold leg injection valves with a low pressurizer pressure signal coincident with an SI signal.

P-19 Permissive

- Charging cold leg injection valves do not open unless RCS pressure $<$ low pressurizer pressure reactor trip setpoint and an SI signal is present.
- A single fault does not cause the cold leg injection valves to open. (P-19 would have prevented the incident of 2005.)

K021001

PREVENTS LOW PRESSURE
(LEAD/ LAD COMPARTMENT)



Rod Withdrawal At Power

- Rod withdrawal at power evaluated in Licensing Report with acceptable results
- LR referenced a generic disposition of the potential for RCS overpressurization, given a RWAP initiated at a low power level
- Staff questioned the generic evaluation

Low Power RWAP – Generic Study

- Westinghouse evaluated the potential for overpressure conditions following a RWAP initiated at a power level where the high neutron flux-low setting can be blocked.
- Evaluation pertained to plants with water-filled loop seals on pressurizer safety valve discharge piping.
- Millstone 3 does not have water-filled loop seals; pressure relief would occur earlier.

Details of Generic RWAP Evaluation

- Performed for 4-loop Westinghouse plant
- Total power less than Millstone 3 SPU
- Pressurizer level lower than Millstone 3
- Remaining input parameters conservative relative to Millstone 3 SPU

Westinghouse Study of RWAP at Millstone 3

- Remove seal purge delay on pressurizer safety valve
- Increase core power level
- Increase pressurizer initial water level

Westinghouse Study of RWAP at Millstone 3 Continued

- Results confirmed that eliminating seal purge delay compensated for increased liquid volume in pressurizer and increased nuclear power addition capability
- Conclusion: Positive Flux Rate Trip terminates transient and Pressurizer Safety Valves mitigate pressurization effects.

LOCA

- Large Breaks evaluated with ASTRUM Best Estimate Method (Change from BART/BASH Appendix K Method)
- Small breaks evaluated using NOTRUMP (no change)
 - SBLOCA results show significant margin to regulatory limit

LOCA Results

	Small Break	Large Break	Acceptance Criterion
Peak Clad Temp, °F	1193	1781	2200
Local Cladding Oxidation, %	0.05	3.5	17
Core Wide Oxidation, %	0.01	0.12	1.0

Summary

- Transient and accident analyses demonstrate acceptable results at uprated conditions
- Fuel design remains acceptable to support the uprate
- Methods implemented acceptably

Staff Conclusion

- The staff concludes that there is reasonable assurance that the health and safety of the public will not be endangered by the proposed SPU.

The top of the page features a black banner with the word "GREENPEACE" in white, bold, sans-serif capital letters on the left. To the right of the text is a black and white photograph of a large ship, possibly a Greenpeace vessel, with a banner on its deck. Three black circular punch holes are visible along the top edge of the page.

GREENPEACE

Aircraft Impacts & New Nuclear Reactor Designs

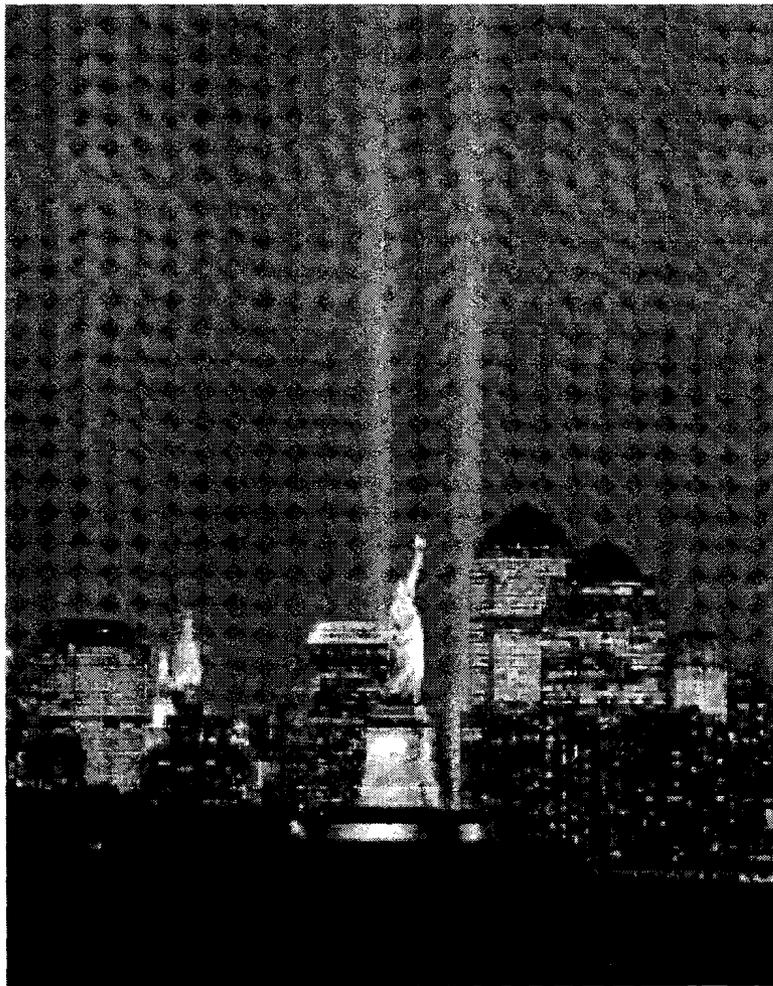
U.S. Nuclear Regulatory Commission
Advisory Committee on Reactor Safeguards
July 9, 2008

Jim Riccio
Nuclear Policy Analyst

GREENPEACE



Aircraft Impacts & New Nuclear Reactor Designs

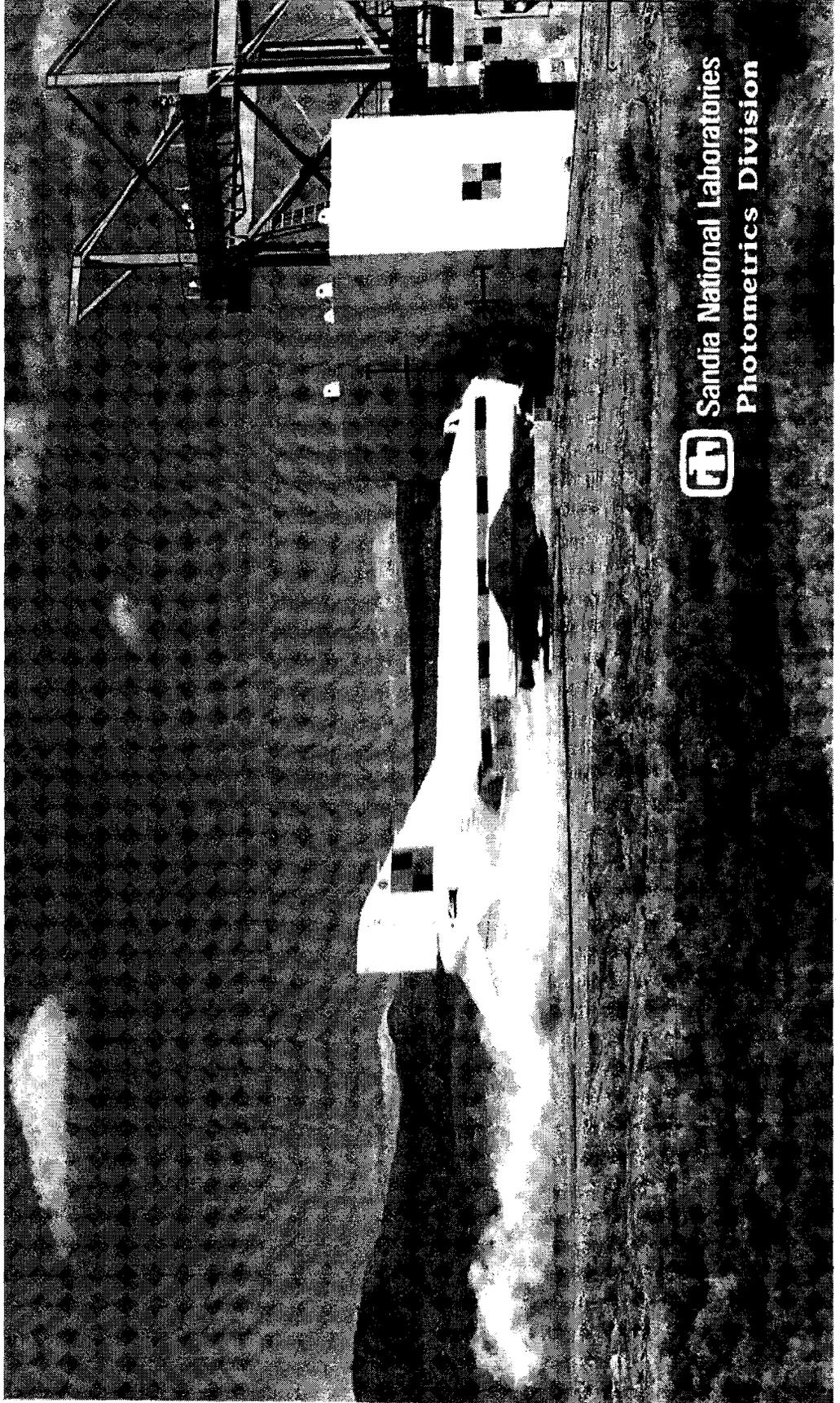


After the attacks of September 11th, the government and the nuclear industry have continued to traffic in half-truths about the vulnerability of nuclear power plants.

Rather than address the new reality the NRC and the nuclear industry have attempted to deceive, inveigle and obfuscate.

GREENTPEACE

Aircraft Impacts & New Nuclear Reactor Designs



Sandia National Laboratories
Photometrics Division

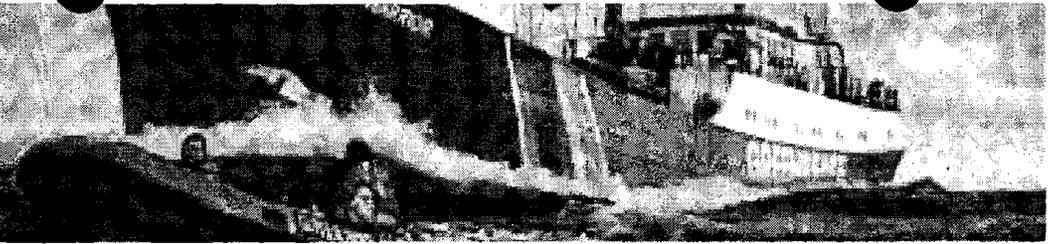
GREENPEACE

Aircraft Impacts & New Nuclear Reactor Designs

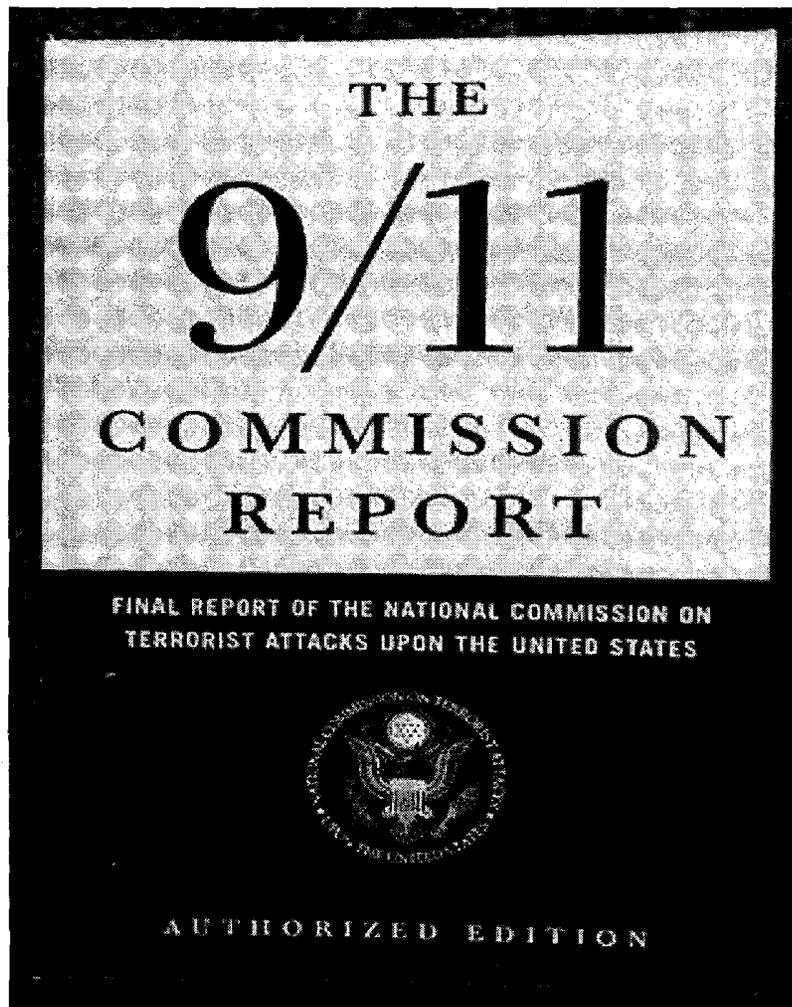


Sandia National Laboratories
Photometrics Division

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Aircraft Impacts & New Nuclear Reactor Designs



After 9-11, the terrorist threat is no longer hypothetical:

“KSM has admitted that he considered targeting a nuclear power plant as part of his initial proposal for the planes operation....

