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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

THERMAL-HYDRAULICS PHENOMENA SUBCOMMITTEE

RG 1.82, "WATER SOURCES FOR LONG-TERM RECIRCULATION

COOLING FOLLOWING A LOSS-OF-COOLANT ACCIDENT"

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WEDNESDAY

SEPTEMBER 7, 2011

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B3, 11545 Rockville Pike, at 8:30 a.m., Sanjoy
Banerjee, Chairman, presiding.

COMMITTEE MEMBERS:

SAID ABDEL-KHALIK, Chairman

J. SAM ARMIJO, Vice Chairman

SANJOY BANERJEE, Member

JOY REMPE, Member

WILLIAM J. SHACK, Member

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ACRS CONSULTANTS PRESENT:

GRAHAM B. WALLIS

NRC STAFF PRESENT:

ILKA BERRIOS, Designated Federal Official

JOHN BURKE, RES/DE

ERVIN GEIGER, NRR

PAUL KLEIN, NRR

JOHN LEHNING, NRR

RICHARD LOBEL, NRR

STUART RICHARDS, RES/DE

STEPHEN SMITH, NRR

GARY WANG, RES/DE

ALSO PRESENT:

JOHN BUTLER, NEI

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

8:30 a.m.

CHAIRMAN BANERJEE: The meeting will now come to order. This is a meeting of the Thermal-Hydraulics Phenomena Subcommittee. I'm Sanjoy Banerjee, chairman of the subcommittee. ACRS members in attendance are Sam Armijo, Said Abdel-Khalik, Joy Rempe, William Shack. ACRS consultant in attendance the former chair of the ACRS is Graham Wallis. Ilka Berrios of the ACRS staff is the designated federal official.

The subcommittee will review the draft final regulatory guide 1.82, Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident. This is Revision 4. We will hear presentations from the NRC staff. In addition we have received a request for time to make an oral statement from John Butler from the NEI. No written comments from members of the public regarding today's meeting were received.

The subcommittee will gather information, analyze relevant issues and facts and formulate proposed positions and actions as appropriate for deliberation by the full committee. The rules for participation in today's meeting have been announced

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1 as part of the notice of this meeting previously
2 published in the Federal Register. A transcript of
3 the meeting is being kept and will be made available
4 as stated in the Federal Register notice. Therefore
5 we request that participants in this meeting use the
6 microphones located throughout the meeting room when
7 addressing the subcommittee. The participants should
8 first identify themselves and speak with sufficient
9 clarity and volume so that they may be readily heard.
10 We will now proceed with the meeting and I will call
11 upon John Burke to begin. Thank you.

12 MR. BURKE: Good morning. Okay.

13 MR. RICHARDS: I'm Stu Richards. I'm from
14 the Office of Research and I work with John and Gary.
15 We're glad to be here and thank you for your time.
16 The only thing I'd like to note is that you know there
17 are some things that are not addressed by this reg
18 guide update. We have to move forward with the things
19 that we can update it with and some of these other
20 issues that are resolved we'll come back and revise
21 the update. The revised reg guide has those issues to
22 resolve.

23 CHAIRMAN BANERJEE: Right. We expect to
24 write a letter in the October full committee meeting.

25 MR. RICHARDS: Right. Correct. We

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1 appreciate that. And with that, John?

2 MR. BURKE: All right. Good morning,
3 thank you. Next to me is Gary Wang of the staff.
4 Gary helped me do this revision to the reg guide. So
5 what we're going to talk about today if I can -- is
6 the reason for the revision. And I selected topics
7 from the reg guide that we added a lot more detail in
8 what had been the previous revision. And a review of
9 some of the public comments. So Reg Guide 1.82, Water
10 Source for Long-Term Recirculation Cooling Following
11 a Loss-of-Coolant Accident was last revised in
12 November, 2003. And that was to incorporate the
13 information we knew at the time for PWRs based on the
14 1990s work with the BWR suction strainer. So in the
15 1996-1998 time frame suction strainers for BWRs were
16 evaluated and the reg guide was revised at that time.
17 So then in 2003 we added some information that we
18 learned from the BWRs to make it apply to the PWRs.
19 Since then, since 2003 quite a bit of research has
20 been done both by the NRC and industry to improve the
21 knowledge about PWR suction strainer guidance. So
22 this revision incorporates what we've learned since
23 2003 and also incorporates as a result of GSI-191.

24 This revision is a complete rewrite of the
25 prior revision to improve the readability and updated

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1 information. And what I mean by that, in the prior
2 revision those separate sections for BWRs both in the
3 background and in the regulatory position and a
4 separate section for PWRs. Where it was appropriate,
5 those are combined now. So in the background section
6 there's common background and common regulatory
7 positions followed by much shorter reactor type-
8 specific regulatory positions.

9 This revision endorses various topical
10 reports by industry. An NEI guidance report on GSI-
11 191 or Generic Letter 2004-02.

12 MEMBER SHACK: I was curious, I didn't go
13 through a check. Is there complete consistency
14 between 0407 and this reg guide?

15 MR. BURKE: It's more, I would say unless
16 there was an exception to 0407 by the SE.

17 MEMBER SHACK: In the SE.

18 MR. BURKE: Yes. And then also, like I
19 said, and the safety evaluations for those topical
20 reports. And then some of the NUREG reports that have
21 been completed since 2003.

22 Another area that we added into this one
23 was the -- in the areas of head loss testing,
24 vortexing, protective coatings and chemical effects
25 those weren't addressed in much detail in the topical

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1 reports, but the staff has issued guidance memos to
2 NEI and those are incorporated in this revision. And
3 then as part of the improvement in readability and
4 usability obsolete figures and tables were deleted.
5 And it also incorporates guidance on Generic Letter
6 2008-01 on gas accumulation in ECCS containment spray
7 systems.

8 And like Stu mentioned earlier not
9 everything related to GSI-191 or suction strainers is
10 included in this revision. The issues listed here --

11 DR. WALLIS: I think report one is
12 unfortunate.

13 MR. BURKE: Yes.

14 DR. WALLIS: I mean I read this and I read
15 the statement that 10psh should be independent of the
16 calculated increases in containment pressures caused
17 by phosphate LOCAs. And so I said aha, they've
18 abolished containment over-pressure, right? There's
19 the statement. And then the weasel words later on as
20 it does now. I don't think that's very good. Are you
21 going to straighten that out?

22 MR. BURKE: Yes. Someday.

23 (Laughter)

24 DR. WALLIS: Someday. Will I still be
25 alive?

1 (Laughter)

2 CHAIRMAN BANERJEE: Weren't you the one,
3 Graham, that actually wrote that 2005 ACRS letter?

4 DR. WALLIS: It's taking a long time. I
5 mean it's a simple thing, isn't it?

6 MR. BURKE: There was a SECY paper
7 approved early this year, SECY-1114 addressing that
8 issue and the staff is working through that. And so
9 we -- we plan on revising both this reg guide and Reg
10 Guide 1.1

11 DR. WALLIS: Well, the words minimize to
12 the extent possible are the most vague guidance you
13 can give guidance you can give it seems to me.

14 MR. BURKE: I agree and like you said
15 those words have not changed from the prior revision
16 except maybe to make it -- we've reorganized it to try
17 to make it a little bit better but we haven't changed
18 our position yet.

19 DR. WALLIS: Thank you.

20 CHAIRMAN BANERJEE: I mean there's also in
21 between Fukushima that has happened and lessons
22 learned. I mean, there's a lot of water under the
23 bridge now which we have to take into account.

24 MR. LOBEL: This is Richard Lobel from the
25 staff. We made the decision not to make any changes

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1 to the reg guide in this area because there's a lot
2 going on and it just wasn't the right time to try to
3 put down some final guidance or even really interim
4 guidance. We're working with the BWR Owners' Group
5 right now. They have a contract with Sulzer Pumps and
6 they're doing some work with pump uncertainty and that
7 kind of thing that we've talked about before with the
8 committee. And we're waiting for that to be done.
9 There's several power up-rates that are being reviewed
10 right now that are waiting for this work that's being
11 done by the BWR Owners' Group. So really I wouldn't
12 put anything into the words that are in the reg guide
13 now. The decision is just to leave that part as is
14 because we're not ready to make the revision. I can
15 talk about that more later if you want but that's not
16 really the subject of this meeting.

17 CHAIRMAN BANERJEE: Yes, we've got that.
18 Yes.

19 MR. BURKE: And like I said, we're not
20 adding any specific guidance on downstream in-vessel
21 effects for a similar reason. The testing is still
22 going on by industry and the test results are being
23 evaluated by the staff. And then in line with, there
24 was another SECY paper recently approved or SECY-10-
25 113 that provided the staff some direction from the

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1 commission and that is still under evaluation so
2 that's not in this revision either.

3 Some of the selected topics that I picked
4 to talk about today are those listed, suction strainer
5 head loss, chemical effects, debris downstream of the
6 strainer, coatings, latent debris and vortexing and
7 air ingestions.

8 DR. WALLIS: When you talk about ZOI it
9 seems to me this guidance is vaguer about ZOI than it
10 was before. It doesn't cite references, it says
11 you've got to do experiments but no one's going to do
12 experiments for the 2-foot pipe in a 100-foot
13 containment or something are they? How are you going
14 to do that?

15 MR. BURKE: The guidance on ZOI hasn't
16 changed any.

17 DR. WALLIS: But it says you've got to do
18 experiments. It doesn't refer to any document about
19 how to do it, it just says you've got to do tests.

20 MR. BURKE: True. And the, I guess right
21 now the Owners' Group is doing some testing.

22 DR. WALLIS: On a full-size, full-scale?

23 MR. BURKE: No, I believe it's 3- or 4-
24 inch diameter pipe.

25 DR. WALLIS: So there's always that

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1 problem of how do you predict this ZOI which by some
2 methods is the whole containment. How do you --
3 what's the right way to do that?

4 MR. BURKE: I know the committee did not
5 like what was in NEI-0407 and --

6 MEMBER SHACK: But this sort of implicitly
7 still endorses NEI, you just avoid mentioning ANSI
8 58.2. But you go back to 0407 and there it is.

9 MR. BURKE: Yes, that's true.

10 CHAIRMAN BANERJEE: Remind me, was the
11 ANSI withdrawn?

12 MEMBER SHACK: Yes.

13 MR. BURKE: In 1988 I believe.

14 DR. WALLIS: So there's sort of a hole
15 there isn't there?

16 MR. BURKE: The staff has agreed to accept
17 what is in 0407 and the ANSI 58.2.

18 DR. WALLIS: So they accept something that
19 doesn't exist?

20 MR. BURKE: Well, it's withdrawn. It
21 exists.

22 MEMBER SHACK: Some effort at least with
23 GE with the ESBWR to do a more realistic calculation
24 in zones of influence. Did that go somewhere? Or was
25 that just a conceptual thing that? Is anybody really

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1 doing those kinds of calculations?

2 MR. BURKE: Steve? John?

3 MR. SMITH: Yes, this Steve Smith from the
4 staff. The ANSI model was not withdrawn because there
5 was any technical shortcomings seen. It was withdrawn
6 because ANSI couldn't support -- support continuing to
7 have the model out there. They just didn't, for some
8 reason they just stopped --

9 MEMBER SHACK: If you go to the ANSI
10 website there's statements there that because of
11 comments by Professor Wallis.

12 MR. SMITH: They didn't see anything wrong
13 with it. They just couldn't, they couldn't come up
14 with any --

15 MEMBER SHACK: Justification for it.

16 DR. WALLIS: So they didn't see anything
17 wrong with it? They actually said that?

18 MR. LEHNING: This is John Lehning from
19 the staff. The -- we spoke with the people from the
20 ANS committee that worked with the standards and the
21 reason that they told us that they withdrew that is
22 that there's a 10-year period where the committee has
23 to meet, review and then continue to accept that
24 standard for the next 10-year period. And so that was
25 -- they had not done that on it before any of the ACRS

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1 comments on the model had been put forth.

2 MR. SMITH: Now, that said, there is an
3 ongoing project that the PWR Owners' Group is working
4 on to develop a new model which should be a more
5 accurate model and Research is helping us to review
6 that model and it's also being validated against the
7 more recent tests, some other tests that were done by
8 Westinghouse Canada and the new testing that's being
9 done with the 4-inch nozzle that John talked about
10 earlier. So that is what we're hoping to come up with
11 a more accurate model.

12 Now, the PWR Owners' Group is hoping that
13 it's going to show smaller ZOIs than what we're
14 currently showing for various materials but it hasn't
15 been -- it hasn't been completed yet. I mean, the
16 model is complete, relatively complete. They still
17 haven't validated it to all the new test data but they
18 have validated it to Marviken data which is a larger
19 scale, which is a larger-scale test.

20 DR. WALLIS: Marviken is pretty short
21 range.

22 MR. SMITH: That is true and that's one of
23 the questions that we are discussing with them, you
24 know, how valid is it at the further distances because
25 the Marviken tests were relatively, you know, very few

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1 L over Ds out where they were taking --

2 DR. WALLIS: So you're hoping the new
3 model will be less conservative?

4 MR. SMITH: No, we're not hoping that.

5 DR. WALLIS: But you're hoping it will
6 show a smaller zone of influence?

7 CHAIRMAN BANERJEE: They're not industry.

8 DR. WALLIS: But it seems to me that there
9 is a problem if it shows a bigger zone of influence.

10 MR. SMITH: It may be -- it will be a
11 problem for some plants.

12 DR. WALLIS: And then you'll rewrite the
13 guidance or something?

14 MR. SMITH: We will consider, yes, we will
15 rewrite the guidance if we need to, you know, if there
16 is a reason to rewrite it once the new model is
17 accepted by us. If the new model shows smaller ZOIs
18 you know then plants will be able to use that, if they
19 participate in that project they'll be able to use
20 that to show smaller ZOIs and less material
21 obstructed. I think it's a proprietary testing so we
22 won't be able to generally put it out there, you know,
23 accept it. But if we do see an issue that would
24 indicate the ZOI should be larger we would have to do
25 something about that.

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1 CHAIRMAN BANERJEE: If I recall, maybe my
2 memory is faulty, at least some of the tests that were
3 being done had some problems with regard to internal
4 choking. Have these tests been redone?

5 MR. SMITH: That's correct, that's the
6 current project right now is redoing those tests that
7 were done previously with no upstream choking taking
8 place.

9 CHAIRMAN BANERJEE: Right. Okay, so the
10 whole thing is still up in the air and until we get
11 more reliable data and a more reliable model we're
12 just going to go on the basis of the existing model.

13 MR. SMITH: That's correct.

14 DR. WALLIS: That's very strange. On the
15 expansion of a supersonic jet there's an old story and
16 it shouldn't be debatable within the technical
17 community. It should be clear. What's the problem?

18 CHAIRMAN BANERJEE: Well, there's also the
19 two-phase aspect.

20 DR. WALLIS: Yes. You mean if it's two-
21 phase you can't do anything for 10 years?

22 CHAIRMAN BANERJEE: Well it's a little
23 more difficult as you know.

24 DR. WALLIS: Well, let's drop it. We've
25 made the point I think now.

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1 CHAIRMAN BANERJEE: Yes. Okay. Let's
2 carry on.

