

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Future Plant Designs Subcommittee

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Friday, June 25, 2004

Work Order No.: NRC-1559

Pages 1-158

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

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

+ + + + +

MEETING OF THE SUBCOMMITTEE ON

FUTURE PLANT DESIGNS

+ + + + +

FRIDAY, JUNE 25, 2004

+ + + + +

The Subcommittee meeting commenced at 8:30 a.m., in Room T-2B3 of the Nuclear Regulatory Commission, 11545 Rockville Pike, Rockville, Maryland, Dr. Thomas S. Kress, Subcommittee Chairman, presiding.

SUBCOMMITTEE MEMBERS PRESENT:

THOMAS S. KRESS, Chairman

VICTOR H. RANSOM

STEPHEN L. ROSEN

WILLIAM J. SHACK

JOHN D. SIEBER

GRAHAM B. WALLIS

NRC STAFF PRESENT:

GOUTAM BAGCHI

STEVEN BLOOM

NEAL R. GROSS

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

1 NRC STAFF PRESENT (Continued):

2 THOMAS CHENG

3 GANESH CHERU

4 JOSEPH COLACCINO

5 DAVID CULLISON

6 BOB DENNIG

7 ANDRE DROZO

8 LAURA DUDES

9 ROB ELLIOT

10 BARRY ELLIOTT

11 MICHELLE HART

12 MATTHEW A. MITCHELL

13 LAUREN QUINONES

14 SELIM SANCAKTAR

15 JOHN SEGALA

16 PATRICK SEKERAK

17 DAVID SOLORIO

18 DAVID TERAQ

19 JERRY WILSON

20

21 ALSO PRESENT:

22 MIKE BATTAGLIA, Ionics, Inc.

23 ED CUMMINS, Westinghouse

24 CESARE FREPOLI, Westinghouse

25 R.O. GAUNTT, Sandia National Labs

NEAL R. GROSS

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

1 ALSO PRESENT (Continued):

2 RANDOLPH GOUNDER, Ionics, Inc.

3 PAIGE NEGRES, GE

4 JIM SCOBEL, Westinghouse

5 TERRY SCHULZ, Westinghouse

6 JOHM TROTTLER, Framatome

7 LEE TUNON-SANJUR, Westinghouse

8 RON VIJUK, Westinghouse

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

C O N T E N T S

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

PAGE

Introduction, Chairman Kress 5

AP1000 Design Certification Review

Design Overview, Terry Schulz 6

NRC Review Status, John Segala 90

Aerosol Removal Coefficient, Michelle Hart . . 114

ACRS Interim Letter Issues, John Segala . . . 135

Summary Statements 153

Agenda for July Full Committee Meeting 153

NEAL R. GROSS

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

P R O C E E D I N G S

(8:30 a.m.)

CHAIRMAN KRESS: This is the meeting of the Advisory Committee on Reactor Safeguards, Subcommittee on Future Plant Designs.

I am Thomas Kress, Chairman of the subcommittee. Members in attendance are Jack Sieber, Bill Shack, Steve Rosen, and Graham Wallis.

MR. SIEBER: And Vic is here.

CHAIRMAN KRESS: Vic Ransom is here also. Okay. He just arrived.

MR. SIEBER: There he is.

CHAIRMAN KRESS: Okay. The purpose of this meeting is to discuss with the NRC staff and Westinghouse representatives the AP1000 safety evaluation report, and the resolution of any open items and any ACRS lingering concerns and issues.

The subcommittee will gather information, analyze relevant issues and facts and formulate proposed positions and actions as appropriate for deliberation by the full committee.

Dr. Medhat El-Zeftawy is the designated federal official for this meeting.

The rules for participation in today's meeting have been announced as part of the notice of

NEAL R. GROSS

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

1 this meeting previously published in the Federal
2 Register on June 14th, 2004.

3 A transcript of the meeting is being kept
4 and will be made available as stated in the Federal
5 Register notice. Therefore, it is requested that
6 speakers identify themselves and use a microphone if
7 possible.

8 We have received no written comments or
9 requests for time to make oral statements from any
10 members of the public regarding today's meeting.

11 I don't have any particular preliminary
12 comments except to say that this is probably the
13 culmination meeting of a long series of ACRS meetings
14 with Westinghouse and the staff on this subject. So
15 with that, I'll turn the floor over to the
16 Westinghouse people to get started.

17 MR. VIJUK: And I'm Ron Vijuk. I manage
18 the licensing for AP1000 in Westinghouse, and we
19 wanted to start today with an overview of the design
20 and some of the analysis that backs it up just as a
21 refresher, if you will, and Terry Schulz will make
22 that presentation.

23 MR. SCHULZ: Good morning. As Ron said,
24 my name is Terry Schulz, and I hope to just throw some
25 information up here for your consideration. You've

NEAL R. GROSS

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

1 probably seen it all before, but it will put us all on
2 the same page.

3 CHAIRMAN KRESS: It never hurts to refresh
4 the memory of the ACRS.

5 (Laughter.)

6 MR. SCHULZ: I didn't want to say too
7 much.

8 DR. WALLIS: Is this an eye test on the
9 bottom right-hand side there?

10 MR. SCHULZ: No, you don't have to read
11 that. This is sort of a visual thing here,
12 impression.

13 AP1000 is built on a huge investment that
14 Westinghouse and our partners made in AP600
15 technology, developing and designing systems,
16 arranging the RCS loop, introducing and developing
17 modular construction.

18 The eye test down here is a very, very
19 detailed construction schedule which I certainly don't
20 intend to get into, but it is based on actual sort of
21 bottoms-up, you know, piece by piece building.

22 The design approach results in major
23 simplifications in the design which help construction
24 schedule, help safety in terms of having fewer things
25 to worry about, maintain, inspect and test. Severe

NEAL R. GROSS

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

1 accident PRA has been incorporated into the design
2 from the beginning of the development program. AP600
3 has been licensed before, which is a stepping stone
4 with a big step forward helping us go ahead with
5 AP1000, and of course, behind it is a lot of testing
6 that you've hear about to prove out the passive
7 systems.

8 Of course, the thing about AP1000 is
9 trying to increase the power sufficiently so that we
10 can be competitive in the deregulated U.S. power
11 market.

12 We had a lot of constraints that we put on
13 ourselves to maximize the use of AP600 design basis
14 and all the information we did, and in particular, the
15 structures. We basically didn't change any of the
16 plan view of the structures. We did have to raise the
17 containment a bit. I'll show you some more of that
18 later.

19 In our mind we needed to retain the AP600
20 proven component, and this, in particular, the power
21 generation, the core, the reactor, the steam
22 generator, the reactor coolant pumps, those things.

23 And of course, this all then relates to
24 the basis and the credibility of the cost estimate and
25 construction schedule and all of that. And of course,

NEAL R. GROSS

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

1 we had been talking about licensing with you, and
2 we're nearing completion of that process, and having
3 piggybacked on AP600 has obviously helped us all.

4 The design features, the basic design
5 features are the same as AP600. We are talking about
6 an integrated plant design, the proof in components,
7 no prototype, simplified loop and canned pumps,
8 passive systems, increased safety margins, a
9 simplified defense-in-depth systems, the digital I&C
10 pump at control room (phonetic), and optimize plant
11 arrangement incorporating construction maintenance,
12 modularization, and all of that.

13 CHAIRMAN KRESS: What's your experience
14 base with hand motor pumps of that size? Have you --

15 MR. SCHULZ: The pumps that we were going
16 to use in AP600 were of very similar size to what's
17 been the latest Navy pumps in the carriers.

18 CHAIRMAN KRESS: I see.

19 MR. SCHULZ: So that size pump has got a
20 solid, very direct basis. The pumps for the AP1000
21 are a little bigger. The experience that the pump
22 designers have had in, for example, creating the Navy
23 pumps which were a step up from pumps they had before
24 was very good. They've developed design techniques
25 and the test development programs that they have seem

NEAL R. GROSS

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

1 to be effective in these incremental increases in pump
2 sizes.

3 So the pump for AP1000 hasn't been built
4 exactly, but things that are near to it have been
5 built, and there has been confidence and good
6 experience in making, you know, such size increases.

7 DR. RANSOM: As long as we're asking
8 questions, what was the nth in the cost on the first
9 slide?

10 MR. SCHULZ: What's that? Six? Three,
11 three plants.

12 DR. RANSOM: Or three, that's a third
13 plant?

14 MR. SCHULZ: Yes.

15 AP1000 is going to start out at a higher
16 level of design detail than we did in the past. So
17 I think we'll be a sharper learning curve.

18 You've seen the main loop. It is
19 obviously a two-loop plant, four pumps. Having four
20 pumps does minimize the size of the pumps, which helps
21 us in incorporating the canned motor pumps.

22 The fuel internals, reactor vessel, are
23 very similar to the Doel Tihange 3, which were three-
24 loop plants with a similar power rating. South Texas
25 has similar internals, but it's obviously a four-loop

NEAL R. GROSS

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

1 plant and a little bit bigger. There's no bottom on
2 instrumentation. So the traditional Westinghouse
3 movable in-core instrumentation has been eliminated.
4 Again, this is the same as AP600.

5 Improved materials for 60-year life.

6 We have a larger steam generator, which is
7 similar to what the Westinghouse CE type design, and
8 in the System 80 and Westinghouse-Pittsburgh has
9 actually built replacement steam generators of a
10 similar size.

11 We talked a little about the canned motor
12 pumps. they have a lot of benefits for the plant
13 design in terms of new seals that can fail, can leak,
14 and from an accident point of view, they also require
15 maintenance of the utilities like that. So these
16 pumps are very almost maintenance free.

17 There's a lot of good experience, history
18 mostly in the nuclear Navy, but also in some earlier
19 like shipping support in Yankee Rowe (phonetic)
20 plants.

21 The main loop piping has been greatly
22 simplified. Each leg has got a weld on either end.
23 So there's fewer welds in between. The supports
24 because the pumps are connected to the steam
25 generator, they're not supported directly; just the

NEAL R. GROSS

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

1 steam generator.

2 The pressurizer is larger, which gives us
3 operating margins relative to operating plants.

4 Approach to safety, we use our, quote,
5 unquote, passive safety systems which do rely on
6 realignment, a one time realignment of valves, but
7 does not rely on any active pumps, diesels, fans to
8 operate.

9 So once we realign the systems into their
10 passive safety mode, they continue operating without
11 the need for support systems. The only support system
12 we actually do need, of course, is anything involved
13 with realigning the valves. A lot of the valves are
14 fail safe, which then means if you lose power, lose
15 the I&C system completely, they go to the safe
16 position.

17 There's a few of them, like the ADS valves
18 which need to be powered. So we do need electrical
19 power in I&C.

20 Importance of operator reactions has been
21 significantly reduced. You can see that in some of
22 the PRA numbers.

23 Design basis accidents are met with just
24 the passive systems, without reliance on the non-
25 safety. The PRA safety goals can be met without the

NEAL R. GROSS

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

1 non-safety systems.

2 We do still have active non-safety related
3 systems for normal reactor make-up, start-up
4 feedwater. These things reliably support normal
5 operation. They can also minimize the challenges to
6 the passive safety systems by dealing with anticipated
7 occurrences. They typically have redundant active
8 equipment powered by on-site, non-safety diesels,
9 again, not required to mitigate design basis
10 accidents.

11 CHAIRMAN KRESS: On the use of the active
12 systems, I presume that they're being used to
13 compensate for some transient or some accident that
14 you don't want the passive systems to come on. Would
15 they completely overwhelm the passive if you needed
16 them because of the driving forces?

17 They probably wouldn't even know the
18 passive systems were there, except for maybe the tanks
19 that blow down from the nitrogen.

20 MR. SCHULZ: The potential interaction of
21 active and passive systems was a significant
22 discussion we had on AP600. A lot of the both SPES
23 and OSU testing incorporated active features as well
24 as passive features so that we could not only analyze,
25 which we did do, but the tests, the potential

NEAL R. GROSS

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

1 interactions.

2 And basically we didn't see anything which
3 was adverse. Now, there are some almost designed-in
4 interactions. For example, if you have ADS, one of
5 the things the operators are told to do is to start
6 the shutdown cooling system in an injection mode, and
7 that's a nonsafety feature.

8 One of the purposes of that is to provide
9 a back-up in case something goes wrong, but it also
10 avoids the need for Stage IV, and the way it does it
11 is it interacts with the core make-up tank draining
12 because it goes into the same line and through the
13 same orifice that limits the same T drain down. It
14 builds up back pressure, and as long as it's
15 pumping, --

16 CHAIRMAN KRESS: The core make-up tank
17 just --

18 MR. SCHULZ: -- core make-up tank stops
19 about half full or something, depending exactly on
20 when the operators start that, but it's still active
21 aligned. So if the RNS stops, then the CMT would
22 start going again, and then you'd get Stage IV, and
23 then you'd get gravity injection of RWST injection.

24 So that's one interaction that was really
25 designed into the plant, but for example, start-up

NEAL R. GROSS

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

1 feedwater to passive OHR, now those are a bit more
2 functionally connected differently. So we don't
3 really see an interaction.

4 We do have automatic signals to cut off
5 the nonsafety features if things degrade, okay, and we
6 really need the passive features. So if you're
7 getting like a steam line break and you're getting
8 excessive cooling, that signals stop start-up
9 feedwater because that could be contributing to
10 excessive cool-down.

11 Just because we start passive RHR, we
12 don't cut off start-up feedwater, but if there's a
13 plant condition overfilling of the steam generator,
14 over cooling of the RCS will cut off start-up
15 feedwater, and we do similar things with the CDS make-
16 up to make sure we don't overfill the pressurizer
17 because of it.

18 On overview of the passive core cooling
19 system. You see all of the major components here.
20 The passive RHR, of course, is the transient, non-LOCA
21 decay heat removal feature. Natural circulation. It
22 puts heat into the RWST, which is inside containment.
23 That provides a heat sync for several hours, and then
24 it starts boiling. The steam goes into containment,
25 passive containment cooling system, condenses it, and

NEAL R. GROSS

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

1 it drains back into the RWST with a gutter collection
2 system. That's all safety related.

3 That basically replaces the function of
4 safety related auxiliary feedwater system in the
5 current plan.

6 The passive safety injection is made up of
7 the core make-up tanks, which are a unique feature to
8 AP600, AP1000. These replace the high head pumps, and
9 they can operate at any RCS pressure. For minor leaks
10 and tube rupture they operate in a water recirculation
11 mode, and they never really drain down in that
12 situation.

13 For small LOCAs, you would eventually
14 transition into a steam drain down mode when the cold
15 leg is voided. For larger LOCAs that happens pretty
16 quickly without any water recirculation.

17 Accumulators, of course, work similar to
18 current plants, except they're connected to the
19 reactor vessel directly. So for large LOCAs, you
20 don't spill one.

21 The RWST injection is a very low pressure,
22 just a gravity hit of the tank, and from a functional
23 point of view, they really replace the low head safety
24 injection pumps. We eventually would get into a
25 containment recirculation, which uses the containment

NEAL R. GROSS

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

1 to drive the flow-through screens and into the --

2 DR. WALLIS: And presumably you have no
3 fibrous insulation.

4 MR. SCHULZ: We have no fibrous
5 insulation. That's right. We've talked about that.

6 DR. WALLIS: And you have a very clean
7 containment?

8 MR. SCHULZ: A very clean containment. We
9 still have screens with a good surface area. So we
10 can tolerate some degree in --

11 DR. WALLIS: But you don't have much head
12 to drive that closed.

13 MR. SCHULZ: We don't have much head,
14 right. Now, current plants don't have a lot of head
15 tolerance either because they have to supply NPSH to
16 pumps. So I'm not sure that the head requirements are
17 all that different.

18 MR. ROSEN: When you say "a good screen,"
19 do you know what square footage you're talking about?

20 MR. SCHULZ: It's bigger than typical
21 plants, although that could be changing and plants
22 vary. It's about -- the trash rack is about 70 square
23 feet each, but the screen is a folded design which has
24 more than twice that surface area. So it's more like
25 140 square feet each, each of the two screens.

NEAL R. GROSS

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

1 MR. ROSEN: So you have 280 square feet?

2 MR. SCHULZ: Yes, and the screens are
3 cross-connected such that if one of the passive core
4 cooling system recirc. lines fails to open or is
5 blocked, both screens will function to feed the intact
6 lines.

7 MR. ROSEN: Would you have a big problem
8 if somebody said you needed four times as much square
9 footage? I mean, is there a space for more?

10 I mean, this is a current issue and really
11 you don't know where it's going.

12 MR. SCHULZ: It is a current issue. These
13 screens are located along walls. We have some
14 vertical height to play with. We don't have
15 necessarily a lot of width to play with. We probably
16 could do something. I mean, you always can do things
17 with the areas.

18 CHAIRMAN KRESS: But whatever the
19 resolution of this issue is, you guys have made it
20 what, a COL action item?

21 MR. SCHULZ: Yes. Yeah, we've done some
22 preliminary work on resident debris and DPs across the
23 screens, but the staff and we recognize we couldn't
24 really resolve it now given the state of knowledge.
25 So we ended up putting a COL that will be recalculated

NEAL R. GROSS

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

1 based on more definitive information from testing and
2 plant feedback, although we have a very robust design.
3 With the last of fiberglass insulation, with larger
4 screens than operating plants, with folded screen
5 designs which tend to be good from a debris trapping
6 point of view, we've got these horizontal plates that
7 protect the screens from heavier debris settling in
8 front of them.

9 It doesn't protect them against fibrous
10 type debris which tends to move with the flow. We
11 have done a lot of things to improve the design and
12 make it robust, but until we get a final resolution of
13 the data, the information, we can't confirm that
14 everything is okay.

15 DR. RANSOM: What is the mesh size of the
16 screens?

17 MR. SCHULZ: It's pretty much a standard.
18 I think it's one-eighth of an inch. I'm not 100
19 percent sure about that. It's controlled by a fuel
20 passage openings like current plants.

21 We don't have --

22 DR. RANSOM: It is about an eighth of an
23 inch, you say?

24 MR. SCHULZ: I think. I think that's
25 right. I'll confirm that.

NEAL R. GROSS

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

1 DR. RANSOM: And the other question is:
2 is there any paint in the containment.

3 MR. SCHULZ: Yes, there is paint in the
4 containment. There's sort of two things to think
5 about there. One of them is on the inside of the
6 containment shell, which, of course, is involved in
7 our passive heat, transfer heat cooling system, is an
8 inorganic zinc which is safety related. Okay? And
9 it's safety related because we want to make sure that
10 the heat conduction is properly accounted for, and
11 also the wetting and the film formation on the inside
12 of the containment.

13 It's not as critical as outside where we
14 want the thin water cooling film to form a nice,
15 spread out surface, and we don't want rivulets running
16 down. Inside of the containment we tested it with the
17 inorganic zinc on it. So we've kind of ended up with
18 that being a safety requirement.

19 So we expect that to stay put. If it
20 doesn't, it's not an issue because it's 85 percent
21 zinc. So it's very heavy. So, you know, it will
22 sink, especially with our screens. There's, you know,
23 two foot below the bottom of the screen. The screens
24 are ten to 13 feet high, and then there's this
25 horizontal plate on top of them. So the zinc can't

NEAL R. GROSS

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

1 enter the water right in front of the screen. It has
2 got to enter ten feet in front of the screen, and it
3 will sink before it gets to the screen.

4 Now, there are other coatings inside
5 containment on concrete walls or steel walls that are
6 part of our modules. These will typically be epoxies.
7 they will re purchased as safety related, qualified
8 coatings with a high density, specified density, where
9 we've shown that that kind of a density will result in
10 the paint chips if they were to come loose to sink
11 before it gets to the screens.

12 Now, the actual application and
13 maintenance of the coatings is not required to be
14 safety in this plant.

15 DR. RANSOM: There's some concern about
16 chemical reaction. This is borated water, I assume.

17 MR. SCHULZ: Yes.

18 DR. RANSOM: And how it would react with
19 the coatings.

20 MR. SCHULZ: Again, these are qualified
21 coatings. Okay? So to the extent we know about the
22 coatings, as in operating plants, the coatings are
23 supposed to stand up to that environment. Okay?