He also stated that Atta included a nuclear plant in his preliminary target list, but that Bin Laden decided to drop that idea.”

The image features the Greenpeace logo in a bold, white, stylized font on a black background. To the right of the logo is a black and white photograph of a protest scene, showing a person in the foreground and a large banner in the background. The banner has some text, but it is not clearly legible.

GREENPEACE

Aircraft Impacts & New Nuclear Reactor Designs

Despite the known threat the NRC's proposed rule will not review these new nuclear reactors to ensure that they can survive a 9-11 type attack:

<u>Corporation</u>	<u>Design</u>	<u>Site</u>	<u>State</u>
Duke	AP1000	William Lee Station	SC
NuStart Energy	AP1000	Bellefonte	AL
South Carolina E&G	AP1000	Summer	SC
NRG Energy	ABWR	South Texas Project	TX
Progress Energy	AP1000	Harris	NC
Progress Energy	AP1000	Levy County	FL
Southern Nuclear	AP1000	Vogtle	GA

The top of the page features a black banner with the word "GREENPEACE" in white, bold, sans-serif capital letters on the left. To the right of the text is a black and white photograph of a large ship, possibly a cargo vessel, with a white hull and a dark superstructure, sailing on the water. Three black circular punch holes are visible along the top edge of the page.

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Aircraft Impacts & New Nuclear Reactor Designs

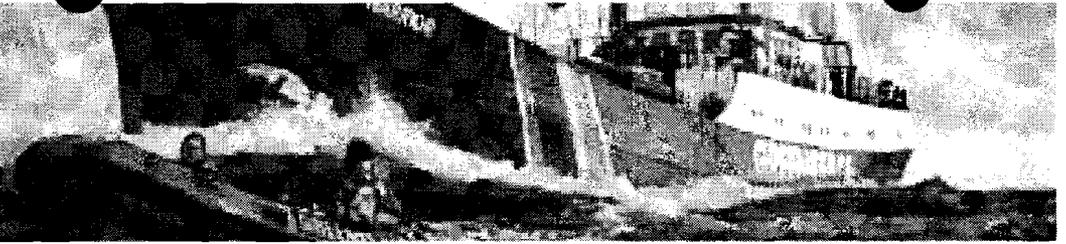
Commissioner Lyons and the Nuclear Energy Institute have offered up the strikingly similar “high level acceptance criteria.”

Commissioner Lyons suggested that the industry:

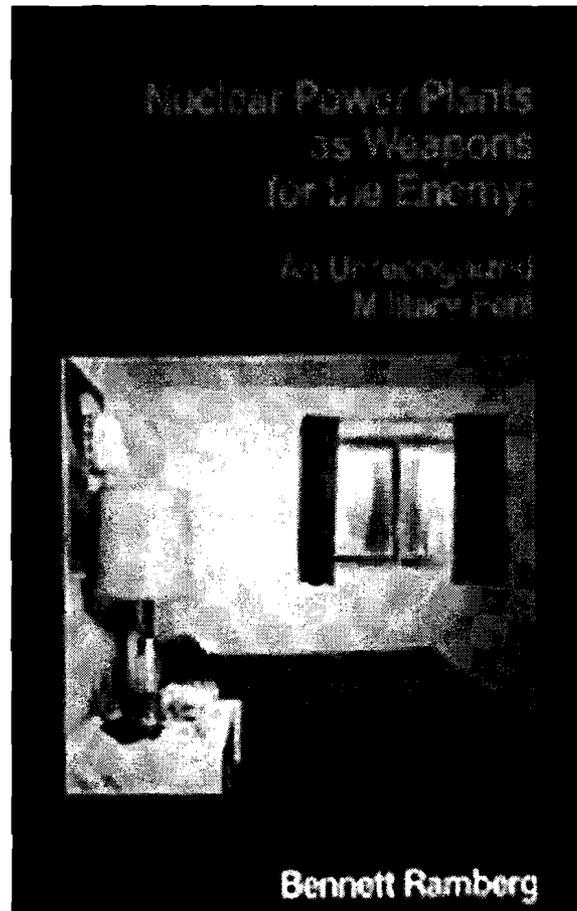
- demonstrate an acceptable dose at the site boundary or
- demonstrate that the core remains cool or the containment remains intact and that spent fuel cooling is maintained.

(U.S. Nuclear Regulatory Commission, Commission Voting Record, SECY-06-204, Proposed Rulemaking - Security Assessment Requirements for New Nuclear Power Reactor Designs, April 24, 2006.)

GREENPEACE



Aircraft Impacts & New Nuclear Reactor Designs

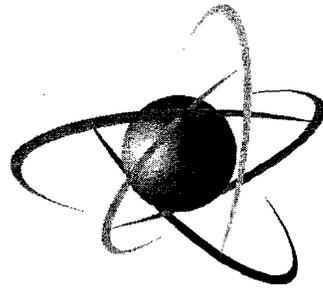


“Keeping the terrorists guessing about our defenses was presumably one motivation for the secrecy. However, it might also reflect the commission's desire to play down its acquiescence to the nuclear industry's hubristic view that the plants are nearly invulnerable...the commission doesn't seem to have learned the lesson of those attacks.”

Bennett Ramberg,
New York Times, May 20, 2003

LUMPED MASS-SPRING MODEL SEISMIC ANALYSIS vs. FINITE ELEMENT STATIC STRUCTURAL ANALYSIS

- RESULTS OF LUMPED MASS-SPRING MODEL ANALYSIS INCLUDE: NODAL MASS PT. ACCE./DISPL. RESPONSE FUNCTIONS AS WELL AS FLOOR RESP. SPECTRA (e.g., DAC-3N Code)
- DIRECT SPRING (MEMBER) FORCES, SHEAR AND BENDING MOMENTS AND JOINT DISPL./ROTATIONS
- THE ABOVE RESULTS ARE THEN APPLIED TO AN ADVANCED FINITE ELEMENT STRUCTURAL MODEL USING, SAY, ANSYS, OR SAP2000 FOR COMPUTING ELEMENT FORCES, LOCALIZED MOMENTS AND SHEARS USED IN SIZING THE ELEMENT DIMENSIONS INCLUDING REBARS, STEEL PLATE SECTIONS, MEMBER DIMENSIONS, ETC.



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Presentation to the ACRS Full Committee

ESBWR Design Certification Review

Chapter 3 – Design of Structures, Components,
Equipment, and Systems

July 9, 2008

ACRS Subcommittee Presentation ESBWR Design Certification Review Chapter 3 Sections & Reviewers

Richard McNally
3.2

Mohamed Shams
3.3.1
3.3.2
3.4.2

David Shum
3.4.1
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3.5.1.2
3.5.1.4
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Patrick Sekerak
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Thomas Scarbrough
3.9.6
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P.Y. Chen
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Amar Pal
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John Fair
3.12

**ACRS Full Committee Presentation
ESBWR Design Certification Review
Chapter 3 RAI Status**

Total RAIs Issued – 583

Open RAIs – 57

Open RAI Details

- 3.8 – 19
- 3.9 – 15
- 3.6 – 8
- 3.11 - 7

ESBWR Design Certification Review

Section 3.2 – Seismic Classification and Quality Group Classification

Regulatory Basis:

10 CFR 50 Appendix A, General Design Criteria (GDC) 1 and 2

Criterion 1 --Quality standards and records. Structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. A quality assurance program shall be established and implemented in order to provide adequate assurance that these structures, systems, and components will satisfactorily perform their safety functions. Appropriate records of the design, fabrication, erection, and testing of structures, systems, and components important to safety shall be maintained by or under the control of the nuclear power unit licensee throughout the life of the unit.

Criterion 2 --Design bases for protection against natural phenomena. Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.

ESBWR Design Certification Review

Section 3.2 – Seismic Classification and Quality Group Classification

Classification Process

Blend of deterministic and risk-informed approach

- **RG 1.26 and 1.29 for quality group and seismic classifications based on safety function**
- **PRA and RTNSS process establish scope and risk-significance**

ESBWR Design Certification Review

Section 3.2 – Seismic Classification and Quality Group Classification

Risk Considerations Applied to Classification Process

Regulatory Treatment of Nonsafety-Related Systems (RTNSS) SSCs

- **Nonsafety-Related SSCs with high risk significance are identified as RTNSS SSCs**
- **GEH has proposed a new Special Class to distinguish high risk significant SSCs from other nonsafety-related SSCs with low risk significance**
- **RTNSS SSCs will receive special treatment in terms of seismic and quality requirements**
- **RTNSS process is described in DCD Section 19 and evaluated in FSER Chapter 22**

ESBWR Design Certification Review

Chapter 19A (SER Chap. 22)

Regulatory Treatment of Non-Safety Systems (RTNSS)

CRITERIA FOR SELECTING RTNSS SSCs:

- Non-safety SSC relied on to meet ATWS and SBO rules.
- Non-safety SSC needed for core cooling, containment heat removal or control room habitability beyond 72 hours post accident.
- Non-safety SSC that provides diagnostic info beyond 72 hours post accident.
- Non-safety SSC relied on to meet Commission's safety goals
- Non-safety SSC relied on to meet containment performance goals.
- Non-safety SSC relied upon to prevent significant adverse interaction with passive safety system.

ESBWR Design Certification Review

Section 3.7 – Seismic Design

Discussion Topics:

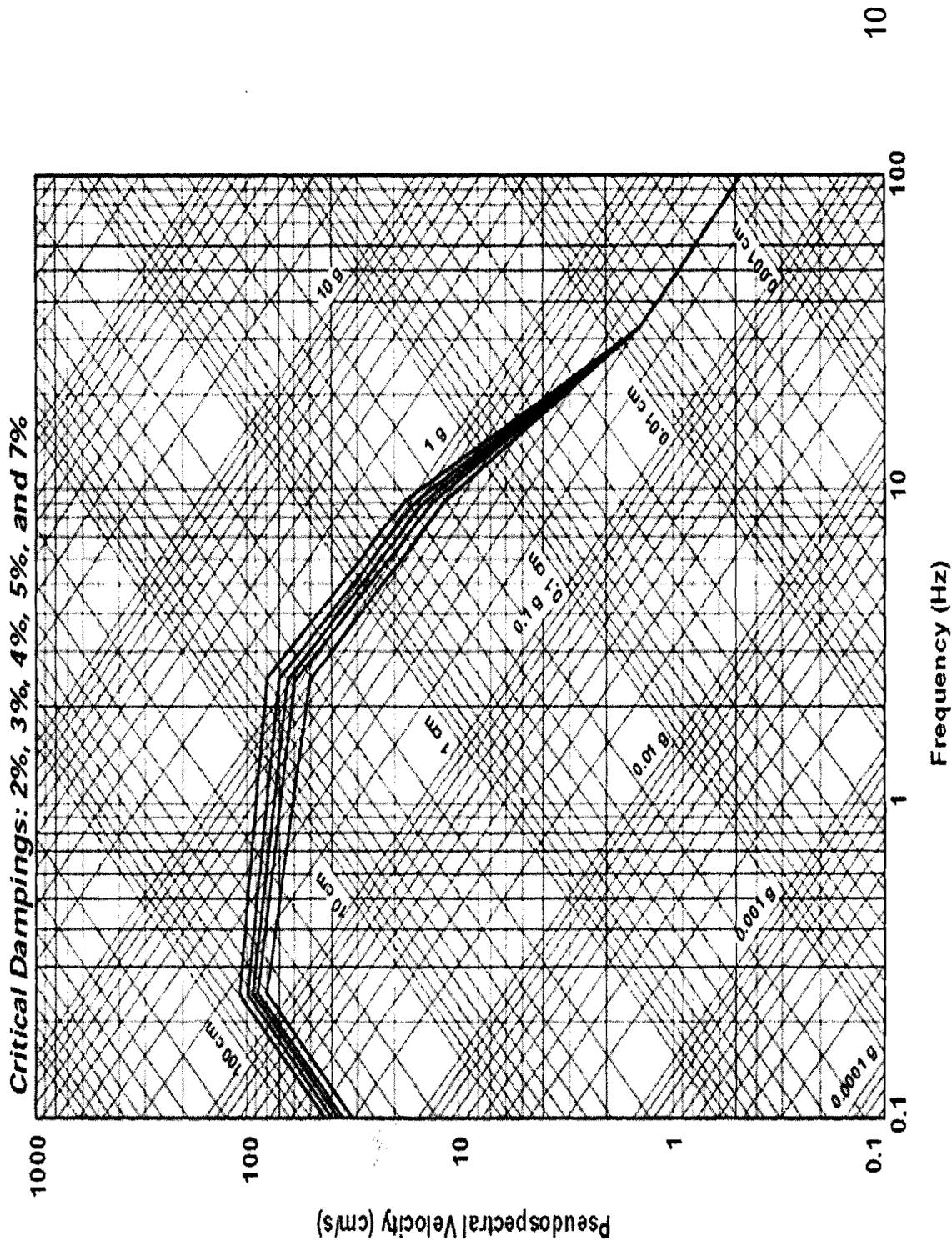
- **ESBWR SEISMIC GROUND MOTION SPECTRA CURVES AND THEIR USE IN SEISMIC ANALYSIS**
- **ESBWR POOLS AND THEIR IMPACT ON SEISMIC ANALYSIS**