3 MR. BURKE: All right. In the area of
4 strainer head loss prototypical head loss testing is
5 now the recommended or preferred way of determining
6 suction strainer head loss. In the prior revision of
7 this reg guide, NUREG/CR-6224 contained a correlation
8 where -- and we don't, the staff no longer accepts the
9 use of the correlation for determining strainer head
10 loss. And as discussed in the next bullet there were
11 some limitations on the use of the correlation in the
12 safety evaluation for NEI-0407 and we believe those
13 limitations are still valid. And so in the reg guide
14 we're recommending any new strainer designs be
15 qualified by testing and not use the correlation.

16 CHAIRMAN BANERJEE: If you go back and
17 look at say the BWR strainers.

18 MR. BURKE: Yes.

19 CHAIRMAN BANERJEE: This is -- I saw the
20 public comment on this as well. Do they use this 6224
21 and what would happen if they do? You would have to
22 reevaluate it or something?

23 MR. BURKE: Yes. In the 1996 time frame
24 the BWRs by and large used the correlation. Recently
25 we, the staff pointed out to the Owners' Group some of

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1 our concerns with the use of the correlation and the
2 BWR Owners' Group has agreed to go back and revisit
3 that area and take a look at the appropriateness of
4 what they did 15 years ago. That is being handled
5 outside of the generic letter or GSI program. It's,
6 there were a list of 12 areas that, like chemical
7 effects and coatings and downstream effects and then
8 this is one of them where the BWRs did things quite a
9 bit different 15 years ago. They are revisiting that
10 as a separate program now.

11 DR. WALLIS: Could I comment on this? Now
12 you have no theoretical way of predicting, that's
13 acceptable, of predicting strainer head loss. I
14 understand. You can scope but you can't predict --

15 MR. BURKE: Correct.

16 DR. WALLIS: -- the two tests. And then
17 in the text it says the test specs should be designed
18 to determine the worst case head loss from all of the
19 possible types of debris burdens. Now we know from
20 the history of the tests that it's very difficult to
21 do that, there are always surprises and so on. And I
22 think determining the worst case may take thousands of
23 tests. If you really want the Mount Everest you've
24 got to measure all the peaks. And that seems to me
25 very unrealistic.

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1 MR. SMITH: What we've done -- this is
2 Steve Smith again. What we've done with the testing
3 is we have developed guidance which is referenced now
4 in the reg guide. And the utilities have been using
5 this guidance in the tests done in the last few years.
6 And we understand that they may not, by using this
7 guidance they may not come up with the highest
8 possible head loss that could ever occur. However, we
9 feel it's a reasonable assurance that they're going to
10 come up with a head loss that is limiting for what
11 could happen in their plant because there are many
12 aspects of the way that the evaluation is done that
13 have conservatisms in them. So from debris generation
14 to transport, all these things contribute some
15 conservatism to the evaluation. And the way we have
16 the testing done is also a conservative test
17 methodology. And we have them test various
18 conditions, you know, depending on what their
19 potential debris loads are to the point where we
20 believe that they're going to come up with a head loss
21 that will be limiting for their plant.

22 DR. WALLIS: Well, that's a very different
23 statement than the one that I just read. And maybe
24 then you need to think about the guide. If the guide
25 asks you to find the worst case head loss from all

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1 possible types of debris tests.

2 MR. SMITH: And that is, that's basically
3 what --

4 DR. WALLIS: That's a very tall order.

5 MR. SMITH: That's basically what the
6 guidance is telling them to do.

7 DR. WALLIS: Well, that's a very
8 formidable task for industry.

9 CHAIRMAN BANERJEE: But there was a public
10 comment on this if I recall as well because I mean,
11 they were concerned that you know there is such a
12 multiplicity of brakes, locations and all, you know,
13 the debris iteration, that it's not a linear
14 relationship. The biggest break does not necessarily
15 give you the largest head loss. So there should be
16 some form of -- they ask for almost like a design
17 basis, the comment that I read, just like a design
18 basis accident that there would be some sort of a
19 design basis to use. Though I feel that your
20 guidance, even if it doesn't -- this is just private
21 opinion, it's not the committee's necessarily at the
22 moment -- does get you know to a point where you're
23 never going to be able to identify what is the worst
24 possible case, but you've got enough conservatisms in
25 your guidance probably to cover a lot of the issues.

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1 For example, with regard to settling and other things
2 like that, you know. There is some conservatism built
3 into that guidance. We can look at the guidance in
4 more detail offline if needed. We do have the
5 guidance available.

6 MR. SMITH: Yes, I think the way to look
7 at it is we understand you could -- you may always be
8 able to make the head loss get a little bit higher if
9 you keep testing, but there's not going to be a
10 significantly higher head loss and the probability is
11 that the head loss during a real event is going to be
12 significantly lower than what these guys find during
13 their test.

14 DR. WALLIS: Well, that's what you say but
15 in some testing, you see we've got the history here
16 where people have done tests then suddenly found the
17 head loss 10 times anything they measured before for
18 some peculiar combination of things.

19 MR. SMITH: I know.

20 DR. WALLIS: So your assurance that it's
21 a nice linear well-behaved problem is a little bit
22 unsupported by some of this process.

23 CHAIRMAN BANERJEE: I don't think they're
24 saying it's linear.

25 DR. WALLIS: Well, but it's well-behaved.

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1 You don't suddenly find all the mountains are like
2 this and suddenly there's a peak 10 times as tall.

3 CHAIRMAN BANERJEE: There's very strange
4 things that you find.

5 MEMBER SHACK: But I mean they are looking
6 at thin bed versus maximum debris versus beds with
7 stratified debris which covers a range of conditions
8 that could lead to surprises.

9 DR. WALLIS: So you're looking for an
10 intelligent search for high pressure drops, really,
11 not sort of for just a scattered thing. If you start,
12 if the industry starts to find evidence of a high
13 pressure drop for certain conditions I think what
14 you're asking is that they don't just put that aside,
15 they think about it and explore with more tests. I
16 think that's what you're looking for is a very
17 intelligent search for what could be worse within the
18 conservatisms and so on, but not finding the
19 absolutely worst. But not being content with a few
20 points which show some anomalies.

21 CHAIRMAN BANERJEE: I think you're just
22 taking contention with the words as written.

23 DR. WALLIS: That's -- yes, that's a bad
24 word to look for.

25 CHAIRMAN BANERJEE: That's not that. It

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1 should be called --

2 DR. WALLIS: But you should look for
3 symptoms of causes or evidence for possible higher
4 pressure drops or something and pursue that which is
5 a more sensible engineering thing to do. But you're
6 not going to look for the very worst, you'll never
7 find that.

8 CHAIRMAN BANERJEE: Well, what sort of
9 surprises you in a lot of these things is you make a
10 relatively small change to an experiment and you can
11 get sort of an outlier. So anyway, for what it's
12 worth let's carry on.

13 MR. BURKE: I'll take a look at how that's
14 worded.

15 CHAIRMAN BANERJEE: Yes, just -- maybe,
16 what he's really saying is it may be very hard to find
17 what is the absolute worst case so they really need
18 guidance as to what to do and if they follow staff
19 guidance maybe that's enough.

20 MR. BURKE: I think I understand.

21 CHAIRMAN BANERJEE: Yes, okay.

22 MR. BURKE: And like we talked about a
23 little bit, that staff guidance was put together by
24 the staff going to the different facilities,
25 witnessing the testing and reviewing the protocols the

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1 different vendors were using and putting this guidance
2 together. And it was discussed at public meeting in
3 2007-2008 and it's been incorporated into the reg
4 guide by Regulatory Position 1.311.

5 CHAIRMAN BANERJEE: We also brought up
6 from previous meetings a number of issues as to what
7 you mean by prototypical or representative because you
8 could have flows which were partially parallel to the
9 strainers where the normal velocity is very low. So
10 if you just used the normal velocity to the strainers
11 it might show that you could get settling, but because
12 you have components parallel in certain cases the
13 Reynolds number can be fairly high and that would keep
14 things in suspension. So we liked what the staff did
15 in not allowing people to take credit because that
16 seemed a conservative way to go whereas if you did it
17 strictly based on, you know, these very low velocities
18 through the strainers you probably allow settling. So
19 these are the sort of conservatisms which are built
20 in, at least into the guidance. Am I correct?
21 Correct me if I'm saying something wrong. You know,
22 I'm just speaking from memory.

23 MR. LEHNING: This is John Lehning again
24 from the staff. That is a correct statement. There's
25 two choices. I guess a plan could either choose the

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1 test with an agitated tank and ensure essentially 100
2 percent transport or in the case where you know the
3 staff has still been discussing with one vendor how to
4 test with a test that allows settlement credit. If
5 that test, in that test protocol the vendor would have
6 to account for not only the normal but also this
7 parallel velocity of the surfaces and the turbulence,
8 et cetera, as well.

9 CHAIRMAN BANERJEE: Right. Okay.

10 MR. LEHNING: So that's correct.

11 DR. WALLIS: Can we go back to slide 8?

12 I'm sorry here.

13 MR. BURKE: Sure. If I can figure out
14 how.

15 DR. WALLIS: Now you've done a fairly good
16 job on this guidance and we're just picking up things
17 where we think we might help you to maybe change it a
18 little bit in the direction of improvement. This
19 water temperature effect. It's said here that scaling
20 temperature to ensure that other phenomena do not have
21 a non-conservative effect when the temperature is
22 scaled. Well, we don't know how to predict, right?
23 We don't know how to predict pressure drop, it's all
24 got to be done by testing. And yet somehow,
25 somebody's got to know how to scale temperature. Now

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1 it's not only viscosity, temperature changes chemical
2 effects, it changes the flexibility of the fibers, it
3 probably changes the mobility of the particles within
4 them. Temperature does various things, right? I
5 don't understand why you don't require tests at real
6 temperatures. Then you'd know and we wouldn't have
7 this question all the time about what's the effect of
8 temperature.

9 MEMBER ARMIJO: Yes, I was going to ask
10 that question in a different way. But the water
11 temperature can have big effects. We saw it in a
12 limited amount of testing I think done for the AP-
13 1000, I'm not sure. But also there's a lot of
14 chemistry going on, you know. And does your
15 prototypical head loss testing that you recommend, are
16 you looking for true prototypicality with regard to
17 the water chemistry as well as the temperature as well
18 as all the fluid flows and geometries and everything
19 else? What are you -- is that going to be not
20 included? What is prototypical? I guess that's the
21 bottom.

22 MR. BURKE: I'll let Steve try that one
23 again.

24 MR. SMITH: This is Steve Smith. The
25 testing has generally not been done in buffer borated

1 water at the early high temperatures that could occur
2 during or following an accident. Typically the
3 temperatures that have been tested have been between
4 room temperature and about 120 degrees. There has
5 been some tests run by some utilities that actually
6 ran. They never went above 212 degrees. They would
7 run up to about 190 degrees and do a long-term 30-day
8 test and cool the fluid down, actually use a
9 prototypical fluid. But that's only been a few
10 utilities that have done that. Most of the tests have
11 been done in room temperature up to 120 degree just
12 tap water, river water, things like that.

13 CHAIRMAN BANERJEE: With surrogates.

14 MR. SMITH: With surrogates, yes.

15 CHAIRMAN BANERJEE: And we approved, I
16 mean, we discussed and the staff agreed to certain
17 surrogates.

18 MR. SMITH: That's correct.

19 CHAIRMAN BANERJEE: We looked through this
20 in some detail in the past.

21 MR. SMITH: And that's in accordance --
22 this is all in the -- in our guidance that's
23 referenced in the reg guide.

24 DR. WALLIS: Well, the question is why not
25 make -- work with prototypical temperature?

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1 CHAIRMAN BANERJEE: Because eventually it
2 can get pretty cool, right?

3 DR. WALLIS: Yes, but there are higher
4 temperatures being found when you initiate or
5 something.

6 MR. SMITH: Some plants actually have very
7 high temperatures when they initiate recirculation.
8 We haven't seen an indication that the higher
9 temperature test resulted in a significant difference
10 in head loss. Usually the higher temperatures
11 actually result in a reduced head loss due to the
12 reduction of viscosity. We haven't noticed any, say,
13 bed issues that would create higher head losses at
14 these tests that were done up close to 200 degrees.

15 DR. WALLIS: Has anybody really explored
16 that? I mean, there have been a handful of tests at
17 temperature. No one's really looked for temperature.

18 MR. SMITH: We haven't explored it and
19 we're not aware of any testing that was done, you
20 know, above.

21 DR. WALLIS: But you're not aware means
22 you don't know.

23 MR. SMITH: That's correct, we don't know.

24 CHAIRMAN BANERJEE: Were these high-
25 temperature tests done with surrogates or with actual

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1 chemistry?

2 MR. SMITH: The high-temperature tests
3 were done with chemistry that was the same as what
4 would be expected in a plant, some of the tests.

5 CHAIRMAN BANERJEE: And stuff didn't get
6 gooey?

7 MR. SMITH: Did not get gooey.

8 MR. KLEIN: This is Paul Klein from NRR.
9 In the tests that we're aware of where people have
10 used either high-temperature near 200 degrees or even
11 higher temperatures with autoclaves there's never been
12 any occurrences that we thought came close to the more
13 typical test which is the pre-mixed surrogate. So any
14 tests that have had representative environments and
15 then evolved the chemistry over long periods of time
16 have been -- tended to be much less aggressive with
17 respect to chemical precipitates compared to the WCAP
18 premix surrogate that's added to the tap water and
19 ambient temperatures.

20 CHAIRMAN BANERJEE: In a sense this is a
21 bounding. You know, in the absence of a detailed
22 model I think we have to accept some sort of bounding
23 or bounding test.

24 DR. WALLIS: But then there's this
25 statement in here. Maybe you need to be careful about

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1 the guide when it's talking about the scaling
2 temperature to make sure that other phenomena do not
3 have a non-conservative effect when temperature is
4 scaled. I mean, that implies to me you've got to do
5 tests to show that this is the case.

6 Can we move on to the thin bed effect? No
7 one knows what it is. It's like entropy or something.
8 People have discovered anomalously high pressure drops
9 with thin beds. People have discovered anomalously
10 high pressure drops with various things. And people
11 have supposed that a thin bed effect was because the
12 particles somehow filled up the holes in the fibers.
13 That's not unique to thin beds. So it's still very
14 vague what this thing is. We're sort of looking for
15 one of those things in Alice in Wonderland or those
16 rhymes of Edward Lear or something where no one quite
17 knows what it is but it's something you have to worry
18 about. And I would look forward to the day when we
19 understand what it is and so we know what we're
20 looking for and how to avoid it.

21 CHAIRMAN BANERJEE: Other than I mean what
22 should -- is there some wording change that?

23 DR. WALLIS: Well, it seems to me it's not
24 unique to thin beds. I mean, it's something to do
25 with the particles filling up the interstices, that

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1 can happen any time and it could happen on top of a
2 bed. You could have a thin bed covered with something
3 else, you could have something else covered with a
4 thin bed. There's all kinds of -- there's nothing
5 unique about having a very thin layer of fibers.