24 The issues of chemical debris, chemical
25 corrosion, debris related to screens is part of the

NEAL R. GROSS

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

1 COL item that will have to be revisited for the COL.

2 DR. RANSOM: One other quick. What is the
3 diameter of the CMT balance lines?

4 MR. SCHULZ: Those are eight inch Schedule
5 160. The inside diameter is 6.8-something. That's
6 the same size as the injection line, by the way.
7 Those are the same size lines for AP600 and AP1000.
8 We get more flow in AP1000 by changing the orifice,
9 which we had a fairly strong orifice, small orifice
10 for AP600. We've opened it up a bit for AP1000 to get
11 a little more flow.

12 MR. SIEBER: Is there any aluminum in
13 containment?

14 MR. SCHULZ: I think there's allowed to be
15 some limited amount, but it's typically not used. We
16 use some galvanized steel for ratings in stairs and
17 things like that, cable trays. I don't --

18 MR. SIEBER: No insulation jacketing or
19 anything like that?

20 MR. SCHULZ: No, would not be aluminum,
21 no.

22 DR. RANSOM: What kind of insulation is
23 used?

24 MR. SCHULZ: For the thermal insulation,
25 it's the metal reflective foil type.

NEAL R. GROSS

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

1 DR. RANSOM: Multiple layers?

2 MR. SCHULZ: Yes, yes. It has been shown
3 that especially in the flow fields that we all have,
4 that kind of insulation even if damaged will sink.
5 It's stainless steel.

6 DR. RANSOM: Aren't the layers separated
7 by fibers?

8 MR. SIEBER: No.

9 MR. SCHULZ: No, no.

10 DR. RANSOM: And particles?

11 MR. SIEBER: No.

12 MR. SCHULZ: No.

13 DR. RANSOM: No?

14 MR. SIEBER: Air.

15 MR. SCHULZ: Just air, and it's not leak-
16 tight.

17 MR. SIEBER: Pure air.

18 CHAIRMAN KRESS: Is the ADS four-line
19 aimed in a direction? Is it away from any of this
20 fibrous area or this insulation?

21 MR. SCHULZ: Yes. It's basically aimed at
22 a compartment wall.

23 CHAIRMAN KRESS: It's at a wall?

24 MR. SCHULZ: Yes. So it will probably
25 remove some paint from that wall.

NEAL R. GROSS

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

1 CHAIRMAN KRESS: How far is that wall from
2 the --

3 MR. SCHULZ: Not terribly far. A few
4 feet.

5 MR. CUMMINS: This is Ed Cummins.

6 I think it's between two and three feet.
7 We actually take the thrust loads on it by hooking
8 back into the wall.

9 MR. ROSEN: Two and three feet, and how
10 big a line is it?

11 MR. CUMMINS: It's a 14 inch line. The ID
12 of the valve is like nine inches.

13 DR. WALLIS: It's impinging on a piece of
14 steel though, isn't it?

15 MR. SCHULZ: Yes, it's a steel module,
16 modular.

17 DR. WALLIS: It would eat the concrete if
18 it was --

19 MR. SCHULZ: Yes.

20 DR. WALLIS: -- part of the concrete.

21 MR. SCHULZ: But there's not concrete.
22 Well, there's concrete behind steel. It's protected
23 by the steel. It's part of the steel modules that
24 make up the compartment walls.

25 CHAIRMAN KRESS: How thick are those

NEAL R. GROSS

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

1 walls? The steel?

2 MR. SCHULZ: The steel?

3 CHAIRMAN KRESS: Yeah.

4 MR. CUMMINS: Ed Cummins again.

5 That's a structural requirement because it
6 is the reinforcement, and I'm not sure I remember. I
7 think it's quarter inch.

8 DR. WALLIS: So that steel is going to
9 swell up.

10 MR. SCHULZ: Yes, it's going to.

11 DR. SHACK: Which of the piping is
12 designed to be leaked before a break?

13 MR. SCHULZ: Basically everything -- well,
14 in these lines here, all of these lines are at least
15 eight inches, except for Stage 1 ADS up here, which is
16 four inch. All of the eight inch lines in all of
17 these things you see here are leak before break. The
18 four inch is not.

19 DR. SHACK: Okay. So it stops at the four
20 inch.

21 MR. SCHULZ: Right.

22 MR. CUMMINS: We weren't allowed to have
23 four inch.

24 MR. SCHULZ: So six inch and up is leak
25 before break, and that includes everything here except

NEAL R. GROSS

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

1 for Stage I.

2 Here's a little bit more detail on the
3 passive RHR system. Normally isolated by --

4 DR. WALLIS: What do you do with something
5 like the diaphragm in the ADS-4 valve? Is that leak
6 before break or what do you do with something like
7 that?

8 MR. SCHULZ: The diaphragm?

9 DR. WALLIS: Well, the Squib valve.

10 MR. SIEBER: The gate.

11 DR. WALLIS: What do you do with that in
12 terms of leak before break? That could fail
13 presumably.

14 MR. CUMMINS: I believe it has the same
15 acceptance criteria as the pipe. So it is qualified
16 for leak before break.

17 MR. SCHULZ: This configuration is
18 identical to AP600. The elevations are identical.
19 The pipe sizes were increased from I think ten to 14
20 inch to support more flow. The tube surface area was
21 increased by adding a few tubes and making the
22 horizontal sections longer to get about the same
23 amount of power increase as the power in the core went
24 up.

25 CHAIRMAN KRESS: Do you have a drain line

NEAL R. GROSS

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

1 in the bottom of the reactor vessel?

2 MR. SCHULZ: No. No penetration.

3 CHAIRMAN KRESS: How do you get the water
4 out when you want to?

5 MR. SIEBER: Put a pipe down there.

6 MR. SCHULZ: Yes.

7 CHAIRMAN KRESS: Suck it out.

8 PARTICIPANT: Suck hard.

9 MR. SCHULZ: If you need to. You don't
10 normally have to do that.

11 CHAIRMAN KRESS: Well, I was thinking
12 about when you go to mid-loop operation or whatever.

13 MR. SCHULZ: Well, you don't. You leave
14 the water down there. Your mid-loop, you go to a mid
15 -- it's actually not quite mid-loop. It's about
16 three-quarters full hot leg, and you drain water out.
17 It actually comes out of the RNS piping, which comes
18 off the bottom of the hot leg, and off of the RNS
19 piping is the connection to the CDS, and that gets
20 automatically isolated, that drain line, if the water
21 level starts getting low in the hot leg to protect RNS
22 pump.

23 The passive safety injection, we've talked
24 about the major components here. Again, the types of
25 valves that we're using are identical with AP600. The

NEAL R. GROSS

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

1 same configuration. The only real change in
2 configuration is this MOV is normally closed, shown
3 normally closed in AP600. We've opened it to improve
4 the PRA reliability because the MOV is a lot less
5 reliable than the Squib valve.

6 So in terms of -- this line has a dual
7 purpose. It's both a recirc. line during a LOCA.
8 It's also the line we use in a severe accident to dump
9 the IRWC. Obviously this line can't be used because
10 of the check valve, and of course, there's two of
11 these, two screens and two sets of these valves, and
12 so this line has a dual purpose to dump, and by
13 opening that valve, we've reduced the probability of
14 failure of not being able --

15 DR. WALLIS: Now, the ADS-4 line goes to
16 the PRHR. We noticed that.

17 MR. SCHULZ: On one of them, right.

18 DR. WALLIS: Right, and we had a question
19 about that. I'm not sure if that was resolved or not.
20 What happens during the ADS-4 operation? Does flow go
21 up that line as well?

22 We had a question about that, I remember,
23 and I thought you were going to get that resolved. It
24 presumably was resolved at some time. Maybe we should
25 ask the staff.

NEAL R. GROSS

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

1 MR. CUMMINS: This is Ed Cummins.

2 You have the ADS-4. You have sufficient
3 cooling just from a feed-and-bleed sort of thing. I
4 believe our analysis model shows a very little bit of
5 flow goes into the PRHR, but it doesn't really
6 contribute to the --

7 DR. WALLIS: It seemed to be going the
8 wrong way is the thing. Maybe we could ask the staff
9 about that. It's in the minutes of our meeting.

10 MR. SCHULZ: I remember it being
11 discussed.

12 The core makeup tanks are about 25 percent
13 larger, and the flow is about 25 percent greater. The
14 RWST surface area is the same, but we've raised the
15 water level, normal water level. So we've got a
16 little bit more head and a little bit more water.

17 The injection lines from the RWST, the
18 recirc. lines, and the ADS-4 lines were made larger.
19 ADS-1, 2, and 3 are the same size as AP600.

20 DR. RANSOM: Well, you said there were no
21 bottom penetrations in that IRWST.

22 MR. SCHULZ: No, I said off the reactor
23 vessel.

24 DR. RANSOM: Oh, the reactor vessel.
25 Okay.

NEAL R. GROSS

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

1 MR. SCHULZ: No, the RWST you need --

2 DR. RANSOM: How do you get the water out
3 of the IRWST?

4 MR. SCHULZ: Yeah. Yes, there's little
5 pits, two pits that serve as bottom drains as well as
6 injection lines out of the RWST.

7 We have a little bit more detailed
8 information here about ADS-4 qualification, which we
9 understood there was maybe a question about that. So
10 the next three slides show you what commitments there
11 are in the DCD, what ITAACs there are, and the final
12 one is anticipated testing that Westinghouse would do
13 to qualify the valve.

14 In terms of the DCD in the section shown
15 here, it basically says there's a need for valve
16 qualification, pre-operational testing, and in-service
17 testing. I'm not going to talk any more about these
18 things. They are also discussed in the DCD, but in
19 terms of valve qualification, there's a specific
20 requirement to verify the flow capability. It doesn't
21 say exactly how to do that, but it does address that,
22 and --

23 DR. WALLIS: That's an interesting test
24 because you get varying qualities going into this
25 thing. It tends to be a fairly interesting test to

NEAL R. GROSS

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

1 supply the steam and the water and everything with
2 this big valve.

3 MR. SCHULZ: I'll show you what we're
4 planning on doing. Okay? It maybe is not quite as
5 interesting as you think it could be.

6 (Laughter.)

7 DR. WALLIS: Oh, okay. Are you going to
8 impinge on a steel plate when you come out of it?

9 MR. SIEBER: Once you test it, it's no
10 longer any good for anything.

11 MR. SCHULZ: Oh, no, that's not true. You
12 need to replace some internal parts, but the valve is
13 the one --

14 MR. SIEBER: Yeah, the ones that function.

15 MR. SCHULZ: Yeah, yes.

16 MR. SIEBER: That's what you're testing.

17 MR. SCHULZ: Well, actually you're testing
18 the geometry once you've opened it. Okay? That's the
19 flow test.

20 Now, there's also will the valve open.

21 MR. SIEBER: Right.

22 MR. SCHULZ: Is a separate question, and
23 that's what this second one here is, to verify the
24 opening capability, and this says you can do type
25 testing, ASME QME-1, as well as EEE type, as it

NEAL R. GROSS

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

1 applies to the different components.

2 And this would be done considering some
3 minimum-maximum DPs, limiting plant condition in terms
4 of environmental aging, steam heat, as well as
5 structural loads on the valve.

6 So this would be very --

7 MR. ROSEN: What can you do to assure us
8 that the valve you actually test will be identical or
9 so nearly identical that you can't tell the difference
10 between it and the valve that's actually being used?

11 There's a concern that some of this
12 testing is done on prototypical stuff that doesn't
13 really represent the actual --

14 MR. SCHULZ: ASME QME-1 has a lot of
15 criteria on that. One of the things that you have to
16 deal with in a typical operating plant, although it's
17 a little bit less -- it doesn't really apply so much
18 to the ADS Stage IVs because they're going to be
19 unique valves, but if you have, say, a whole range of
20 gate valves, motor operated gate valves in a plant
21 design, how many of them do you have to test?

22 And that's where you get into the type
23 testing and what are the restrictions in terms of how
24 many tests you have to do so that you can show that
25 all of the valves get qualified even though you don't

NEAL R. GROSS

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

1 test every single size.

2 And there are issues, I think, that it
3 addresses in terms of, you know, providing a -- and I
4 think there's something in the ITAAC, which I didn't
5 include in the next page, which talks about there will
6 be a report that shows that the valve installed in the
7 plant is covered by the testing an analysis done so
8 that it's applicable.

9 And it is stated like that, and the staff
10 would have to be satisfied that the report, in fact,
11 justifies that.

12 MR. ROSEN: Well, you gave an example of
13 a low range with different size gate valves, which is
14 inapplicable to this case, but just talking about the
15 ADS-4 valves, we know exactly or you know exactly what
16 that's going to be. So it's just a question of how
17 close you get. The valve you use for testing, how
18 close is it going to be to the one that you actually
19 use in the plants?

20 And that's my question.

21 MR. SCHULZ: Yeah, The only answer that
22 I have in terms of what commitments have been made is
23 what I said. Okay? Is that there will be a report
24 that justifies that the valves tested are analyzed, is
25 consistent with what's put into the plant.

NEAL R. GROSS

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

1 Now, this valve is from a flow geometry
2 point of view, is very simple. It's like an orifice.

3 MR. SIEBER: A straight pipe.

4 DR. WALLIS: It's a straight pipe almost.

5 MR. SCHULZ: Yes. There's a little step-
6 down. There's a picture, two pages, ahead that we'll
7 show you.

8 DR. WALLIS: That's fine. The
9 interesting part is the up stream conditions. You've
10 got bends and things. So the up stream two-phased
11 pattern is going to be more important than just the
12 geometry. The geometry is simple. It's a straight
13 pipe.

14 CHAIRMAN KRESS: Well, I'm not sure what
15 happens to the diaphragm when they blow it off.

16 MR. SCHULZ: Okay.

17 MR. ROSEN: Why can't you just say a
18 simple thing, which is what I expected you to say,
19 which is we'll test the valve we use in the plant?

20 MR. SCHULZ: That's what we intend to do.
21 That's not a licensing commitment written down in the
22 VCD or the --

23 MR. ROSEN: Why don't you make it? What's
24 the hardship?

25 MR. SCHULZ: Because when you say that,

NEAL R. GROSS

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

1 that means if one rounded corner is a millimeter
2 different, then it's not identical. So when you start
3 about saying "the same," it's very hard to pass that
4 test sometimes.

5 MR. CUMMINS: This is Ed Cummins. I think
6 the way most of the industry works is that you try to
7 build the valve that you think that you want. That's
8 the objective, and the testing process, you may find
9 that there's ways that you can improve the performance
10 of the valve that you test, and you want to
11 incorporate those improvements in the valve in the
12 plant, and whether you find that or not is not
13 something that you know before you try this whole
14 thing.

15 So as you enter the qualification program,
16 you start with an objective of producing the valve
17 that you are going to have in the plant. In the end
18 you might decide that there's something that you can
19 improve, and then it's slightly different.

20 But then you go to QME-1 to see. If you
21 deviate too much, you fail in QME-1.

22 MR. SCHULZ: You have to retest if it's
23 too big of a change.

24 These are the specific ITAACs, and these
25 are kind of listed separately sort of by function. So

NEAL R. GROSS

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

1 there's a seismic capability function, and it says a
2 type test would be required and/or analysis.

3 Harsh environment. So this is the igniter
4 in the case of the Stage IV primarily, and again, type
5 tests or analysis.

6 The change position function specifically
7 says tests or type tests. That doesn't give you any
8 option.

9 DR. WALLIS: But these kind of igniters
10 have been in radiation environments before. They're
11 used in other nuclear systems.

12 MR. SCHULZ: Yes. They have been used in
13 high temperature containments. The BWR is used in
14 radiation fields, but not inside containment.

15 DR. WALLIS: And not at the same
16 temperatures. Okay.

17 MR. SCHULZ: However, there was a
18 qualification program that the GE actually did for
19 their SBWR on a valve that looks very much like this
20 for service conditions inside containment. So they
21 developed and actually went through the qualification
22 of the propellant.

23 Then in terms of flow capability, these
24 are the commitments in terms of the ADS lines for
25 noncritical flow would be inspected and an analysis

NEAL R. GROSS

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

1 would be done to show that the resistance is less than
2 some limiting value. It wasn't practical to actually
3 put flow through those lines. They're very big lines.
4 They discharge into the containment. So you'd need
5 more flow than we can produce from the RNS system, and
6 we don't really have a place to put it.

7 And given that the lines are simple from
8 a single phase or noncritical flow -- I shouldn't say
9 single phase -- we have this --

10 DR. WALLIS: I wonder if any university
11 uses units of feet per gallons per minute squared.

12 (Laughter.)

13 DR. WALLIS: Most extraordinary units I've
14 seen in a long time.

15 MR. SCHULZ: We have had some
16 communication issues with us and our nuclear safety
17 buddies, but we sorted that out. So we have got
18 conversions that you can do. There are some
19 advantages to doing that, but it's not important.

20 For critical flow, we have an inspection
21 of the Stage IV valve which is to inspect the minimum
22 flow area. Again, this is very simple geometry.

23 DR. WALLIS: That's just a measurement,
24 isn't it? I mean, it can't be way off. It was made
25 with a certain diameter; it has got that diameter.

NEAL R. GROSS

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

1 MR. SCHULZ: Yes, yes, and that's the real
2 important thing.

3 There's also one on the elevation of the
4 Stage IV to make sure it's proper.

5 So that's the DCD and the ITAAC. And this
6 is more what we intend to do, and the intention would
7 be to take the as designed valve and run it through
8 these tests. So if things work out well, we would end
9 up testing what we install.

10 MR. ROSEN: Now, this valve is bolted in.

11 MR. SCHULZ: The valve? Here you see the
12 pipe, and the pipe ends in a flange.

13 MR. ROSEN: So do you typically take this
14 valve out during each outage and do anything to it
15 or --

16 MR. SCHULZ: No, not typically. What will
17 be happening on a sequential basis is that I think
18 every outage one of the four valves will have its
19 booster removed and test fired in a --

20 MR. ROSEN: Let me tell you about my
21 concern. My concern is right there are the orifice,
22 right there at the --

23 MR. SCHULZ: Here?

24 MR. ROSEN: No, the seal, what forms the
25 pressure boundary.

NEAL R. GROSS

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

1 CHAIRMAN KRESS: Right there.

2 MR. ROSEN: Right there. What I'm worried
3 about is cracking that proceeds along that line.

4 MR. SCHULZ: Yeah, we've discussed that.

5 MR. ROSEN: Over time and ultimately
6 weakens the joint, and is there any way to detect
7 that?

8 MR. SCHULZ: We've discussed that in the
9 past with the ACRS. I don't know if you were here
10 when we did that, and we talked about we would do
11 inspections in accordance with ASME code requirements
12 to look at, in particular, that joint.

13 DR. WALLIS: Did you see any boron
14 stalactites hanging off the end of this valve?

15 MR. SCHULZ: Yeah.

16 DR. WALLIS: How do you do it? If you
17 don't take it off, how do you inspect that?

18 MR. SIEBER: The discharge is open.

19 MR. SCHULZ: This is open. There's
20 nothing connected on this site. So you can get very
21 close on this site. So if there's any leakage at
22 all --

23 MR. ROSEN: Oh, well, yeah, you can see
24 leakage, but that's too late. I'm worried about
25 cracking that's not through wall.

NEAL R. GROSS

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

1 MR. SCHULZ: Yes, yes. And the intention
2 is on, I guess, a plan basis. We would take the valve
3 off and actually inspect that.

4 MR. ROSEN: Yeah, I'd think you'd have to
5 look at it this way, with ultrasonics or dye penetrant
6 or something on that surface, and the only way to get
7 at it is to take the valve off.

8 MR. SCHULZ: Yes, yes.

9 MR. ROSEN: And then, you know, if you did
10 that fairly routinely for a while and there was no
11 cracking, why, you know, you could extend the
12 frequency dramatically, but I think at the beginning
13 you need to assure me, assure someone, yourselves, the
14 owner, that you're not going to have a LOCA right
15 there.

16 That's the nasty thing about relief
17 valves. They're designed to open, and sure enough,
18 they do.

19 Now, this is a special valve, granted, but
20 still, the cracking along that line would create
21 exactly the LOCA you're trying to prevent.

22 CHAIRMAN KRESS: What's the material? Is
23 it 609?

24 MR. SCHULZ: We are, I think, 316.

25 CHAIRMAN KRESS: Three, sixteen?

NEAL R. GROSS

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

1 MR. SCHULZ: That's what we're thinking
2 right now, but I don't know that we've really made a
3 final determination. So obviously it's not a very big
4 part, and --

5 DR. SHACK: It won't be Alloy 600 if
6 that's what you're thinking.

7 CHAIRMAN KRESS: That's what I was worried
8 about, yeah.

9 (Laughter.)