DESIGN GROUND MOTIONS USED IN SEISMIC DESIGN OF ESBWR PLANTS

- ESBWR standard plant SSE design ground motion is rich in both low and high frequencies
- The low-frequency ground motion follows RG 1.60 ground spectra anchored to 0.3 g (Fig. 1)
- The high frequency ground motion matches the North Anna ESP site-specific spectra as representative of most severe rock sites in the Eastern US (Fig. 2)
- These two ground motions are considered separately in the basic design (Used DAC-3N Code)
- To verify the basic design the two separate inputs (both low and high frequencies) are further enveloped to form a single envelope design ground response spectra, also termed as the Certified Seismic Design Response Spectra (CSDRS) (Fig. 3)

LOW FREQUENCY DESIGN GROUND MOTION

RG 1.60 Spectrum Anchored at 0.30 g (Fig. 1)



HIGH FREQUENCY DESIGN GROUND MOTION

North Anna ESP Site Specific Spectrum
Anchored Approx. at 0.50 g (Fig. 2)

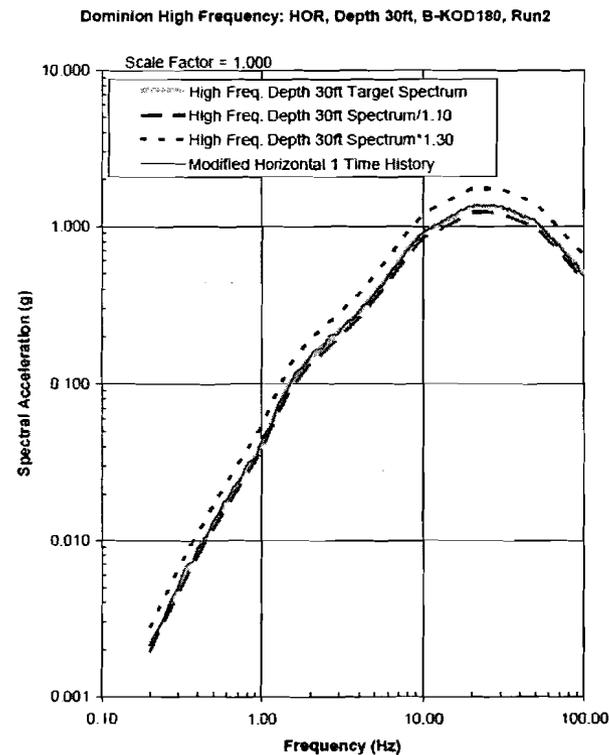
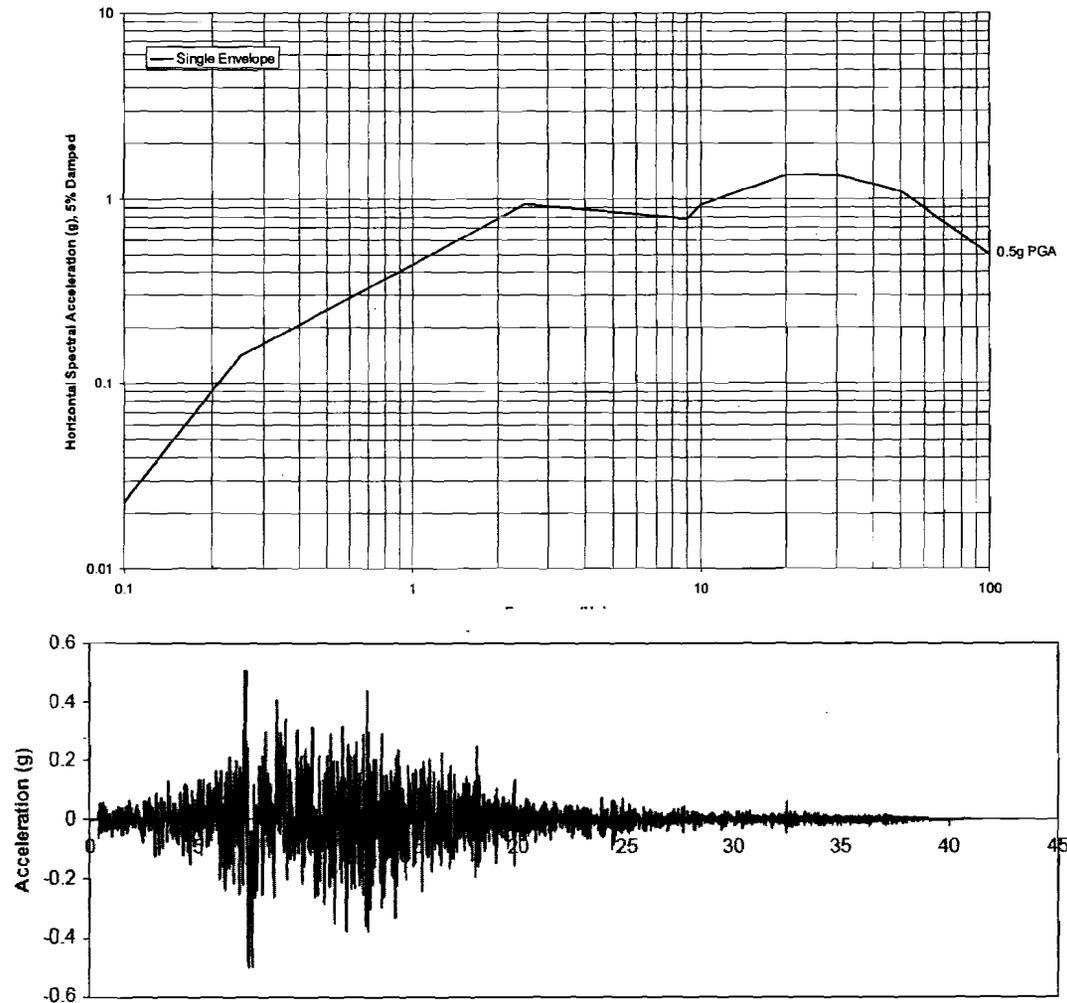


Figure 3.7-24. North Anna ESP Horizontal H1 Target Spectrum at ESBWR CB Base

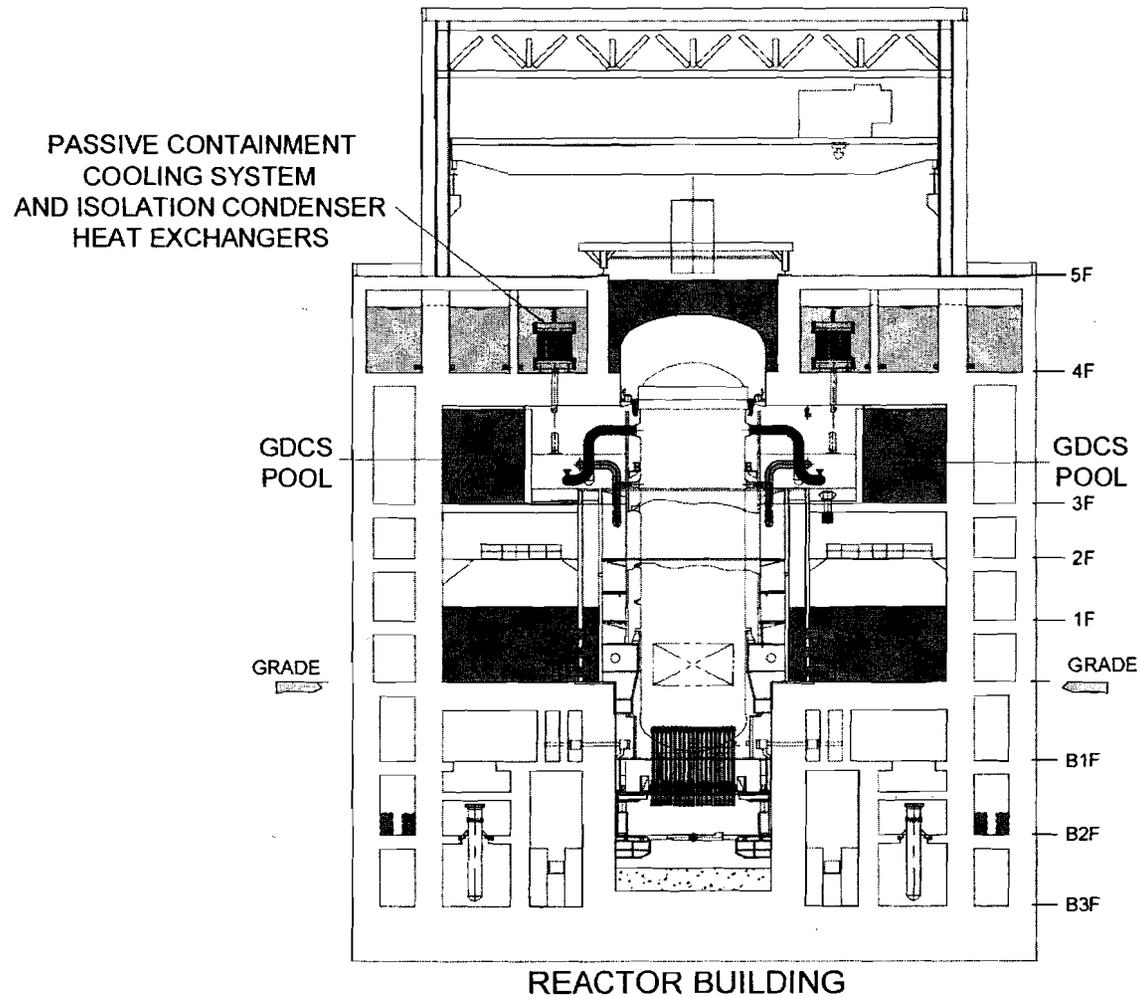
ESBWR Certified Seismic Design Response Spectra (CSDRS) (GEH SLIDE) (Fig. 3)



SEISMIC ANALYSIS OF ESBWR WATER TANKS AND FUEL POOLS

- ESBWR Water Tanks and Fuel Pools including Water Masses are modeled in the Seismic Analysis Models per ESBWR DCD Sections 3.7
- For Global Seismic Analysis Modeling, ESBWR Conservatively Used 100 % Water Mass for the Impulsive Mode analysis
- Design of Water Tanks and Fuel Pools Conforms with SRP Sections 3.7 and 3.8

SEISMIC ANALYSIS OF ESBWR WATER TANKS AND FUEL POOLS (GEH Slide)



CONCEPTUAL MODELING OF SEISMIC ANALYSIS OF WATER TANKS

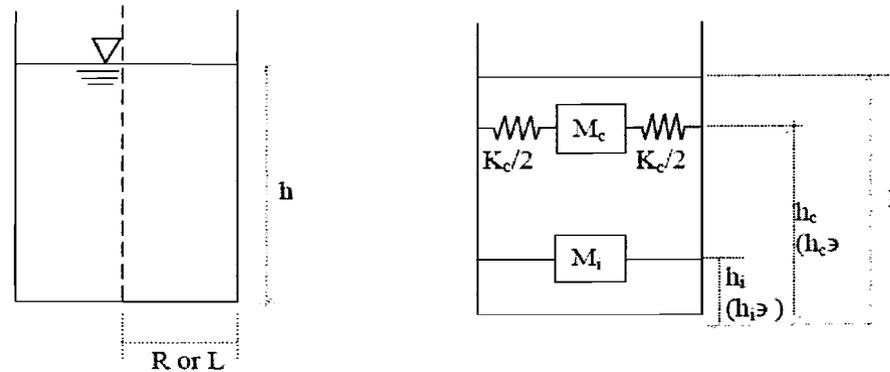


Figure 1: Description of tank dimensions and mechanical model

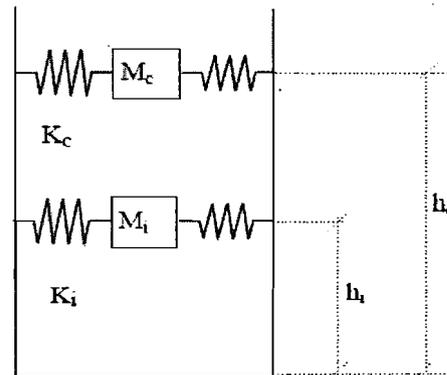


Figure 2: Mechanical models for flexible circular tanks (Malhotra et. al., 2000)