6 CHAIRMAN BANERJEE: I think the point that
7 they might be trying to make is that you can get very
8 high pressure drops even in the case that you don't
9 have --

10 DR. WALLIS: Even. But not only with thin
11 beds.

12 CHAIRMAN BANERJEE: Yes, not only. But.

13 DR. WALLIS: So maybe we need a better
14 understanding of what it is. Then we could know what
15 we're looking for. It's not just because the bed is
16 very thin there's a problem, it's just that there have
17 been anomalously high pressure drops.

18 CHAIRMAN BANERJEE: I guess the point is
19 even with a small amount of fiber you can get --

20 DR. WALLIS: You can fill up the
21 interstices.

22 CHAIRMAN BANERJEE: Yes.

23 DR. WALLIS: Yes. But then if you have
24 the small amount of fiber there first with a lot of
25 debris you could do it, then put fiber on top and it

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1 won't make any difference.

2 CHAIRMAN BANERJEE: Sure.

3 DR. WALLIS: So it's not really clear what
4 you're looking for. So, again, this is one of these
5 things I raised before. But I think it's very
6 difficult to ask industry to look for something when
7 no one knows what it is.

8 CHAIRMAN BANERJEE: But that's why they've
9 laid down a protocol.

10 DR. WALLIS: Yes, but that protocol if you
11 look at some of the tests doesn't really always cover
12 thin bed effect. From what I've looked at.

13 MR. LEHNING: This is John Lehning from
14 the staff. I guess there are two things associated
15 with a thin bed and why it's highlighted in the
16 guidance. I think the subcommittee has hit on one
17 that there is a small amount of fiber that's necessary
18 in some cases to get this type of effect. I think the
19 other thing is an issue with the testing and in order
20 to do let's say a relatively finite number of tests to
21 qualify the strainer we understand and have seen that
22 with just a small amount of fiber we can concentrate
23 the particulate into a thin layer whereas if, you
24 know, we're talking about larger quantities of fiber,
25 you know, and I'm trying to concentrate. That's what

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1 we're really looking for is a thin layer where we've
2 concentrated and minimized the flow area through that
3 by concentrating the debris area. So by having the
4 thin bed we can control that in an experimental
5 setting and try to recreate that most conservative
6 condition possible. So the staff sees it differently.
7 We do think, you know, we understand what we're
8 looking for, what the industry is looking for and this
9 is a way to create that during a test and have
10 confidence that --

11 DR. WALLIS: Well, how about the tests
12 where having more particles made less pressure drop?
13 That doesn't fit your model at all.

14 MR. LEHNING: I think that the testing you
15 may be referring to reflects on the in-vessel.

16 DR. WALLIS: Yes, but it's still a fiber
17 bed with particles in it. It's a different --

18 CHAIRMAN BANERJEE: The geometry --

19 DR. WALLIS: A different geometry, yes.
20 But it's still presumably a fiber bed with particles
21 in it and anomalously having more particles led to
22 less pressure drop which seemed very strange to me
23 because I can imagine having the thin bed already
24 there. Then you pile particles on top. That's not
25 going to reduce the pressure drop. I don't understand

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1 that at all. So there are these anomalous things.

2 MR. SMITH: We have seen anomalous results
3 during the in-vessel testing and that's why it's not
4 included in this revision to the reg guide.

5 DR. WALLIS: And it doesn't have any
6 relevance to this? I mean, the bed that formed in the
7 in-vessel test is somehow uniquely different from the
8 bed formed on the strainer?

9 MR. SMITH: We've seen many more strainer
10 tests than we have fuel tests and we feel much more
11 comfortable with the consistency of the tests that
12 have been done for strainers in that condition. We
13 are not comfortable with the tests that have been done
14 for fuel with the consistency of those tests and
15 that's why we're not including that in this one. But
16 we think that the test program that we have set up or
17 the guidance that we have set up for the strainers
18 will capture a reasonably maximum head loss for the
19 plants.

20 CHAIRMAN BANERJEE: If I understand the
21 purpose of this revision it's to try to
22 compartmentalize the problem to some extent, that we
23 deal with the strainers here, we deal with the in-
24 vessel stuff again in a separate tank and eventually
25 there's a containment accident pressure issue. We

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1 deal with that separately. So at least trying to --
2 if I'm wrong tell me, but I think that's what we're
3 trying to do, at least solidify the guidance with
4 regard to the strainers so that industry knows what it
5 has to do. Because you know, it's not up in the air.

6 MR. LEHNING: That's correct.

7 CHAIRMAN BANERJEE: Right.

8 MEMBER SHACK: Well, let me express it
9 another way. They feel confident enough in their
10 guidance for the strainers that they can actually put
11 it in a reg guide which is kind of a fairly, you know,
12 sort of carved in stone --

13 CHAIRMAN BANERJEE: And hopefully for
14 awhile.

15 MEMBER SHACK: Hopefully lasts for awhile
16 whereas the other stuff they're still kind of working
17 their way through that.

18 CHAIRMAN BANERJEE: With good reason. I
19 think we're willing to deal with the in-vessel effects
20 later when it comes.

21 DR. WALLIS: But if there's some evidence
22 that it feeds back to strainers we can't ignore it.

23 CHAIRMAN BANERJEE: It does. However, I
24 mean that's more of an ill-posed problem because small
25 changes in configuration and so on can make fairly

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1 large changes whereas I think with the strainers
2 there's enough experiments done now that you know
3 you've covered a fairly wide range of conditions and
4 you have some confidence that you can get it. But we
5 can review the evidence if necessary.

6 DR. WALLIS: No, I think I would say I
7 respect the comfort and confidence of the staff. I
8 mean, you've looked at this for a long, long time.

9 CHAIRMAN BANERJEE: Right, a very long
10 time.

11 DR. WALLIS: And so the comments are from
12 someone who doesn't have the time to look at it that
13 much. But I think what I'm trying to do is avoid you
14 finding some discomfort in the future if something
15 turns up that was unpleasant.

16 MEMBER ABDEL-KHALIK: Did anyone look at
17 the back side of the strainer after one of these thin
18 bed experiments?

19 MR. LEHNING: Yes, they typically do try
20 to look at that.

21 MEMBER ABDEL-KHALIK: The back side.

22 MR. LEHNING: For certain strainer designs
23 they have. I think that typically they look at the
24 outside much more so than the inside.

25 MEMBER ABDEL-KHALIK: Was there any

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1 interaction between neighboring holes that you find
2 more in thin beds than you would in a thick bed
3 experiment?

4 MR. LEHNING: Maybe could you clarify your
5 question a little bit more? Do you mean --

6 MEMBER ABDEL-KHALIK: If fiber --

7 MR. LEHNING: -- on the inside of a
8 strainer?

9 MEMBER ABDEL-KHALIK: If fibers are longer
10 than the pitch between neighboring holes then there
11 may be more interaction between neighboring holes in
12 the case of a thin bed than you would in a thick bed
13 experiment. So you can only find that out if you look
14 at it from the back side.

15 MR. SMITH: Yes, just from experience,
16 from seeing a few of these tests generally what you
17 see is a bed that forms on the surface and you'll see
18 dimples. If you actually peel that bed off you'll see
19 dimples that -- where the debris is actually
20 penetrating down into the hole somewhat. But really
21 there's nothing happening on the back side of that
22 strainer besides just little dimples sticking down
23 where the holes were.

24 MEMBER ABDEL-KHALIK: But you get that by
25 pulling the bed off. But has anyone looked at it

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1 before pulling it off?

2 CHAIRMAN BANERJEE: To see this band.

3 MR. SMITH: I don't know of anyone who's
4 done that. There is one strainer vendor who actually
5 does disassemble and these are the strainers that have
6 the bypass eliminator, like it's like a steel wool
7 inside and they pull that out after the test. But
8 other than that I don't know of any other vendor that
9 actually, you know, has used a borescope or something
10 to look in the inside of the strainer.

11 MEMBER ABDEL-KHALIK: Because it may just
12 simply be you know interactions between neighboring
13 holes that are more prevalent in the case of a thin
14 bed than there are in the case of thicker beds.

15 CHAIRMAN BANERJEE: One of the main
16 effects with these thin beds which make them difficult
17 to predict is you blow holes in them. That sort of --

18 DR. WALLIS: That should help you, though.

19 CHAIRMAN BANERJEE: Well, it helps you but
20 what it makes it is difficult to predict, you see,
21 because the prevalence of these holes and how they
22 come about.

23 DR. WALLIS: In some tests you have one
24 hole, some tests you get none.

25 CHAIRMAN BANERJEE: Yes.

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1 MEMBER ABDEL-KHALIK: Okay. Is there any
2 way to find out if anybody had looked at the back side
3 of the strainer after a test? Without peeling off the
4 back.

5 MR. LEHNING: I guess the staff has seen
6 testing and the vendors have seen testing from the
7 outside and watching how the debris builds up we
8 haven't seen differences between the two. I
9 understand your view that you know only from the
10 inside you can see this but I guess our view would be
11 from seeing this from the outside we haven't seen
12 substantial differences with how it builds up and
13 don't believe that that's the fundamental driver.

14 DR. WALLIS: Let's look at the history
15 here. You had a research program where people asked
16 you the questions and tried to figure out what was
17 going on. And then in the last few years you've
18 simply looked at prototypical testing where people
19 have measured something without trying to understand,
20 or doing diagnostic tests or examining what was going
21 on. So it hasn't been a sort of scientific inquiry as
22 to what is a thin bed effect and how does it happen.
23 It's been what kind of pressure drop do we get, that's
24 been the question and there hasn't been this
25 questioning of all the phenomenon. Am I being unfair?

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1 I think I'm describing what's happened. I think it's
2 a bit unfortunate that you haven't maintained some
3 effort to understand the phenomenon at the same time.

4 MR. LEHNING: This is John Lehning from
5 the staff again. The way we see it is that at the
6 beginning we did testing at a more general level and
7 understood the phenomena at general level. And then
8 what was done during the implementation phase is the
9 licensees went and did specific testing. They
10 implemented a procedure that was based on these more
11 sort of general concepts and things that we did
12 understand and so we did try to understand at each
13 plant let's say you know very detailed aspects of
14 what's going on and why their debris bed arranged in
15 a certain way. But we did base our overall procedure
16 on a look at you know not only testing on a small
17 scale but also tests --

18 DR. WALLIS: Well, I have an offer for
19 you. If you understand the thin bed effect and how to
20 predict it would you please come to my university and
21 give a seminar on what it is, how you predict it and
22 how you know how to avoid it?

23 MR. LEHNING: As much as I'd like to take
24 you up on that --

25 (Laughter)

1 MR. LEHNING: The proposition there is
2 that we can't -- we don't have correlations as John
3 Burke's slide pointed out and so we do have to do
4 testing. But we do understand what quantities tend to
5 push this in certain directions and which quantities
6 --

7 DR. WALLIS: Well, I think that's a very
8 good test. I mean think about it, rather than just
9 talking to your colleagues if you had to explain to an
10 intelligent, well-informed audience, technically
11 competent some of these things, how would you do it?
12 And I think I would have difficulty. I don't know how
13 you'd do it so I'd be interested to see.

14 MR. LEHNING: We could I mean do it at a
15 qualitative level but in terms of quantitative
16 prediction --

17 DR. WALLIS: If I invited you would you do
18 that?

19 CHAIRMAN BANERJEE: Why not? But leaving
20 that aside, I have a separate question here. Often
21 instead of using real materials, for example, latent
22 debris in a containment might have a lot of hairs, you
23 know, surrogates for these are used. And we're not
24 sure that you know your guidance covers this because
25 we've run into problems in the past where the sort of

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1 fibrous debris or whatever that's being used is not
2 entirely similar to what you would expect. There are
3 two aspects to this. One is a lot of the limitations
4 on pressure losses depend on these holes being blown
5 through the thin bed. I think this is more evident
6 when it comes to downstream effects, I mean, in-vessel
7 effects than the screens. We're not particularly
8 worried about the latent debris effects on the
9 screens, but just to warn you when it comes to
10 downstream it might be sort of important to have
11 typical debris rather than surrogates, particularly
12 things like hairs which seem to have a different
13 behavior from other fibers, at least the one or two
14 tests that we've seen. So this is just a flag for the
15 downstream effects. It's less of a concern I would
16 say. You wanted to make a comment on that?

17 MR. KLEIN: Actually not a comment on that
18 but to address an earlier question about the back side
19 strainers. I was thinking about some of the vertical
20 loop testing that I've observed that have included
21 thin beds with high head loss and in those cases there
22 didn't appear to be a network of connecting fibers on
23 the back side of the strainer that would explain that
24 thin bed effect.

25 MEMBER ABDEL-KHALIK: Where -- did these

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1 experiments actually result in an unusually high
2 pressure drop?

3 MR. KLEIN: With -- very high pressure
4 drops.

5 CHAIRMAN BANERJEE: So you didn't see a
6 network?

7 MR. KLEIN: No, we didn't see a network on
8 the back side.

9 CHAIRMAN BANERJEE: Let's continue. How
10 are we doing for time? Because I have this habit of
11 losing track of time when the discussion gets
12 interesting. Are we okay?

13 DR. WALLIS: We may be covering things now
14 which are on the schedule later or something. But
15 that's not so bad because we don't seem to ask the
16 same question again. We hope.

17 MR. BURKE: And I think this discussion,
18 I think John mentioned all points to the reason why we
19 want testing and we don't like the correlation
20 anymore.

21 Chemical effects if we're finished with
22 head loss guidance. In the prior revision of this reg
23 guide the chemical effects issue, it was just stated
24 that chemical effects should be considered. There was
25 no guidance given on how to consider chemical effects.

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1 In this revision we're providing a little more detail
2 on how to address chemical effects. The Westinghouse
3 Topical Report WCAP 16530-NP-A accepts the industry
4 approach as one method to evaluate chemical effects in
5 the SE on that topical report. So those two items are
6 incorporated into this revision. And again, in the
7 March 2008 letter to NEI one of the attachments or
8 enclosures to that letter addressed chemical effects.

9 DR. WALLIS: I'm sorry. Are you going to
10 talk about debris transport which is way up front in
11 the guidance? I don't see it here.

12 MR. BURKE: I wasn't going to.

13 DR. WALLIS: Because it says in the
14 guidance the calculation of debris quantities
15 transported to the ECCS strainer -- seems to be an
16 important issue -- should consider all modes of debris
17 transport. So you expect these people to analyze
18 debris cascading downstairs and where do all the
19 fibers go and how big they are and all that? I don't
20 think they can possibly do that. So what are you
21 asking for?

22 MR. LEHNING: John, I can take that. This
23 is John Lehning from the staff again. So this is
24 saying that when we talk about the modes, the major
25 modes of wash-down. And so it could be washing down

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1 gradings or stairs or other things like that. So we
2 don't expect that licensees have a detailed I guess
3 model of that, but we do expect that they either treat
4 it conservatively or in some kind of representative
5 way.

6 DR. WALLIS: Well say that. Say it's
7 conservative because there's been no research on all
8 the detailed mechanisms to -- there's been some in
9 settling, stuff like that.