10 MR. SCHULZ: And so this will be something
11 that will be both the material selection, the
12 engineering of it will be done very, very carefully.

13 MR. ROSEN: See, I don't get any
14 confidence from you telling me that it's going to be
15 tested and inspected in accordance with the ASME code.
16 I mean, the code is great for a lot of things, but for
17 this particular circumstance, I don't know what the
18 code says about it.

19 Does it say you need to take it out and
20 inspect it every outage? That's kind of what I would
21 want to do for a while.

22 MR. SIEBER: No.

23 MR. ROSEN: Until I got real confidence
24 that there wasn't something special going on in there.
25 It's a highly stressed location. It's in oxygenated

NEAL R. GROSS

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

1 steam.

2 MR. SCHULZ: No, no steam. It's not
3 oxygenated.

4 MR. ROSEN: Why is there no steam against
5 the valve?

6 MR. SIEBER: It's water.

7 MR. SCHULZ: It's water from the hot leg.

8 MR. ROSEN: So you don't get steam until
9 it opens.

10 MR. SCHULZ: Right.

11 DR. WALLIS: You hope.

12 MR. ROSEN: You hope.

13 DR. WALLIS: If you get steam, there's a
14 crack.

15 MR. ROSEN: A crack wouldn't produce steam
16 here.

17 DR. WALLIS: No, but it would come out in
18 the --

19 MR. ROSEN: Well, obviously as it goes
20 through the -- yes.

21 So what are the ASME test requirements?
22 You say it's going to be tested in accordance with the
23 ASME code. What are the ASME -- does that mean
24 everything, every ten years and once a ten-year cycle
25 or --

NEAL R. GROSS

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

1 MR. SCHULZ: That's my understanding. The
2 only thing that we've done differently than that is
3 say that it would be done on a sequential basis so
4 that you wouldn't wait ten years to do them all. You
5 do one of them and --

6 MR. ROSEN: So you have four of them in
7 the plant, right?

8 MR. SCHULZ: Yes.

9 MR. ROSEN: And you do one at two and a
10 half years, another at five, another at seven and a
11 half, and the other at ten.

12 MR. SCHULZ: Yes.

13 MR. ROSEN: Presumably. So we'll have to
14 wait two and a half years before you see an inspection
15 of this, of the first one.

16 CHAIRMAN KRESS: That seems reasonable.

17 MR. SEGALA: This is John Segala from the
18 NRC staff. Back in the last future plant meeting, we
19 have a copy of Westinghouse's slides at that time, and
20 they said in accordance with ASME every ten years
21 perform the following: measure sheer cap dimensions
22 to assure no thinning. Perform dye penetrant tests to
23 insure no cracking. Use staggered testing.

24 That's what they said back at the last
25 meeting.

NEAL R. GROSS

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

1 MR. ROSEN: That's pretty consistent with
2 what was just said. So that means staggered testing
3 every ten years, four valves, two and a half years.

4 Well, how long is the operating cycle?
5 How long is your operating cycle going to be?

6 MR. SCHULZ: Oh, the fuel cycle is more
7 like a year, 18 months.

8 MR. ROSEN: So this would probably be in
9 the second operating cycle you would have to do the
10 first valve 36 months into it roughly.

11 DR. WALLIS: The figure we had shows
12 something attached to the outlet. There's obviously
13 some holes for bolts at the outlet.

14 MR. SCHULZ: Yes.

15 DR. WALLIS: What is on there?

16 MR. SCHULZ: In our design there will be
17 nothing.

18 DR. WALLIS: Ah, there will be nothing.

19 MR. SCHULZ: The drawing was taken from
20 another application that actually was going to have a
21 pipe.

22 DR. WALLIS: Okay. I thought there was
23 nothing there. I thought ours has something there.

24 MR. SCHULZ: Yes, yes. These bolt holes
25 here won't exist in our final design, and there won't

NEAL R. GROSS

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

1 be any flange or any pipe connected to the outlet of
2 the valve.

3 DR. WALLIS: So the massive pieces of pipe
4 are hardly necessary.

5 MR. SCHULZ: Massive?

6 DR. WALLIS: The massive housing there is
7 hardly necessary. It doesn't attach to anything.

8 MR. CUMMINS: This is Ed Cummins.

9 I mentioned before that we have four
10 struts that come from the wall that hook to that end
11 thing so that when it blows even at full pressure,
12 that it doesn't cause damage to the rest of the
13 reactor coolant system.

14 So while there's no pipe at the end of
15 that, there are some pretty big lugs that go back to
16 the wall to take the force of the --

17 DR. WALLIS: Thank you.

18 MR. SCHULZ: So we may still have those
19 old --

20 MR. ROSEN: That's a very good idea
21 actually.

22 MR. SCHULZ: Okay. I was trying to go
23 through this here. From a valve operability point of
24 view, we will test the valve using both maximum and
25 minimum inlet pressures. Minimum pressures actually

NEAL R. GROSS

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

1 can be potentially limiting in this valve because if
2 you have a high pressure in here, it has got this
3 connection stress, and it may be a little bit easier
4 to break it off.

5 With very, very low inlet pressures, then
6 all of the force necessary to shear that point needs
7 to come from the booster assembly. So we will test
8 both conditions to make sure that the valve will
9 function in both cases, and we will use a degraded
10 booster by an arbitrary amount. I think what has bene
11 used in the past has like a 80 percent booster to,
12 again, provide some margin and robustness to the
13 design.

14 From a flow capability, our intentions are
15 to use a water flow, pulled water flow test to
16 establish an L/D of the valve and then to do a
17 saturated steam flow test to basically give us an
18 effective flow area, which is what the nuclear safety
19 people use as an input to their safety analysis.

20 DR. WALLIS: So there is no two-phased
21 testing.

22 MR. SCHULZ: That's right.

23 DR. WALLIS: And everything is done
24 theoretical in terms of a fee squared (phonetic) or
25 some --

NEAL R. GROSS

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

1 MR. SCHULZ: Well, it's not theoretical.
2 It's based on the testing we've done at OSU and --

3 DR. WALLIS: Scaled up from OSU.

4 MR. SCHULZ: So we use OSU to establish
5 the system kind of interaction performance. This test
6 is really making sure the valve is consistent with the
7 systems test and the system analysis.

8 DR. WALLIS: Typically if you know the
9 water flow capability, you can convert it to steam
10 flow. So it shouldn't be very interesting.

11 MR. SCHULZ: We hope not.

12 And then, of course, there's the
13 environmental considerations with irradiation, steam,
14 and heat aging, which would cover the whole life cycle
15 of the boosters from storage normal standby condition
16 and then post accident conditions, and then the aged
17 boosters, it would be actuated to show that they would
18 work.

19 And then there would also be seismic and
20 other dynamic load testing, which is envisioned to be
21 a shaker table kind of thing.

22 DR. WALLIS: Now, this is a dead end pipe
23 with hot water in it.

24 MR. SCHULZ: Normally hot water. There
25 is, say, a partial loop seal.

NEAL R. GROSS

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

1 DR. WALLIS: Right. No, what I'm thinking
2 is --

3 MR. SCHULZ: Which means that this going
4 to be --

5 DR. WALLIS: -- these things where you get
6 weird circulation patterns and you get thermal
7 fatigue.

8 MR. SCHULZ: This system is all well
9 insulated right up to this flange. So --

10 DR. WALLIS: But it is cool at the end,
11 isn't it?

12 MR. SCHULZ: The end is --

13 MR. SIEBER: Cooler.

14 MR. SCHULZ: -- cooler.

15 DR. WALLIS: Right.

16 MR. SCHULZ: Yeah, but because of the size
17 of the pipe and the fact that it doesn't dip very
18 much, it's going to be--

19 DR. WALLIS: It's probably all right.
20 It's just that there are these events where you get
21 weird circulation patterns which get intermittent. So
22 there's a temperature cycling at the end of the pipe.

23 DR. SHACK: Well, the good news is this
24 valve won't leak.

25 DR. WALLIS: Yes. It's probably okay.

NEAL R. GROSS

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

1 MR. SIEBER: Theoretically.

2 DR. WALLIS: I guess it's something to
3 bear in mind always when you get this sort of
4 situation.

5 MR. ROSEN: You mentioned the degraded
6 booster with the 80 percent. How did you pick that
7 number? Why wouldn't you use 30 percent or some other
8 number?

9 MR. SCHULZ: That's something that the
10 vendor has suggested and used from his experience base
11 with these type of valves. What he's told us is that
12 if applying at 20 percent margin will cover, more than
13 cover the kind of changes that they might have seen in
14 making the boosters, they put a lot of quality control
15 on the boosters when they make the propellant
16 initially, test it in samples, and then when they make
17 a batch of boosters, they test, you know, some
18 boosters right away to make sure they're okay.

19 And the tolerance and variation that they
20 get in that is significantly less than that 20
21 percent, though that seems to be adequate to cover
22 reasonable variations in the boosters in terms of
23 manufacturing and environmental effects.

24 DR. SHACK: When you replace a booster, do
25 you then go off and blow it up?

NEAL R. GROSS

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

1 MR. SCHULZ: Yes.

2 DR. SHACK: So you'll have a check on
3 that.

4 MR. SCHULZ: That's a standard ASME in-
5 service testing for a Squib valve. They've actually
6 got it codified. That's what we've committed to do in
7 the CD, is that when we replace the booster and
8 there's a schedule for that, we would then take the
9 one that was in the valve and then go test it to make
10 sure it would have been okay, and if there's any
11 problem shown up, then you use your tracing of finding
12 similar boosters and maybe replacing them or go root
13 cause and try to figure out what went wrong and that
14 kind of stuff.

15 But that does give you a reasonable check
16 on if it would work.

17 MR. SIEBER: The effect of using a very
18 degraded booster, actually what you're doing, it takes
19 a certain amount of energy to get the valve to
20 operate. So if you want to test it in a degraded
21 mode, the only way you can do that is make a larger
22 booster, which makes a larger actuator housing and a
23 larger valve for no real purpose.

24 MR. SCHULZ: Other than the margin, right.

25 MR. SIEBER: Other than that test.

NEAL R. GROSS

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

1 MR. SCHULZ: So if you kind of overdo
2 that, then the valve is getting huge.

3 MR. SIEBER: Yeah, and perhaps less likely
4 to work because all of the parts are heavier.

5 DR. WALLIS: The propellant does
6 deteriorate with time at these temperatures. Isn't
7 that --

8 MR. SIEBER: Yes.

9 MR. SCHULZ: Yes. In fact, one of the
10 things about this, since this pipe is hot, you'll
11 notice there's fins here.

12 DR. WALLIS: I was assuming that most of
13 this whole thing is pretty well at primary
14 temperature.

15 MR. SCHULZ: Well, the booster is supposed
16 to be less than 280 degrees or something.

17 DR. WALLIS: It's as cold as that?

18 MR. SCHULZ: And in order to make it that
19 cold, the valve body is not insulated, and there's
20 fins located here. There's also vertical fins around
21 the top of this housing, and a test will be done with
22 this at maximum design inlet temperature.

23 DR. WALLIS: So there is quite a lot of
24 heat transfer going on in that area then. So that's
25 okay.

NEAL R. GROSS

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

1 MR. SIEBER: Which causes some internal
2 food.

3 DR. WALLIS: So you have water coming in
4 at primary temperature going through some natural
5 circulation in there and some of it leaving that may
6 be two or 300 degrees colder?

7 MR. SCHULZ: No, I don't --

8 DR. WALLIS: No? Well, you said that
9 temperature is --

10 MR. SCHULZ: Yes, the temperature up here.
11 The temperatures here will be much closer to --

12 DR. WALLIS: To uniform, the primary
13 temperature. Okay.

14 MR. SCHULZ: That's an awful big pipe
15 connected here.

16 DR. WALLIS: Yeah.

17 MR. SCHULZ: Okay. Moving on to passive
18 containment cooling, we've talked a little bit about
19 this. Again, the same configuration as AP600, except
20 we added a third valve path, which was due to PRA
21 considerations, and it is a different normally closed
22 valve. It's a motor operated gate valve instead of
23 air operated butterfly valves, and that was done to
24 add diversity as well as redundancy to help the PRA.

25 And the reason we did that is because

NEAL R. GROSS

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

1 there's a slight chance that if you were running on
2 air only cooling in AP1000 that the containment could
3 fail after a day, whereas in AP600, you could go
4 basically indefinitely with design basis and ambient
5 conditions and not fail the containment at emergency
6 stress limits.

7 But with AP1000 we have a little less
8 margin. So to compensate for that, we added a more
9 reliable water drain system.

10 We did increase the volume of the tank in
11 order to account for the fact that we have higher
12 decay heat. The standpipes control the flow of water.
13 With all standpipes running, we have a relatively high
14 flow rate that lasts for about three or four hours.
15 That quickly establishes the water film initially and
16 also it is greater than decay heat so that the
17 containment pressure has tended to be dropped down in
18 that time frame.

19 After that, the stand pipes are arranged
20 to more or less follow decay heat out through the 72
21 hours.

22 MR. SIEBER: There is a -- if those valves
23 fail, there is an operator action in the SAM-Gs
24 (phonetic) to go up on the side of the containment and
25 open the valves manually. Do you have a ladder built

NEAL R. GROSS

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

1 into the containment?

2 MR. SCHULZ: There's stairs and ladders,
3 depending on --

4 MR. SIEBER: That gets to those valves?

5 MR. SCHULZ: Yes, yes.

6 MR. CUMMINS: There's actually an
7 elevator, kind of a crawler elevator and stairs, and
8 then the plant vent is up there, too. So you need to
9 go inspect the air inlet. So there's a reason that
10 you want to be up there periodically anyway, and so we
11 needed to be able to get there easily.

12 MR. SIEBER: Are the stairs between the
13 concrete and the steel liner?

14 MR. SCHULZ: No. They're on the outside.

15 MR. SIEBER: Okay.

16 MR. SCHULZ: Obviously the valves are
17 actually inside the concrete area. They have to be
18 protected from --

19 MR. SIEBER: Right.

20 MR. SCHULZ: -- in the environment, but
21 eventually you have to go inside.

22 MR. SIEBER: So you've got to get in
23 there.

24 MR. SCHULZ: Yes. There are obviously
25 then conditions where you might not want to go up

NEAL R. GROSS

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

1 there. If you had a--

2 MR. SIEBER: I could think of hundreds --

3 MR. SCHULZ: Yes.

4 MR. SIEBER: -- of reasons not to.

5 MR. SCHULZ: Now, there are other ways of
6 getting water up there. We have a pipe that goes up
7 to the same drain point where we can put the water
8 from the fire protection system. We can also put
9 water from the Demion (phonetic) water system. We can
10 also put water from fire trucks or something.

11 So there are a multitude of other ways of
12 getting water up there if you cannot get up there and
13 open those valves up.

14 DR. SHACK: How robust is that concrete
15 shield building around the containment?

16 MR. SIEBER: How thick is it?

17 MR. CUMMINS: It's three feet thick.

18 MR. SCHULZ: With lots of rebar.

19 MR. CUMMINS: By the structure. Rebar is
20 because of the structural requirements.

21 MR. SCHULZ: Yes. Yeah, because it's
22 supporting the concrete tank and --

23 MR. SIEBER: So it's sort of like the
24 current ice containment.

25 MR. CUMMINS: Yes.

NEAL R. GROSS

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

1 MR. SCHULZ: Yes. I had mentioned safety
2 margins, and here's a listing of some key accidents
3 and criteria and comparing a typical Westinghouse PWR
4 against AP600 and AP1000. Loss of flow limits is
5 significantly better than operating plants and AP1000
6 is a little better than AP600.

7 The feed line break analysis, again, AP600
8 and AP1000 are much better than operating plants.
9 AP1000 is not quite as good as AP600, but again, still
10 much bigger than operating.

11 Computer tube rupture, although it's not
12 very interesting from a thermal hydraulic analysis
13 point of view, it can be challenging in a sense of the
14 operators have to do a lot of things in operating
15 plants. They have to do things.

16 AP600 and AP1000, the operators don't have
17 to do anything. I mean there are procedures to do
18 things to minimize operation of passive systems and
19 things like that, but if they do nothing, the plant is
20 still okay, and that's the way the plant is actually
21 analyzed in Chapter 15 in the CDC.

22 Small LOCA, again --

23 MR. ROSEN: Have you looked at errors of
24 commission, operators doing the wrong things? Are
25 there any set of those that you've looked at?

NEAL R. GROSS

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

1 MR. SCHULZ: The way you have to really
2 look at that is in how you design the man-machine
3 interface and emergency procedures to avoid doing
4 that. Ultimately you get to the point where the
5 operators could turn things off like TMI.

6 That can still happen, and the main
7 defense that you have against that is to, first of
8 all, try to avoid putting the operator in a situation
9 where you could have got conflicting goals. He
10 doesn't want to overfill the pressurizer, but he needs
11 to keep the high hid (phonetic) pump on. Okay?

12 We have pretty much designed those kind of
13 things out of AP600/AP1000. So we don't think he'll
14 be in that situation where he's damned if he does,
15 damned if he doesn't kind of thing.

16 But still ultimately you have to rely on
17 training because you can postulate if the operator
18 turns off the SI or cooling or something to the core,
19 he could eventually get into trouble.

20 Now, things will actuate, tend to actuate,
21 but eventually in order to allow recovery of the
22 plant, you have to be able to block the safety
23 injection signals and start feedwater cooling or not
24 startup, but passive RHR signals to be able to recover
25 the plant from an accident.

NEAL R. GROSS

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

1 So how do you know that's recovery versus,
2 you know, errors of commission? So you do the best
3 job you can from the design point of view and try to
4 minimize putting the operator in a situation where he
5 has got conflicting goals, and then you do a good job
6 on managing interface in terms of telling him is the
7 core being cooled; what are the temperatures and then
8 good emergency procedures on what he should be doing
9 and checking and rechecking to making sure that he has
10 not gone off and done something stupid.

11 MR. ROSEN: And you'll have a full scope
12 simulator.

13 MR. SCHULZ: Yes.

14 MR. ROSEN: So that they can practice
15 doing the right thing and not doing the wrong thing.

16 MR. SCHULZ: We actually did a little bit
17 of prototyping of that in the AP600 days, but it was
18 not a full scope simulator at that point. We were
19 just starting to develop wall panels and the soft
20 touch controls because it's a new design. So we were
21 actually bringing some operators in to get some
22 preliminary experience, but the ultimate one will be
23 a full-scale simulator, yes.

24 DR. WALLIS: That's an Appendix K figure
25 or was there a 95th percentile, that large LOCA?

NEAL R. GROSS

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

1 MR. SCHULZ: Yes.

2 DR. WALLIS: It's Appendix K?

3 MR. SCHULZ: Yes. No, excuse me, not
4 Appendix K. This is --

5 DR. WALLIS: This is a realistic person.

6 MR. SCHULZ: With uncertainty.

7 DR. WALLIS: With uncertainty. This is a
8 95th percentile thing or something?

9 MR. SCHULZ: Yes.

10 DR. WALLIS: I see.

11 MR. SCHULZ: So it's a very conservative
12 number. The best estimate or more realistic numbers
13 are 200 degrees plus cooler than that, lower
14 temperature.

15 And then ATWS is with the low boron core.
16 We have no exceedance of time during the core cycles,
17 and the pressures are lower.

18 MR. SIEBER: At the risk of causing
19 confusion, I'd like to ask one more question about
20 passive containment cooling.

21 MR. SCHULZ: Okay.

22 MR. SIEBER: And manually operating the
23 valves. You say the valves are inside the concrete
24 shield wall?

25 MR. SCHULZ: Yes.

NEAL R. GROSS

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

1 MR. SIEBER: And as I recall it, the
2 operator has 24 hours to go up and open those valves
3 before the probability of containment failure
4 becomes --

5 MR. SCHULZ: Non-zero.

6 MR. SIEBER: Well, it's .02.

7 MR. SCHULZ: Yes.

8 MR. SIEBER: Okay. After 24 hours after
9 a LOCA, what's the radiation dose where those valves
10 are?

11 MR. SCHULZ: Well, it depends on what
12 happened. Okay? If it's a small LOCA, it's very,
13 very low. If the core is melted, he can't get up
14 there.

15 MR. SIEBER: Okay.

16 MR. SCHULZ: And he wouldn't even try. He
17 would use his other --

18 MR. SIEBER: And so you go to the
19 increased probability of containment.

20 MR. SCHULZ: No, you go to putting water
21 up there from other sources.

22 MR. SIEBER: All right.

23 MR. SCHULZ: The other multitude of ways
24 of getting water up there.

25 DR. WALLIS: Well, you can be a hero and

NEAL R. GROSS

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

1 go up there.