RB/FB COMPLEX SEISMIC MODEL

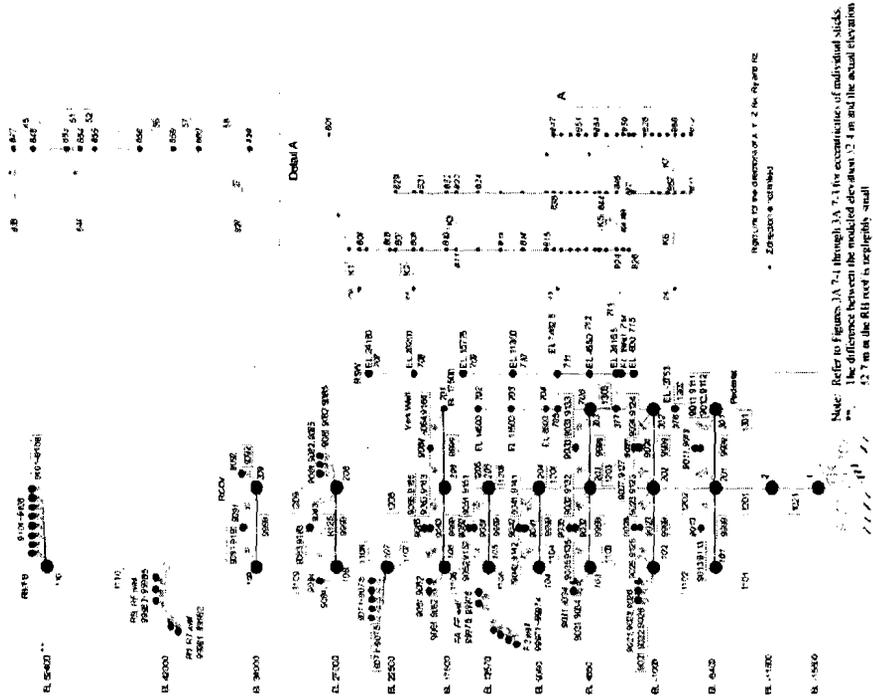
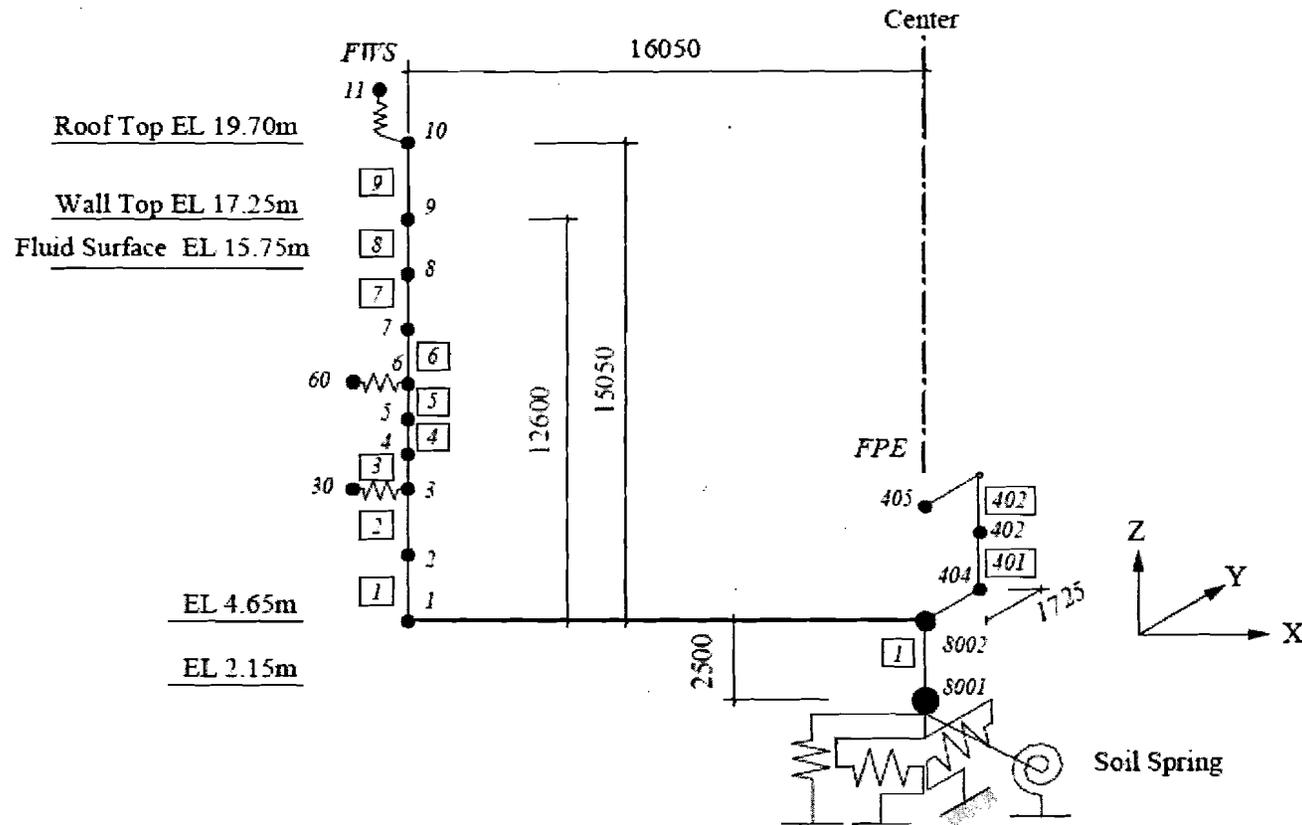


Figure 3A.7-4. RB/FB Complex Seismic Model

FWSC SEISMIC MODEL



Mass at Node 30 represents the impulsive mode.

Mass at Node 60 represents the fundamental sloshing (convective) mode.

The model is assumed to be symmetric about YZ-plane including the center line.

SEISMIC ANALYSIS OF ESBWR WATER TANKS AND FUEL POOLS (Cont'ed)

- The horizontal response analysis includes at least one impulsive mode and the fundamental sloshing (convective) mode. At least one vertical mode of fluid vibration are included in the analysis.
- The analysis models evaluate impulsive and convective masses, time period of impulsive and convective modes of vibrations, hydrodynamic pressure distribution and sloshing wave height.
- Damping values used to determine the spectral acceleration in the impulsive mode are based upon the system damping associated with the tank shell material as well as with the SSI.
- In determining the spectral acceleration in the horizontal convective mode, damping ratio is 0.5% of critical damping.

SEISMIC ANALYSIS OF ESBWR WATER TANKS AND FUEL POOLS (Cont'ed)

- The maximum overturning moment at the base of the tank and the seismically induced hydrodynamic pressures on the tank shell at any level are obtained by the modal and spatial combination methods.
- The maximum hoop forces in the tank wall are evaluated with due regard for the contribution of the vertical component of ground shaking.
- The hydrodynamic pressure at any level is added to the hydrostatic pressure at that level to determine the hoop tension in the tank shell.
- Either the tank top head is located at an elevation higher than the slosh height above the top of the fluid or else is designed for pressures resulting from fluid sloshing against this head.

ESBWR Design Certification Review

Section 3.11 – Environmental Qualification of Mechanical and Electrical Equipment

- Safety-related electrical equipment in harsh environment will be qualified by test or other methods as described in IEEE 323-1974.
- Safety-related mechanical equipment in harsh environment is qualified using test, analysis or a combination of test and analysis.
- Safety-related computer based equipment in mild environment is qualified by type testing.
- The equipment qualification method (by test or analysis or a combination of test and analysis) will be available during inspection.

CODES AND APPLICABLE TYPES OF TANKS

Table 1: Types of tanks considered in various codes

Code	Types of tanks
ACI 350.3	<ul style="list-style-type: none"> • Ground supported circular and rectangular concrete tanks with fixed and flexible base. • Pedestal supported elevated tanks.
AWWA D-100 & D-103	<ul style="list-style-type: none"> • Ground supported steel tanks with fixed and flexible base. • Elevated steel tanks with braced frame and pedestal type supporting tower.
AWWA D-110 & D-115	<ul style="list-style-type: none"> • Ground supported prestressed concrete tanks with fixed and flexible base.
API 650	<ul style="list-style-type: none"> • Ground supported steel petroleum tanks (Types of base support are not described).
NZSEE Guidelines	<ul style="list-style-type: none"> • Ground supported circular and rectangular tanks with fixed and flexible base. • Elevated tanks.
Eurocode 8	<ul style="list-style-type: none"> • Ground supported circular and rectangular tanks with fixed base. • Elevated tanks.

MAXIMUM SLOSHING WAVE HEIGHT GIVEN BY CODES

Table 7: Expressions for maximum sloshing wave height given in various codes

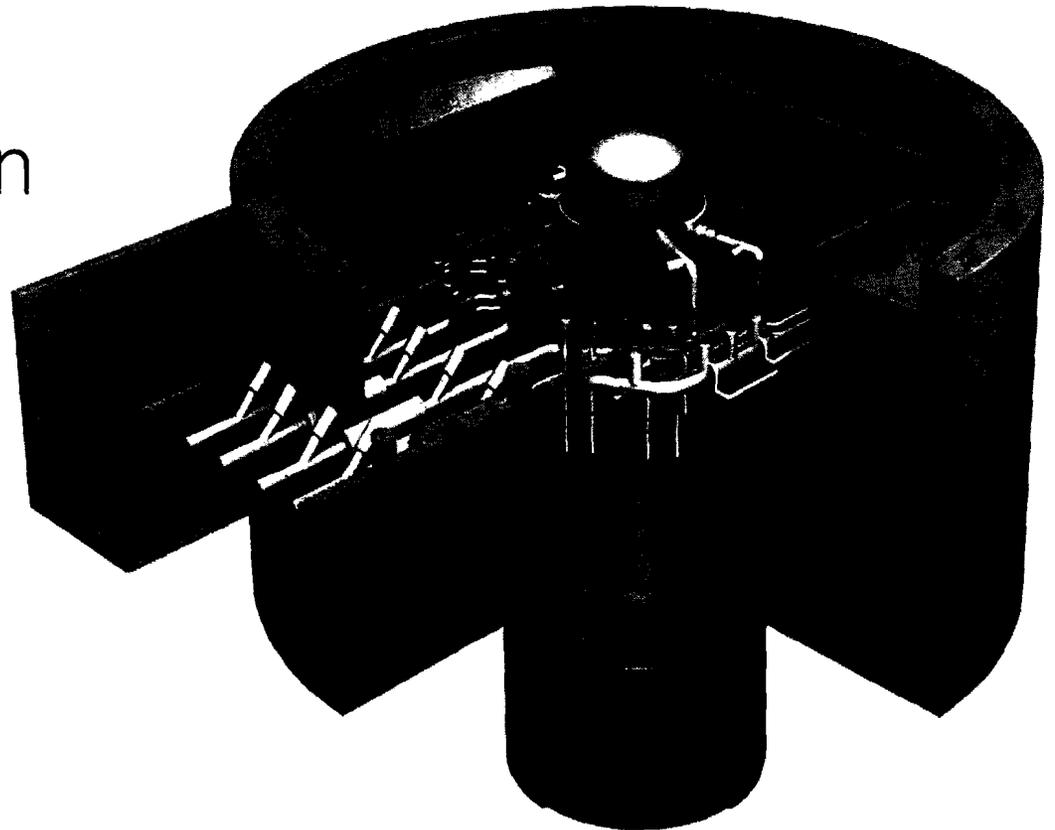
Code	Sloshing wave height
ACI 350.3	$A_c R$
AWWA D-100 & D-103	$0.84 A_c R$
AWWA D-110 & D-115	$A_c R$
API 650	Not mentioned
NZSEE Guidelines	$0.84 A_c R$ (Considering only first mode)
Eurocode 8	$0.84 A_c R$

A_c = Convective acceleration; R = Radius of tank

ESBWR DCD Chapter 3

Design of Structures,
Components, Equipment and
Systems

Advisory Committee on
Reactor Safeguards



July 9, 2008

GE Hitachi Nuclear Energy

Introduction

> Presenters

- David Hamon, ESBWR Engineering
- Jerry Deaver, ESBWR Engineering
- Ai-Shen Liu, ESBWR Engineering
- Jeffrey Waal, ESBWR Regulatory Affairs

● ● ● Presentation Content

- Chapter 3 Overview
- Selected Topics
- Summary

Chapter 3, Overview

- Chapter 3 describes the design of structures, components, equipment and systems.
 - > 3.1 – Conformance with NRC General Design Criteria.
 - > 3.2 – Classification of Structures, Systems and Components
 - > 3.3 – Wind and Tornado Loadings.
 - > 3.4 – Water Level (Flood) Design
 - > 3.5 – Missile Protection
 - > 3.6 – Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping

Chapter 3, Overview (cont'd)

- Chapter 3 describes the design of structures, components, equipment and systems.
 - > 3.7 – Seismic Design
 - > 3.8 – Seismic Category I Structures
 - > 3.9 – Mechanical Systems and Components
 - > 3.10 – Seismic and Dynamic Qualification of Mechanical and Electrical equipment
 - > 3.11 – Environmental Qualification of Mechanical and Electrical Equipment
 - > 3.12 – ASME Code Class 1, 2 and 3 Piping Systems, Piping Components and Associated Supports
 - > 3.13 – Threaded Fasteners for ASME Components

Section 3.2 – Classification of SSCs

- Safety-Related Definition – 10 CFR 50.2
 - > Safety-related structures, systems and components means those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:
 - (1) The integrity of the reactor coolant pressure boundary
 - (2) The capability to shut down the reactor and maintain it in a safe shutdown condition; or
 - (3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the applicable guideline exposures set forth in § 50.34(a)(1) or § 100.11 of this chapter, as applicable.