10 MR. LEHNING: Right, there have been
11 certain tests for example on how much debris washed
12 down from gradings, et cetera, but there are details
13 where in a large part there is not data. So --

14 DR. WALLIS: So I think you need to be
15 careful when you say that -- the implication to me
16 really is that they're supposed to analyze all this
17 motion of the debris throughout all this complicated
18 geometry of the containment. I don't think that's
19 what you're looking for. Maybe you need to give some
20 clearer guidance that helps industry.

21 CHAIRMAN BANERJEE: Let me ask for
22 clarification of that. Are they allowed to for
23 example do CFD calculations which get some level of
24 turbulence based on some correlation which is very
25 difficult for us because of hindered settling and

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1 turns and flows to what -- whether some of the debris
2 will settle, especially the fines, or would they have
3 to take the conservative approximation which is none
4 of the fines or the fibers settle. I mean, if that's
5 what you imply then you should probably say that.

6 MR. LEHNING: This is John Lehning again.
7 The -- in terms of the analytical evaluation there
8 have not been any accepted cases where the staff has
9 allowed settlement of fine debris based on a CFD
10 calculation and some kind of turbulence metric or
11 other metric. It's not to say that we would never
12 allow that. We didn't put that in the regulatory
13 guide but our safety evaluation on NEI-0407 does cover
14 that. And furthermore to go back to the other point
15 on the detail of this or the flow-down and wash-down
16 models, that is somewhat covered in position 1.3.4.7
17 where we say in lieu of detailed models licensees can
18 conservatively assume that as all the debris washes
19 down into the pool. So that is our default position
20 pretty much is that we don't credit that hold-up in
21 upper containment. We assume that the debris washes
22 down but licensees, you know, if they have enough
23 detail and we're to accept that the testing that they
24 do then we're willing to accept something different.

25 CHAIRMAN BANERJEE: So is there any aspect

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1 of the wording, Graham, that you feel is ambiguous?

2 DR. WALLIS: Well, there's that and
3 there's some detail on -- I'm looking for my notes
4 here -- about sort of ensuring that drains don't clog
5 and so on. Well again, is there a guidance on how you
6 do that? There's quite a few words about things which
7 should be considered and then it just stops there. It
8 doesn't say how.

9 MR. BURKE: Isn't that in NEI-0407? On
10 the upstream effects?

11 DR. WALLIS: It may have been in there but
12 I mean -- then maybe you should give the reference or
13 something. You should say as in so-and-so or give a
14 pointer to how they're going to do it. You're
15 supposed to help these guys figure things out as well
16 as --

17 MR. SMITH: If you look on 1.3.7(A) where
18 it talks about upstream effects. The first sentence
19 there says the staff's SE provides guidance on
20 evaluating flow paths upstream. So I think that
21 should be adequate.

22 DR. WALLIS: So it is there somewhere,
23 okay. Maybe it just isn't in the part I was reading.
24 Thank you.

25 MR. BURKE: Okay. So the chemical

1 effects, we've added three regulatory positions to --
2 one in the comment section and then one each in the
3 PWR-specific and another one in the BWR-specific
4 positions on chemical effects.

5 CHAIRMAN BANERJEE: You don't say anything
6 specific here about the use of surrogates or is it
7 implied in the WCAP SE?

8 MR. BURKE: It's implied by accepting the
9 WCAP.

10 CHAIRMAN BANERJEE: All right.

11 MR. BURKE: Downstream effects.
12 Downstream effects has two subcategories, ex-vessel
13 and in-vessel where ex-vessel would be piping systems
14 and components downstream of the strainer and in-
15 vessel is typically looked at as the fuel. So the
16 prior revision of the reg guide just stated that
17 debris clogging of flow restrictions should be
18 assessed but provided no guidance on how to do that.
19 So for in-vessel effects the staff has accepted WCAP
20 16406-P-A and --

21 CHAIRMAN BANERJEE: Ex-vessel you mean.

22 MR. BURKE: For ex-vessel, correct. And
23 that provides a method to evaluate the system
24 components of abrasion, wear, blockage of flow paths
25 in orifices or the pump seals. One thing that was

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1 brought out in the public comments is that this is a
2 proprietary report indicated by the "-P." The staff
3 safety evaluation is a public document. We reference
4 both of those in this revision of the reg guide and we
5 make a footnote that this is a proprietary
6 Westinghouse Topical Report. So the details are
7 limited that we can put in this reg guide.

8 And then on the in-vessel as we mentioned
9 earlier there is a Westinghouse report 16793-NP. The
10 report is still under review by the staff so we're not
11 providing detailed guidance at this time for in-
12 vessel. On protective --

13 MEMBER ABDEL-KHALIK: Go back to the
14 previous slide, please.

15 MR. BURKE: Okay.

16 MEMBER ABDEL-KHALIK: You made the point
17 that this WCAP report is proprietary.

18 MR. BURKE: Yes.

19 MEMBER ABDEL-KHALIK: And therefore you
20 are constrained as to how much detail you can offer in
21 the reg guide.

22 MR. BURKE: Yes.

23 MEMBER ABDEL-KHALIK: What are you telling
24 people? You go work it out with Westinghouse?

25 MR. BURKE: Pretty much. If what you need

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1 is in the safety evaluation then the safety evaluation
2 is a public document. But if you need the details
3 that are in the topical report then yes, go work it
4 out with Westinghouse and the PWR Owners' Group.

5 MEMBER ABDEL-KHALIK: You don't have an
6 alternate acceptable method that you can offer people
7 that is not proprietary?

8 MR. BURKE: No, we don't.

9 MR. LEHNING: This is John Lehning. I
10 mean, we're not saying you know go to Westinghouse,
11 we're saying come up with a methodology that's
12 acceptable. So they're free to come up with their own
13 method, they're free to purchase that from
14 Westinghouse, they're free to you know do whatever
15 they need to do.

16 MR. SMITH: I think right now all of the
17 PWRs are participating and the BWRs are trying to work
18 something out with the PWR Owners' Group to be able to
19 use that report. So it seems like it's going to be
20 consistent throughout all the operating reactors, the
21 way that they evaluate this, the downstream ex-vessel,
22 you know, not the in-vessel part but the ex-vessel
23 part. I think that everyone is at least attempting to
24 use this one methodology.

25 MR. BURKE: There are two associated

1 NUREGs that -- they're mentioned in the public
2 comments. I don't remember if we have them mentioned
3 in the reg guide or not. But two research efforts to
4 look at downstream effects. But that are public
5 documents, that provide a little more information and
6 more public information than what you could get from
7 just the safety evaluation.

8 CHAIRMAN BANERJEE: Are they worth
9 mentioning or are they so tangential to this report?

10 MR. BURKE: I believe the approach
11 velocities or the velocities used in the research were
12 not typical of the velocities now with the large
13 strainers. I think that was the reason we did not
14 discuss them in any detail.

15 CHAIRMAN BANERJEE: Does this guidance
16 shed any light on what passes through the -- or how
17 one should calculate what passes through the strainers
18 that you get downstream?

19 MR. BURKE: In the reg guide we give a
20 couple methods of determining that. And the staff has
21 accepted several different methods and the term we use
22 is "bypass flow," what debris passes through the
23 strainers. Some of the vendors use a grad sample
24 technique to determine what is downstream of the
25 strainers. And I know one vendor in particular uses

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1 a filter system with a 1 micron filter socks
2 downstream of the strainer. And the staff has
3 accepted either approach but we don't specify which
4 approach is best or which one we prefer.

5 CHAIRMAN BANERJEE: But is this based on
6 -- these experiments that are being done currently or
7 have been done to look at head losses on the strainers
8 and the screens or whatever, obviously the amounts
9 that pass downstream could be measured. Are they
10 being measured in these tests and is some sort of an
11 estimate being made of what might go downstream from
12 the strainers?

13 MR. BURKE: It's handled different by the
14 different vendors. I know like I said one vendor has
15 put in filter socks downstream of the strainer with 1
16 micron size hole.

17 CHAIRMAN BANERJEE: So they are trying to
18 measure it.

19 MR. BURKE: And they, yes, they weigh the
20 sock afterwards to see how much debris is captured
21 downstream. And then they're using that quantity to
22 do the in-vessel testing.

23 CHAIRMAN BANERJEE: The reason I'm asking
24 is we had a question at a subcommittee meeting
25 somewhere back in history maybe four or five years ago

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1 because there were some assumptions being made about
2 how much debris gets through. And there was a
3 discussion as to how this might be measured and
4 correlated or whatever.

5 DR. WALLIS: I picked up on this too and
6 on page 29, item G the only place I found anything was
7 licensees may sample the flows downstream of the test
8 strainer. That's a very vague statement, they may or
9 they may not. There's no guidance about how they
10 estimate debris bypass. I think you need to give them
11 some help about how they should estimate debris
12 bypass.

13 CHAIRMAN BANERJEE: Because then it has a
14 significant effect on downstream effects.

15 DR. WALLIS: Yes.

16 CHAIRMAN BANERJEE: I mean all downstream,
17 ex-vessel and more importantly in-vessel.

18 MR. SMITH: This is Steve Smith. We
19 currently don't have a specific guidance on how to
20 measure bypass. All of the strainer vendors have
21 measured bypass in some fashion during testing.
22 However, no vendor has attempted to measure the bypass
23 of when you have both particulate and fibrous debris
24 in the loop. It's very difficult to separate that
25 debris, to capture that debris. Your, basically your

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1 downstream mechanism is going to clog up faster than
2 your strainer. It's really something that's hard to
3 do. So what they have done is generally they assume
4 that all of the particulate bypasses the strainer.
5 And then what they do is they attempt to measure in a
6 separate test with only fibrous debris in it how much
7 fiber bypasses the strainer. Now as John said there
8 is different -- different vendors use different
9 methodologies for that. Some try to capture the
10 entire whatever passes through the strainer and some
11 take samples, and there's advantages and disadvantages
12 to each way of doing that.

13 CHAIRMAN BANERJEE: When it comes to
14 looking at these downstream effects though what are
15 you going to require them to assume that these tests
16 that they're doing, fibers separately and assuming all
17 the particulates pass through. Is that going to set
18 the benchmark for what they have to do?

19 MR. SMITH: Yes. Because of the
20 importance of the amount of fiber that bypasses and
21 how that affects the head loss for the in-vessel we
22 haven't really come to an agreement with industry on
23 how that's going to be measured. You know, what would
24 be a conservative measure of how much fiber might
25 bypass. But that is very important for those tests.

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1 We're still working with industry on what would
2 constitute a conservative amount of bypass for each
3 plant.

4 DR. WALLIS: I think maybe you should
5 state that in the guidance because at the moment it
6 doesn't help them at all.

7 MR. SMITH: Yes, we understand. You know,
8 we know that we have some unknowns with the in-vessel.
9 We don't think that the bypass is important, you know,
10 the amount of fiber bypass is very important for other
11 aspects. So we could, I suppose we could change the
12 wording for the bypass for now but certainly when we
13 update for in-vessel we would want to do that.

14 DR. WALLIS: Now you said that you assume
15 all the particles go through the strainer?

16 MR. GEIGER: This is Ervin Geiger, NRR.
17 In the WCAP 6406-P there is guidance for determining
18 what -- for estimating what the bypass is. Like Steve
19 said, all particulate is assumed to bypass plus all
20 particles, some percentage over the size of the
21 openings in the strainer assumed to bypass and that
22 includes fiber, certain sizes that would also bypass.
23 So it depends on the strainer hole size and it's like
24 a 25 percent larger than the strainer hole size in the
25 criteria.

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1 DR. WALLIS: I think this is related to
2 page 630 when it talks about sequencing. This is
3 another issue which is a bit difficult. It says the
4 most transportable debris should be added first and
5 the least transportable last. So but this is a loop.
6 So you add the particles, they go through the
7 strainer, they're gone. Then you add the fiber, they
8 pile up on the strainer, then the particles come
9 around again and they get stuck on the fibers. So
10 this way in which you modeled the whole loop seemed to
11 be important, not just how you add stuff to the
12 strainers in the test. Because stuff comes around
13 again. If the particles go through the fibers form a
14 bed, then they come around and they have another go at
15 getting stuck. Was this model in the test?

16 MR. GEIGER: There was some depletion --
17 in the WCAP there's a depletion allowance for
18 downstream effects depending on --

19 DR. WALLIS: Well, I was saying this is
20 related also to strainer pressure drop, too. How you
21 do the tests. Does it consider this sort of recycling
22 of the fines --

23 CHAIRMAN BANERJEE: But of course any
24 recycling is subject to capture mechanisms downstream
25 as well. So it's not as straightforward.

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1 DR. WALLIS: It's not a straightforward
2 experiment. And if they get caught in the reactor
3 they don't recycle.

4 CHAIRMAN BANERJEE: Yes, so I think what
5 they're saying is it all goes through, that's sort of
6 a conservative position to take, whereas --

7 DR. WALLIS: Is it?

8 CHAIRMAN BANERJEE: Well, I thin it's
9 conservative in the sense of erosion of downstream
10 components and things like that. It could be better,
11 I mean it could be that some part of it gets stuck in
12 the --

13 DR. WALLIS: Well, my questions were I'm
14 not sure how you know what's more transportable. You
15 have to explain what you mean by that. And also it
16 wasn't clear to me which sequence is going to be more
17 conservative because of these interactions of various
18 effects. So it's hard to determine which sequence
19 really is conservative when some things go through and
20 some things don't.

21 CHAIRMAN BANERJEE: Well, they've taken a
22 position.

23 DR. WALLIS: I'm not sure what you mean by
24 least transportable. You have to somehow give a
25 definition or guidance about how you estimate

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1 transportability which is a new thing. You have to
2 define it or something.

3 CHAIRMAN BANERJEE: Let me try to get this
4 clear because you've spoken it in words but I don't
5 know if this guidance is available or not. If I
6 understand it, you're saying that with regard to
7 downstream effects essentially all the particulate
8 matter which is smaller than the hole size goes
9 through. Yes, for ex-vessel, yes. And the fibrous
10 matter which gets through which is probably not all
11 that important for ex-vessel anyway is based on
12 experiments which are done with fibers alone. Is that
13 guidance available somewhere or is it just lore at the
14 moment? Can they refer to something?

15 MR. SMITH: I think that the 16406 tells
16 you that you have to, you know, test your strainer to
17 determine how much fiber would bypass.

18 CHAIRMAN BANERJEE: But what you're saying
19 is industry practice is if they do it with fiber
20 alone. Is that what?

21 MR. SMITH: When determining the amount of
22 fiber that would bypass, that's correct.

23 CHAIRMAN BANERJEE: Right.

24 MR. SMITH: There's no particulate in the
25 test when they're looking for fiber bypass.

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1 MR. SMITH: Yes, because it's much more
2 difficult to separate how much is particulate. Okay.

3 DR. WALLIS: But then on page 21 I have
4 another related question. It says should also
5 consider the potential for further decomposition of
6 the debris as it is transported to the debris
7 strainers. So what starts out as a fiber might end up
8 as particles? Or something?