2 PARTICIPANT: Once.

3 MR. SIEBER: Well, you probably have time
4 to open the valve.

5 MR. SCHULZ: We weren't putting that into
6 the emergency procedures.

7 Moving on toward the risk part of the
8 plant design, one of the things that's good to keep in
9 mind is the multiple levels of defense that have been
10 designed into AP1000, many more than the current
11 operating plant. This is showing a tube rupture as an
12 example, and operating plants have basically sort of
13 two levels of defense. One is the safety one, which
14 is using I-head safety injection pumps, auxiliary
15 feedwater, and operator actions to reduce and stop the
16 leak.

17 And then they have some other means to
18 back that up which typically are in the PRA in the
19 feed-and-bleed type cooling thing where they would
20 reduce the RCS pressure, minimize the leakage. The
21 leakage is not really isolated, and the RCS is vented
22 to the containment. And that is considered a success
23 path. And if that doesn't work you get into core
24 damage.

25 For AP1000, the first level of defense

NEAL R. GROSS

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

1 shown here which is probably -- the way these are
2 shown is from the most likely to be used to the least
3 likely to be used.

4 In this case, the most likely to be used
5 is the operators would do the same things they would
6 do in the operating plant, but instead using startup
7 feedwater, CVS makeup, and operator controls to
8 isolate the leak.

9 If he doesn't do that, then the passive
10 systems come into play automatically, and this is what
11 we show in the DCD, and that would also isolate the
12 leak through CMT, passive RHR, actuation, automatic
13 isolation of DVS and startup feedwater, and steam
14 generator isolation.

15 And then if that doesn't work you get into
16 several different kinds of, again, feed and bleed, the
17 pressurization schemes similar to this, but with some
18 variations. This kind of thinking ends up getting
19 built into the PRA event trees, and is the main reason
20 why the probability of core melt from, say, tube
21 ruptures of other kind of things is much lower.

22 It's not just that we have a passive
23 system that's incredibly reliable. It's mainly that
24 we have many different ways of --

25 MR. SIEBER: Alternatives.

NEAL R. GROSS

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

1 MR. SCHULZ: Alternatives.

2 DR. SHACK: And there's nothing he could
3 do in that first stage that would negate the action of
4 the passive safety system

5 MR. SCHULZ: Nothing? "Nothing" is a
6 pretty strong word.

7 DR. SHACK: "Nothing" is a big word, or
8 that's included in the PRA.

9 MR. SCHULZ: Typically what happens here,
10 in order to avoid getting into this, he's got to shut
11 the plant down without getting a safety injection
12 signal. So if you actually have a tube rupture that
13 captures the operators sort of off guard, they're not
14 aware of leaking and they're not following the event
15 and they're not shutting the plant down, then you tend
16 to get into this second mode here.

17 If the operators are tracking leakage and
18 they're anticipating what's going on and they --

19 DR. WALLIS: They anticipate a ST tube
20 rupture?

21 MR. SCHULZ: Well --

22 MR. SIEBER: Yes, you can.

23 DR. WALLIS: Can you?

24 MR. CUMMINS: There's steam radiation
25 detectors.

NEAL R. GROSS

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

1 DR. WALLIS: So it is leaking first. It
2 hasn't ruptured yet.

3 MR. ROSEN: Yeah. You track this very
4 small leakage over long periods of time.

5 MR. SIEBER: Detectability is pretty good
6 in current plants.

7 MR. SCHULZ: So if they get into this mode
8 here, they can completely avoid, potentially
9 completely avoid the start-up of the passive RHRs.
10 Now, if they're in that mode and the steam generator
11 water level is going up because they're not doing
12 something, they're not being effective at terminating
13 a leakage, that will stop, automatically isolates
14 startup feedwater and CVS, which is one of his main
15 tools.

16 DR. WALLIS: So they could block the ADS
17 line presumably if they were really foolish and
18 prevent it opening?

19 MR. SCHULZ: Well, yeah. The ADS is not
20 going to come into play.

21 DR. WALLIS: No, but I think the question
22 was is there anything they could do to prevent success
23 by the later paths.

24 MR. SCHULZ: Okay. I was addressing this
25 guy versus this guy.

NEAL R. GROSS

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

1 DR. WALLIS: Right, but the later ones, it
2 all depends on ADS working.

3 MR. SCHULZ: Some level of ADS working.
4 Now, you basically have to block the CMT actuation,
5 which is a precursor or necessary to get ADS, which
6 you can do, but again, from a procedures point of view
7 they shouldn't need to do that when they're just doing
8 this.

9 So it would be only if this thing starts
10 screwing up and the plant starts getting out of -- the
11 water levels in the generator get too high. They lose
12 startup feedwater. Eventually they get an S signal
13 because the pressure goes low because they're not
14 getting makeup anymore from the CVS, and then they get
15 an S signal.

16 Now, they should get into emergency
17 procedures then. They shouldn't just go run off and
18 isolate it. Again, operators can make errors of
19 commission. If they make enough of them, you can get
20 into trouble initially. This event in that situation
21 would take a while because it doesn't evolve rapidly.

22 DR. WALLIS: is the weakest part of this
23 whole thing the reliability of this S signal,
24 depending on the level? That's something a little bit
25 less than 100 percent reliable?

NEAL R. GROSS

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

1 MR. CUMMINS: No, the S signal is part of
2 the protection system, and it has got four divisions
3 independently sensed and then a vote, two out of four.
4 So it's as reliable as you can get in current plants.

5 DR. WALLIS: That's why it has got four
6 division.

7 MR. CUMMINS: Right.

8 MR. SCHULZ: Yeah, and it's actually the
9 main input. There is a pressurizer low level that
10 will start it. There's also a pressurizer pressure
11 which will start it.

12 Diverse actuation system also comes into
13 play to start core makeup tanks, passive RHR. It
14 won't automatically kick in ADS, but it does provide
15 some level of backup.

16 DR. WALLIS: I think you're going to take
17 twice your allotted time here.

18 MR. SCHULZ: The PRA, you see the summary,
19 the numbers here for core damage frequency, large
20 release frequency, at power, shutdowns, based on
21 internal events, floods and fires compared to the
22 safety goals.

23 And we think that not only just from the
24 numbers, but from the sensitivity studies that we've
25 done that we have a very robust design. It ha lots of

NEAL R. GROSS

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

1 margin and relatively little uncertainty, and a lot of
2 that goes back to the passive systems are simply.
3 There's not a lot to model. There's not a lot that
4 can go wrong.

5 You don't have the complex network of
6 systems that start from AC power, cooling water
7 systems, HVAC systems that go all the way up through
8 your front line pumps and fans and whatever that you
9 have in the current plants.

10 MR. ROSEN: These are very interesting
11 results. They first show something that we've
12 suspected for some time in operating plants, that risk
13 during shutdown is comparable to the risk during
14 operation, and we show that again here, two or E to
15 the minus seven in both cases.

16 MR. SCHULZ: Yeah.

17 MR. ROSEN: And the other thing it shows
18 is something else we've suspected all along, is that
19 fires are important both during operation and
20 shutdown, and that you show again here, and in fact,
21 you show it more important than shutdown and
22 operation. I mean it's a higher risk.

23 I'd be interested if you could off the top
24 of your head tell me why, but it's really just
25 perverse curiosity.

NEAL R. GROSS

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

1 MR. SCHULZ: I'd say first that the
2 shutdown internal events is --

3 MR. ROSEN: The fire number.

4 MR. SCHULZ: I understand. I just wanted
5 to say something about -- because you had commented on
6 both.

7 This number is calculated in a very
8 similar way than the at power, which is kind of unique
9 to this plant design, which doesn't rely on shutdown
10 systems to provide the safety. We still have -- a
11 shutdown cooling system is still a non-safety system.
12 Okay? So we always have passive features that provide
13 the bulk of the core melt protection, and so we don't
14 have to rely on trying to anticipate maintenance
15 outages and having taken part of your protection out
16 of service during a shutdown.

17 So it's a lot simpler and probably less
18 uncertainty in the shutdown number here. When you do
19 that with an operating plant, it's a lot more
20 difficult, and it's probably more uncertainty in terms
21 of, you know, in-service testing, inspection,
22 maintenance.

23 Now, internal fires, these numbers are not
24 calculated with the same level of detail as the
25 internal events. In order to simplify the analysis,

NEAL R. GROSS

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

1 we ended up making it more conservative, and so I
2 think these numbers are not as comparable in terms of
3 their accuracy. It's more of a conservative number,
4 but they're a little bit higher than we would think
5 they would really be.

6 So I think your statement may be misled or
7 we may be misleading you a little bit by showing these
8 numbers that are more comparable and you saying that
9 fire is important. And what we're saying is that
10 these are conservative numbers, more conservative than
11 these numbers just because of the simplifications we
12 did in doing the fire PRA.

13 MR. ROSEN: Well, I was specifically
14 commenting on the fact that the shutdown fire core
15 damage frequency is higher than your at power.

16 MR. SCHULZ: No, it's not.

17 MR. ROSEN: Eight E to the minus --

18 MR. SCHULZ: Eight, minus eight though.

19 MR. ROSEN: Yeah, versus five E to the
20 minus eight.

21 MR. SCHULZ: Oh, okay. You're comparing
22 this. Yes, yes.

23 MR. ROSEN: And that was the -- I believe
24 that because I think at least in current operating
25 plants there's a lot more going on in shutdown. There

NEAL R. GROSS

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

1 are a lot more people there. Fires, you know, are
2 more likely.

3 MR. SCHULZ: What tends to happen to
4 AP1000 is that when you start looking at those levels
5 of defense, when you look at shutdown, you have fewer
6 levels of defense involved, and that's what tends
7 to -- even though you're there less often so the
8 initiating event challenges are lower, you also have
9 less protection.

10 MR. ROSEN: You're there less often for a
11 shorter duration of time than you are at power.

12 MR. SCHULZ: Yes.

13 MR. SIEBER: Do you have a seismic CDF in
14 WHARF (phonetic)?

15 MR. SCHULZ: No. The seismic was done on
16 a seismic margins basis.

17 MR. SIEBER: Okay.

18 MR. SCHULZ: We looked at, I think, .5 G.

19 MR. SIEBER: And so that's not included in
20 your final number?

21 MR. SCHULZ: That's not. Seismic is not
22 in there, right.

23 And at risk of showing the in-vessel
24 retention picture, I wanted to at least go through the
25 different things that are in the design that relate to

NEAL R. GROSS

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

1 severe accidents and capability. Obviously core
2 competent interaction, the in-vessel retention is a
3 feature that minimizes, reduces that importance.
4 We've done testing analysis for both AP600 and AP1000.

5 For AP1000, we improved the shape of the
6 insulation. In AP600 there was more of a cone shape
7 down here, which was less effective at promoting the
8 actual circulation and cooling of the lower head than
9 the hemispherical head that we now have. And this was
10 one of the things that we tested for AP1000.

11 High pressure core melt is dealt with by
12 the highly reliable ADS which has --

13 DR. WALLIS: You do have instrument
14 penetrations in the bottom of this vessel?

15 MR. SCHULZ: No.

16 DR. WALLIS: Nothing at all?

17 MR. SCHULZ: No.

18 MR. SIEBER: No.

19 MR. SCHULZ: High temperature core melt is
20 reduced greatly in probability because of the highly
21 redundant, diverse ADS system. You know, ADS-1, 2, 3
22 or 4, all or any of those are sufficient to get you
23 down low enough in pressure to prevent a high pressure
24 core melt.

25 Hydrogen burn detonation is dealt with by

NEAL R. GROSS

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

1 arrangement of the containment, where we put vents on
2 the IWST to keep potential hydrogen flames from
3 damaging the containment shell, as well as by the fact
4 that we have redundant, diverse igniters/pourers
5 (phonetic) in there.

6 Ex vessel steam explosions. Again, heat
7 being the core in the vessel would prevent that, and
8 we've also, as you heard, I think, the last time we
9 talked about containment integrity even if IDR fails.

10 DR. RANSOM: The vessel insulation, is
11 that on multiple shields, too?

12 MR. SCHULZ: Yes.

13 DR. RANSOM: What material is that made
14 out of?

15 MR. SCHULZ: Stainless steel.

16 DR. RANSOM: And how many layers or how
17 thick is each layer?

18 MR. SCHULZ: They're like foil. so
19 they're very thin.

20 DR. RANSOM: Very thin.

21 MR. SCHULZ: The interior layers. Now,
22 there's an inside layer which is heavier and an
23 outside layer which is heavier for handling purposes.

24 DR. RANSOM: So they're a jacket that's
25 made and installed.

NEAL R. GROSS

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

1 MR. SCHULZ: Yes, yes. It has to be, you
2 know, fit to the --

3 DR. RANSOM: Are they evacuated also?

4 MR. SCHULZ: No.

5 DR. RANSOM: No. Are they filled with
6 argon?

7 MR. SCHULZ: No, just air. They're not
8 sealed.

9 DR. WALLIS: No, they're filled with Oak
10 Ridge actually.

11 (Laughter.)

12 MR. ROSEN: I assume they're probably
13 dimpled or something so there is a means of creating
14 an air gap between the layers.

15 CHAIRMAN KRESS: Yeah, they're spaced.

16 MR. SIEBER: I don't recall that.

17 MR. ROSEN: Pardon?

18 MR. SCHULZ: The samples --

19 MS. CUMMINS: You can't see the -- on the
20 outside you see a box which looks like a stainless
21 steel box, and on the inside are all of these foils.

22 CHAIRMAN KRESS: They generally have
23 spacers, shims.

24 MR. SIEBER: They are not a precision kind
25 of a thing.

NEAL R. GROSS

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

1 CHAIRMAN KRESS: No.

2 DR. RANSOM: Well, I assume that they're
3 at least made so that, you know, the gap provides some
4 resistance to conduction.

5 CHAIRMAN KRESS: That's true.

6 MR. SIEBER: Well, the joints, you have
7 conduction all the way through. So they get --

8 MR. SCHULZ: And leakage. You take a
9 little bit of a hit here from insulation effectiveness
10 point of view. So you have to account for that and
11 the normal heat loads in containment are a little bit
12 greater with this kind of insulation.

13 DR. RANSOM: Have you ever brought a
14 sample of that here?

15 MR. SCHULZ: No. I have one sitting on my
16 desk back in Pittsburgh.

17 MR. SIEBER: It's the same as what they
18 use in plants today.

19 MR. SCHULZ: Yeah.

20 DR. RANSOM: Today?

21 MR. SIEBER: Yeah.

22 MR. SCHULZ: It's not new.

23 MR. SIEBER: It takes a bunch of sections
24 and you strap them all together.

25 MR. CUMMINS: You buckle them together,

NEAL R. GROSS

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

1 and you have to take them off if you want to inspect
2 the pipe, and it's kind of a pain actually. That's
3 why people start using the other stuff.

4 DR. RANSOM: So if these are ripped off by
5 the discharge from an ADS valve, why, they're just big
6 chunks.

7 MR. SIEBER: Then you've got a bunch of
8 boxes on the floor.

9 MR. CUMMINS: Yeah, it's stainless steel
10 pieces.

11 MR. SIEBER: A bunch of boxes on the
12 floor.

13 MR. SCHULZ: The next couple of slides
14 deal with some structural considerations. This is
15 pretty much a list of the main structural changes to
16 the AP1000. As I mentioned the containment shell, as
17 well as the containment vessel, were raised about 25
18 and a half feet.

19 DR. WALLIS: Only on the top, right?

20 MR. SCHULZ: Yeah, the top part. Down
21 here was not changed, but basically inserted a ring in
22 both the steel shell and the concrete that was 25 and
23 a half feet.

24 The PCS capacity was increased about 50
25 percent, and that's this water storage up here. Now,

NEAL R. GROSS

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

1 that's less than the containment or the core increase,
2 and we did a couple of things there to minimize the
3 increase. One of them is that we didn't have to
4 increase the flow rate in the first several hours
5 because that was based more on establishing a water
6 film quickly and the flow rate was high enough to
7 still reduce the containment pressure. So that didn't
8 have to be increased. So that didn't contribute to
9 water flow or water volume increase.

10 The other thing was that AP600 originally
11 was designed to try to go seven days with water
12 instead of three days, but we basically didn't have
13 enough water left over after three days to provide
14 sufficient cooling. So we tried to do something and
15 we ended up not really pulling it off.

16 So we ended up deciding with this AP1000
17 we're just going to use that extra water in the first
18 three days. So that also reduced the amount of
19 increase that we needed in the tank volume, and at the
20 end of three days this tank would be empty.

21 Now, of course, there is still the
22 ancillary water storage tank that we have provided and
23 ancillary pumps that can refill that, plus the fire
24 connections and all of that.

25 MR. ROSEN: Now, these valves that Jack

NEAL R. GROSS

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

1 Sieber was worried about earlier, you can show us
2 where they are?

3 MR. SIEBER: There's the spares right
4 there.

5 MR. SCHULZ: There's a little room that's
6 depicted here. Here' stairs that are inside the
7 concrete, and then outside. I think this is actually
8 part of the covered access up to this side of the
9 containment. It's on the outside of the concrete.

10 So from here down you're outside the
11 concrete, and then you have to transition in to get to
12 that room.

13 MR. ROSEN: And where are those valves
14 right there in that?

15 MR. SCHULZ: They're right there in this
16 room so that the lines come down from the tank into
17 this room and then go over to the top of the
18 containment.

19 MR. SIEBER: And the containment there is
20 about an inch and a half thick, the steel part.

21 MR. CUMMINS: Inch and three-quarters.

22 MR. SCHULZ: And three-quarters. It's
23 slightly thicker than AP600, and then I think the next
24 slide actually shows it.

25 DR. SHACK: And it's a higher strength

NEAL R. GROSS

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

1 steel, too.

2 MR. SCHULZ: Right.

3 MR. SIEBER: But from a radiation
4 shielding point of view, it's almost transparent.

5 MR. SCHULZ: The air inlets up at the top
6 here were reconfigured in shape, this same area, and
7 the reconfiguration was to allow for a stronger
8 connection between the dome and the side wall.

9 The polar pane was raised and facet
10 increased because of the larger steam generators.
11 Obviously the reactor vessel gets a little bit longer.
12 Steam generators are bigger. The concrete walls
13 around the steam generators were raised because the U
14 tubes were raised, and the pressurizer height was
15 raised because of volume changes.

16 And the only thing out in the auxiliary
17 building that changed was the lowering of the spent
18 fuel pit floor because we have longer fuel.

19 CHAIRMAN KRESS: You had to change out
20 those steam generators. Did you have to cut a hole
21 through the containment?

22 MR. SCHULZ: Yeah. It would go up through
23 the center here. It would move this concrete shield
24 and the screens that are in here, and if you cut a
25 hole in the steel and then --

NEAL R. GROSS

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

1 CHAIRMAN KRESS: Pulled it right up there.

2 MR. SCHULZ: -- pull it right up there,
3 right.

4 MR. SIEBER: That's one way. You don't
5 have room enough to turn it inside.

6 MR. CUMMINS: I think we do, but we
7 haven't finished that study.

8 MR. SIEBER: You have to cut the moisture
9 separator off to do that.

10 MR. SCHULZ: This shows you the steel
11 containment vessel. The same diameter as AP600.
12 Again, it's 25 or so feet longer. Here's the
13 different material we're using. Design pressure went
14 up from 45 to 59 psi, the same design pressure, and we
15 have some external pressure capability to deal with.

16 DR. WALLIS: But you never pull a vacuum
17 in there, do you?

18 MR. SCHULZ: We've tried hard to see if we
19 could, and basically the limiting case is if you have
20 very, very cold weather and you lose your heating.
21 Then the cold weather will tend to pull the
22 containment down, and if you're starting at
23 atmospheric pressure, you will drift into a mild
24 vacuum.

25 There is no spray system. Turning water

NEAL R. GROSS

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

1 on with cold weather actually helps because the water
2 is warmer than the air.

3 The seismic design basis, the main point
4 here is that both AP600 and AP1000 have a response
5 spectrum that's amplified at high frequencies to
6 cover -- to bound off the reg. guide.

7 CHAIRMAN KRESS: Is this a limitation on
8 the site you can use?

9 MR. CUMMINS: The hard rock is the
10 limitation on the sites you can use. I think the
11 current sites, maybe 30 percent are hard rocks, and
12 this was a decision to expedite the process because
13 the soft soil analysis is long and expensive, and we
14 ultimately will expand to soft soil sites and do that
15 analysis, but it's not in design cert.