Section 3.2 – Classification of SSCs

- Safety Classification (DCD Section 3.2.3)
 - > Consistent with safety classifications used in ABWR DCD.
 - > Safety Class 1 – RCPB components and supports.
 - > Safety Class 2 – Mechanical SSCs involved in containment isolation functions not included in Safety Class 1, ECCS and RHR functions.
 - > Safety Class 3 – All other mechanical safety-related SSCs not included in Safety Classes 1 and 2. All safety-related electrical/I&C SSCs are Safety Class 3.
 - > Safety Class N – Nonsafety-related SSCs.
 - > Safety Classes 1 through 3 very closely related to Quality Groups A through C classifications for safety-related SSCs.

Section 3.2 – Classification of SSCs

- Safety Classification (DCD Section 3.2.3)
 - > Safety Classification establishes minimum requirements for all other classifications (seismic, quality group, QA)

Table 3.2-2

Minimum Safety Class Requirements

Safety Class	Minimum Design Requirements for Specific Safety Class				
	Quality Group	ASME Section III Code Class	Seismic Category ¹	Electrical Classification ²	Quality Assurance ⁴
1	A	1	I	N/A	10 CFR 50 Appendix B
2	B	2	I	N/A	10 CFR 50 Appendix B
3	C	3	I	Class 1E	10 CFR 50 Appendix B
N	D ³	N	II or NS	Non-Class 1E	—

Section 3.2 – Classification of SSCs

- Seismic Classification (DCD Section 3.2.1)
 - > Based on RG 1.29 and SRP 3.2.1.
 - > Seismic Category I required for all safety-related SSCs.
 - > Seismic Category II required for nonsafety-related SSCs whose failure could degrade performance of safety-related SSCs and for SSCs classified as RTNSS Criterion B from PRA analyses (DCD Section 19A.3).
 - > Some nonsafety-related SSCs assigned to Seismic Category I when required by regulations.
 - > Remaining SSCs assigned to Seismic Category NS.
 - > RG 1.143 applies special seismic requirements for radioactive waste handling SSCs

Section 3.2 – Classification of SSCs

- System Quality Group Classification (DCD Section 3.2.2)
 - > Based on RG 1.26 and SRP 3.2.2.
 - > Quality Group A – Pressure-retaining portions and supports for Reactor Coolant Pressure Boundary.
 - > Quality Group B – Pressure-retaining portions and supports not in Quality Group A for safety-related containment isolation, ECCS and residual heat removal functions.
 - > Quality Group C – Pressure-retaining portions and supports for other safety-related functions not included in Quality Groups A and B.
 - > Quality Group D – Pressure-retaining portions and supports for other systems that contain or may contain radioactive material.

Section 3.2 – Classification of SSCs

- Conclusions

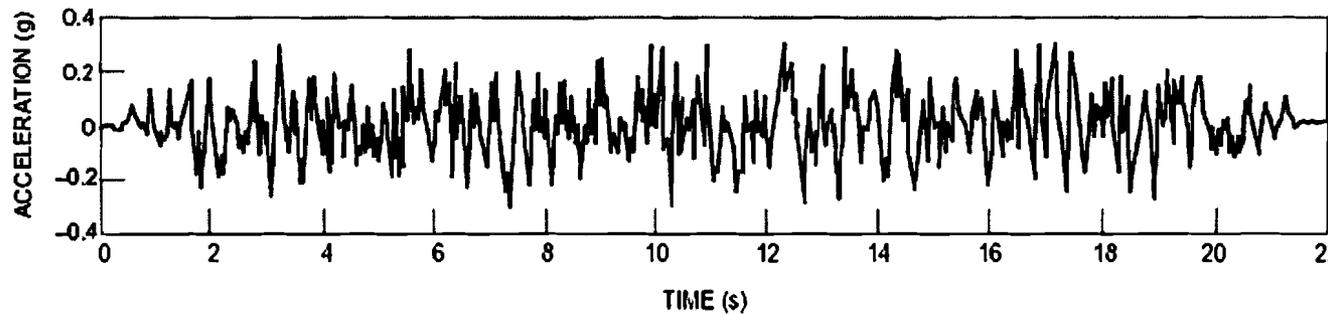
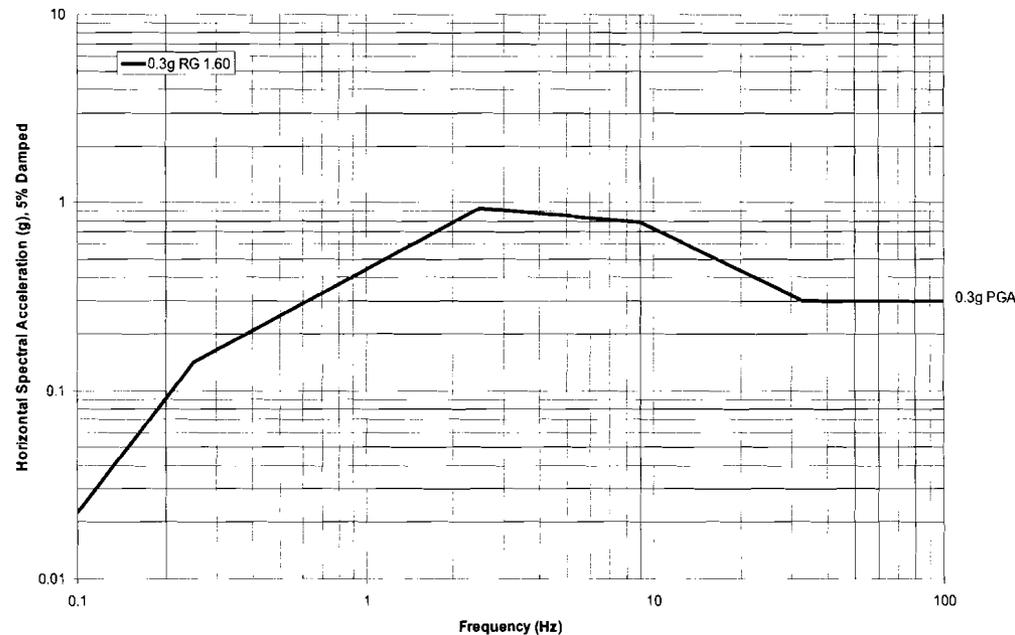
- > ESBWR classification system is consistent with previously licensed designs
- > Safety-related SSCs are determined based on 10 CFR 50.2 definition.
- > Safety classification establishes minimum requirements for other classifications and serves as entry point to QA program
- > Minimum Seismic and Quality Group classifications are upgraded as required by SRPs, RGs and design practices
- > PRA analyses determine SSCs requiring upgraded seismic design requirements due to RTNSS considerations
- > Seismic and Quality Group classifications establish basis for NRC review under SRPs 3.2.1 and 3.2.2.

Section 3.7 – Seismic Design

- Section 3.7.1 provides seismic design parameters.
 - > The CSDRS follows RG 1.60 spectra and North Anna ESP site-specific spectra at high frequencies.
 - > North Anna spectra is representative of most severe rock sites in the Eastern US.
 - Note: No recorded seismic event contains simultaneously very high low-frequency and high-frequency motions. CSDRS is very conservative.
 - > Artificial time histories were developed to match the CSDRS spectra per NUREG/CR-6728 criteria.

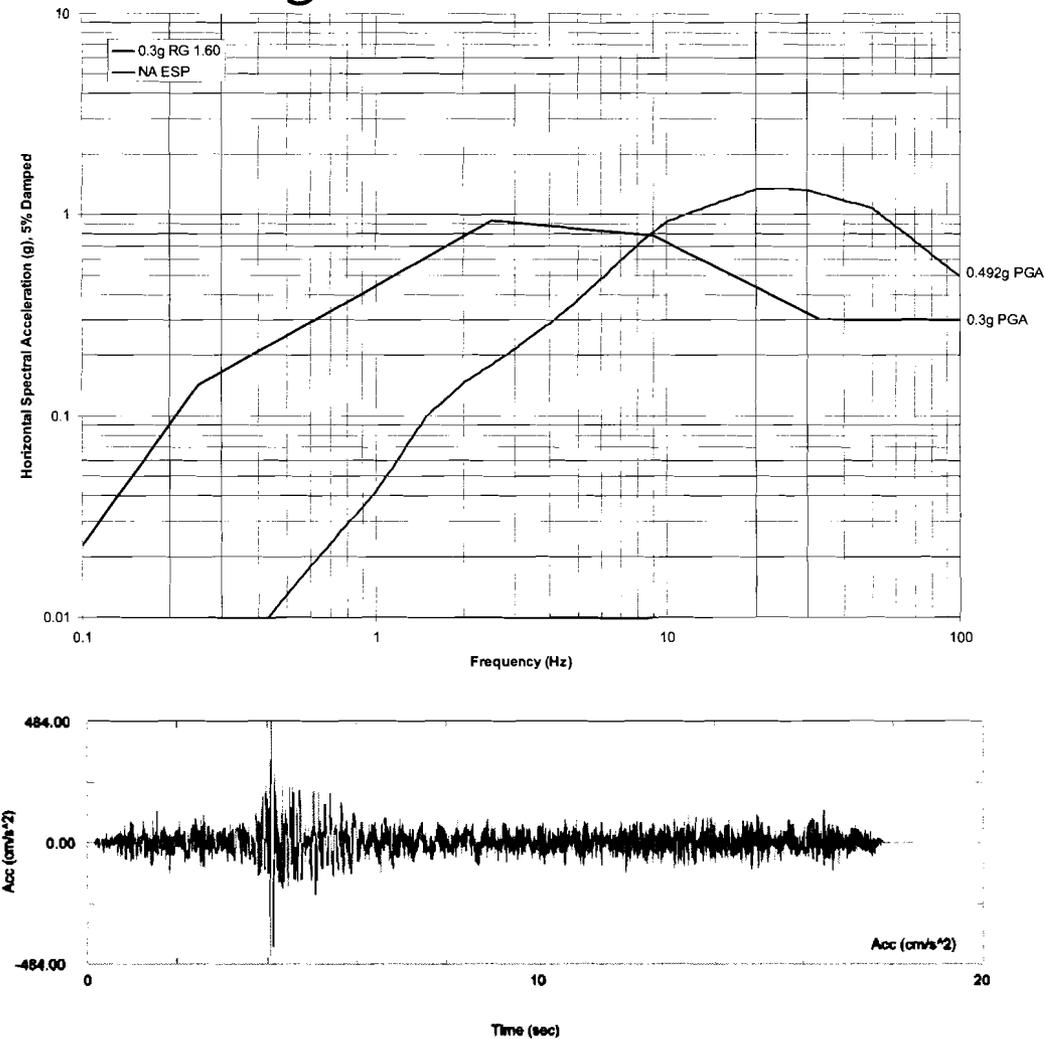
Derivation of CSDRS

- Low-Frequency Ground Motion follows RG 1.60 with 0.3g Peak Ground Acceleration (PGA).



Derivation of CSDRS

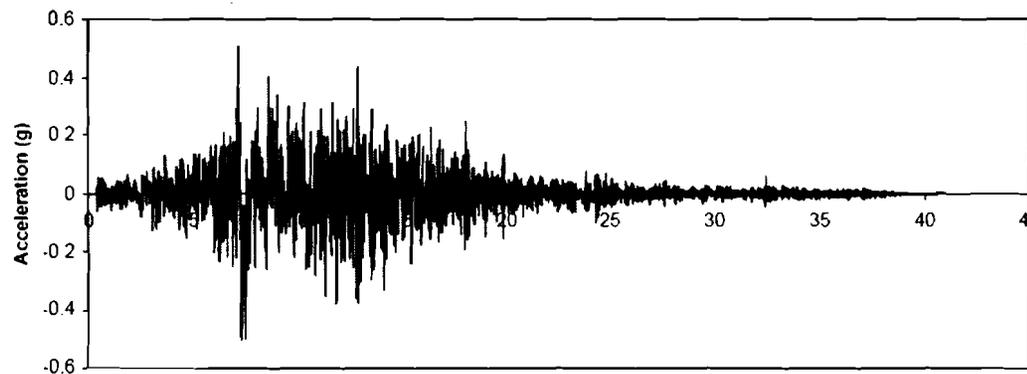
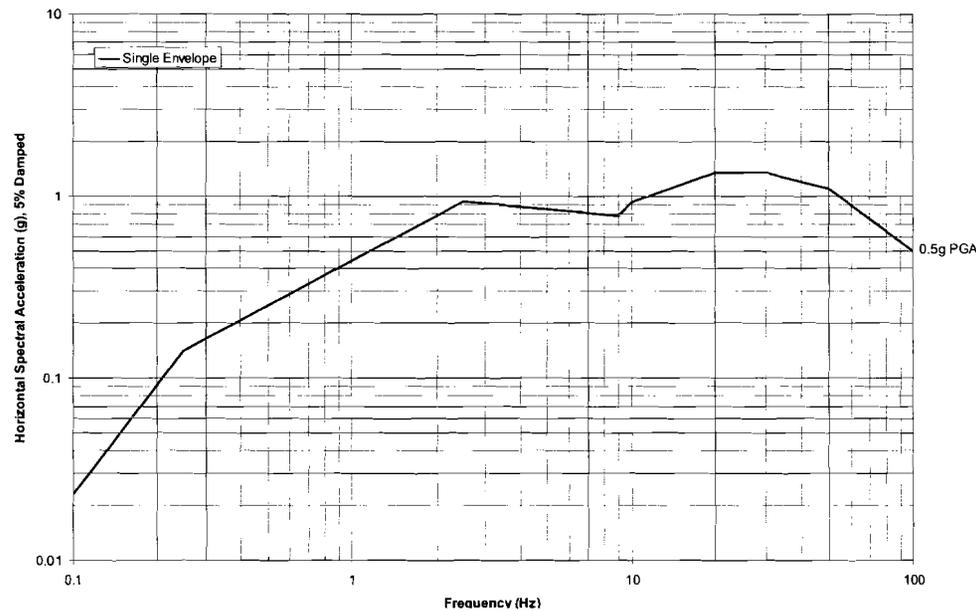
- High-Frequency Ground Motion follows North Anna ESP with 0.492g PGA.