9 CHAIRMAN BANERJEE: Particles may become
10 smaller.

11 DR. WALLIS: What are they supposed to do
12 with this? Are they supposed to analyze the breakup
13 of fibers on the way to the strainer? What are they
14 supposed to do?

15 MR. SMITH: What it is is that's for
16 fibrous debris that may not transport and we have
17 accepted some industry testing that shows how much
18 erosion would be expected for the most common types of
19 fibrous debris. So that's what that statement is
20 about.

21 DR. WALLIS: So this requires industry
22 testing in order to answer this? I mean, every time
23 you put down something they have to do you have to
24 give them help about how to do it it seems to me.
25 This is what guidance is all about.

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1 MR. SMITH: And these, this information is
2 available on --

3 DR. WALLIS: But could you put a pointer
4 in there or something?

5 MR. SMITH: Just, I don't know if that
6 report, that's also a proprietary report but is it
7 referenced in the?

8 MR. LEHNING: No.

9 MR. SMITH: We may be -- that might be a
10 good report.

11 DR. WALLIS: So we have a whole lot of
12 these I noticed where they're asked to do something
13 and it doesn't tell them how to do it. I think that
14 you should always, when you ever ask them to do
15 something in the guidance you should think, well, how
16 are we going to ask them to do it.

17 MR. SMITH: In addition to the proprietary
18 report that comes up with a more realistic number for
19 erosion we do have default values that are included in
20 the guidance you know which is a very, very
21 conservative number.

22 DR. WALLIS: So it's there somewhere.

23 MR. SMITH: Most plants would not want to
24 use that default number because it's 90 percent
25 erosion.

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1 DR. WALLIS: Ninety percent erosion?

2 MR. SMITH: Yes. Basically 90 percent of
3 your material that's left in the pool would erode into
4 fine material by the end of the event.

5 DR. WALLIS: It all goes through the
6 strainer?

7 MR. SMITH: It would go to the strainer.

8 CHAIRMAN BANERJEE: So it was piece of
9 cloth, whatever, left behind it would become fiber?

10 MR. SMITH: I don't think we would require
11 cloth to erode. We would require any of the base
12 insulating material like the NUCON or tent mat, those
13 types of materials.

14 CHAIRMAN BANERJEE: So what happens with
15 cloths?

16 MR. SMITH: Cloth just, it just hangs out
17 there in the pool.

18 DR. WALLIS: Well, I think this really
19 surprises me. Ninety percent of this stuff break up
20 and become fines?

21 MR. LEHNING: This is John Lehning.
22 That's, like Steve said a default conservative
23 position. It was based on short-term testing for 2-
24 to 4-hour type periods under fairly significant
25 turbulence in the pool. And so again we would not

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1 expect that to be representative of what --

2 DR. WALLIS: But I would expect to see
3 that when I read that they have to consider this
4 effect. I would like to read that the default
5 assumption is blah blah blah so they know what they
6 have to do. Otherwise it's just a vague statement,
7 just consider something, but that's -- that's -- at
8 the very first level you have to do engineering and
9 figure out how to work it out.

10 MR. LEHNING: Our view of what the
11 regulatory guide was is stating the principles of what
12 has to be done and then the documents like the safety
13 evaluation for 407 and other more detailed review
14 guidance for strainer testing cover the details.

15 DR. WALLIS: The reg guide is helping
16 industry to figure out how to do the job in an
17 acceptable way.

18 CHAIRMAN BANERJEE: Well, are you
19 suggesting that references should be put more --

20 DR. WALLIS: Yes, I think so. If you're
21 putting in something like that there's got to be
22 something so that --

23 CHAIRMAN BANERJEE: More frequently --

24 DR. WALLIS: -- should be doing this
25 doesn't have completely open-ended requirement. Put

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1 down some references or something.

2 CHAIRMAN BANERJEE: Yes. What they're
3 saying is there are SEs and so on.

4 DR. WALLIS: Yes, that's right.

5 CHAIRMAN BANERJEE: Which makes their
6 position clear. But what you're saying is put those
7 pointers in so people know where to look.

8 DR. WALLIS: Otherwise I don't think it's
9 guidance.

10 CHAIRMAN BANERJEE: All right.

11 MR. BURKE: We've tried to make this a
12 roadmap.

13 DR. WALLIS: Right.

14 MR. BURKE: Just like the head loss
15 testing that we were talking about earlier.

16 CHAIRMAN BANERJEE: Yes, he wants a few
17 more science.

18 MR. BURKE: That particular document is 40
19 pages. This, this 16406 is 200 pages. We don't want
20 a 500-page reg guide.

21 DR. WALLIS: No, but just a reference
22 isn't a lot of pages is it?

23 MR. BURKE: We'll try to provide a few
24 more road signs, okay?

25 CHAIRMAN BANERJEE: All right.

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1 MR. BURKE: Okay, are we ready for
2 coatings then?

3 CHAIRMAN BANERJEE: Yes, we're ready for
4 coatings.

5 MR. BURKE: All right.

6 CHAIRMAN BANERJEE: Well, maybe before you
7 go on to coatings let me see. Why don't we take a
8 little break.

9 MR. BURKE: All right.

10 CHAIRMAN BANERJEE: This might be a good
11 time to do it. So if it's okay let's break for 15
12 minutes, come back at 5 past. Okay?

13 (Whereupon, the foregoing matter went off
14 the record at 9:49 a.m. and resumed at 10:04 a.m.)

15 CHAIRMAN BANERJEE: Back in session. And
16 it's in your hands, John.

17 MR. BURKE: Let's talk about protective
18 coating for a little while.

19 CHAIRMAN BANERJEE: I'm sure Graham will
20 have lots to say about this.

21 MR. SMITH: Can we make a point before we
22 start? One thing John and I were discussing during
23 the break, some of the questions about the amount of
24 detail and the references included in the reg guide,
25 we understand this reg guide may be a little bit more

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1 harder to pin down some of the technical bases for it
2 because some of those are changing, especially with
3 the downstream effects and things like that. But we
4 do reference the knowledge base right in the beginning
5 in the discussion. This is NUREG/CR-6808 which
6 documents a lot of information you know that underlies
7 the basis for this. The other thing is that we're
8 coming out with a new knowledge base which will also
9 provide, you know, a good background or an updated
10 background on the knowledge we have in this area.

11 In part what we think as far as the amount
12 of detail that's included in this is that people who
13 are working on these types of evaluations are going to
14 have some background and should be familiar with at
15 least these knowledge base type documents. So just
16 being familiar with those would give them the
17 knowledge of where to go to look for more detailed
18 guidance. It's really difficult to put -- this
19 document could end up being a thousand pages long if
20 we put every bit of guidance in this thing so that's
21 kind of what we're struggling with is where to put the
22 guidance in, where to put the references in. And
23 we'll try to improve that but we think that there is
24 a good knowledge by the people who are doing these
25 types of evaluations of where to go look for this

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1 stuff.

2 MR. BURKE: And like Steve said, the
3 current knowledge base, NUREG/CR-6808, is being
4 revised and I'm also the project manager for that.
5 And the schedule for that is about this time next year
6 it should be published. We have a good draft and
7 we're, the NRR and NRO staff and I have provided
8 comments and we're incorporating those comments now.
9 So that knowledge base document is moving along.

10 CHAIRMAN BANERJEE: Okay.

11 MR. BURKE: On coatings then. Like I say
12 here in the prior revision of this reg guide just
13 listed coatings as one debris source and left it at
14 that. It provided no guidance on how to evaluate
15 coatings and the characteristics of coating debris.
16 And that was similar in the BWRs 15 years ago. The
17 URG which was the BWR version of NEI-0407, the URG
18 stood for Utility Resolution Guidance and the staff
19 safety evaluation did not provide a lot of guidance on
20 coatings.

21 So in March 2008 the staff wrote a letter
22 to NEI and industry with one of the enclosures being
23 a guidance on how to handle coatings for GSI-191 and
24 we've incorporated that into this reg guide. And
25 specifically we added information about both qualified

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1 coatings which means coatings that have been tested to
2 withstand a LOCA and then unqualified coatings. And
3 coating debris transport analysis as opposed to
4 insulation debris transport as a -- there was a
5 separate research effort mentioned here, NUREG/CR-6916
6 which we've accepted to provide a guidance on how to
7 handle coating debris transport.

8 Okay, latent debris. In the prior
9 revision to the reg guide latent debris was very
10 minimally addressed. It just, it pretty much relied
11 on the cleanliness program of the licensees and that
12 was about all it said. Since GSI-191 came about
13 there's been an NEI report, NEI-02-01 revision 1 on
14 how to evaluate latent debris in containment. And the
15 NEI guidance report 0407 incorporates that prior NEI
16 report and the staff safety evaluation accepted that
17 process. And it's basically a process of taking
18 samples in containment, determining how much latent
19 debris you have and determining the mix between fibers
20 and particulate.

21 DR. WALLIS: So what you're doing on this
22 side is exactly what you said was so difficult to do
23 in the report. You're giving pointers to all useful
24 documents that tell you how to do it.

25 MR. BURKE: True.

1 DR. WALLIS: Thank you.

2 MR. BURKE: And one thing I wanted to
3 point here, for the low-fiber plants which is plants
4 with very little or no fiberglass insulation latent
5 debris is the major source of fiber that collects on
6 the strainers.

7 CHAIRMAN BANERJEE: All the -- new
8 reactors are also the main source of debris.

9 MR. BURKE: If I understand it right the
10 new reactors have assumed a certain quantity of latent
11 debris similar to what the current plants have and
12 then they have an ITAAC to confirm that later on.

13 DR. WALLIS: Well --

14 MR. BURKE: Or to benchmark it might be a
15 better terminology.

16 CHAIRMAN BANERJEE: Yes, but in some cases
17 based on downstream effects they may have to ensure
18 the latent debris is below a certain amount.

19 MR. BURKE: Right. Vortexing and air
20 ingestion is the next topic. This issue has changed
21 a lot with the new types of strainers.

22 CHAIRMAN BANERJEE: Before you move on.

23 MR. BURKE: Okay.

24 CHAIRMAN BANERJEE: Going back to latent
25 debris. As I just was saying hair seems to behave

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1 differently from fiber. Now, these programs -- at
2 least there are some indications that that's the case.
3 So that it's not so easy to do experiments with hair
4 but there's been the odd one done where somebody's
5 gone to a barber and got the hair and put it into an
6 experiment. It does show some rather interesting
7 characteristics. For example, compared to fibrous
8 debris the buildup of pressure loss over time takes
9 longer but once it gets there you know it keeps rising
10 because holes don't easily blow in hair whereas they
11 do in other types of debris. So in some ways whether
12 fiber bounds hair is not clear, or a mixture of hair
13 and fiber. But you're not determining things like
14 hair care, right? Though it might become important in
15 the future.

16 MR. BURKE: I think that's correct. I'm
17 not, I don't have a lot of detailed information or
18 knowledge on how the NEI-0201 sampling is done, fiber
19 versus hair. When you do smear samples in containment
20 you're going to collect both.

21 CHAIRMAN BANERJEE: Yes, you are but
22 correct me if I'm wrong but there's no --

23 MR. SMITH: From the testing that was
24 done, now this was testing that was done for a new
25 reactor I believe that included the hair.

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1 CHAIRMAN BANERJEE: There's only one case.

2 MR. SMITH: It was, I believe that was
3 done for a plant that has a break that would allow the
4 strainer to be bypassed. So they did testing with
5 larger fibers than the existing reactors are tested
6 with because the fibers cannot bypass the strainer in
7 the new reactors. I think that they were testing for
8 a specific grate that would completely bypass the
9 strainer and allow debris to flow into the reactor.
10 So I think that's why they tested with the hair. So
11 I'm not really familiar with the differences in how
12 the head loss came up for that test.

13 CHAIRMAN BANERJEE: Yes, so you're
14 absolutely right of course. That was the case. The
15 issue though is would all the hair be taken out by the
16 strainers or would it also, some of it bypass?

17 MR. SMITH: Most of the hair would be
18 taken out. I think that the hair load in containment
19 is probably relatively low and then what would be
20 filtered out by the strainer would make it so that
21 there would be a very small amount downstream of the
22 strainer, at least for the operating reactors. I
23 understand that this guidance is also for other
24 reactors you know that aren't in operation yet. So
25 you know, there may be some thought to be put into

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1 that.

2 CHAIRMAN BANERJEE: Yes, okay. Let's move
3 on.

4 MR. BURKE: Okay. In this revision of the
5 reg guide most of the changes are in Appendix A to
6 this reg guide and they're related to Generic Letter
7 2008-01.

8 DR. WALLIS: This is the only place you
9 actually have formulae.

10 MR. BURKE: Yes.

11 DR. WALLIS: And tables of numbers, how to
12 predict and things like that.

13 MR. BURKE: Correct.

14 DR. WALLIS: And it's very strange. You
15 say that all these things depend on a Froude number.
16 Now a Froude number has nothing to do with a vortex,
17 vortices. If you have a bathtub which is very still
18 and you open the drain all that happens is the water
19 goes out and at some level the depression of the
20 surface will begin to suck air down. That's a Froude
21 number effect. But you don't get vortexing until you
22 have vorticity. The Froude number has nothing to do
23 with vorticity. So there's something odd about this,
24 the technical basis of this appendix.

25 MR. BURKE: But the basic guidance hasn't

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1 changed in this appendix.

2 DR. WALLIS: Well, I didn't look at what
3 the experiments were and all that, I just looked at
4 you know various straightforward what seemed to be the
5 basic technical assumptions and they just seem strange
6 to me.

7 MR. SMITH: For the new strainers what we
8 do is that we have them test at the minimum
9 submergence level and maximum flow rate to ensure that
10 vortexing will not occur. Now some strainer vendors
11 have used the Froude number to -- as a predictor.
12 It's not, you can't directly take the Froude number
13 and say whether you're going to have vortexing or not,
14 but under the conditions that they tested with they
15 could draw some parallels as to you know what
16 submergence, what flow rates you would have which are
17 inputs to the Froude number and where vortexing would
18 occur for their strainers.

19 DR. WALLIS: I guess what I'm saying is
20 technically from a fundamental basis Froude number has
21 nothing whatever to do with vortices.

22 CHAIRMAN BANERJEE: It's the gravity with
23 velocity over --

24 DR. WALLIS: Velocity draw-down of the
25 surface which is a rather modest thing about a drain.

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1 Well then you just put a bit of vorticity in the
2 bathtub and you get this swirling, sucking noise and
3 all that. But you have to put that in and that's done
4 by the upstream flow to this thing which is the
5 important part really. So you need some CFD or
6 something to predict vorticing or experiments with
7 suitable geometry like the real thing. It's mentioned
8 slightly in the text.

9 MR. SMITH: That's why we --

10 DR. WALLIS: But the Froude number is not
11 --

12 MR. SMITH: That's why --

13 DR. WALLIS: -- for vorticing.

14 MR. SMITH: That's why we have them test
15 the specific strainers --

16 DR. WALLIS: That's good, yes.

17 MR. SMITH: -- under the limiting
18 positions.

19 CHAIRMAN BANERJEE: You require tests,
20 right?

21 MR. SMITH: Yes, we require tests of --
22 all the strainer vendors have done tests. And some
23 licensees may not have a specific test for their
24 strainer but if their strainer type was tested under
25 you know conditions which were shown not to vortex

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1 which were more limiting for another plant we would
2 allow them to use that.