16 CHAIRMAN KRESS: I was wondering if you
17 could sell one to Japan with that limitation.

18 MR. CUMMINS: Well, the .2 G is probably
19 not sufficient for Japan.

20 MR. ROSEN: So you're limited to .3 G with
21 a hard rock foundation for now.

22 MR. SIEBER: But there's still room for
23 additional analysis.

24 MR. CUMMINS: Yes, you can expand that.
25 There's no question. It just takes lots of

NEAL R. GROSS

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

1 engineering hours. What we're going to expand it to
2 is to the utility requirements document set of soil
3 conditions which bounded I think it was 80 percent of
4 U.S. sites.

5 MR. SIEBER: And for non-hard rock sites,
6 it doesn't really pay you to do a generic analysis
7 because soil liquefaction and all of that differs from
8 site to site.

9 MR. SCHULZ: The last couple of slides are
10 basically summarizing some of the other features of
11 the design. I had mentioned great simplifications of
12 the design. Here you see some numbers in terms of
13 your reduction in safety related valves. This is just
14 total numbers of pumps, safety related piping, 83
15 percent less, again, with a great simplification in
16 not having pumps outside containment, multiple headers
17 inside containment.

18 The cable reductions are mainly with
19 multiplexing and digital I&C, as well as having fewer
20 valves and pumps and thing. This all ends up
21 translating into smaller buildings, especially the
22 seismic buildings.

23 This gives you sort of a graphical picture
24 of how much smaller the footprint is, and the colored
25 parts are the safety related stuff that's train

NEAL R. GROSS

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

1 oriented and whatever. This is actually Seiswell,
2 which is sort of advanced evolutionary type design
3 with four trains. So with four diesels, and it's
4 probably a little bigger than most operating plants,
5 but not too different from where you'd end up with an
6 evolutionary advanced design.

7 MR. SIEBER: When you did the civil
8 layout, did you take into account providing sufficient
9 space to maintain the equipment?

10 MR. SCHULZ: We had a lot of help back in
11 AP600 from U.S. utilities. We had a handful of guys
12 sitting in our building helping us to make sure we had
13 laid on space. There were reviews done, and the EPRI
14 requirements are pretty strong in that area.

15 So we didn't make the plant smaller
16 because we chined on maintenance and lay-down space.

17 MR. SIEBER: Well, that was the practice
18 in the middle to late '60s and early '70s. You know,
19 let's make it smaller, smaller, smaller until you
20 couldn't work on the heat exchanger, couldn't retube
21 anything. You know, it was always a big adventure.

22 So I hope that that mistake wasn't made
23 here.

24 MR. SCHULZ: Well, we think not. We've
25 done a lot of things in terms of --

NEAL R. GROSS

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

1 MR. SIEBER: Well, you've thought about it
2 at least.

3 MR. SCHULZ: Installed platforms, where
4 things are located so that you don't have to put
5 scaffolding up.

6 MR. SIEBER: Right.

7 MR. SCHULZ: All that kind of stuff.

8 MR. SIEBER: Okay. Good.

9 MR. SCHULZ: We've done a lot of work in
10 the general arrangement. AP1000 is the same as AP600.
11 Separation of radioactive/nonradioactive areas out in
12 the AUX building; fire separation even in containment.
13 We obviously can't put wall barriers up per se, but we
14 try to do some innovative things.

15 We're having two trains above the
16 operating deck and two trains below the operating deck
17 as the primary routing to get some separation.
18 Safety/non-safety, again, especially outside in
19 containment.

20 Here's your maintenance inspection. We've
21 also added access areas and staging areas right
22 outside of the main operating deck out into an annex
23 building out here. So right before refuelings, you
24 can get everything all ready here to go in a nice, big
25 space.

NEAL R. GROSS

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

1 You also have some storage space out here
2 so that you don't have to keep -- you're not tempted
3 to keep tools and fixtures and things inside
4 containment which can end up being debris in an
5 accident.

6 The access to the containment, we have
7 basically two equipment hatch kind of things, one at
8 the operating deck and one at the main level below the
9 operating deck so that we can get stuff in and out
10 easier and quicker during fuelings.

11 MR. SIEBER: But those are both inside the
12 aux. building?

13 MR. SCHULZ: That's right. They're both
14 covered by you can see here safety related structures.
15 Now, there is another building out here, which is a
16 non-safety related structure. It's still a radiation
17 controlled environment.

18 MR. SIEBER: Having one equipment hatch
19 outside was a convenience for moving material in and
20 out.

21 MR. CUMMINS: This is Ed Cummins.

22 The utility requirements document
23 prevented that.

24 MR. SIEBER: Oh, okay.

25 MR. SCHULZ: Yeah, that was their --

NEAL R. GROSS

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

1 MR. SIEBER: They didn't want it.

2 MR. SCHULZ: Now, the lower one you can
3 get a truck up from grade to that door. So we have
4 some pretty easy access to that one, but they wanted
5 to get through the building.

6 MR. SIEBER: Yeah. Well, okay. It's
7 still easier to rig and lift on the outside rather
8 than inside some building someplace, but whatever the
9 customer wants, I guess.

10 (Laughter.)

11 MR. SCHULZ: That's what we were working
12 on.

13 Improved construction methods. The first
14 thing, of course, is simplifying, reducing what you
15 have to build. Another main thing was use of
16 modularization, extensive use. You see here sort of
17 an outline.

18 The main module inside containment with
19 the steam, two-loop compartments, the refueling canal,
20 reactor cavity underneath, the pressurizer
21 compartment.

22 That thing will be put together by steel
23 panels. You see these lines here are panels that
24 would be factory fabricated, shipped to the site and
25 then welded together in this large module outside of

NEAL R. GROSS

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

1 containment, and then the whole thing lifted inside
2 containment. That kind of construction we think will
3 add to the quality as well as to the speed of
4 construction.

5 We've done a lot of work on construction
6 schedule including what we call 4D modeling using our
7 3D computer model of the plant coupled with time in
8 a construction kind of mode to see how the plant goes
9 together.

10 You know this story probably better than
11 we do. We've been successful with maintaining our
12 schedule, and we just have a few steps to go,
13 important steps though.

14 This is just a summary. We think that
15 AP1000 meets with some comfort the NRC and industry
16 standard, both deterministic and probabilistic, and
17 that the final design approval is an important step in
18 our journey.

19 DR. WALLIS: Tell us the status for future
20 plants. There are not any future standards though.
21 You don't know what they're going to be.

22 MR. SCHULZ: No.

23 DR. WALLIS: So these are really existing
24 standards.

25 MR. SCHULZ: Existing standards, yes. To

NEAL R. GROSS

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

1 the extent that they do exist for --

2 DR. WALLIS: For light water reactors.

3 MR. SCHULZ: -- light water reactors and
4 for new plants.

5 MR. ROSEN: This picture raises a question
6 in my mind, which may be better addressed on Slide 18.
7 Could you go back to that one?

8 Yeah. Where is the grade in this? Oh,
9 that's it. Okay.

10 Could it be deeper? Could you sink this
11 whole thing deeper?

12 MR. SIEBER: Sure.

13 MR. ROSEN: I mean, is there any reason
14 that the grade needs to be at that point?

15 MR. SIEBER: You just have a little stack
16 coming out of the ground.

17 MR. ROSEN: Well, that's where the access
18 is, right?

19 MR. CUMMINS: Yeah. Maybe if you started
20 all over again you could have it, but at this stage
21 you have a lot invested in the access and all the
22 other arrangements on how you got any piece of
23 equipment out for repair. You couldn't have the whole
24 thing underground because you have to have air
25 cooling, but you could have had a design philosophy of

NEAL R. GROSS

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

1 more underground, but the studies done by the industry
2 in probably the '80s assessed that underground
3 construction was much more expensive and difficult
4 than above ground, and all of the recommendations from
5 these DOE sponsored constructability things said that
6 it would be good to minimize underground.

7 Of course, we have a little bit different
8 environment now, but --

9 DR. WALLIS: But what the underground is
10 the core is essentially underground and the spent fuel
11 pool is --

12 MR. CUMMINS: Yeah, there's two floors of
13 the auxiliary building underground, but I don't think
14 that that gives you much because the steam generators
15 aren't. So we don't claim any security benefit from
16 that.

17 MR. ROSEN: Where is the fuel pool on this
18 one now?

19 MR. SIEBER: It's out there.

20 MR. ROSEN: But where? But relative to
21 grade?

22 MR. SCHULZ: See, this is operating deck
23 here.

24 MR. CUMMINS: I believe that the top of
25 the fuel pool is 135 and grade is 100. So maybe the

NEAL R. GROSS

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

1 fuel is -- I don't exactly know -- maybe the fuel is
2 below, but there's a lot of water above.

3 MR. SCHULZ: Another thing to consider in
4 our design, we did wind tunnel testing to make sure
5 that the air inlets and the air exhaust were not
6 perturbed by air flow over the turbine building or
7 nearby hills. If you started lowering the containment
8 I don't know what would happen to such interactions.

9 MR. SIEBER: It would lower everything.

10 MR. SCHULZ: The hills?

11 MR. SIEBER: Office buildings, turbine.

12 MR. SCHULZ: Yeah, I see. If you lower
13 the --

14 MR. SIEBER: All you'll have is that
15 little stack at the top that's coming out of the
16 ground.

17 CHAIRMAN KRESS: Okay. I guess at this
18 time would be a good time to take a break. So I'll
19 declare a break until 10:30, and then we'll come back.

20 (Whereupon, the foregoing matter went off
21 the record at 10:12 a.m. and went back on
22 the record at 10:30 a.m.)

23 CHAIRMAN KRESS: Okay. I guess on the
24 agenda we're at the place where the staff is going
25 into take over. Are you ready, John?

NEAL R. GROSS

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

1 MR. SEGALA: I'm just recovering from a
2 cold. So you'll have to bear with my voice here.

3 CHAIRMAN KRESS: Just don't breathe on us.

4 MR. SEGALA: That's all right. I think
5 I'm better. I just have the residual at this point.

6 MR. SIEBER: What's important is are you
7 contagious.

8 MR. SEGALA: I have no idea.

9 MR. SIEBER: I may move over.

10 (Laughter.)

11 MR. SEGALA: There are some open seats
12 over there.

13 MR. SIEBER: In the middle.

14 MR. SEGALA: Well, I'm John Segala. I'm
15 the lead project manager for the AP1000 design
16 certification review.

17 The other project managers are Joe
18 Colaccino. He's stepped out for a minute. Steve
19 Bloom and Lauren Quinones over there.

20 What we did here was we went back to the
21 previous Future Plant Design Subcommittee meeting in
22 Pittsburgh and worked off of what we presented at that
23 meeting and developed an update package for you for
24 this meeting.

25 So the purpose is to provide a summary of

NEAL R. GROSS

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

1 our review and the current status of the project;
2 discuss major milestones and successes that you
3 understand what we reviewed and how we resolved it;
4 and current status of future milestones.

5 CHAIRMAN KRESS: Success of your
6 presentation is if we have these attributes; is
7 that --

8 MR. SEGALA: Yes, yes. And you'll see
9 some more attributes as we go down.

10 So because of time constrained I put both
11 my earlier presentation and later presentation
12 together. So this will actually be two mini
13 presentations.

14 Just really quick, March 2002 we completed
15 a pre-application review. Westinghouse submitted
16 their design certification application March 28th. On
17 June 25th, NRC accepted the application. June 16th we
18 issued a DSER with 174 open items.

19 On May 18th, we responded to your interim
20 letter that we received, and on May 25th, we sent you
21 an advanced copy of the FSER.

22 This slide just points out how many ACRS
23 meetings we've had. A total of 18, including today's
24 meeting. We'll have one more meeting in July for the
25 full committee, and so that will be 19.

NEAL R. GROSS

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

1 Although we did a complete review for
2 AP1000, if you go back to AP600, there were 44 ACRS
3 meetings, which that all sort of builds together.

4 The remaining milestones, July 7th, full
5 committee meeting which I mentioned before. This July
6 17th sort of forward looking at we're requesting that
7 that's when you could get us a letter by in order for
8 us to meet the future milestones.

9 The division director --

10 CHAIRMAN KRESS: How come it isn't that
11 the slash on that approval, say, slash, discipline?

12 MR. SEGALA: Well, we're being optimistic.

13 CHAIRMAN KRESS: Oh, okay.

14 MR. SEGALA: August 6th, where you have to
15 get --

16 CHAIRMAN KRESS: Excuse me for that.

17 PARTICIPANT: You had our heart beating.

18 DR. WALLIS: From the point of view of
19 punctuation, is there one or two or ten directors
20 involved and is there an apostrophe somewhere in
21 there?

22 MR. SEGALA: There's four division
23 directors.

24 DR. WALLIS: So there's an apostrophe
25 after the S.

NEAL R. GROSS

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

1 MR. SEGALA: Yeah.

2 DR. WALLIS: Okay. Thank you.

3 MR. SEGALA: August 13th, OGC, no legal
4 objection.

5 August 30th, EDO memo to the Commission,
6 and then on September 13th, we issue the FSER and FDA.

7 And December 2005 is our current schedule
8 for the final design certification rulemaking,
9 although we've committed to reassess the schedule and
10 discuss that when we issue the FSER.

11 CHAIRMAN KRESS: Are you trying to move it
12 up?

13 MR. SEGALA: Yeah. We're looking at
14 whether we can do that or not.

15 This is just to give you an idea of the
16 resources that we've put towards this review. This is
17 a total of 88 technical reviewers as well as project
18 managers that have worked on both the draft SER and
19 FSER.

20 It also shows you that I couldn't have all
21 of these people here today to answer your questions.
22 So if things come up that I don't know the answer to
23 we'll try and get back to you.

24 As well as the reviewers, these are the
25 contractors we've had supporting our review.

NEAL R. GROSS

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

1 Just really quick, we had 742 RAIs as
2 compared to 7,000 RAIs for AP600. This just gives you
3 a general idea of what areas the RAIs fell into. The
4 significant number of RAIs doesn't necessarily mean
5 anything. The individual items may be significant
6 even though you may only have a few of them.

7 We issued the DSER on June 16th, 174 open
8 items in it, and in ten months we got that down to
9 resolving all of the open items, and then when
10 Westinghouse issued their Rev. 11 of the DCD, that
11 allowed us to confirm all of the open items.

12 DR. WALLIS: It's interesting not items
13 appeared between 6/16/03 and --

14 MR. SEGALA: Well, I'm about to get to
15 that.

16 DR. WALLIS: Oh, there are some new items
17 which aren't shown here.

18 MR. SEGALA: There are some new items.

19 DR. WALLIS: Oh, okay.

20 MR. SEGALA: This doesn't show that.

21 DR. WALLIS: Thank you.

22 MR. SEGALA: Seven hundred -- I went
23 backwards. Am I still going backwards?

24 MR. SIEBER: There you go.

25 MR. SEGALA: Okay. One hundred seventy-

NEAL R. GROSS

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

1 four open items as compared to 1,300 for AP600. We
2 issued five new open items after the DSER was issued.
3 Four of those were related to materials that were
4 brought up at the Future Plant Subcommittee meeting in
5 Pittsburgh, and one was brought up on sumps.

6 And we have a slide in a little while that
7 you'll see that will discuss those.

8 Design acceptance criteria, these are
9 typically limited to those areas that are affected by
10 rapidly changing technologies or design areas which as
11 built or as procured information is not available,
12 and for AP1000 we've I&C, human factors, control rooms
13 design, and piping.

14 CHAIRMAN KRESS: There was some debate
15 about the piping early on.

16 MR. SEGALA: Yeah, piping was not
17 originally approved. For AP600, they did the full
18 piping, but for AP1000 they proposed a DAK approach.

19 Exemptions. We had three exemptions for
20 AP1000, 5,034 for the safety parameter display.
21 Westinghouse asked for an exemption to have an
22 integrated safety parameter display system, rather
23 than having a separate, stand alone system how current
24 plants have.

25 And this is something that the staff found

NEAL R. GROSS

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

1 acceptable, and I believe it's in our SRP that allows
2 them to do that.

3 For the ATWS requirements, Terry alluded
4 to this before. They asked for an exemption regarding
5 the requirement to have an aux. feedwater system, and
6 they have a passive RHR system.

7 And then GDC 17 requires two independent
8 off-site sources, and because Westinghouse doesn't
9 rely on that, that we gave them an exemption on that.

10 Okay. So this was my first conclusion
11 remarks, was all open items resolved. We believe all
12 ACRS issues are addressed, but that remains to be
13 seen, and we're on schedule to issue the FSER on
14 September 13th.

15 And I'll just seque into the next
16 presentation.

17 The purpose of this presentation is to
18 give you a summary of the staff's review and
19 resolution of the open items, and to have you gain
20 understanding of what we reviewed and how we resolved
21 it and get your agreement that the items are resolved.

22 This other slide you have seen before.

23 Back in the Future Plant Design
24 Subcommittee in Pittsburgh in July of '03, we had
25 discussed with you the possibility of having some

NEAL R. GROSS

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

1 supplemental DSER sections. We ended up completing
2 the review. For Chapter 21 we included the AP600
3 evaluation in in the AP1000 FSER, and for Chapter
4 14.2, we issued 28 additional open items. They're
5 sub-open items on the initial test program which we
6 didn't review for the DSER. they're all resolved.

7 And for Section 13.6, 3.6, 3.4, and 3.3,
8 we resolved all of the open items with that. So in
9 general because there were no remaining open items, we
10 just included that in the final SER rather than issue
11 supplementals.

12 In Chapter 1 of the DSER, there were three
13 open items that were sort of generic in nature. One
14 was we had a check. The DSER was reviewed up to Rev.
15 3 of the DCD. We're now up to Rev. 12. So this open
16 item was to make sure that we reviewed the latest
17 revision of the DCD, and we don't expect any future
18 technical changes at this point.

19 TRT Star information, that's information
20 that's locked down. They have to get staff approval
21 before they can make changes to that. We have
22 reviewed all of that and are happy with what's in the
23 DCD for that.

24 Combined license action items, the staff
25 has reviewed them and found them acceptable.

NEAL R. GROSS

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

1 For the post SER open items, the four were
2 on materials, and one was on the sump screens. The
3 first materials one is poor shroud susceptibility to
4 stress corrosion cracking. Westinghouse provided a
5 response to that item and stated that based on
6 operational experience no inspections were required
7 beyond ASME, and the staff agreed with that.

8 This item was no discussed in the FSER.

9 The next materials question was Alloy
10 52/152 weldment QA criteria. In Westinghouse's
11 response, they proposed to use 100 percent volumetric
12 examination of all partial penetration J groove welds
13 in the vessel, and the staff found that acceptable,
14 and that is discussed in the FSER.

15 High chromium nickel-based alloy
16 susceptibility, a low temperature crack propagation
17 was a third materials question, the new item that we
18 asked. Westinghouse's response concluded that there
19 were four conditions that were necessary for the
20 occurrence of low temperature propagation: relative
21 high concentrations of hydrogen in the environment and
22 in the metal relatively low temperatures; the presence
23 of a sharp cracked tip; the presence of loads which
24 rise at a moderate rate to levels great enough to fail
25 a flawed material.

NEAL R. GROSS

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

1 Westinghouse looked at their conditions
2 and concluded that the occurrence of low temperature
3 crack propagation cannot take place in the AP1000
4 design, and the staff found that acceptable. That is
5 also discussed in the FSER.

6 MR. SIEBER: A quick question on the
7 course rep. In current PWRs, I don't recall there
8 being any shroud cracking in PWRs; is that correct?

9 It's BWRs that had the shroud cracking
10 problem as I recall it. Does anybody know?

11 MR. MITCHELL: Yes, this is Matthew
12 Mitchell, Acting Section Chief, Materials and Chemical
13 Engineering Branch.

14 I'm not aware of any occurrences of shroud
15 cracking in pressurized water reactor designs.
16 Certainly we have been very familiar with the
17 phenomena in boiling water reactor designs.

18 MR. SIEBER: Yeah, it seems to me there's
19 no stress. The shroud just sort of sits there, and so
20 it's not a structural member. It's just a flow
21 device.

22 MR. MITCHELL: Well, the stresses which
23 are attributable to causing the cracking of BWR design
24 generally tend to be welded to residual stresses.