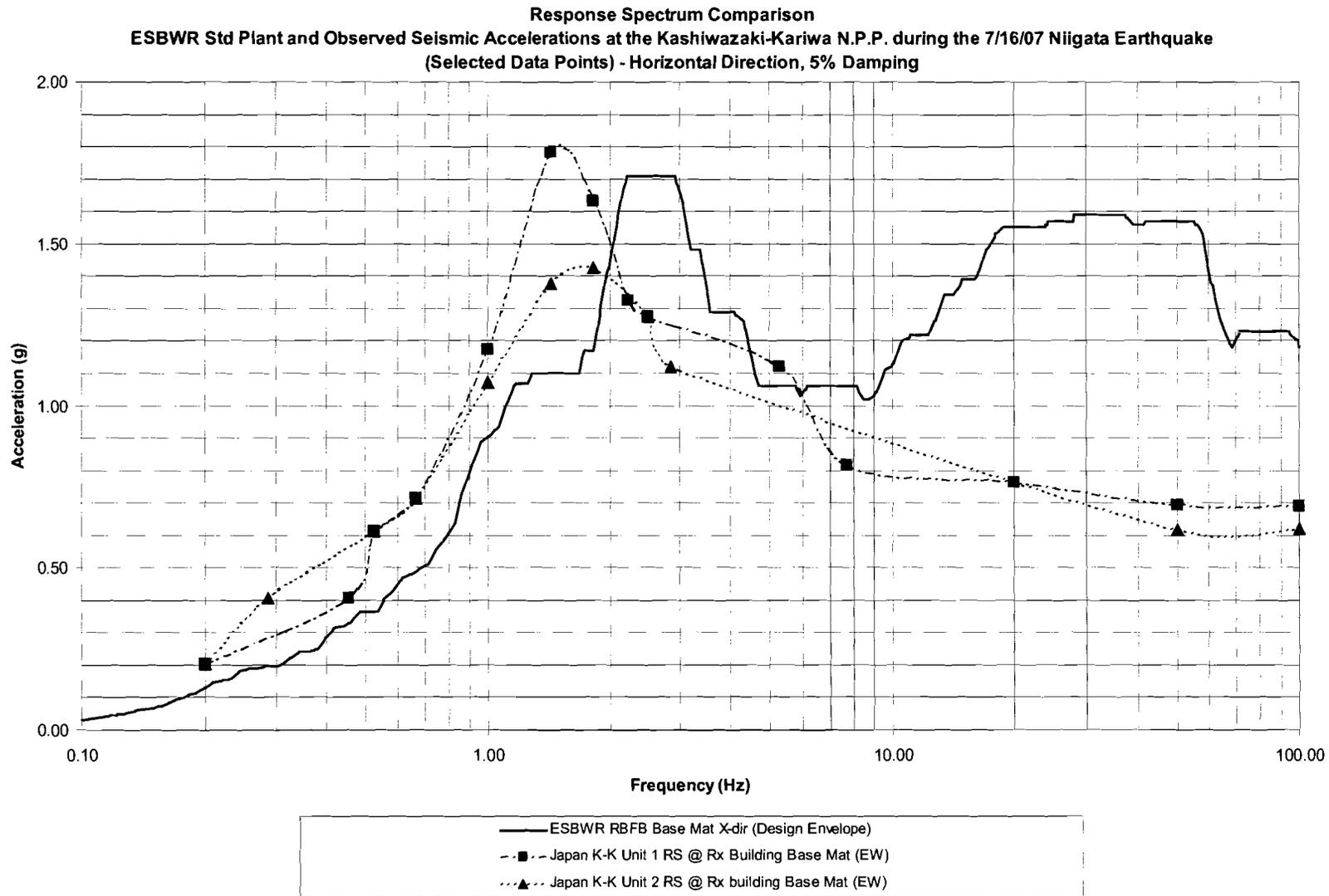
NA Time History

Derivation of CSDRS

- Design Ground Motion is the envelope of RG 1.60 and North Anna ESP Spectra with 0.5g PGA.

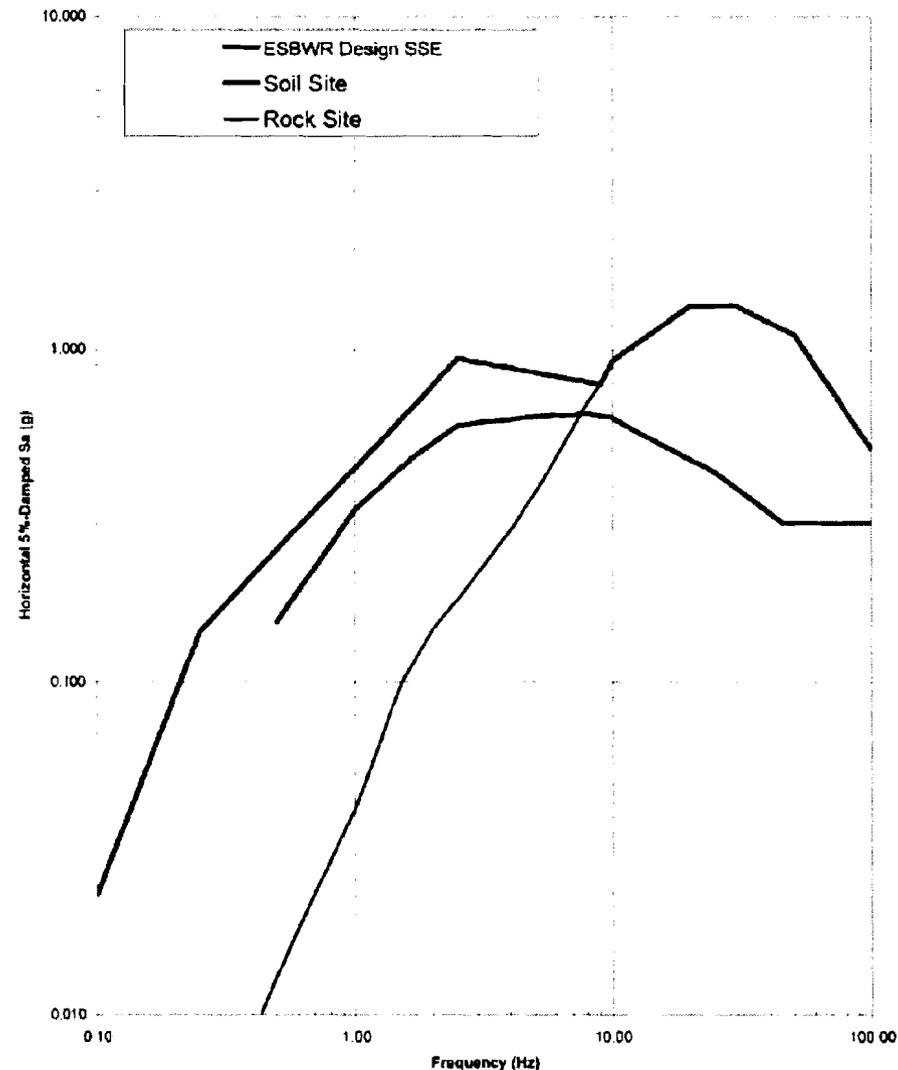


Comparison with Recent Japan Earthquake



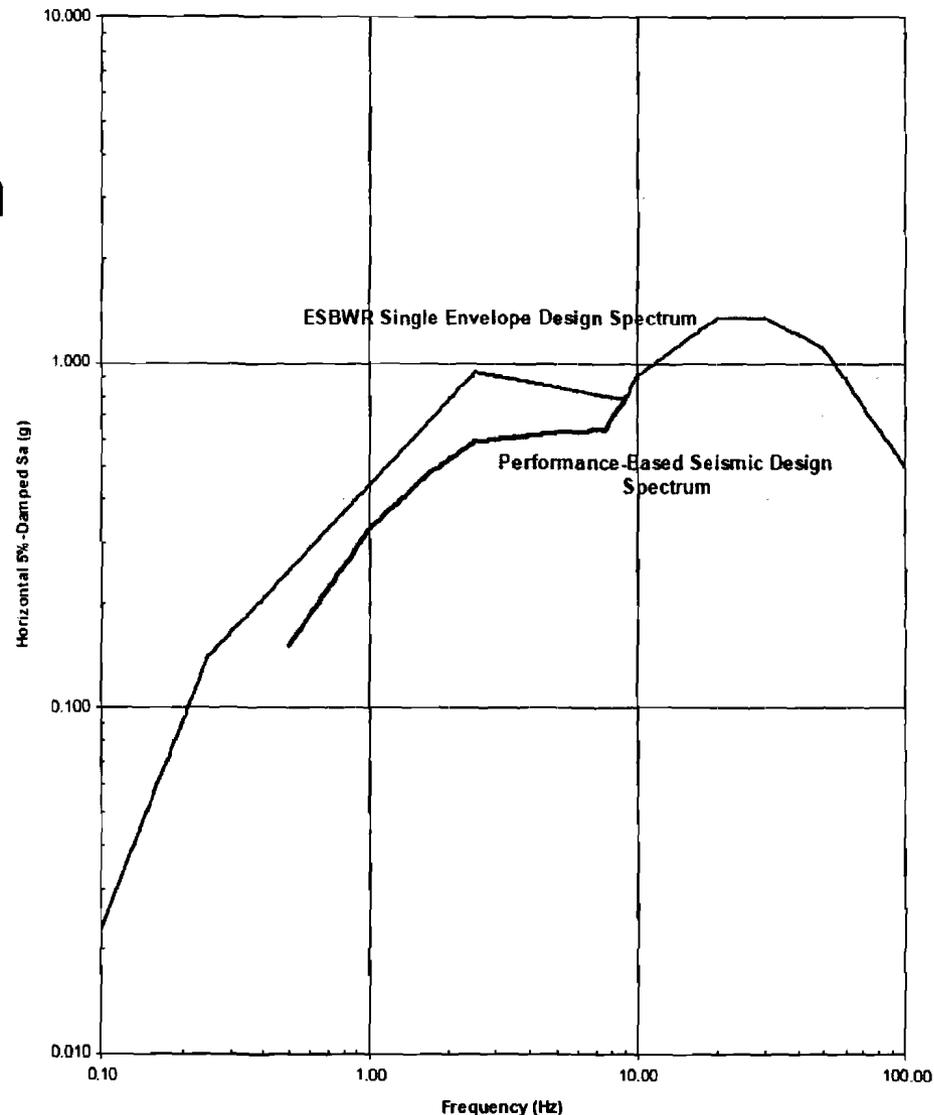
Ground Spectra Considered in Seismic Margin Analysis

- Soil site spectrum is the bounding SSE spectrum of soil sites among the 28 sites (excluding Vogtle) included in the current EPRI study
- Rock site spectrum is North-Anna ESP spectrum