3 DR. WALLIS: Well, the table is very
4 conservative so minimum submergence of 9 feet is that
5 what they have? It seems, for the Froude number
6 you've got it seems very conservative so maybe that's
7 okay.

8 MR. SMITH: And generally that's included
9 for -- we really don't see any plants that have this
10 type of you know sump anymore. Some do have sumps
11 downstream, that could be a sump downstream of their
12 strainer where this type of an evaluation could be
13 done, but generally most of the strainers are piped
14 directly into the pump suction now.

15 DR. WALLIS: While we're talking about
16 submergence could I bring that up? On page 30 it says
17 ECCS strainers should be located in the lowest flow
18 level and containment to maximize the pool depth
19 relative to the strainers. That's the submergence of
20 the strainer. And then on page 9 it says elevating
21 the sump strainers slightly above the containment
22 floor level, preferably on a pedestal, minimizes the
23 potential for debris buildup. Well, that's contrary
24 to the other reg guidance.

25 CHAIRMAN BANERJEE: And there is another

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1 statement which says it should slope up.

2 DR. WALLIS: That's right and how much
3 should it slope up. And the word "minimize" is
4 entirely inappropriate. It doesn't minimize potential
5 at all. It may reduce the potential but it certainly
6 doesn't minimize it. Minimize is used -- the word
7 "minimize" is used --

8 MR. SMITH: There are competing effects.
9 Some strainers are down in the sump under the floor so
10 they're a lot more likely to have debris transport to
11 them unless they have a large curve or something
12 around.

13 DR. WALLIS: I'm just saying giving two
14 bits of guidance which are in contradiction doesn't
15 help. One thing says it should be as low as possible,
16 the other guidance says it should be on a pedestal.
17 That's sort of --

18 MR. SMITH: Both are true.

19 DR. WALLIS: Both are true.

20 MR. SMITH: The pedestal at the lowest
21 level.

22 (Laughter)

23 DR. WALLIS: Well, but the idea of on a
24 pedestal minimizing the potential, that doesn't mean
25 anything.

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1 MR. BURKE: I mean, the ones I've seen,
2 you want them on the lowest floor but --

3 DR. WALLIS: You want some settling around
4 them so that they're not --

5 MR. BURKE: But they might be up 2 or 3 or
6 4 inches above that base floor level.

7 DR. WALLIS: Yes.

8 MR. BURKE: So the heavy insulation that
9 does transport on the floor doesn't collect on the
10 strainer.

11 DR. WALLIS: I agree with that. I'm not
12 sure anyone knows how to predict these and you
13 certainly don't minimize anything when you do that.

14 MR. LEHNING: This is John Lehning. I
15 think the wording could possibly make --

16 DR. WALLIS: The word "minimize" is used
17 in a sort of profligate way throughout this report to
18 mean reduces or may help or something. Anyway, be
19 careful of that sort of a statement. And I don't
20 think it guides because then how would they determine
21 how big the pedestal should be and things like that?
22 Anyway. I just brought that up as another thing I
23 noticed in here which seemed a little strange. Thank
24 you.

25 MR. BURKE: One other thing to point out

1 on this slide then is along with Generic Letter 08-01
2 we added information to differentiate between
3 transient and steady state operating conditions for
4 the pumps. The prior revision was just for steady
5 state pump operation.

6 DR. WALLIS: I noticed that but then you
7 don't say anything about how to determine how long it
8 could work in a state at which something happened.
9 You use just transient condition for the pump.

10 MR. BURKE: That's in table A-2.

11 DR. WALLIS: Is it there somewhere?

12 MR. BURKE: Yes, table A-2 in the
13 appendix.

14 DR. WALLIS: So I should look at that.

15 MR. BURKE: There's one, there's a column
16 about the operating point at the best efficiency point
17 and then transient operations.

18 DR. WALLIS: Okay, thank you.

19 MR. BURKE: That's it. Like I said
20 Appendix A has been revised to incorporate this
21 information and on my second bullet there, what I have
22 in parentheses, the box-like strainers, I was reminded
23 some of the new reactors may have box-like strainers.
24 What's in parentheses is not entirely correct for new
25 reactors.

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1 DR. WALLIS: There were some good points
2 about partially submerged strainers and things like
3 that in this appendix.

4 MR. BURKE: I had a lot of help from NRR
5 on this appendix.

6 DR. WALLIS: You see this is interesting
7 because now you're being specific about some of the
8 technical things that have to be considered in a way
9 that you're not in some other parts of the report. So
10 maybe it's appendices where one should look for
11 things.

12 MR. BURKE: Maybe.

13 DR. WALLIS: Maybe there will be more
14 appendices in the future. And they're allowed to have
15 credit for horizontal parts of a strainer or
16 something?

17 MR. BURKE: Correct. Horizontal parts.

18 DR. WALLIS: Why is that? Because I mean
19 you have these strainers which are disks, stacked
20 disks. An awful lot of that is horizontal. You
21 don't, you certainly get credit for that. And you
22 have pockets which have horizontal surfaces. I don't
23 know what you mean by no credit may be taken for any
24 horizontal strainer surfaces.

25 MR. BURKE: That was more in line with the

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1 square screen-shaped strainers and --

2 DR. WALLIS: Well, that's making sure it's
3 properly submerged and things like that. Okay.

4 MR. BURKE: So that's it for the specific
5 areas of the reg guide I was going to talk about. On
6 the public comments we received comments from five
7 separate organizations and some of the I guess more
8 controversial ones we've already talked about in some
9 depth here, the use of containment accident pressure,
10 the use of the NUREG/CR-6224 correlation. And like I
11 mentioned earlier, Appendix A criteria was revised to
12 match the current criteria or current staff guidance
13 for Generic Letter 2008-01 and then we talked quite a
14 bit about head loss testing and what's in this reg
15 guide is consistent with the head loss testing
16 guidance the staff issued in March 2008.

17 DR. WALLIS: Now was the statement on page
18 2, maybe I misunderstood. It said this reg guide is
19 a rule.

20 MR. BURKE: Which page are you looking at?

21 DR. WALLIS: Page 2, right at the
22 beginning where it says what it is.

23 MR. BURKE: Page 2 of the reg guide?

24 DR. WALLIS: Did I misunderstand that?

25 This is a rule but not a major rule. Did I

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1 misunderstand that?

2 MR. BURKE: I don't know what page.

3 DR. WALLIS: It seems strange. I don't
4 know what it meant. Page 2. Right at the beginning
5 when you're saying what it is. Maybe I mistook, maybe
6 I misread it.

7 MR. BURKE: Oh, okay, I see it here. This
8 is a rule as designated by the congressional --

9 DR. WALLIS: Is a reg guide ever a rule?

10 MR. BURKE: I think this particular choice
11 of words.

12 MR. RICHARDS: This is Steve Richards with
13 the Office of Research. I think that has to do with
14 the OMB requirements for congressional approval and
15 the process that we have to follow for submitting this
16 down through OMB. It doesn't really relate to whether
17 it's an NRC rule.

18 DR. WALLIS: I thought a rule was
19 something much stricter than a reg guide. You have to
20 obey the rules. You have to observe the reg guide.

21 MR. BURKE: I think this is boilerplate
22 language that you see in all reg guides.

23 DR. WALLIS: Aren't there rules which are
24 different? The rules --

25 MEMBER SHACK: That's what he's

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1 explaining. This is not an NRC rule, this is --

2 DR. WALLIS: It's a government rule, not
3 an NRC rule? Maybe that should be made clearer
4 because if you just say it's a rule that sounds as if
5 it's an NRC rule.

6 MR. RICHARDS: We've actually had quite a
7 bit of discussion on this part of generic language in
8 reg guides with the Office of the General Counsel to
9 meet the legal requirements of OMB. We can take your
10 feedback but --

11 (Laughter)

12 DR. WALLIS: There's nothing you can do
13 about it.

14 MR. RICHARDS: We've been through the mill
15 on these words, so.

16 DR. WALLIS: So I won't drag you through
17 the mill again.

18 MR. RICHARDS: The important thing here is
19 that we meet the OMB requirements for the way we
20 process reg guides. And it really is addressed at
21 that aspect of the reg guide process.

22 MR. BURKE: All right?

23 CHAIRMAN BANERJEE: One of the things,
24 going back to your previous slide, is can you sort of
25 tell us a little bit more with regard to the situation

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1 regarding the BWRs?

2 MR. BURKE: The BWRs?

3 CHAIRMAN BANERJEE: The BWRs.

4 MR. BURKE: BWR, yes.

5 CHAIRMAN BANERJEE: Because clearly you
6 know this 6224, you started to tell us something about
7 what's going on but maybe a little more detail.

8 MR. BURKE: All right.

9 CHAIRMAN BANERJEE: That's a little
10 troubling.

11 MR. BURKE: I'll tell you as much as I
12 know.

13 CHAIRMAN BANERJEE: Okay.

14 MR. BURKE: In the 2007-2008 time frame
15 the staff started to take another look at the BWRs and
16 looked at the differences in how the BWR strainers
17 were handled in the 1996 era versus how we're handling
18 GSI-191 now. And we came up with 12 technical areas
19 that were handled different, like protective coatings
20 that I mentioned already or latent debris or
21 downstream effects. The NRR staff sent a letter to
22 the BWR Owners' Group in 2008 outlining those 12
23 items. And since then we've had a series of meetings
24 with the Owners' Group making -- to ensure we had a
25 common understanding of the differences. And the

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1 Owners' Group has begun to address those. I guess the
2 first issue they're looking at is downstream in-vessel
3 effects. And they've submitted a topical report to
4 the staff for the staff to review. And the whole
5 issue, they've laid out a schedule and a plan on
6 addressing all 12 items culminating in a revision to
7 this URG or Utility Resolution Guidance document. And
8 their schedule is to have a revised URG submitted to
9 the staff in 2015.

10 In the area of head loss testing in the
11 6224 correlation, I don't know if you were around in
12 '96 when the BWRs did their thing but for the most
13 part the BWRs qualified their strainers by generic
14 testing. There were not very many plant-specific
15 tests done back then and Research did their own work
16 and came up with this correlation that was published
17 in this NUREG. And that's how the BWRs are primarily
18 qualified, using that correlation. In the area of
19 protective coatings they -- we left it really unclear
20 in our guidance how to handle protective coatings.
21 Most of the BWRs, we talked a little bit earlier about
22 the zone of influence and the spherical zone of
23 influence and the ANSI standard. The coatings for the
24 BWRs was handled completely different. They used a
25 conical projection out of the break location and used

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1 the surface area of that projection as the area of the
2 coatings that would be destroyed. So they're looking
3 at all those issues and revised their guidance.

4 CHAIRMAN BANERJEE: So how will this reg
5 guide affect them?

6 MR. BURKE: This revision of the reg guide
7 wouldn't necessarily affect the operating BWRs.

8 MEMBER SHACK: Well it explicitly says it
9 doesn't, doesn't it?

10 MR. BURKE: I mean, yes. Like I said in
11 the public comment matrix on the comments to the
12 correlation we're not back-fitting or we're not
13 imposing a back-fit on the BWRs with this revision of
14 the reg guide to say you have to go do plant-specific
15 testing. We're just saying any strainers in the
16 future should be qualified with plant-specific
17 testing.

18 DR. WALLIS: You talked about coatings.
19 On page 20 it talks about erosion of concrete at the
20 point of impact.

21 MR. BURKE: All right.

22 DR. WALLIS: Is that something that
23 matters?

24 MR. BURKE: It could. I mean it --

25 DR. WALLIS: You worry about the coating

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1 coming off, but there's something behind the coating.

2 MR. BURKE: The jet -- there's a multi-
3 part answer to that question. The jet will erode the
4 coatings at the point of impact. It could erode the
5 concrete. What the AP-1000 -- now as far as the PWRs
6 and the operating reactors in GSI-191 the staff
7 position is the debris that we use with the WCAP 16530
8 and some of the other debris sources more than
9 adequately cover any concrete abrasion that would
10 occur. Westinghouse did some testing quite a few
11 years ago that's discussed in the SE for the AP-1000
12 where they demonstrated that you would have very
13 minimal concrete erosion from the jet. So for GSI-191
14 we don't require a specific debris source from the
15 concrete erosion and in the -- the Westinghouse report
16 that I mentioned earlier is a proprietary report. So
17 unless you're a Westinghouse client you don't have
18 access to it. So you should do, you need to address
19 concrete erosion somehow.

20 DR. WALLIS: Somehow, okay. It is part of
21 the problem, it could be.

22 MR. BURKE: It could be.

23 DR. WALLIS: Do you accept air tests for
24 the zone of influence and debris damage?

25 MR. BURKE: Do you want to handle that

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1 one, Steve?

2 MR. SMITH: Do we accept air tests?

3 DR. WALLIS: Yes. There have been tests
4 using air jets rather than two-phase steam water
5 tests.

6 MR. SMITH: Yes. The basis for -- the
7 basis for most of our zones of influence is those air
8 jet tests that were done for the BWRs.

9 DR. WALLIS: That bothers me because if
10 you have, you know, the way that they take rust off
11 ships and so on and the way I take debris off my maple
12 syrup thing and all that is to get droplets because
13 droplets on impact produce a local water hammer in the
14 droplet which is very effective at getting a local
15 very high pressure. Droplets are very different from
16 gaps when they affect the surface and clean it or do
17 something to it. So I'm not sure that you should
18 accept air tests at all.

19 MR. SMITH: Unfortunately we don't have a
20 lot of steam tests that were done. Most of the
21 testing has been air tests. The new testing that is
22 being done now is steam testing, so.

23 DR. WALLIS: It's steam water.

24 MR. SMITH: Steam water, yes, two-phase
25 testing on saturated water testing and then the

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1 rupture disbursed and you can have a two-phase jet.
2 So we will gain some knowledge from that testing to
3 determine if there is a difference between air, steam,
4 water, you know, the different media. So you know, we
5 are waiting to see what this shows us but right now
6 our position is that there is not a large difference
7 and most of the damage is done just by the pressure.

8 DR. WALLIS: But you don't clean dirty
9 surfaces usually using an air jet, you pull in
10 particles of water or something because they clean it
11 far more effectively.

12 MR. SMITH: Yes. We're not trying to
13 clean anything but --

14 DR. WALLIS: No, but it's similar and when
15 it's peeling something off the surface.

16 MR. LEHNING: I just want to -- this is
17 John Lehning again.

18 DR. WALLIS: If I wanted to peel the skin
19 off a potato and I take a garden hose I do much better
20 if I use it in the droplet mode than in the jet mode.
21 I've done the experiment. So just telling you there's
22 evidence that droplets are very useful at peeling
23 things off surfaces. So I wonder if you should accept
24 air jets at all for evaluating damage to insulation.