25 MR. SIEBER: Right.

NEAL R. GROSS

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

1 MR. MITCHELL: Which would also be true of
2 a welded shroud design in a PWR, but the chemical
3 environmental conditions are obviously much less
4 aggressive in a pressurized water reactor design.

5 MR. SIEBER: Okay. Thank you.

6 And so it's no surprise that the staff
7 would agree tha these plants are not susceptible to
8 that?

9 MR. MITCHELL: Correct.

10 MR. SIEBER: Okay.

11 MR. SEGALA: The fourth materials new open
12 item was ADS Squib valve notch susceptibility to
13 stress corrosion cracking. Westinghouse' response
14 stated that this sheer section designed to ASME code
15 and environment is not susceptible to stress corrosion
16 cracking, and the staff agreed with that.

17 The next item on the sump screens, after
18 the DSER was issued, we, the staff, issued Rev. 3 to
19 Reg. Guide 1.82, and in there was a discussion on the
20 chemical effects precipitation that might form and
21 cloud up the screens.

22 The staff sent this concern to
23 Westinghouse and had them address it, and Westinghouse
24 added a COL action item to consider the generation of
25 chemical debris in an evaluation.

NEAL R. GROSS

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

1 We'll talk a little bit more about the
2 sump screens.

3 MR. ROSEN: Before you get off there,
4 would you talk a little bit more about the first
5 bullet? What's the rationale? Is there some capsule
6 rationale you can give me why they feel it's not
7 susceptible? Is it materials, stress, environment
8 rationale? What is it?

9 I believe that it was the conditions for
10 that to happen.

11 MR. MITCHELL: Yeah, this is Matthew
12 Mitchell again.

13 I was not directly involved in that
14 particular issue, but I believe what I have heard is
15 that it's a relatively shallow notched design, not
16 likely to lead to a severe stress intensification for
17 the Squib valve design. Plus the material that's
18 being used has been not shown to be prevalent to
19 stress corrosion cracking in a PWR environment.

20 If the gentleman from Westinghouse could
21 refresh my memory as to what the material is on that,
22 I believe it's a low carbon stainless; is that
23 correct?

24 MR. CUMMINS: A 316 stainless steel.

25 MR. MITCHELL: Three, sixteen.

NEAL R. GROSS

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

1 MR. SEGALA: The ITAAC for the plan are to
2 assure that the as-built plant conforms with the
3 certified design. We had 35 ITAAC related open items.
4 Some of them proposed new ITAACs are changes to
5 existing ITAACs, and some of them are related to
6 resolutions of other open items that we had in other
7 chapters.

8 And to date all of those have been
9 resolved.

10 Quality assurance. There were five open
11 items in the DSER. The staff went out and did
12 inspections at OSU, as well as at Westinghouse. For
13 OSU they identified a notice of violation and two
14 nonconformances, and OSU corrected that and provided
15 a response and the staff found that acceptable.

16 And at Westinghouse we had a notice of
17 nonconformance, and Westinghouse went out and
18 performed some audits of their vendors, and they
19 provided a response and the staff found that that was
20 acceptable.

21 Leak before break, we had two leak before
22 break open items. The issues included Alloy 690, 52,
23 152, susceptibility to pressurized water, stress
24 corrosion cracking. The results from the sensitivity
25 studies using stress corrosion cracking, crack

NEAL R. GROSS

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

1 morphologies indicate that that if margin exist in LBB
2 application.

3 Acceptability of Westinghouse's LBB
4 approach was another item. Westinghouse used a
5 combination of qualitative assessment and quantitative
6 evaluation to evaluate all AP1000 candidate, AP1000
7 LBB piping subsystems. That --

8 DR. WALLIS: Getting back to the 690, 690
9 is the magic material, isn't it, which is much better
10 than the previous material? There's not much
11 experience with it yet in nuclear plants, or is there?

12 MR. SIEBER: There is.

13 DR. WALLIS: How much experience? There
14 is a lot of experience.

15 MR. SIEBER: Steam generator tubes.

16 DR. WALLIS: So there is a lot of
17 experience. So we have a really good basis for making
18 this evaluation.

19 MR. ROSEN: Well, we don't have a long
20 experience, but we have a lot recently. I think the
21 jury is still out on 690.

22 DR. WALLIS: Right. So if something comes
23 up, you'd just be alert if something comes up with
24 this material

25 MR. SEGALA: Yeah. Westinghouse did one

NEAL R. GROSS

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

1 LBB analysis for the DVI-A subsystem, and then they
2 did an assessment of the AP1000 LBB subsystems using
3 the AP600 analyses and scaling factors for pipe
4 diameters and response spectra against bounding
5 analysis curves.

6 And Westinghouse considered in their LBB
7 assessments statistically based material properties,
8 more sensitive leakage detection capability, and
9 inclusion of pipe whip restraints, and the staff
10 concluded that this approach was acceptable, and all
11 LBB issues are resolved.

12 Regarding the sump screen performance,
13 there were six sump screen open items. They were
14 related to debris loading of the IRWS screens and
15 their recirculation screens, as well as debris through
16 the reactor coolant system break.

17 All open items are resolved. The staff
18 concludes that the screen design is acceptable based
19 on what Terry discussed, how they increased the screen
20 surface areas. They also put a cross-connect between
21 the two sumps. So that was their containment recirc.
22 screen redesign.

23 The screen designer is robust to prevent
24 screen blockage. They have low flows and the plate
25 over top of the screens help keep material away, and

NEAL R. GROSS

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

1 the lack of fibrous insulation.

2 they have ITAAC which verify the location
3 of the plates above the containment research sump
4 screens. There are screen surface areas. The bottom
5 of the containment research sump screens, how far
6 they're located off the bottom of the containment, and
7 the type of insulation and the dry film density of the
8 coatings.

9 They also have two COL action items. They
10 have one regarding their cleanliness program, and one
11 performing an evaluation consistent with Revision 3 of
12 Reg. Guide 1.82.

13 MR. ROSEN: Which means they'll use the
14 NEC guidance or at some point they'll actually show as
15 all other existing PWRs are going to be showing that
16 they can properly and adequately enter and maintain
17 recirc.?

18 MR. SEGALA: Well, the staff has approved
19 this based on the current design, and we believe that
20 anything that might come out of this evaluation would
21 just require programmatic changes.

22 MR. ROSEN: Oh, so we don't have to do all
23 of the work we're doing unclogging research and all of
24 that. We can just ask you how to solve it. You seem
25 to have a state of knowledge that far exceeds the

NEAL R. GROSS

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

1 industry's.

2 MR. SEGALA: Well, if it turns out down
3 the road -- well, let me turn it over.

4 MR. CULLISON: This is Dave Cullison from
5 the staff.

6 When we put in the Reg. Guide 182
7 evaluation, at the time that was basically what we
8 had, but the expectation is that the NEI methodology
9 expands on the information in Reg. Guide 182, and we
10 would expect that anybody doing an analysis would be
11 using an NRC approved methodology, which right now is
12 going to be the NEI methodology.

13 MR. ROSEN: So you feel you have enough of
14 a hook into the licensing of AP1000 that we can be
15 sure that there will be a full and thorough review of
16 the sump design that is analogous or equally complete
17 as is being done for operating PWRs?

18 MR. CULLISON: Yes, we do.

19 MR. ROSEN: What is that hook? I know
20 Westinghouse will do the right thing, but what is the
21 regulatory hammer? Where does it arise? I don't get
22 it.

23 MR. CULLISON: Well, we referenced the
24 Reg. Guide 1.82, which as I explained is the NEI
25 methodology is an expansion on that, but also, we're

NEAL R. GROSS

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

1 going to continue to evaluate what comes out of GSI
2 191, and if more information comes out that makes us
3 decide we need to revisit this, we can evaluate what
4 that we've done for AP1000 and, if necessary, backfit
5 them.

6 MR. ROSEN: Oh, that's what I was afraid
7 of. So you would have to backfit this design rather
8 than front fit, rather than put a condition in the
9 license now that says you'll --

10 MR. SIEBER: Once you make it a COL item,
11 doesn't that -- that's the hook, the regulatory hook
12 that makes them comply with whatever requirements
13 develop between now and when they --

14 MR. ROSEN: I hope so because I don't
15 think that the answer is satisfactory. I would have
16 to condition the ARS approval because I don't think
17 that's adequate. I mean, to say that if this turns
18 out that there's some substantial problem here that we
19 will go to Westinghouse and argue backfit, I simply
20 don't think that's appropriate. Certainly it's not
21 appropriate for the operating plants. I mean, we're
22 not doing that with the operating plants. It's not a
23 backfit to say that they have to successfully say that
24 they have to successfully execute recirc. That's
25 their design basis.

NEAL R. GROSS

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

1 MR. SEGALA: It's a compliance backfit.

2 MR. ROSEN: Compliance backfit.

3 MR. SEGALA: Compliance backfit, and that
4 would be the same, I mean that would be the same
5 approach that we would take for Westinghouse, but --

6 DR. WALLIS: Your Appendix A requires the
7 sump screens to work, and so if you ask a licensee,
8 "Show me that your sump screens work," they have to
9 take into account all of this information and do an
10 analysis.

11 MR. ROSEN: I'm trying to make sure we
12 have the regulatory authority to not get into a
13 discussion of whether it's required for AP1000 or not.
14 I mean it is. It should be; it must be, and so I am
15 still a little bit confused with the terminology
16 that's being used here. I mean, it's a regulatory
17 point.

18 MR. WILSON: Jerry Wilson, NRR.

19 As I understand it, the staff is saying at
20 this point in time that the design that Westinghouse
21 has provided is acceptable and meets the regulations.

22 So this issue here in the COL action item
23 deals with operational and procedural matters that we
24 would do later on.

25 MR. CUMMINS: This is Ed Cummins. I think

NEAL R. GROSS

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

1 that we have a COL item that says perform an analysis
2 in accordance with this Reg. Guide 1.82 and satisfy
3 the staff that that analysis is acceptable, and we see
4 that and I think maybe the staff should describe what
5 the regulatory process is, but we see that as an open
6 item that we have yet to satisfy and that we must
7 satisfy as we got to the COL stage.

8 MR. ROSEN: Well, I appreciate that, Ed.
9 I think that's the right point, position to be on, but
10 I'm still trying to figure out why the staff doesn't
11 see it that way, why the staff is saying, "Well, no,
12 we're just going to look at procedures, when in fact
13 we're looking at designs for the operating plants and
14 presumably we ought to be looking at it here, too, on
15 the same basis. It's not a different issue.

16 Now, clearly AP1000 has a lot of
17 advantages over the amounts to the operating plants
18 because you come so late in the design, in the cycle
19 of knowledge, core acquisition that you know what a
20 lot of the issues are, and you've done things that
21 clearly make the situation better, not less.

22 I still think we need some sort of -- I
23 don't know -- maybe it's a condition on the license or
24 something other than the staff saying we're going to
25 require Westinghouse to show us the procedures.

NEAL R. GROSS

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

1 Westinghouse is willing to go a lot beyond that.
2 They're saying that they're going to resolve the issue
3 just like the operating plants are.

4 I hope they will because that's the best
5 knowledge we will have based on all of the research
6 that's going on that will be built in.

7 CHAIRMAN KRESS: The operation plants will
8 have an option of using their risk informed approach,
9 which Westinghouse may very well take advantage of.

10 MR. ROSEN: Westinghouse will what?

11 CHAIRMAN KRESS: Could take advantage of.

12 MR. ROSEN: I would see no difference
13 between the way the Westinghouse -- Westinghouse
14 should have all of the flexibility that the operating
15 plants have, but in the same breath, one has to say
16 they have to do just as rigorous an analysis based on
17 the current research as the operating points, not some
18 -- there's no pass here. I'm not issuing any free
19 passes on this issue.

20 MR. CUMMINS: I think maybe we could take
21 an open item and bring the words of the COL item, and
22 I believe that the words of the COL item will satisfy
23 you, but I'm not positive.

24 MR. ROSEN: Maybe you could do that for
25 the full committee meeting because I could make a

NEAL R. GROSS

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

1 point that what is Westinghouse's commitment, and
2 maybe the staff could take another look at that.

3 MR. SEGALA: With regard to structure
4 seismic design, the review methodology was based on
5 review of critical sections selected by the staff, and
6 they were similar sections that were reviewed for
7 AP600. The design constraints which Terry discussed
8 were a hard rock site and a fixed base model for
9 seismic analyses.

10 There were 38 structural seismic related
11 open items. The major items included basemat uplift
12 and completion of the containment design.

13 CHAIRMAN KRESS: But could you refresh my
14 memory on what the basemat uplift issue is?

15 MR. SEGALA: Goutam, do you want to?

16 DR. WALLIS: It's a rather strange failure
17 mechanism of something. It seems to be that something
18 lifted up into the containment, the bottom of
19 containment.

20 MR. SIEBER: And then falls over.

21 MR. BAGCHI: This is Goutam Bagchi from
22 NRR.

23 The structural properties of the nuclear
24 island, particularly the height, extended height of
25 the shield building and so on increased the

NEAL R. GROSS

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

1 susceptibility to overturning, and at safe shutdown
2 earthquake level, it is not a problem.

3 But at the margins level we reviewed the
4 potential for lifting of the corners of the basement
5 up, and that slapping down of that at another cycle of
6 seismic motion could potentially produce high impact
7 and, therefore, difficulty in analyzing that
8 condition, and as a result they made some changes.
9 They provided sheer connectors to the bottom of the
10 steel containment, and there is still slight uplift,
11 but we have reviewed the calculations in detail, and
12 determined that it is acceptable.1

13 There was a detailed audit of actual
14 calculations.

15 MR. SIEBER: When you do the calculation
16 for uplift, does that include an analysis of piping
17 that penetrates containment and goes to the auxiliary
18 building to look for bending and stress and strain
19 effects?

20 MR. BAGCHI: Well, the whole building is
21 rather complex. It is a finite element model that was
22 used for the analysis, and everything is represented
23 there.

24 MR. SIEBER: Okay.

25 MR. BAGCHI: The masses are there. The

NEAL R. GROSS

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

1 stiffness is. Interconnections, all of those things
2 are there.

3 MR. SIEBER: Okay.

4 MR. BAGCHI: The staff, along with all of
5 the consultants, reviewed over several days all of the
6 calculations that were done. I think this is as
7 thorough a review as I have done in my more than 30
8 years with the NRC.

9 MR. SEGALA: Okay. Thanks, Goutam.

10 I think that completes that slide.

11 Thermal hydraulics was an area that we
12 spent considerable effort on. There were five thermal
13 hydraulic ACRS meetings where we talked about all of
14 the thermal hydraulic codes and analysis that were
15 performed.

16 There were four thermal hydraulic related
17 DSER open items which spanned on --

18 DR. WALLIS: Well, really they include
19 their result now. They did include.

20 MR. SEGALA: Did include, yes.

21 Liquid entrainment which included the hot
22 leg and upper plenum, course weld, long-term cooling
23 and blond precipitation. All of the open items are
24 resolved related to thermal hydraulic, and the staff
25 concludes that they meet 50.46.

NEAL R. GROSS

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

1 For PRA, we had a PRA subcommittee meeting
2 in January of 2003. There were 24 PRA related pen
3 items, and thais lists some of the notable topics, PRA
4 input to design certification process, PRA input to
5 witness process, impact of uncertainties on PRA
6 results and conclusions, success criteria and thermal
7 hydraulic uncertainty, SAMDA evaluation, reactor
8 vessel insulation design and shutdown risk, and all of
9 those open items are resolved.

10 I now am going to turn over the
11 presentation to Michelle Hart to give her evaluation
12 of aerosol removal.

13 MS. HART: Okay. I'm Michelle Hart. I'm
14 from the NRR staff. I did the dosage estimate for the
15 AP1000. I also had help from Sandia labs and from
16 other members of the staff.

17 Westinghouse initially intended to use the
18 AP1000 removal rates for the AP1000 sign. We
19 questioned that concept, and they eventually performed
20 a best estimate analysis with the AP1000 thermal
21 hydraulics calculated by MAAP, and they used aerosol
22 mechanistic code STARNAUA.

23 And in that code credit was given for
24 gravitational settling, diffuser phoresis, and thermal
25 phoresis, and we accepted these mechanisms as removal,

NEAL R. GROSS

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

1 but we questioned the actual calculational values that
2 they came up with.

3 CHAIRMAN KRESS: The MAAP thermal
4 hydraulic calculations, was that one sequence or a lot
5 of sequences.

6 MS. HART: It is one particular sequence,
7 and in fact, it's the 3BE-1, the double ended line
8 break of the DVI line, with the failure to activate
9 the intact train.

10 CHAIRMAN KRESS: Was that risk dominance
11 sequence?

12 MS. HART: It is risk dominance sequence.
13 It's the one that -- in fact, it's the one that is the
14 dominant contributor to CDF for the AP1000 design.

15 Also, those thermal hydraulic conditions
16 are typical for the majority of the sever accident
17 sequences, the 3DE class, fully depressurized and
18 reflooded, and as they used the alternative source
19 term reg. guide that we had written for the current
20 operating plants which implements NUREG 1465, the
21 revised source term, and that's supposed to
22 representative of low melt core melt accidents, which
23 is similar to the 3BE sequence.

24 CHAIRMAN KRESS: How did they synchronize
25 the-- there was a timing in the source term.

NEAL R. GROSS

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

1 MS. HART: Right.

2 CHAIRMAN KRESS: The timing in the thermal
3 hydraulics, how did they synchronize that?

4 MS. HART: Right. During the course of --
5 we had several discussions with Westinghouse over
6 these issues, and the way we had modeled it when we
7 did our independent analyses and we asked if they had
8 done it this way as well, and eventually they did do
9 it this way, is in the full integrated thermal
10 hydraulic analysis when it shows that you have the
11 release from the core, then because 1465 has that
12 timing aspect, that GAP release happens for 30
13 minutes, and then the core release happens for the one
14 and a half hours. You backed up 30 minutes from that
15 time that it shows in the thermal hydraulics, and
16 that's your start time for the overlaid, deterministic
17 source term.

18 We contracted with Sandia and did an
19 independent analysis that was a Monte Carlo sampling
20 using the melt core thermal hydraulics. We used our
21 own thermal hydraulics for the same scenario, and used
22 the aerosol deposition mode that is within MELCOR,
23 which is the MAEROS model.

24 WE sampled on 13 parameters that would
25 affect the aerosol parameters, and ran so many runs

NEAL R. GROSS

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

1 that we would have a ninth-fifth confidence level, 95
2 percent confidence level.

3 Engineering judgment was used for the
4 choice of parameters and the distribution of those
5 parameters.

6 DR. WALLIS: What does "engineering
7 judgment" mean?

8 MS. HART: If we were not sure as to what
9 the actual distribution would look like, we did use
10 something that was skewed toward a more reasonable,
11 conservative value.

12 DR. WALLIS: That's better. That's a
13 better statement.

14 MS. HART: Right.

15 CHAIRMAN KRESS: And in general, these
16 parameters that you sample, you really do know
17 something about the limits on a lot of those.

18 MS. HART: Right. We understood the
19 limits. If we didn't understand the behavior between
20 those limits, a lot of times we went with the
21 uniformed distribution. Some of them are a normal
22 distribution type.

23 And these are the sample parameters. I
24 won't mention each one by name. You can look over
25 them later. Some of the more important ones are the

NEAL R. GROSS

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

1 shape factors, the aerosol size, and the
2 nonradioactive aerosol mass.

3 DR. WALLIS: By sample, do you mean these
4 varied randomly?

5 CHAIRMAN KRESS: Monte Carlo.

6 MS. HART: Yes. This is the total runs.
7 These are the results from each run varied over time.
8 The large spike at around three and a half hours or so
9 is dues to a hydrogen burn. We don't know why it's
10 such an enormous, obnoxious looking spike, but there
11 it is.

12 DR. WALLIS: Because if you average all of
13 the curves, you make the spike go away.

14 MS. HART: Exactly, and that is exactly --

15 DR. WALLIS: But that's not the way to do
16 it though.

17 MS. HART: Well, there is some differences
18 in timing. We don't know if a hydrogen spike would
19 actually occur at that time. So you don't want to
20 take account of that in your removal.

21 DR. WALLIS: Yeah, but the last thing that
22 you want to do is average the curves to make the
23 spikes go away..

24 CHAIRMAN KRESS: But I suspect the spikes
25 are good things here. You want them to go away. What

NEAL R. GROSS

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

1 you're doing is increasing the thermal phoresis
2 problem.

3 MS. HART: Yes. And it just blows its
4 stuff over to the side, and so really it's a removal
5 mechanism that I mean you don't care if it goes away.