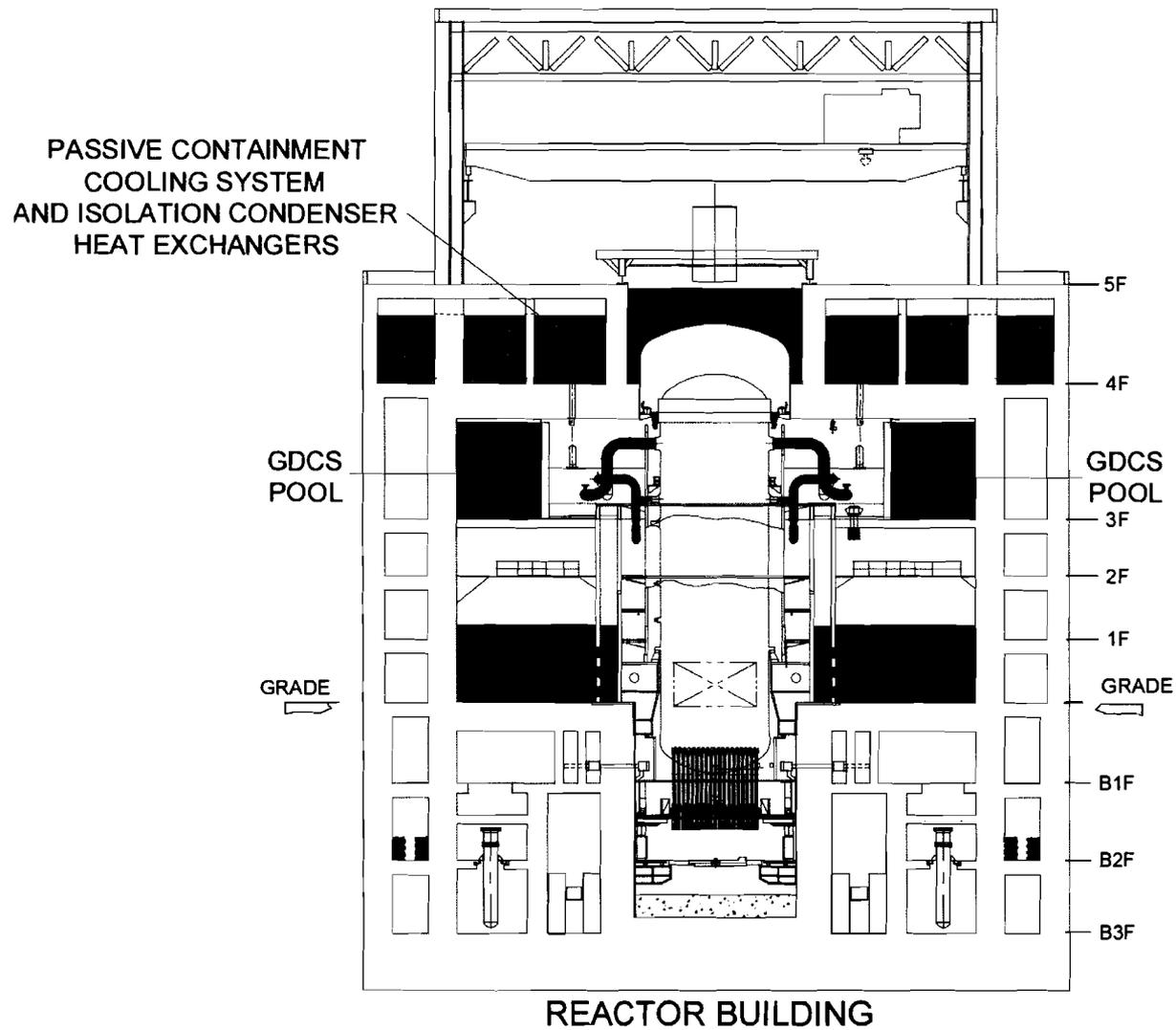


Ground Spectra Considered in Seismic Margin Analysis

- For consistency with single envelope design spectrum for all sites, performance-based soil and rock spectra are enveloped for seismic margin consideration
- Same 0.5g PGA as design spectra

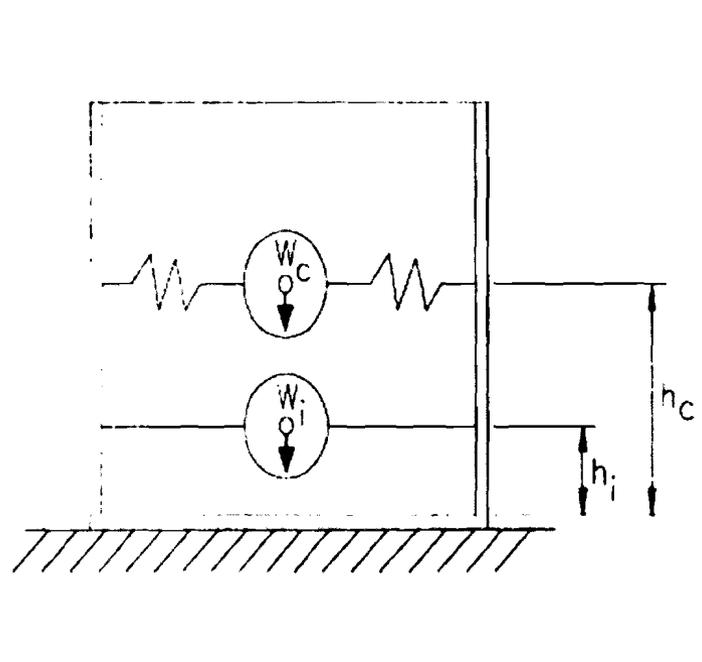


Pools in Reactor Building



Modeling of Pool Water in Seismic Analysis

- Fluids contained in pools are commonly modeled as mass-spring system made of convective (sloshing) and impulsive (rigid) components.

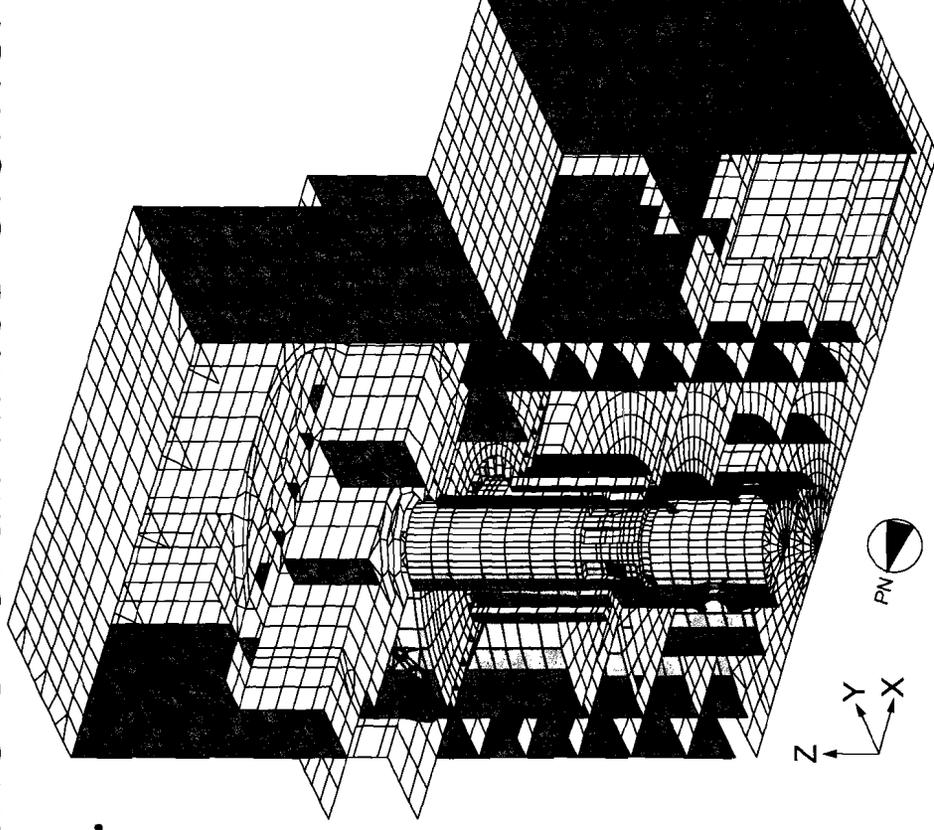


Modeling of Pool Water in Seismic Analysis

- Sloshing component responds in very low frequencies (typically < 0.5 Hz) where no structural modes of vibration exist.
- Impulsive component responds in unison with the pool structure and its effect is treated as added mass.
- The sum of masses associated with each component is equal to the the total water mass in the pool.
- For conservatism, the entire water mass of each pool is considered as impulsive mass rigidly attached to structural nodes in the seismic stick model for predicting overall response of the building structure.
- All pools are included in the model, thus the effect of pool interaction is accounted for.

Stress Analysis of Pool Structures

- Each pool structure is explicitly modeled and included in the overall finite element model of the building.



Stress Analysis of Pool Structures

- Input seismic loads consist of
 - Global loads in the form of maximum shear, moment and accelerations calculated from the seismic response analysis.
 - Local loads in the form of hydrodynamic pressures due to convective and impulsive modes on the pool boundaries.
- Resulting stresses are combined with others per required load combinations to meet design code acceptance criteria.

-
-

Summary

- Chapter 3 provides design basis of structures, components, equipment and systems.



Dominion

Millstone 3 Stretch Power Uprate

**ACRS Meeting
Containment**

July 9, 2008



Dominion

Analysis Summary

- Containment Analysis Methodology Updated To Current Standards.**

- Significant Margin Remains Following SPU.**
 - 3.6 psi containment pressure margin.
 - EEQ profiles essentially unchanged.
 - No impact on current NPSH analysis.
 - Minimum pressure unaffected by SPU.
 - Subcompartment analysis remains bounding

- Modifications Made To RSS Pipe Supports To Restore Stress Margins.**



Dominion

Containment Analysis

- Current Long Term Mass and Energy release calculations have not been updated since original licensing.**
- SPU long term mass and energy releases incorporates NRC approved methodology updates.**
- Containment analysis changed to in-house NRC approved methodology.**
- Because of changes in both mass and energy releases and containment methodologies, comprehensive sensitivity studies performed to assure limiting conditions identified.**
- Original sensitivity studies repeated as well as new sensitivity studies performed consistent with current approved updated methodologies.**



Dominion

Containment Analysis

- Ranges of initial conditions expanded for operational flexibility.**
- Containment results used for a number of different component evaluations.**
 - Containment minimum and maximum design pressure.
 - Maximum containment liner temperature.
 - Maximum pressure and temperature profiles for equipment qualification.
 - Maximum sump temperature at time of recirculation for pump NPSH.
 - Minimum and maximum temperature combinations for pipe stress evaluations.
- Bounding assumptions are dependent upon the component being evaluated.**
- Reduction in cold leg temperature for SPU evaluated for impact on subcompartment analysis.**



Dominion

Subcompartment Analysis

- For Most Scenarios, The SPU Mass And Energy Releases Are Bounded By The 10% Margin Provided In Current Analysis.**

- SPU Analysis Credits Leak-Before-Break For Exclusion of RCS Piping Break In The Steam Generator Cubicle.**

- New Analyses Performed For The Pressurizer Surge Line Break.**



Final Rule — Consideration of Aircraft Impacts for New Nuclear Power Reactor Designs

George Tartal & William Reckley
Office of New Reactors

1



SRM on SECY-06-0204

- Proposed rule - security assessment requirements for new reactor designs
- Terminate the security assessment rulemaking
- Part 73 rulemaking "sets the adequate protection standard"
- Include aircraft impact assessment requirements in Part 52
- Commission-specified proposed rule language

2



Proposed Rule

- Implemented the Commission's specified rule language
- Developed a technical and legal rationale for the rulemaking
- Published on October 3, 2007 (72 FR 56287)
- Public comment period ended on December 17, 2007

3



Public Comments

- 32 comment letters received
 - 10 from industry
 - 2 from government organizations
 - 12 from non-government organizations
 - 8 from private citizens
- 31 in favor of requiring aircraft impact assessments on nuclear power plants
 - None supported it exactly as proposed

4

Public Comments (cont)

- 8 specific requests for comment
 - Inclusion of impact assessment in application
 - Acceptance criteria
 - Records retention
 - Criteria for judging DC amendments
 - Future Part 50 applicants
 - Requirements in Part 50 or Part 52
 - Design approvals and manufacturing licenses
 - Scope of the design to be evaluated

5

Public Comments (cont)

- Overall need to address aircraft impacts
- Applicability
- Adequate protection/beyond-design-basis
- Aircraft characteristics
- Assessment
- Evaluation
- Issue Resolution / Implementation
- Safeguards/Sensitive Information
- Compliance with NEPA
- Other comments

6

Final Rule Requirements

- Applicability – § 50.150(a)
 - New construction permits (CP)
 - New operating licenses referencing new CP
 - New standard design certifications (DC)
 - New standard design approvals (DA)
 - Combined licenses not referencing DC/DA/ML
 - Combined licenses referencing noncompliant DC
 - Manufacturing licenses (ML) not referencing DC/DA
 - Manufacturing licenses referencing noncompliant DC

7

Final Rule Requirements (cont)

- Assessment – § 50.150(b)(1)
 - Assess effects of impact of a large, commercial aircraft
 - Identify and incorporate those design features and functional capabilities that avoid or mitigate, to the extent practical and with reduced reliance on operator actions, the effects of the aircraft impact on core cooling capability, containment integrity, spent fuel cooling capability, and spent fuel pool integrity
 - NRC expects to endorse NEI guidance

8

Final Rule Requirements (cont)

- Aircraft impact characteristics – § 50.150(b)(2)
 - Large, commercial aircraft used for long distance flights in the U.S.
 - Aviation fuel loading for such flights
 - Impact speed and angle of impact considering pilot (in)experience and low altitude
 - More specific aircraft impact parameters will be provided in guidance

9

Final Rule Requirements (cont)

- Content of application – § 50.150(c)
 - Description of design features and functional capabilities identified in assessment
 - Description of how those design features and functional capabilities avoid or mitigate, to the extent practical and with reduced reliance on operator actions, the effects of the aircraft impact

10

Final Rule Requirements (cont)

- Control of changes – § 50.150(d)
 - If licensee changes § 50.150-compliant information included in PSAR/FSAR
 - Redo that portion of assessment addressing changed feature or capability
 - Describe how the modified features and capabilities avoid or mitigate, to the extent practical and with reduced reliance on operator actions, the effects of the aircraft impact

11

50.54(hh) & 50.150 Relationship

- 50.54(hh)
 - Preparatory actions for potential or actual aircraft attack; Guidance and mitigative strategies for loss of large areas due to fires/explosions (ICM Orders B.5.a and B.5.b)
 - Focused on human actions and operational considerations
 - Necessary for adequate protection
- 50.150
 - Assessment of newly designed facilities to avoid or mitigate the effects of aircraft impacts
 - Focused on design considerations
 - Not necessary for adequate protection