25 MR. LEHNING: This is John Lehning from

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1 the staff. When we did accept those air jest test
2 results for the thresholds for damage in the 0407
3 there was a 40 percent factor that those factors were
4 reduced from the value where they were at air testing,
5 they were reduced 40 percent to account for this
6 uncertainty with two-phase. Steve mentioned that
7 we've looked more at the data and you know, we haven't
8 seen a significant difference you know trying to
9 correct for maybe differences in what the threshold
10 for damage was considered in different tests, et
11 cetera. But I think if we look at the regulatory
12 guide positions here the idea is that we want testing
13 to be done in a representative way. So if we're going
14 to be going forward using testing for a certain
15 purpose, if it's a steam break then it should, you
16 know, the best idea would be to test with that kind of
17 fluid or if it's a two-phase test, test that.

18 DR. WALLIS: I think it depends on what
19 you're impacting on. If you're impacting on a coating
20 then the droplets are probably much more effective at
21 peeling it off. If you're impacting on something like
22 a blanket then there's probably global effect of
23 pressure and the droplets don't make much difference.

24 MR. SMITH: Yes, that's true. Definitely
25 the material interaction with the jet media could have

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1 a significant effect.

2 DR. WALLIS: So you're on top of all that.

3 MR. BURKE: The guidance on the coatings,
4 like I was mentioning earlier, we have provided more
5 specific guidance on coatings and the zone of
6 influence for coating destruction is based on the new
7 --

8 DR. WALLIS: Steam water.

9 MR. BURKE: -- steam water testing.

10 DR. WALLIS: That's good. Thank you.

11 MR. BURKE: And that's all I have.

12 CHAIRMAN BANERJEE: Any questions?

13 MR. BURKE: And the last sentence is what
14 I wanted to repeat. There's nothing in this reg guide
15 that I would consider new staff guidance. It's all
16 either in safety evaluations or guidance letters to
17 industry. It might be new in this document but it
18 isn't new to the industry or --

19 CHAIRMAN BANERJEE: It's in practice.

20 MR. BURKE: In practice, yes.

21 CHAIRMAN BANERJEE: All right. So I think
22 we go around the table but first we take presentation
23 from NEI. So thank you very much and we'll come back.

24 DR. WALLIS: So you're just going to give
25 us the overview like this? You're not going to put up

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1 your very interesting figures, diagrams that show what
2 we need to -- sort of a box diagram of things like
3 that?

4 MR. BURKE: In the appendix?

5 DR. WALLIS: I'll just comment in my
6 written report then if you're not going to put that
7 up. There's some funny things about the box diagrams
8 but generally they're helpful. Okay. I'll just
9 comment on those.

10 MR. BURKE: All right.

11 CHAIRMAN BANERJEE: Okay, thanks John,
12 thanks Gary and.

13 MR. BUTLER: Are we ready? Would you like
14 me to stand here?

15 CHAIRMAN BANERJEE: Wherever you like.
16 Just use a microphone.

17 MR. BUTLER: Let me come around so I can
18 face you.

19 CHAIRMAN BANERJEE: Yes, I think that's
20 better.

21 DR. WALLIS: The box diagram is actually
22 in the thing itself. They start on page 28. You
23 weren't going to say anything about those? You're
24 apparently not.

25 CHAIRMAN BANERJEE: Go ahead.

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1 MR. BUTLER: My name is John Butler. I'm
2 with NEI and I appreciate the opportunity to come
3 speak to you. I asked for some time here before I
4 heard the presentation so this is mainly just to make
5 sure I had some time reserved in case I had something
6 important to say. I listened to the discussion and
7 the presentation that John gave. I thought it was a
8 very good discussion and I'm glad I came.

9 As far as important points to make I don't
10 have any significant problems with what I heard and
11 how they've captured the current guidance. I do have
12 to say I don't know how our comments have been
13 addressed in the revised reg guide as well as any
14 other stakeholder comments so I'm not making any
15 comment on how those comments have been addressed in
16 this revised draft because we haven't seen it yet.
17 But what I heard in the discussion does accurately
18 reflect where we stand with guidances out there.

19 My main question, and I'll pose it as a
20 question, is what is the primary purpose of this reg
21 guide and take -- answer that question relative to is
22 it appropriate to issue it now, recognizing as was
23 pointed out there are still a number of gaps in this
24 process that are still being resolved and probably
25 resolution paths that are still being developed. It

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1 was pointed out I think in one of the slides that the
2 commission SRM issued last December encouraged the
3 development of other resolution paths than what have
4 been currently being sought and that is being pursued.
5 I still have hopes that some of those resolution paths
6 will bear fruit so to speak. But the bottom line is
7 we aren't in a position where that can be incorporated
8 in any kind of final form in the reg guide. So if
9 this reg guide is finalized I think there needs to be
10 a recognition of those gaps, also a recognition that
11 is not going to be picked up and utilized right away
12 by anyone if at all or ever. There will be a need to
13 revise this further to incorporate hopefully a final
14 resolution for both Ps and Bs. So I would just ask
15 you to take that into account in your comments.

16 But as far as the technical discussion I
17 wish this reg guide had a lot more of the technical
18 detail. I wish the reference documents in the reg
19 guide had a lot more technical detail but this issue
20 has been very difficult. The more questions you ask
21 the more questions you create. One of the -- we
22 jokingly said you know how do you know if you've had
23 a successful strainer test or an acceptable strainer
24 test? And the answer is if you get an unacceptable
25 result. Because you can change the parameters of your

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1 test to conservatively address the phenomena in so
2 many different ways to the point where you can't live
3 with the result. So we're hoping that in the end we
4 can find some way to adequately address all the
5 phenomena without doing it in the current fashion
6 which is to compartmentalize all the phenomena,
7 address each of them individually in the most
8 conservative way that we can imagine and then put the
9 pieces back together and find out you can't live with
10 the result. And that's where we stand right now.

11 I'll stop there and I don't know if you
12 have any questions for me.

13 MEMBER ARMIJO: I do. You mentioned that
14 this reg guide may never be used by industry, this
15 revision, except as a starting point for another
16 revision later on.

17 MR. BUTLER: Yes, I'll explain what I mean
18 by that. It is being -- what's in the reg guide is
19 being used currently. It's not being cited. You
20 know, the pieces in this reg guide are being used in
21 various forms as part of --

22 MEMBER ARMIJO: For example, the BWR, the
23 new work that the BWR --

24 MR. BUTLER: Well, the BWRs, they
25 currently use the URG but they are addressing some

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1 questions that have been raised as part of the
2 comparison of the P resolution with the B resolution,
3 and are in the process of resolving those questions.
4 And I believe they've probably revised their URG
5 document and utilized that URG document and hopefully
6 the staff SE on that revised document has their
7 resolution approach. They're not specifically citing
8 the reg guide, they are citing the reg guide or the
9 URG as their appropriate guidance document. And when
10 they revise it they'll cite the revision to the URG.

11 MEMBER ARMIJO: But not necessarily -- but
12 they're using the approaches I would expect where
13 applicable that are in this revised reg guide.

14 MR. BUTLER: I think you started to say
15 that the reg guide will either now or in a future
16 revision accurately capture the approaches that are
17 being utilized by the Bs as well as the Ps. But it's
18 not like you know the Bs are referencing the reg guide
19 as an acceptable approach. They're referencing
20 another document and the reg guide is just capturing
21 what they are doing if that makes sense.

22 MEMBER ARMIJO: I think I understand.

23 CHAIRMAN BANERJEE: So you don't think
24 that -- let me try to phrase this correctly. The reg
25 guide basically captures what's going on right now.

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1 MR. BUTLER: Correct.

2 CHAIRMAN BANERJEE: It sort of puts it
3 into a structure which at least gives some regulatory
4 certainty on these issues, at least what is being done
5 today in the sense that it's all been staff guidance
6 documents and things like that, it'll become part of
7 the reg guide. You don't think that is a particularly
8 useful thing to do until say the commission position
9 has been dealt with? Because that gives you
10 alternative methods as you pointed out to resolving
11 the issue.

12 MR. BUTLER: It does you know put into a
13 single document positions that are --

14 CHAIRMAN BANERJEE: All over the place.

15 MR. BUTLER: All over the place. I don't
16 know that plants and licensees have had difficulty
17 finding those documents if they're citing. So I
18 don't, you know, while it's nice to have it all in one
19 place I don't know that not having it in one place has
20 been a particular point of difficulty. Those areas
21 where we do not have specific guidance and some of
22 those were pointed out in the discussion today, this
23 reg guide doesn't help those situations because the
24 guidance just doesn't exist. As was pointed out in
25 the last slide this reg guide doesn't pose any new

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1 staff positions it just kind of captures in one place
2 all the staff positions that are in various documents.

3 DR. WALLIS: So John, you mentioned that
4 it doesn't present acceptable approaches. Those were
5 your words, was it didn't present an acceptable
6 approach. In some cases the guide will say you have
7 to consider all methods of debris transport or
8 something like that, it's a general, very general
9 statement. Would you like to see a more specific
10 description of what would be acceptable approaches to
11 this consideration? Because you mentioned that it
12 didn't present acceptable approaches. The implication
13 to me was you'd like to see them.

14 MR. BUTLER: My preference would be to
15 step back and take a more holistic look at how we're
16 addressing this issue. The current approach of
17 addressing the phenomenon in a compartmentalized
18 fashion is not giving us an easily resolvable path.

19 CHAIRMAN BANERJEE: But John, if you look
20 back and this is just a question. Except a few high-
21 fiber plants most of the plants have been able to move
22 towards resolution at least of the strainer issue if
23 not the downstream in this case, correct?

24 MR. BUTLER: Yes, but --

25 CHAIRMAN BANERJEE: That's the reality.

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1 MR. BUTLER: These are --

2 CHAIRMAN BANERJEE: Using this approach.

3 MR. BUTLER: It's got to look at the
4 situation they find themselves in. These are plants
5 that are basically no-fiber plants. The only fiber
6 source they have would be the latent debris source
7 that they assume and --

8 CHAIRMAN BANERJEE: Or low-fiber.

9 MR. BUTLER: Low-fiber, all right?

10 CHAIRMAN BANERJEE: There's some fiber.

11 MR. BUTLER: And with this low-fiber
12 source and the conservative methods that we employ
13 that they are able to scrape through with acceptable
14 results with a strainer that probably approaches you
15 know three or four thousand square feet, a couple of
16 orders of magnitude larger than what they started
17 with. And --

18 CHAIRMAN BANERJEE: That's done.

19 MR. BUTLER: It's done until they find out
20 something in their containment that they had not
21 accounted for before. And because we're not dealing
22 with something that you can easily just punch in a
23 number and see how it affects your results and there's
24 no margin in your analysis because of the conservative
25 methods so a plant that had very low fiber suddenly

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1 finds themselves with, you know, and I've used this
2 analogy or example kiddingly, finds a Snicker bar
3 wrapper in their containment. Well, there's no
4 testing that demonstrates what the effect of a Snicker
5 bar wrapper is on their strainer test. They have no
6 margin in their analysis to account for that area of
7 the screen that would be accounted for by this Snicker
8 bar wrapper so they are in a potentially inoperable
9 condition because of this finding.

10 It's that lack of the capability to
11 evaluate new findings and the lack of any margin in
12 your analysis even though you're you know a very low-
13 fiber plant that it's not a very comfortable position
14 for a plant to be in.

15 CHAIRMAN BANERJEE: So what you're saying
16 if I read you correctly is that if we leave aside the
17 high-fiber plants, there are a few of these around,
18 even the other plants are very close to the sort of,
19 they have virtually no margin. Is that what you're
20 implying?

21 MR. BUTLER: Yes, either no margin or
22 there's no way to quantify the margin.

23 CHAIRMAN BANERJEE: They may have margins
24 because --

25 MR. BUTLER: But if you can't quantify the

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1 margin then you have no margin.

2 CHAIRMAN BANERJEE: Yes. But based on all
3 the conservative assumptions and so on that go into
4 the testing, so you're saying based on that there
5 isn't much apparent margin. So that even relatively
6 small changes in some conditions which arise or are
7 not foreseen can cut into that, or lead to some new
8 testing, whatever is needed. Is that your view?

9 MR. BUTLER: Yes. Yes. And we've already
10 seen instances where plants have discovered fiber
11 sources or insulation sources in the containment that
12 they had not accounted for before and they're faced in
13 a very tenuous position of do they replace that fiber,
14 do they shut down and remove that fiber or do they
15 have some way to justify that there's enough margin in
16 their analysis to continue operation til the next
17 outage. You know, it's -- it's not a comfortable
18 position to be in for many plants.

19 CHAIRMAN BANERJEE: And of course the
20 high-fiber plants still.

21 MR. BUTLER: Yes.

22 CHAIRMAN BANERJEE: So what would you
23 advocate at this point, that the reg guide be held in
24 abeyance till the commission's various alternative
25 ways to deal with this are evaluated and become part

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1 of the reg guide? What's your sense?

2 MR. BUTLER: I don't have a strong
3 recommendation either way.

4 DR. WALLIS: I think you'd like more
5 guidance. Other than just a summary of this is what
6 the staff is sort of generally looking for. How they
7 would -- what they would accept, more of a guidance
8 about what would be an acceptable way to do things
9 rather than some statement about what you have to do.
10 Is that what you're looking for?

11 MR. BUTLER: Not particularly, no.

12 DR. WALLIS: The problem is how do we know
13 we've met the requirement. And it's still very much
14 up to submitting something and seeing how the staff
15 responds rather than being sure that this time you've
16 got it right.

17 CHAIRMAN BANERJEE: Well, I think we'd be
18 -- Joy, you had a question.

19 MEMBER REMPE: It may be a different way
20 of phrasing what you're trying to say. Are there
21 places in this current reg guide where they've opened
22 up additional uncertainty for the plants because they
23 were less specific than they could have been, they've
24 added worst case type wording? Is there anything
25 that's a problem with what they've done here that

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1 caused some consternation among the plants?

2 MR. BUTLER: First off, I preface my
3 answer with I haven't seen this final draft revision.
4 But based upon my memory of the earlier draft that was
5 provided for public comment it is as far as I can tell
6 an accurate reflection of the guidance that exists
7 elsewhere. So I don't think it causes anybody any
8 concern. They are implementing that guidance that is
9 elsewhere in an appropriate fashion. So there's
10 nothing in the reg guide that I'm aware of that would
11 change how they've implemented that guidance.

12 MEMBER REMPE: It's the document
13 basically. And it could maybe go a bit further.

14 MR. BUTLER: Any questions that exist now
15 existed before the reg guide.

16 MEMBER REMPE: Okay. Okay.

17 CHAIRMAN BANERJEE: I think that's an
18 accurate statement we can see as well. I mean there
19 may be spots here and there where there can be some
20 clarity, more clarity, but I don't think it changes
21 anything for the industry from what is practice today.

22 MR. BUTLER: And Dr. Wallis, to answer
23 your question, I don't think I gave you a proper
24 answer. I mean, to use the analogy that was used
25 earlier today I don't think that adding more signposts

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1 along this route is the answer. I would rather find
2 a different route.