6 DR. WALLIS: It doesn't do much. For this
7 purpose, you don't care about the peaks.

8 CHAIRMAN KRESS: That's right.

9 DR. WALLIS: For other purposes you do.

10 MS. HART: For use in a dose calculation,
11 that is true. It would be conservative to not account
12 for that removal from that spike.

13 The late time values converge to around .3
14 per hour, and this is the uncertainty calculation, the
15 bounds that were given. We have the 80 through -- the
16 fifth percentile through the 80th percentile, and you
17 can see the median as well with the green line in the
18 center.

19 CHAIRMAN KRESS: For the elucidation of my
20 brethren, a lambda in this case is analogous to a
21 decay constant, related to the mass outborn in the
22 containment so that you know what we're talking about.

23 MS. HART: Right.

24 CHAIRMAN KRESS: In case you're not an
25 aerosol expert.

NEAL R. GROSS

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

1 DR. WALLIS: Now, what you really care
2 about is the amount of decontamination interval over
3 the period of time presumably.

4 MS. HART: Over a particular period of
5 time. That is correct.

6 DR. WALLIS: So if you integrate the
7 individual curves and get the amount of
8 decontamination, does that give you the same result as
9 if you take the mean of these things and then
10 integrate? That is not clear to me it does.

11 CHAIRMAN KRESS: What you really do is
12 have a race between airborne material being taken out
13 and what's leaking out the containment.

14 DR. WALLIS: No, I'm arguing about the
15 treatment of statistical data.

16 CHAIRMAN KRESS: Oh, oh.

17 DR. WALLIS: Sometimes if you take the
18 average and then use that as your mechanism you get a
19 very different answer than if you take each curve and
20 integrate for each curve and then take the average of
21 that.

22 CHAIRMAN KRESS: Oh, yeah. I see what you
23 -- yeah, you're right.

24 DR. WALLIS: Sometimes you can really,
25 really mislead by taking an average and then using

NEAL R. GROSS

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

1 that.

2 MS. HART: These curves were determined by
3 taking each time step and finding the competence level
4 for each of the --

5 DR. WALLIS: But do you see what I mean?
6 I don't know if you appreciate what I mean. It is a
7 nonlinear process. If you do this, you may be
8 completely confusing the integrated effect of
9 decontamination.

10 CHAIRMAN KRESS: I think what he's talking
11 about is when Westinghouse goes to apply, they don't
12 use the full curve. They use a value of lambda.

13 MS. HART: They are using a value of
14 lambda that they had calculated for a specific
15 scenario.

16 DR. WALLIS: It's an average value?

17 MS. HART: I think it's an average for a
18 time period, but I'm not --

19 MR. CUMMINS: This is a statistical
20 sampling overall of these parameters. They varied.
21 In our analysis we picked the set of parameters.

22 DR. WALLIS: What number did they pick
23 then? How do you compare what they do with what you
24 do?

25 MS. HART: We compared by performing a

NEAL R. GROSS

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

1 dose analysis. We used our median lambdas that we
2 came up with from this curve.

3 DR. WALLIS: Is that the right thing to
4 do?

5 CHAIRMAN KRESS: No, w to be conservative
6 with these lambdas, you want to bias things towards
7 the lower end. If you want to be conservative, you
8 want a smaller lambda.

9 MS. HART: That is true.

10 We did not base our acceptance of their
11 dose calculations on their values for aerosol removal
12 coefficient. We wanted to do our own evaluation using
13 the previous lambdas I had shown you, and we performed
14 an independent dose analysis. We used all other
15 parameters from the Westinghouse DCD except for we did
16 use the medial aerosol removal coefficients.

17 There was some further averaging I did
18 have to do because of our calculational code. You can
19 only input an average lambda over a time step, and
20 there's only ten time steps that you can use.

21 DR. WALLIS: Did you try using one of your
22 -- well, I guess you can't -- or some of the actual
23 Monte Carlo runs in calculating the decontamination
24 from them. It's a nonlinear process.

25 MS. HART: Right.

NEAL R. GROSS

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

1 DR. WALLIS: And this averaging may not be
2 really averaging your integral effect.

3 MS. HART: I did do some sensitivity
4 calculations where I used one value for lambda of
5 around .4, and of course, with the atmospheric
6 dispersion factors that Westinghouse had given us at
7 that time, that was not enough removal during the
8 early phase to allow them to still be below the dose
9 acceptance criteria.

10 However, they have changed their chi/Qs in
11 the meantime, and I have not recalculated with the new
12 chi/Q is.

13 DR. WALLIS: Well, again, it seems to me
14 quite conceivable that although you get all of these
15 statistical variations in your Slide 38, if you
16 actually took the original curves on Slide 37 and used
17 those to predict the amount of contamination, it might
18 turn out they all predict the same amount because the
19 peaks are shifted and so on. And yet on the average,
20 it all comes to the same answer.

21 So there's no statistical variation in the
22 answer, and yet your 38 shows there's a bit
23 statistical variation.

24 CHAIRMAN KRESS: I think we're in design
25 basis space here.

NEAL R. GROSS

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

1 MS. HART: That's correct.

2 CHAIRMAN KRESS: And what you have to
3 think of is this is accompanied by a rule on a
4 pressure and leak rate after containment , and that's
5 a bit artificial. They take a maximum pressure and
6 hold it for 24 hours and then drop it to one-half.

7 DR. WALLIS: You're on another --

8 CHAIRMAN KRESS: And what the idea is is
9 to take what's in the containment during that period
10 and see what goes outside and see if you meet 10
11 CFR --

12 DR. WALLIS: I understand that. I'm just
13 talking about the proper treatment of statistical
14 data.

15 CHAIRMAN KRESS: I understand.

16 DR. WALLIS: Bill Shack is nodding away.
17 He understands what I'm talking about.

18 CHAIRMAN KRESS: I understand. But
19 you're worried about decontamination, and what they're
20 worried about is how one gets out to the atmosphere.

21 DR. WALLIS: I'm just asking whether the
22 treatment is appropriate for these statistical
23 variations.

24 DR. SHACK: And since all of these time
25 histories aren't similar, you know, then when you

NEAL R. GROSS

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

1 average at a given time value, you know, you're
2 averaging many -- it's just not clear, as Grant says,
3 what you've got when you're done.

4 MS. HART: Well, the thermal hydraulics
5 for each of those runs is exactly the same.

6 DR. WALLIS: Is that supposed to reassure
7 me?

8 MS. HART: Well, that has not varied for
9 all of those runs.

10 CHAIRMAN KRESS: Once again, what you're
11 interested in is not the decontamination, but what's
12 left airborne in the containment because that's what
13 leaks out, with a given constant leak rate and a given
14 constant pressure, so that this averaging --

15 DR. WALLIS: Well, you see what I mean.
16 I mean, if you look at the figure 37, if it were true
17 that the curves which are high early are low later and
18 the curves which are low early are high later, it
19 could well be that the integrated decontamination for
20 all of these curves is about the same, and the way
21 that you average on 38 doesn't show that at all

22 MR. GOUNDER: Can I maybe offer some
23 clarification? My name is Randy Gounder, and I did
24 those calculations.

25 That family of curves that you see with

NEAL R. GROSS

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

1 the decontamination coefficient, they all really vary
2 in the same pattern. They're not --

3 DR. WALLIS: That helps a lot. Are they
4 not displaced in time?

5 MR. GOUNDER: They are not canceling each
6 other out if that's, I think, what you're --

7 DR. WALLIS: Well, then if that's true, if
8 they all have the same sort of shape and they all have
9 the same sort of shape as the average curves on the
10 next figure, then we've got some reassurance that
11 there isn't a great distortion of what's going on.

12 MR. GOUNDER: That's in fact how they
13 behave.

14 DR. WALLIS: That helps.

15 MR. GOUNDER: And the big spike that you
16 see shows up in all of the analyses because they're
17 using the same governing thermal hydraulics.

18 DR. WALLIS: It's a very nonlinear thing
19 so that the spike contributes a huge amount to the
20 answer.

21 MR. GOUNDER: It's a very transient --

22 DR. WALLIS: But it has disappeared when
23 you do the statistical averaging.

24 MR. GOUNDER: Right.

25 DR. WALLIS: Okay. So I think you

NEAL R. GROSS

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

1 understand what I'm getting at. Thank you.

2 CHAIRMAN KRESS: But you're interested in
3 the worst two hours of this thing, and what you
4 actually need to be looking at is the airborne
5 concentrations, not the decontamination factors, over
6 the worst two hours, because you basically have a
7 constant leak rate during this time.

8 And I'll tell you for that worst two
9 hours, the shape of these curves are not going to
10 affect it at all.

11 DR. WALLIS: it doesn't make any
12 difference?

13 CHAIRMAN KRESS: It doesn't make any
14 difference at all. It's somewhere during the front
15 end of this thing, is the worst two hours.

16 MS. HART: And you're still injecting
17 source term at that time.

18 CHAIRMAN KRESS: Yeah. So really it
19 doesn't make that much difference because we're in
20 design basis space. Where this kind of argument
21 you're talking about can make a big difference, if
22 you're transferring this type of thing and trying to
23 do severe accident, real severe accident analysis in
24 the PRA.

25 But when you do that, you're actually

NEAL R. GROSS

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

1 using the full curve. You're using what the mean
2 curve is that comes out of the MAAP type code or the
3 MELCOR type code. So you don't average it. You just
4 use it as you go along.

5 So you're talking about two different
6 spaces.

7 MS. HART: Now, the only information we
8 use from this whole study is a removal lambda that
9 would be applied to an airborne concentration that is
10 determined in another way.

11 DR. WALLIS: So what do you use for
12 lambda?

13 MS. HART: I used varying lambdas. I used
14 the median lambdas, which would be the --

15 DR. WALLIS: So it does vary.

16 MS. HART: It does vary, and I have to
17 time average it.

18 DR. WALLIS: And I guess my Chairman is
19 telling me it doesn't make any difference so I don't
20 need to worry.

21 CHAIRMAN KRESS: That's right.

22 DR. WALLIS: All right. Thank you.

23 (Laughter.)

24 CHAIRMAN KRESS: Its value makes some
25 difference.

NEAL R. GROSS

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

1 MS. HART: Right.

2 DR. SHACK: Well, I take more comfort in
3 the fact that all of these things are so similar.

4 DR. WALLIS: And they're not displaced in
5 time because were they displaced in time the you
6 could, again -- Bill Shack knows what I'm talking
7 about.

8 MS. HART: Okay. So having done that,
9 even though we used different removal coefficients
10 than Westinghouse did, we also show that the doses are
11 below the dose criteria of 50.34 for off site and GDC-
12 19 for on site, the control room.

13 DR. WALLIS: Are they far below or just
14 below?

15 MS. HART: Westinghouse had back
16 calculated and used the chi/Qs that give them the
17 maximum dose for LOCA. So they are right at the
18 limits. My doses are somewhat below that because my
19 removal coefficients are different over the period of
20 time than theirs are.

21 DR. WALLIS: So they are right at the
22 limit?

23 MS. HART: They are right at the limit.

24 DR. WALLIS: So a slightly different
25 tweaking of the data might make them above the limit?

NEAL R. GROSS

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

1 MR. CUMMINS: This is Ed Cummins.

2 This is really an issue of a site
3 interface issue, and the chi/Q, which is the
4 dispersion factor for the site, if you were us, you
5 would calculate the dose limit, the chi/Q that gave
6 you exactly the limit because that would permit the
7 most sites to be. So any site with chi/Q less than
8 what we needed in order to pass is acceptable, and if
9 you're over that, then you have to do all of this
10 assessment.

11 So, again, it's a rational thing for us to
12 do.

13 DR. WALLIS: Well, you're always rational.

14 (Laughter.)

15 MR. SIEBER: You're trying to find the
16 limiting condition.

17 MS. HART: Right, right. Exactly.

18 This slide describes why we think the use
19 of the medium values is acceptable. The traditional
20 approach is the accepted bounding value, which in this
21 case would be at the lower end of those uncertainty
22 analysis like the fifth percentile.

23 We do believe it's acceptable for our
24 purposes. The median value is the least affected by
25 the user's subjective judgment for the bounds and the

NEAL R. GROSS

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

1 shape of those sample parameters.

2 We introduced that conservative bias I
3 discussed earlier in the choice of those initial
4 conditions for those parameters and the shape of the
5 distribution.

6 There's a precedence in the Perry AST case
7 where they used a median value for the steam line
8 deposition, and that was based on other conservatisms
9 in the analysis, and our code requires yet another
10 averaging of those lambdas because of the constraints
11 of how the code is operating.

12 And the fully integrated MELCOR calculated
13 removal rates are mostly well above the fifth
14 percentile. That can be seen on this graph.

15 DR. WALLIS: The four different code
16 predictions? It looks like thermal hydraulics.

17 MS. HART: It does, doesn't it? And in
18 fact, it follows thermal hydraulics to some degree.
19 The smooth blue and orange curves are the thermal
20 hydraulics with -- I mean use the thermal hydraulics
21 either from MAAP or MELCOR, and it's the uncertainty
22 calculations that we're running with MELCOR, the Monte
23 Carlo calculations.

24 The dark blue line is an ERI MELCOR run
25 that they had run with just the 3BE scenario, 3BE-1

NEAL R. GROSS

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

1 scenario, and it's the full integrated, and those are
2 the removal that was calculated within MELCOR, and the
3 red line is our Westinghouse's numbers.

4 DR. WALLIS: This is what you call
5 reasonable agreement?

6 MR. SIEBER: Yeah.

7 MS. HART: I would say for our purposes,
8 yes, this is reasonable.

9 DR. WALLIS: For your purposes because you
10 only care about getting the decontamination
11 coefficient within 50 percent or something. Is that
12 the idea?

13 MS. HART: Right.

14 DR. WALLIS: Because the test of whether
15 the codes are doing a good job really doesn't look
16 very good.

17 MS. HART: No.

18 (Laughter.)

19 MR. SIEBER: It is like thermal
20 hydraulics.

21 DR. SHACK: They do go up and down.

22 (Laughter.)

23 MR. SIEBER: Sensitive to something

24 DR. WALLIS: Well, there's some strange
25 looking cliffs and things, but anyway, let's pass on.

NEAL R. GROSS

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

1 MS. HART: And that would be the end of my
2 presentation. Are there any further questions?

3 MR. SIEBER: Thank you.

4 MS. HART: Thank you.

5 MR. SEGALA: This is John Segala.

6 My last slide, all the open items were
7 resolved, and we're still on schedule.

8 After lunch today I have a presentation to
9 go over the interim letter issues. So we'll have
10 another shot at discussing some of these issues.

11 DR. WALLIS: So we have to wait until --

12 CHAIRMAN KRESS: Well, we're ahead of
13 schedule.

14 DR. WALLIS: Can we move on with the next
15 slide? Are we not allowed to do that?

16 MR. SIEBER: It's a title slide.

17 CHAIRMAN KRESS: Well, that's generally a
18 no-no. We could do things like come back at 12:15 --
19 no, that wouldn't work either.

20 MR. SIEBER: Why would we do that?

21 MR. ROSEN: We could take a longer lunch
22 hour.

23 CHAIRMAN KRESS: Yeah, we could come back
24 at 12:30

25 MR. SIEBER: That would be good.

NEAL R. GROSS

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

1 CHAIRMAN KRESS: And start at 12:30 and
2 get ahead. That's not enough of a perturbation to
3 schedule that it hurts anything.

4 So why don't we do that? Break for lunch
5 and come back at 12:30 and start again at 12:30
6 instead of one.

7 DR. WALLIS: And what the NRC is going to
8 present is the rest of these transparencies?

9 CHAIRMAN KRESS: Yes, sir, starting with
10 Item 5 there, and it's the rest of these
11 transparencies.

12 DR. WALLIS: Okay. Thank you.

13 CHAIRMAN KRESS: Okay. I'll recess until
14 12:30.

15 (Whereupon, at 11:30 a.m., the meeting was
16 recessed for lunch, to reconvene at 12:30 p.m., the
17 same day.)

18

19

20

21

22

23

24

25

NEAL R. GROSS

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

AFTERNOON SESSION

(12:31 p.m.)

1
2
3 CHAIRMAN KRESS: Let's get started again,
4 please.

5 MR. SIEBER: Still feeling okay?

6 MR. SEGALA: Well, my voice is a little
7 bit more scratchy.

8 MR. SIEBER: You can sit down.

9 MR. SEGALA: I feel fine. I just can't
10 talk.

11 I'm John Segala again for the AP1000
12 design certification.

13 The purpose of this slide presentation is
14 to go over the interim letter issues that we received
15 from you.

16 This presentation is pretty similar to
17 what we gave you in the beginning of the month. We do
18 have some additional information regarding the organic
19 iodine.

20 Issue one was the ADS Squib valve
21 function. We had a slide on this this morning, and
22 Westinghouse talked about this, but I think in the
23 letter you agreed that an ITAAC assures the values
24 meet the design basis, and it has a simple design,
25 Section 3, Class I valve. It has redundant and

NEAL R. GROSS

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

1 diverse actuation.

2 The staff did a PRA sensitivity study and
3 it increased the failure probability to not change the
4 PRA conclusions, and the ITAAC requires a type test,
5 and it says that a test for type test of Squib valves
6 will be performed to demonstrate the capability of the
7 valve to operate under its design conditions, and a
8 test report concludes that the Squib valves change
9 their position under design condition, and that the as
10 installed Squib valves are bounded by the testes or
11 type tests.

12 For the screen blockage issue, the staff
13 would like to propose -- I guess we had discussions
14 earlier on this, and I think we'd like to have some
15 internal meetings and give you a presentation at the
16 full committee meeting in July if that would work for
17 you.

18 CHAIRMAN KRESS: Okay.

19 MR. SEGALA: Code deficiencies was an
20 issue. This was during the thermal hydraulic review.
21 The item was when deficiencies are found should the
22 weaknesses be corrected, and I think both looking at
23 the APEX AP1000 data we discovered deficiencies in
24 both NRC's and Westinghouse's codes.

25 RELAP, which is the staff's code, we're

NEAL R. GROSS

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

1 not planning to go back and fix. However, the face
2 code the staff is assessing against APEX AP1000, as
3 well as ATLAS and UP --

4 DR. WALLIS: How does fixing up the
5 staff's code accommodate deficiencies in
6 Westinghouse's code?

7 MR. SEGALA: We're looking in the future
8 for future uses of TRACE. In terms of Westinghouse's
9 code, they performed other analyses that showed that
10 they were okay during those time periods where no --

11 DR. WALLIS: Yes, I know that. That's
12 part of the discussion in our letter, but it made
13 quite an impression on the full committee. The
14 NOTRUMP and its' one APEX series which didn't look
15 quite the same as the code predictions, and if this is
16 the case, then it would seem that either now or down
17 the road there should be some awareness of this so
18 that when the code is used again, there's some effort
19 to figure out why it didn't work that last time and to
20 fix it because presumably it's a tool that's going to
21 be used again.

22 So it's not just up to you to fix your
23 code, but there ought to be some way in which the
24 vendor codes, which are sometimes very old, are
25 actually fixed up when deficiencies are found like

NEAL R. GROSS

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

1 this.

2 CHAIRMAN KRESS: Yeah, we didn't consider
3 this an issue with respect to AP1000 certification
4 because they bounded these things and worked around
5 them, but we just thought it wasn't a good idea to
6 have a code there that may have some things wrong with
7 it and needs fixing, and we recognize that NRC blesses
8 these codes for particular uses, and you can put
9 conditions on the use, but we just thought it would be
10 a good idea somehow to get those deficiencies fixed.
11 We're glad you're going to do it for TRACE. That
12 would help.

13 MR. SIEBER: But that really doesn't solve
14 the problem.

15 CHAIRMAN KRESS: Well, the problem is in
16 case the code gets used for some other purpose, and
17 the staff has some constraints on these kind of
18 things.

19 MR. SEGALA: Yeah, when we write our
20 safety evaluations we make it very clear what it can
21 be used for.

22 MR. SIEBER: Well, as each individual
23 plant is licensed, at the operating license stage they
24 have to run that code for that plant, right? In order
25 to meet Appendix K?

NEAL R. GROSS

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

1 And so if a code is deficient, then that
2 means you've got to have these little bounding fix-up
3 segments in order to come up with a result. I guess
4 that's legitimate, but, on the other hand, it seems to
5 me to be a clumsy way to do it

6 MR. COLACCINO: This is Joe Colaccino with
7 the staff.

8 One of the things we asked Westinghouse to
9 do and what they did do was to identify what their
10 evaluation model was in their design control document.
11 So when these plants go into the future, they will
12 have to follow that evaluation model. The constraints
13 do not just exist in our FSER, but it's actually in
14 the design control document.