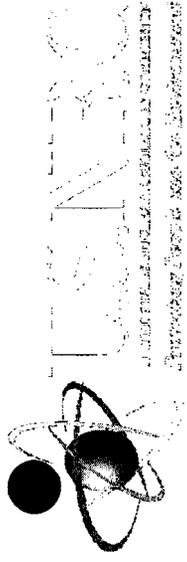
12



Rulemaking Schedule

Proposed rule published	10/3/2007
Public comment period ends	12/17/2007
Final rule ACRS briefing	7/09/2008
Final rule to EDO	9/16/2008
Final rule to Commission	9/30/2008

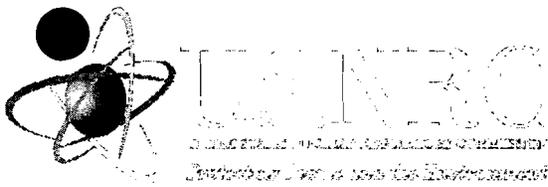
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Security Rulemaking for Nuclear Power Plants

ACRS Presentation

July 9, 2008



Discussion Topics

- Power Reactor Security Rulemaking
 - Currently with EDO (since 6/30/08)
 - Provided status to ACRS on June 4
- Portions requiring ACRS review
 - § 50.54(hh) “Mitigative Strategies and Response Procedures for Potential or Actual Aircraft Attacks”
 - § 73.54 “Protection of Digital Computer and Communication Systems and Networks”
 - § 73.58 “Safety/Security Interface Requirements for Nuclear Power Reactors”
- This briefing focuses on these three pieces
 - Staff requests ACRS to provide the Commission its views on acceptability of these three portions of the final rule package

10 CFR 50.54(hh) Overview

- § 50.54 (hh) Mitigative Strategies and Response Procedures for Potential or Actual aircraft Attacks
 - Reflects section B.5.a and B.5.b of 2002 ICM order
 - Staff believes that § 50.54(hh) is implementing the order requirements (i.e., it is not the intent to go beyond order requirements)
 - Initially in noticed proposed App C - moved to § 50.54, “Conditions of License” – re-noticed as supplemental proposed rule (published in Federal Register 4/10/2008)
- (hh)(1) Preparatory actions taken in the event of a potential aircraft attack (i.e., B.5.a)
- (hh)(2) Mitigative strategies for addressing the loss of large areas due to fires and explosions from beyond design basis events (i.e., B.5.b)

§ 50.54(hh)(1) Preparatory Actions

- § 50.54(hh)(1):
 - Authenticate threat source
 - Maintain communication with source
 - Contact onsite and offsite organizations
 - Take onsite actions to mitigate impact
 - Reduce visual discrimination
 - Disperse equipment and personnel
 - Recall of personnel
- Guidance under development – uses existing advisories and information (DG 50XX)

§ 50.54(hh)(2) Mitigating Measures

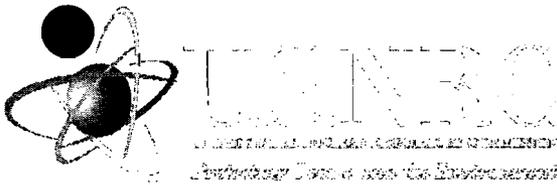
- § 50.54(hh)(2)
 - Fire fighting
 - Operations to mitigation fuel damage
 - Actions to minimize releases
- These requirements map into 14 strategies in current license conditions for all current licensees
- Current licensees are in compliance
- Guidance under development

§ 73.54 Protection of Digital Computer and Communication Systems and Networks

- Cyber threat was included as part of DBT (§ 73.1) issued March 2008
- These requirements were in proposed § 73.55(m)
- Moved to stand-alone section in part 73
- Required to development and submit cyber plans for NRC review and approval (intro paragraph)

§ 73.54 Cyber Security

- § 73.54(a) – Identifies protected digital assets:
 - Safety-related and ITS functions
 - Security functions
 - EP functions
 - Supports systems
- Protect from cyber attacks that:
 - Adversely impact data and/or software
 - Deny access to systems, services, data
 - Adversely impact operation of digital assets
- (b) Requires analysis to identify assets to be protected
- (c) Program design requirements
 - Protect digital assets identified in (b) – ensure function not adversely impacted
 - Apply defense-in-depth
 - Mitigate adverse affects of attacks



§ 73.54 Cyber Security Cont'

- (d) Provides training, risk mgmt, and change control requirements
 - Cyber awareness training
 - Evaluate and manage cyber risks
 - Control changes to ensure that cyber performance objectives are maintained
- (e) Cyber plan requirements
 - Cyber plan is required – requirements for content
 - Cyber plan must be submitted for NRC review and approval)
- (f) – (h) Procedures, Reviews, Records
- Guidance: DG 5022 Cyber Security Programs for Nuclear Facilities
 - Completed 6/1/08 (OUO)
 - Distributed to appropriate licensees
 - Public meeting in July

§ 73.58 Safety/Security Interface

- Addresses part of UCS petition (PRM 50-80)
- Makes explicit what is already implicitly required by regulation
- (b) Requires licensees to assess/manage potential for adverse interactions between security ↔ safety
- (c) Scope – Planned and emergent activities
- (d) Conflicts – Communicate conflicts and take compensatory and mitigative actions

§ 73.58 Safety/Security Interface

- **DG 5021 Safety/Security Interface**
 - Published in Federal Register July 24, 2007
 - Public Meeting held; comments received & under consideration

Summary

- Final rule requirements for § 50.54(hh), § 73.54, and § 73.58 are complete and with EDO
- Draft guidance developed – work continues to finalize guidance
- Expect further interactions with ACRS to finalize guidance (meet with ACRS when finalizing guidance)
- Staff requests ACRS provide its opinion on acceptability of the final rule provisions to the Commission

Containment Review

Ahsan Sallman
Containment & Ventilation Branch
Division of Safety Systems
Office of Nuclear Reactor Regulation

Containment Review

- Primary Containment Functional Design
- Subcompartment Analyses
- Mass and Energy Release
- Combustible Gas Control in Containment
- Containment Heat Removal
- Pressure Analysis for ECCS Performance Capability
- Reconsideration of Generic Letter 96-06

Summary of Staff Review

- RS-001, "Review Standard for Power Uprates," was followed as guidance
- Applied NRC-approved analytical methods
- RAIs were satisfactorily answered
- Applicable GDCs were satisfied
- SRP acceptance criteria were satisfied
- Met 10 CFR 50 requirements

Primary Containment Functional Design

- Application of GOTHIC 7.2a methodology to MPS3 approved by SE, dated August 30, 2006
- Conservative initial conditions for LOCA and MSLB
- Analyzed a spectrum of breaks for LOCA and MSLB

Primary Containment Functional Design Continued

- Conclusions

- Limiting short-term LOCA & MSLB peak pressure & temperature are bounded by the containment design conditions
- Limiting long-term LOCA & MSLB pressure & temperature responses are evaluated to be acceptable from the standpoint of EQ

Subcompartment Analyses

- NRC has approved leak-before-break (LBB) methodology for MPS3 contained in the license renewal SE – NUREG-1838
- Used LBB criteria for selection of pipe breaks
- Conclusion
 - Sufficient margin in the differential pressures across the subcompartment walls under SPU conditions

Mass and Energy Release Analyses for LOCA & Secondary Pipe Ruptures

- Analyzed a spectrum of breaks for LOCA based on NRC-approved methods: LOCA blowdown & reflood (WCAP-10325-P-A & WCAP-8264-P-A) and post-reflood (DOM-NAF-3-0-0-P-A)
- Analyzed a spectrum of secondary breaks based on NRC approved methods in WCAP-8822, WCAP-8822-01-P-A, WCAP-8822-02-P-A, and WCAP-7907-P-A

Mass and Energy Release Analyses for LOCA & Secondary Pipe Ruptures Continued

- Used conservative assumptions and inputs to maximize M&E release
- Conclusion
 - Staff reviewed and agreed with the licensee's evaluation of LOCA M&E release

Combustible Gas Control in Containment

- SER, dated June 29, 2005, removed hydrogen recombiners & monitoring system from Tech Specs as per 10 CFR 50.44 and RG 1.97
- Conclusion
 - SPU does not impact combustible gas control in containment

Containment Heat Removal

- Containment accident pressure was not used for calculation of NPSHA for RSS pumps
- Input parameters are conservative or the same as the current analysis
- Used GOTHIC methodology to calculate the maximum sump temperature

-
-
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Containment Heat Removal Continued

- Conclusion
 - RSS pumps NPSHA requirement is met

Pressure Analysis for ECCS Performance Capability

- Used conservative initial conditions for calculating the minimum containment backpressure transient
- Calculated containment pressure transient bounds the transient used in the ECCS performance analysis
- Conclusion
 - ECCS performance capability is unaffected by SPU

Reconsideration of Generic Letter 96-06

- GL 96-06 states, "Thermally induced overpressurization of isolated water-filled piping sections in containment could jeopardize the ability of accident-mitigating systems to perform their safety functions and could also lead to a breach of containment integrity via bypass leakage. Corrective actions may be needed to satisfy system operability requirements."

Reconsideration of Generic Letter 96-06 Continued

- Licensee reviewed GL 96-06 for piping system penetrating containment along with its relief valves as a part of SPU system design pressure & temperature evaluation
- Conclusion
 - No hardware changes are necessary for SPU conditions

Summary

- Applicable GDCs were satisfied
- SRP acceptance criteria were satisfied
- Met 10 CFR 50 requirements



Millstone 3 Stretch Power Uprate

**ACRS Meeting
Fuel & Safety Analysis**

July 9, 2008



- No Change In Fuel Design.**

- Core Will Be 100% RFA-2. There Are No Mixed Core Issues.**

- SPU Achieved Through An Increase In Feed Batch Size.**

- Reduction In Peaking Factor Design Limits To Increase DNBR Margin.**



Dominion *Fuel Design*

<u>Parameter</u>	<u>Current</u>	<u>SPU</u>
Fuel Type	Robust Fuel Assembly (17x17 RFA-2)	Unchanged
Burnable Poison	Integral fuel burnable absorber (IFBA)	Unchanged
Blankets	Annular pellets in axial blankets	Unchanged
Maximum Enrichment	5 weight percent	Unchanged



Dominion

Initial Conditions

- Currently Analyzed For A Single Nominal Temperature At 100% Power With No Margin For Coastdown.**
- SPU Analyses Performed For A 8°F Nominal Temperature Band At 100% Power And 10°F Coastdown For Added Operational Flexibility.**
- SPU Operation Selected At The Same Nominal Temperature As Current Operation.**
- Modest Increase In Hot Leg Temperature Will Have A Small Impact On The Life Of SG Tubes And Other Hot Leg Alloy 600 Components.**
- Modest Decrease In Cold Leg Temperature Will Have A Modest Improvement In The Life Of Reactor Vessel Head Penetrations And Other Cold Leg Alloy 600 Components.**
- Pressurizer Level Chosen To Balance Margins For Operation And For Design Basis Transients.**



Dominion

Safety Analysis

- ❑ **All plant specific safety analyses re-analyzed at SPU conditions.**

- ❑ **Significant Safety Analysis Margins Remain After SPU.**
 - 11.7% DNBR margin.
 - 419 °F LB LOCA PCT margin.
 - 1007 °F SB LOCA PCT margin.
 - 3.6 psi containment pressure margin.

- ❑ **Margins Achieved Through Plant Modifications.**

- ❑ **Methodologies Updated To Current Approved Standards.**

- ❑ **SPU has small impact on currently approved AST radiological analyses.**



Dominion ***DNBR Margin***

- Included In Margin Management Program.**

- Current DNBR Margin Used To Address Upper Plenum Anomaly.**

- Modifications Will Address Upper Plenum Anomaly And Re-establish DNBR Margin.**

- Preliminary Analyses Used To Establish Target SPU DNBR Margin.**

- Final Analyses Resulted In Small Change To Target SPU DNBR Margin.**



Dominion

Pressurizer Overfill

- Included In Margin Management Program.**

- Initial Pressurizer Level Selected To Balance The Margin To Letdown Isolation For Routine Reactor Trips And Margin To Pressurizer Overfill For Design basis transients.**

- Current Limiting Event Is The Inadvertent ECCS Actuation At Power.**

- Hardware Modification Proposed To Significantly Reduce The Severity Of The Pressurizer Overfill Rate For This Event.**

- Modification Eliminates The Inadvertent ECCS Actuation As The Limiting Event. The New Pressurizer Overfill Limiting Event Changed To The CVCS Malfunction Event, Currently Considered Bounded And Not Explicitly Analyzed For Millstone Unit 3.**



Dominion

Design Basis

- All Design Requirements Are Met At SPU Conditions.**

- In General, SPU Has A Small Impact On The Results.**

- In General, Safety Analysis Margins Are Essentially The Same With Significant Margin Remaining After SPU.**



Dominion

Radiological

- Alternate Source Term Methodology Submitted In 2004 And Approved By The NRC In 2006.**

- 2004 Submittal Included 6.5% Power Increase In Anticipation Of SPU.**

- Alternate Source Term Methodology Resulted In Significant Increase In Available Radiological Dose Margins.**

- For SPU, All Events Have Been Re-analyzed To Take Into Account The Additional 0.5% Power Increase.**

- SPU Impact On Radiological Analysis Is Small.**