15 So I guess with respect to AP1000 we feel
16 like we're on solid ground in the evaluation of the
17 evaluation model.

18 MR. SIEBER: Yeah, but you will still end
19 up using the bounding calculations for certain
20 segments of the transient, which to me is perhaps
21 okay, but not very sophisticated.

22 MR. SEGALA: Yeah, and I think the 50.46,
23 when you look at it, it does not require that you have
24 one evaluation model or one code that fulfills that.
25 So in terms of meeting the regulations, those were the

NEAL R. GROSS

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

1 criteria that we were faced with.

2 MR. SIEBER: Okay.

3 MR. SEGALA: The next issue was the range
4 of pi group values. In the interim letter you stated
5 that the staff should verify a pi group range of .5 to
6 two, as appropriate.

7 This range has been used as a de facto
8 standard in scaling analysis, and we believe this
9 issue is generic, not an issue specific only to
10 AP1000.

11 CHAIRMAN KRESS: We heard from Steve
12 Bejoric (phonetic) that there were plans to actually
13 look at this.

14 MR. SEGALA: Yeah.

15 CHAIRMAN KRESS: Is there a schedule for
16 that?

17 MR. SEGALA: Not that I'm aware of. We
18 don't have Steve here today, but we could -- I think
19 everything he told you the last time is pretty much
20 the same as it is today

21 CHAIRMAN KRESS: Once again, we view that
22 as kind of confirmatory type research. The assumption
23 is that the pi group range is okay, and based on,
24 well, thinking and intuition and looking at code
25 results and things that we'd like to see this as a

NEAL R. GROSS

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

1 confirmatory thing for the staff to do.

2 DR. WALLIS: I think both this item and
3 the previous one point up some what you could call
4 them as generic issues that we have with these things.

5 CHAIRMAN KRESS: These are generic issues.

6 DR. WALLIS: Yeah, they don't invalidate
7 the approval of AP1000, but they are some generic
8 issues that have been raised as a result of what some
9 people call lessons learned from this review.

10 CHAIRMAN KRESS: Well, this will call come
11 up in certification of the other type of design, and
12 we'd like to have a better technical basis for it.

13 The issue is whether or not over those
14 ranges of pi groups, do you somehow change flow
15 regimes that some how causes a marked change in what
16 you should have expected your code to predict or your
17 scaling to be.

18 Well, I understand Steve has plans to look
19 at it or somebody has plans.

20 DR. WALLIS: It's more reassuring when you
21 have a pi group which may be .5 in one facility and
22 it's .2 in another facility, and you can say one is
23 somewhere in between. If it's bracketed in some way,
24 that perhaps is more reassurance than just if the pi
25 group is always under or over in all facilities.

NEAL R. GROSS

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

1 CHAIRMAN KRESS: Pardon? I didn't catch
2 that.

3 DR. WALLIS: I was saying that if you had
4 -- supposed you have two experimental facilities and
5 the pi group is .5 in one and two in the other, you
6 might tend to believe that one is somewhere in
7 between, but if you have two facilities and the pi
8 group is .5 and one is .55 in the other, that's not so
9 good. I'm just thinking how one might require this to
10 be handled in the future if one had doubts.

11 CHAIRMAN KRESS: Yeah, if you had two
12 separate facilities.

13 DR. WALLIS: Right.

14 CHAIRMAN KRESS: And were using those for
15 carrying it, and if you bracketed those --

16 DR. WALLIS: Right. That might be more
17 reassuring.

18 CHAIRMAN KRESS: Yeah, that would be.
19 You're right. Okay.

20 DR. WALLIS: And I think that may be the
21 case for some of these.

22 CHAIRMAN KRESS: It could very well be.

23 DR. WALLIS: Right, right.

24 MR. SEGALA: Issue five, in-vessel
25 retention, fuel coolant interactions. Westinghouse

NEAL R. GROSS

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

1 had a brief slide of that this morning. The interim
2 letter said that the IVR assessment needs to consider
3 the effects of exothermic intermetallic reactions.

4 We'd like to review the FCI models. The
5 staff provides you a copy of contractor reports. I
6 don't know if you have any comments on that.

7 CHAIRMAN KRESS: Well, I haven't had a
8 chance to digest those two reports, but I do have
9 them, and it's -- the vessel flooding for AP1000 is
10 almost a defense in depth thing. They don't need it
11 to meet the goals, and it doesn't enter into the
12 design basis space at all. It's just that it's like
13 another generic type issue. We're going to be faced
14 with the same thing for other reactor types, and I'd
15 just like to know how the staff deals with those
16 things.

17 It may be more important for some other
18 reactors. I don't know, and so the idea of this thing
19 was, number one, did we properly do a review and a
20 defense in depth concept for the AP1000, and I think
21 what I've looked at so far is the sensitivity studies
22 that were done, and it looks like those properly
23 ranged what I would say would be the possible
24 variations in the melt mass to the super heat and a
25 pretty good calculation of the resulting intergetics,

NEAL R. GROSS

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

1 and even those things when you go to the extremes
2 didn't fail the containment.

3 So as far as I'm concerned it's a resolved
4 issue for AP1000, but I still want to know. It's
5 another one of these maybe lessons learned, generic
6 issues, other certification designs.

7 And so I will review these two other
8 reports and see, but as far as I'm concerned, it's not
9 a problem now for AP1000.

10 MR. SEGALA: Okay. Issue six, organic
11 iodine production. The issue involved the inside of
12 containment. During an accident you have steaming and
13 the water condenses on the wall, and the concern was
14 what is the pH of the film on the inside of the wall,
15 and you know, a simple statement: water film pH
16 determines iodine behavior. pH less than seven leads
17 to production of elemental iodine, some of which is
18 converted into an organic iodine, and that's what
19 would get released outside of containment.

20 And sort of the opposite of that is to
21 prevent organic iodine production. The film pH should
22 be maintained above seven.

23 MR. SIEBER: How do you do that?

24 MR. SEGALA: Well, Westinghouse did some
25 calculations. The first calculation, they assumed the

NEAL R. GROSS

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

1 amount of cesium hydroxide present for the DBA source
2 term, and they determined that the pH is maintained
3 above seven. To sort of look at the effects of
4 limited cesium hydroxide, they did a minimum
5 calculation where 270 grams of cesium hydroxide, about
6 .1 percent of what's available is sufficient to keep
7 the pH above seven.

8 And then they did a third evaluation where
9 what they called their sensitivity study. They
10 assumed no cesium hydroxide present and then looked at
11 what were the effects of that, and the organic iodine
12 in containment increased from .15 percent to .33
13 percent, and they were able to show that with the
14 conservatisms in the dose calcs. that they still met
15 the DBA dose criteria.

16 DR. WALLIS: What is your definition of
17 organic iodine?

18 CHAIRMAN KRESS: Methyl iodine.

19 DR. WALLIS: Methyl, it's methyl iodine.

20 CHAIRMAN KRESS: Yeah.

21 MR. SEGALA: After we met with you in
22 June, on June 3rd, I believe, the staff audited
23 Westinghouse's calculations in Westinghouse's
24 Rockville office, and the staff found these
25 calculations to be acceptable, and we agree with their

NEAL R. GROSS

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

1 conclusions.

2 CHAIRMAN KRESS: Dana's problem was the
3 nitrogen in the atmosphere would tend to take the film
4 acid, and apparently the calculation for that is the
5 absorption of nitrogen into the liquid and then
6 conversion to the nitric acid, whereas he says, no,
7 that's not the way to do it, that it gets converted in
8 the gas phase and then gets absorbed.

9 Was anything to address that done?

10 MR. SEGALA: Yeah, I believe our
11 contractor -- Andre, do you have any?

12 MR. DROZO: This is Andre Drozo, and I'm
13 representing Kris Parczewski who was doing the actual
14 calculations.

15 He concluded and we all concluded that
16 indeed the acid is produced in the liquid film.

17 CHAIRMAN KRESS: In the liquid?

18 MD. DROZO: In the liquid, yes.

19 That he went through available literature
20 in at least one Oregon (phonetic) and Oak Ridge test,
21 and that they had a liquid and a gas flowing
22 simultaneously, and they determined that 99.99 percent
23 of acid is being produced in the liquid film.

24 CHAIRMAN KRESS: So Westinghouse's
25 calculation as opposed --

NEAL R. GROSS

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

1 MR. ROSEN: Are you saying Dana is wrong?

2 CHAIRMAN KRESS: I don't know.

3 MR. ROSEN: It will be the first known
4 instance of it.

5 CHAIRMAN KRESS: The first time.

6 DR. WALLIS: That's a very slow reaction
7 to dissolution of nitrogen to form --

8 MR. DROZO: Methyl comes from --

9 DR. WALLIS: Well, I'm sorry. You're
10 answering a different question.

11 CHAIRMAN KRESS: Well, the idea is the
12 nitrogen makes it acidic.

13 DR. WALLIS: Yeah, but it's a very slow
14 reaction, absorption of nitrogen to make an acid.

15 CHAIRMAN KRESS: Yeah, if you're absorbing
16 it, if you're absorbing it. That's not what Dana says
17 happened.

18 MR. ROSEN: Yeah, Dana said --

19 DR. WALLIS: Yeah, but he's saying Dana is
20 wrong, I think.

21 MR. ROSEN: Yeah, and Dana was saying that
22 the formation is of nitrous oxide in the air.

23 DR. WALLIS: Well, if that's there, then
24 I can see it being absorbed.

25 CHAIRMAN KRESS: Yeah, it absorbs rapidly.

NEAL R. GROSS

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

1 DR. WALLIS: But I can't see nitrogen
2 itself being absorbed rapidly.

3 CHAIRMAN KRESS: And that's the point.
4 Which is it? Is it nitrous oxide in the air going in
5 or is it --

6 DR. WALLIS: And what makes that?

7 CHAIRMAN KRESS: Radiation fuel.

8 DR. WALLIS: Radiation fuel.

9 MR. DROZO: And I would never say Dr.
10 Powers is wrong. I would never say that.

11 (Laughter.)

12 MR. SIEBER: He's not here.

13 CHAIRMAN KRESS: He'll be here for the
14 full meeting in July. We may have this on the agenda
15 because I think it is probably the one lingering ACRS
16 item that -- you know, once again it's almost a "no
17 never mind" because it doesn't enter design basis
18 space hardly and because you've got a specified source
19 term in there, and severe accidents are such low
20 frequency that who cares almost.

21 So in my mind it doesn't raise itself to
22 an issue, but it's a kind of a lingering thing that's
23 on Dana's mind, and so it's something we want to get
24 off the table. So keep in mind that this might be one
25 of the things that you want to look at again.

NEAL R. GROSS

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

1 And, in particular, this calculation that
2 Andre is talking about would be well worth bringing
3 forward for the meeting.

4 MR. SCHULZ: This is Terry Schulz.

5 Let me just say one little thing here.
6 The sensitivity study that we redid there doesn't
7 depend on what's going on with the nitrogen and nitric
8 acid at all. That only comes in --

9 CHAIRMAN KRESS: Do you want to let that
10 be acid anyway?

11 MR. SCHULZ: Yes.

12 CHAIRMAN KRESS: Okay. Well, that's
13 another. That's well worth bringing out. That
14 doesn't matter.

15 MR. SCHULZ: Right. This issue of how
16 much nitric acid there is and how quickly it's formed
17 comes into play in the first tube.

18 CHAIRMAN KRESS: Because you want to add
19 Lead B acid.

20 MR. SCHULZ: Yes.

21 CHAIRMAN KRESS: Then Dana is going to ask
22 what were your sources of the organic/inorganic.

23 MR. SCHULZ: There are still questions,
24 yes.

25 CHAIRMAN KRESS: Yeah. But anyway, that

NEAL R. GROSS

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

1 is a good point.

2 MR. ROSEN: Remind me if you will of where
3 this half a pound of cesium hydroxide comes from.

4 CHAIRMAN KRESS: Right out of the fuel.

5 MR. ROSEN: That much

6 CHAIRMAN KRESS: Oh, there's more than
7 that.

8 MR. DROZO: Potentially in the core.

9 CHAIRMAN KRESS: Fission products. It
10 might release ten, 30 percent of it.

11 MR. DROZO: That's correct.

12 MR. ROSEN: Well, where does the methyl
13 group come from?

14 MR. DROZO: Well, that's already there.

15 MR. SIEBER: You need to use the
16 microphone.

17 MR. ROSEN: In the fuel?

18 MR. DROZO: Methyl comes from reaction of
19 elemental iodine and the insulation materials in the
20 containment.

21 CHAIRMAN KRESS: Yeah, it's insulation
22 materials that gives you the --

23 DR. RANSOM: With stainless steel?

24 MR. DROZO: No, no. With not rubber but
25 this plastic electrical insulation.

NEAL R. GROSS

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

1 MR. SIEBER: Cabling.

2 MR. DROZO: Cabling, yes.

3 MR. SIEBER: Yes, wire insulation.

4 MR. DROZO: Wires.

5 DR. RANSOM: It's hydrocarbon material.

6 MR. DROZO: Right.

7 CHAIRMAN KRESS: And you can make some
8 methane in the core if you've got the right chemistry.
9 You've got the hydrogen there, and you've got the
10 carbon. You've got the materials. You could make
11 some, and there has been some chemical equilibrium
12 calculations that says there's a certain level of it.

13 You know, it's not a lot, but you can make
14 it.

15 But, anyway, this is one that Dana will be
16 interested in hearing in July

17 MR. SEGALA: Issue seven, which is the
18 last issue, catastrophic failure of steel containment,
19 the concern was a free standing steel containment can
20 fail in a catastrophic manner. When its failure
21 pressure is exceeded, this could lead to a rapid
22 depressurization and resuspension of the deposited
23 fission products.

24 The staff determination of the frequency
25 of the catastrophic containment failures were small

NEAL R. GROSS

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

1 and resuspension would not have a noticeable impact on
2 the commission's safety goals.

3 DR. WALLIS: You mean on meeting the
4 safety goals.

5 MR. SEGALA: Yes.

6 DR. WALLIS: It's not going to change the
7 goals.

8 MR. SEGALA: yeah.

9 CHAIRMAN KRESS: Although sometimes I wish
10 they would.

11 (Laughter.)

12 MR. SEGALA: So this is in summary open
13 items are resolved from our perspective, although we
14 need to talk to you about one of them. All ACRS
15 issues are addressed, and it looks like you still want
16 to talk about the organic iodine.

17 CHAIRMAN KRESS: I don't see that as a
18 show stopper, but --

19 MR. SEGALA: Okay.

20 DR. WALLIS: You might get questions from
21 Dana.

22 CHAIRMAN KRESS: You certainly will.

23 MR. SEGALA: He'll be there at the next
24 fully committee?

25 CHAIRMAN KRESS: Yeah.

NEAL R. GROSS

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

1 PARTICIPANT: July 7th.

2 MR. SEGALA: NRC staff is still on
3 schedule to issue the FSER.

4 CHAIRMAN KRESS: Okay. Thank you very
5 much.

6 I think we're nearing the end here. This
7 is the time for item number six, and I think we don't
8 need a break yet.

9 Item number six is a summary statement
10 from either Westinghouse, the staff or both. Does
11 Westinghouse wish to make some summary remarks?

12 MR. VIJUK: Not really. I think we
13 believe we've satisfied what the staff has asked for,
14 and we hope we're getting close to satisfying you.

15 CHAIRMAN KRESS: I presume the staff will
16 make any summary remarks or do they?

17 MR. SEGALA: No, not at this time.

18 CHAIRMAN KRESS: Okay. I think what we
19 need to do now before we -- well, there is an item on
20 here for public feedback, and I don't see anybody
21 there. So we'll forget that one.

22 We need to decide on what to do at the
23 full committee meeting in July. Does Westinghouse
24 come to that, I presume?

25 PARTICIPANT: Yes.

NEAL R. GROSS

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

1 CHAIRMAN KRESS: We have two hours. My
2 proposal is to give Westinghouse 45 minutes and the
3 staff 45 minutes.

4 DR. WALLIS: Well, I suggest that
5 Westinghouse concentrate on why they meet the
6 regulations and not so much a description of what a
7 wonderful machine it is.

8 CHAIRMAN KRESS: Yeah, I would suppose you
9 skip the design review. I think we're up on that, and
10 you know, stick on your approach to safety. I think
11 you can skip the Squib valve stuff, too, now and maybe
12 include the PCC and the safety margin slides and maybe
13 the summary of the severe accidents and the CDF and
14 LRF, and that way you can condense this to maybe 45
15 minutes.

16 MR. VIJUK: That's fine.

17 CHAIRMAN KRESS: And the staff, I think
18 you almost have a 45 minute talk with what you have,
19 and I would just sort of repeat that, but remember you
20 may have to spend more time on the organic and add
21 that in.

22 And I think we also would look forward to
23 hearing about the exact wording of the COL action item
24 on the screen blockage. What does it actually say?
25 You might want to bring that with you.

NEAL R. GROSS

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

1 And I think that that would wrap it up for
2 us.

3 DR. WALLIS: I think it's miraculous, Mr.
4 Chairman, how the staff has managed to summarize this
5 one foot high stack of paper over here in a short
6 time.

7 CHAIRMAN KRESS: Yeah. I wonder if I
8 could bill the staff for my eye doctor's appointment,
9 trying to read that off of my PC.

10 (Laughter.)

11 CHAIRMAN KRESS: Would that be billable to
12 Westinghouse?

13 (Laughter.)

14 MR. CUMMINS: Everything seems to be
15 billable to Westinghouse.

16 (Laughter.)

17 CHAIRMAN KRESS: Well, with that, are
18 there any further comments from the subcommittee
19 members?

20 MR. ROSEN: Yeah. I don't think you've
21 characterized or I don't understand the
22 characterization of the sump issue as to summarize the
23 COL action item. I think the issue is that we've come
24 upon a current item, current regulatory issue item,
25 and the question is do we -- and we're about to

NEAL R. GROSS

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

1 certify this design or recommend certification of this
2 design, and the question is how does in regulatory
3 space one handle that subject.

4 Do you include it as a post certification
5 item, a COL action item, or do you say, no, we need to
6 have a resolution or a commitment to resolution in the
7 current licensing basis for this plant?

8 My feeling is it's the latter, that this
9 is not a backfit for this plant. This plant is now
10 being licensed.

11 So you know, to say it's going to be a
12 compliance backfit later like it is for the operating
13 plants, that's because those plants are already
14 licensed. That's why we're treating it that way.

15 This plant is not licensed.

16 CHAIRMAN KRESS: Yeah, but it's being
17 licensed to just about the same rules.

18 MR. ROSEN: Well, the rules are Reg. Guide
19 1.82. That's with that 50 percent blockage
20 assumption, which we know is incorrect.

21 CHAIRMAN KRESS: But the rule has
22 associated with it guidance, and that guidance has
23 been followed by the plants and will be followed by
24 Westinghouse, and the idea is that that guidance is
25 going to change, but it hasn't yet.

NEAL R. GROSS

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

1 And so you're stuck in a time warp there,
2 but maybe the staff could be prepared to elaborate a
3 little bit on how that issue is being treated.

4 MR. COLACCINO: Yeah, this is Joe
5 Colaccino.

6 And as we said, just after the morning
7 session the staff will give you in the July 7 meeting
8 a complete discussion of it and not just a little
9 discussion of the COL item.

10 CHAIRMAN KRESS: Yeah, that would be a
11 good thing to put on there, too.

12 MR. COLACCINO: And we plan to make it a
13 significant part of our presentation to the full
14 committee.

15 CHAIRMAN KRESS: Good. Thank you.

16 I think that might be well worthwhile.

17 Anybody else?

18 (No response.)

19 CHAIRMAN KRESS: Well, seeing none, I want
20 to thank all of the speakers, the staff and
21 Westinghouse, and I must say I think our interactions
22 on this have been, over the period of time, it has
23 been very good, and so, you know, I thank you for
24 that.

25 MR. VIJUK: We feel the same. Thank you.

NEAL R. GROSS

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

1 CHAIRMAN KRESS: And we look forward to
2 seeing you in July.

3 With that I'm going to declare this
4 meeting adjourned.

5 (Whereupon, at 1:01 p.m., the meeting was
6 adjourned.)

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

NEAL R. GROSS

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