3 CHAIRMAN BANERJEE: Well, that's part of
4 the commission's directive anyway.

5 MR. BUTLER: Right.

6 CHAIRMAN BANERJEE: So that'll be
7 considered.

8 MR. BUTLER: Yes.

9 CHAIRMAN BANERJEE: At some point.

10 MR. BUTLER: Well thank you very much for
11 your time.

12 CHAIRMAN BANERJEE: Thank you. All right,
13 I think -- is there any summing statement beyond the
14 conclusions that the staff would like to make? Yes,
15 please do it.

16 MR. RICHARDS: Yes, I'd like just to make
17 a couple of comments. Again, I'm Stu Richards with
18 the Office of Research. I thought it was a very good
19 discussion today, a lot of good feedback and comments.
20 I think we hit the message about having more pointers
21 or road signs. We'll take that back and look at it.
22 To respond a little bit to John Butler's comments, we
23 recognize that there are gaps in the reg guide. I
24 think John laid that out pretty well. We didn't come
25 here with all the solutions to GSI-191, nobody's

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1 saying that. And we recognize that as conditions are
2 resolved hopefully in the future that we need to come
3 back and revise reg guide again to incorporate that.
4 John Burke mentioned that there are no new positions,
5 you just talked about it. So it comes back to the
6 question of why do this. Well, we're trying to stay
7 in process. One thing I think we've found over the
8 years in general with regulations is you get these
9 interim staff guidance documents, you get SEs, you get
10 guidance spread out all over the place and that is a
11 bad thing. The agency's process to bring guidance
12 together is to put it into a reg guide. So we are
13 trying to stay within that process, that process
14 requires us to engage the public maybe more fully than
15 we would otherwise and it's requiring us to engage the
16 ACRS. So those are positive things. If you think
17 about, well, let's not do that, let's not go forward
18 with the reg guide then we're going to not touch those
19 bases, we're not going to take those steps to come up
20 with this unified position. So I would caution you
21 that if you're encouraging us not to follow our own
22 process but rather to continue to go along piecemeal
23 you know there's maybe a consequence potentially for
24 that path.

25 CHAIRMAN BANERJEE: We are not, by the way.

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1 MR. RICHARDS: All right. And this reg
2 guide was last amended in 2003 --

3 MEMBER ARMIJO: Well, we don't decide
4 anything. We're just the subcommittee.

5 CHAIRMAN BANERJEE: No, we can only
6 recommend to the full committee.

7 MR. RICHARDS: Well, if the full committee
8 comes back with a letter saying no, why don't you just
9 wait on this reg guide till you resolve these other
10 issues or there's more policy issues to be dealt with
11 you know we could be five years down the road and
12 we'll be sitting here going wow, I wonder why we
13 didn't update that reg guide. The last time it was
14 done was 2003. We have a larger reg guide update
15 program right now because some of our guidance dates
16 back to the 1970s. We're trying to learn from that
17 not necessarily good experience to maintain our
18 guidance reasonably up to date. Stu, go ahead.

19 MEMBER ARMIJO: What happens with all the
20 other documents that you mentioned, the ISGs and other
21 guidance documents? Do they get retired when this
22 NUREG guide gets issued or do they stay in place and
23 we've got multiple, still multiple documents?

24 MR. RICHARDS: Well, you know as it was
25 described in this case the reg guide points to a lot

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1 of these documents when it provides that roadmap. If
2 you have ISGs for instance in the digital I&C area
3 ultimately the intent of the staff I think would be to
4 incorporate that into our normal regulatory process
5 which is a regulatory guide and then to retire the
6 ISGs such as in the digital area. So you know, the
7 staff has mechanisms to kind of move things forward in
8 a quicker manner but it you know sometimes it bypasses
9 or shortcuts the longer process. I mean, why do we do
10 ISGs? It's because we need to do something quickly.

11 MEMBER ARMIJO: Right, I understand.

12 MR. RICHARDS: The downside of that is
13 that we skip some of those other steps that we benefit
14 from for such as being here today. So we're -- my
15 boss and I, we want to stay within the reg guide
16 process, we want to get away from you know some of
17 these mechanisms that have developed over the years
18 that may be quicker but are not as thorough, don't
19 include all that public comment and comment from the
20 advisory committee.

21 CHAIRMAN BANERJEE: See, I should mention
22 that of course we've been involved for a long time in
23 this issue, almost every step of it. So we are fairly
24 up to speed except for the latest testing that's going
25 on, you know, in various areas. And so it's

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1 worthwhile taking, you know, comments from the
2 subcommittee as to their thoughts about this. I think
3 we're fairly well educated. Even Joy.

4 MEMBER REMPE: I wasn't involved at the
5 beginning of it.

6 CHAIRMAN BANERJEE: Some of us have been
7 involved in this for a very long time but so let's
8 start with you who has --

9 MEMBER REMPE: The least information.

10 CHAIRMAN BANERJEE: A correct view of the
11 situation.

12 MEMBER REMPE: Well, I appreciated the
13 discussion today and I learned a lot. So I want to
14 thank you for that and I may be more sympathetic to
15 what's going on on your position too. But I think it
16 would be beneficial to listen to the comments that
17 were brought up about the road signs. And I'm sure
18 Graham will have a very detailed list of things you
19 may want to try and incorporate before it comes before
20 the full committee. I think it just would make a
21 better document in my impression even though it may
22 not solve some of the concerns industry has at this
23 time.

24 CHAIRMAN BANERJEE: All right. Sam?

25 MEMBER ARMIJO: I have no comments. I

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1 understand what's going on.

2 CHAIRMAN BANERJEE: Okay. Said, what's?

3 MEMBER ABDEL-KHALIK: I have really no
4 additional comments except for the question I raised
5 regarding the condition on the back side. And the
6 comment was made that there was at least one
7 experiment that was observed in which nothing was
8 observed on the back side. If that is not documented
9 anywhere I think it would be a good idea to document
10 that information.

11 CHAIRMAN BANERJEE: Bill?

12 MEMBER SHACK: No real comments. You
13 know, we've been unhappy in the past because reg
14 guides have been so woefully out of date. I mean, the
15 rev 3 doesn't look anything like the current guidance.
16 This is really --

17 CHAIRMAN BANERJEE: It's completely almost
18 a rewrite.

19 MEMBER SHACK: You know, I really think --
20 I like the idea of keeping the reg guides, even if
21 it's only collecting what we're already doing and you
22 know we don't know enough to really make it more
23 definitive. You know, in defense of the vagueness you
24 know this is still really the licensee's condition.
25 If the staff doesn't really have a definitive list of

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1 things that should be considered the licensee should
2 be asked to consider all things and they can dispose.
3 So I think part of the thing here reflects the fact
4 that we still have questions and that this is a very
5 difficult problem to deal with because we simply don't
6 have a good fundamental theory and approach for
7 developing a whole integrated process. And that's a
8 fact of life.

9 CHAIRMAN BANERJEE: Graham?

10 DR. WALLIS: Well, I think it's useful to
11 pull together the staff's position on the various
12 issues. That's what I'm being told has happened. I
13 mean, it's all over the place and here's some there
14 where you can look at it all if you could know where
15 to find the real stuff by pointers. I do as I've said
16 several times in a guide look for more guidance. I
17 was hoping after all these years to have clarification
18 of how to do some of these things. It's not saying
19 you've got to do it but more clarification of how to
20 do it and more assurance that the NRC and industry
21 knows how to address and resolve some of these
22 technical issues.

23 I mean, the technical issues are there but
24 then I don't get a feeling that on matters such as say
25 the ZOI there's been much progress. It seems to be

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1 even going backwards about how industry is supposed to
2 address the ZOI. No longer do we refer to a standard
3 for instance which seemed to be the acceptable way to
4 do it. And you have to sort of dig and ask questions
5 to find out that yes, the NRC will accept this old
6 standard which has probably some technical faults
7 similar to thin bed. I mean, thin bed is introduced
8 but it must be very puzzling to someone to know what
9 we do about that because we don't really know as I
10 said what it is. So I was looking for more clarity
11 about -- and so confidence that we really know what
12 these things are and this is how to go about solving
13 them, and if you do it that way we'll accept it. And
14 I don't see that much. So I do think it's very useful
15 for the staff to put together what I think is a true
16 assessment of its present position on these various
17 matters.

18 CHAIRMAN BANERJEE: Okay. So --

19 DR. WALLIS: And I will give you a report.

20 CHAIRMAN BANERJEE: Of course.

21 DR. WALLIS: I don't know what effect it
22 will have but I'll raise some of the questions I
23 raised orally today I think.

24 CHAIRMAN BANERJEE: The only thing I can
25 say is that we'll write a letter in the October

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1 meeting. And we are going to need a presentation
2 which would be I don't know maybe an hour, hour and a
3 half, something like that should cover it. We'll have
4 to look at the agenda and see how crowded our October
5 agenda is for the meeting. But most of the points
6 you've made I think are useful. A couple of diagrams
7 might be nice to show, you know, to illustrate what's
8 going on. It's always nice to have visual effects.

9 DR. WALLIS: We never looked at those
10 diagrams.

11 CHAIRMAN BANERJEE: It's in the report, I
12 mean in the reg guide but it's always nice to have a
13 few diagrams. Even when I made this presentation to
14 the commission once I showed them bits of insulation
15 floating around and sort of getting to places. It
16 helps the uninitiated to do that.

17 MEMBER ABDEL-KHALIK: I think it would be
18 helpful rather than just making a general statement
19 that you got 84 comments and they were resolved in the
20 appropriate manner to point out to what some of the
21 significant comments were and how they were actually
22 addressed.

23 CHAIRMAN BANERJEE: So, yes, because I'm
24 sure that most of the full committee will not have the
25 time to go through these comments in detail. There's

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1 a lot of comments. It took me like an hour and half
2 actually to just read them and see what the responses
3 were. So it would be useful to have that certainly.
4 Any other guidance that we should provide with regard
5 to the full committee meeting?

6 DR. WALLIS: Well, John Butler raised the
7 question of why issue it now.

8 CHAIRMAN BANERJEE: Well, maybe that
9 should be addressed. I mean, I think Stuart addressed
10 it at the end, at least your view of it. And --

11 DR. WALLIS: It may sort of describe the
12 staff's present position but some of these issues are
13 not resolved yet. Is it useful to answer that no
14 one's going to refer to this particular reg guide?
15 I'll refer to the other documents behind it. So what
16 function does it serve except as a sort of a summary
17 of where we are today.

18 CHAIRMAN BANERJEE: Right, so they're
19 going to address that, okay. Why do it. And clearly
20 there are situations where we simply don't know enough
21 and I think we should simply say that in the light of
22 that we are taking fairly bounding positions. We have
23 to, what else can we do, right? So in particular
24 where that's the situation that should be said.

25 I think John made a comment that there are

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1 many conservatisms being piled one on top of the
2 other. Is that true or not? That's what NEI said.
3 That's not necessarily what the staff thinks and maybe
4 the ACRS thinks differently too on this. It's not so
5 obvious to me that that's the case but I think we
6 should address that as well. Is it really true that
7 that's happening.

8 DR. WALLIS: Well, I think you should also
9 start off saying what a reg guide is for and why this
10 meets those terms at this time.

11 CHAIRMAN BANERJEE: Okay. So with that if
12 there are no other comments I'd like to thank the
13 staff and I'd like to thank NEI for their comments.
14 And we look forward to seeing you in October. The
15 presentation was very good, it was very clear. You
16 had the right people here to answer all the questions
17 and I think you answered them satisfactorily. So we
18 look forward to seeing you again and I'm going to
19 adjourn the meeting. Anything else?

20 DR. WALLIS: I was hoping you would.

21 (Laughter)

22 CHAIRMAN BANERJEE: Early, which has never
23 happened to a Thermal Hydraulics meeting before.

24 (Whereupon, the foregoing matter went off
25 the record at 11:12 a.m.)

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Regulatory Guide 1.82 Revision 4

Water Sources for Long-Term Recirculation Cooling Following a Loss-Of-Coolant-Accident

**ACRS Subcommittee Meeting
September 7, 2011**

**Presented by John Burke and Gary Wang
Office of Nuclear Regulatory Research**

Overview

- Background
 - Reason for the revision
- Selected topics from the Reg. Guide
- Review of Public Comments

Background

- Regulatory Guide (RG) 1.82, “Water Sources for Long-Term Recirculation Cooling Following a Loss-Of-Coolant-Accident”, was last revised in November 2003 to improve the guidance for debris accumulation evaluations of PWR strainers.
- Research conducted by both the NRC and industry related to GSI-191 over the last several years has increased the understanding of the behavior of ECCS suction strainers. This in turn led to the desire to update the regulatory guide.

Background

- Draft of RG 1.82 Rev. 4 is a complete re-write of the prior revision to include updated information and improve readability.
- The discussions in the Background Section and the Regulatory Positions common to both PWRs and BWRs are provided first, followed by guidance specific each reactor types, i.e. PWRs and BWRs, respectively.

Background (cont'd)

- Draft RG 1.82 (Revision 4) endorses various industry Topical Reports, the NEI guidance report and the corresponding Safety Evaluations (SE), and NUREG reports.
- Incorporates staff guidance on head loss testing and vortexing, protective coatings, and chemical effects.
- Deletes obsolete figures and tables for sump screen design.
- Incorporates latest staff criteria for issues related to Gas Management in ECCS and Generic Letter 2008-01.

Background (cont'd)

- The issues listed below are deferred to a future revision of the RG.
 - This draft revision does not include changes in guidance for containment accident pressure (CAP) impacts on net positive suction head (NPSH).
 - It does not provide detailed staff guidance for downstream in-vessel effects.
 - Several GSI-191 resolution closure options were recently approved by the Commission. The staff is currently evaluating those options, such as a risk-informed approach, in response to SRM-SECY-10-0113, dated December 23, 2010.

Regulatory Guide

The following issues were considered to need more detailed guidance by the staff in the revision 4 of RG 1.82:

- Determination of Suction Strainer Head Loss
- Treatment of Chemical Effects
- Evaluation of Debris Downstream of Strainer
- Treatment of Coating Debris
- Treatment of Latent Debris
- Evaluation of Strainer Susceptibility to Vortexing & Air Ingestion

Determination of Strainer Head Loss

- The use of prototypical physical head loss testing is the recommended method for determining suction strainer head loss. The use of an empirical correlation, i.e. NUREG/CR-6224, which was previously accepted in RG Rev. 3, is considered acceptable for scoping only.
- Limitations of the correlations are discussed in the SE for NEI-04-07 and include:
 - Cal-Sil insulation, coating particulates, chemical precipitates, and latent debris were not included in testing to determine correlation
 - Sensitivity to debris preparation and introduction into test loop
 - Water temperature effects were not included
 - Thin bed effect was not sufficiently addressed
- This RG change is consistent with the staff SE for NEI 04-07.

Determination of Strainer Head Loss, cont.

- Regulatory Position 1.3.11. of draft RG 1.82, Revision 4 incorporates detailed staff guidance on methods acceptable for conducting head loss testing as disseminated to industry in a NRC staff letter to NEI dated March 28, 2008.
 - The NRC staff evaluated the industry's head loss testing protocols, and witnessed head loss testing at each of the vendor test facilities in 2006/2007. The staff then developed guidance in the areas of testing procedures, scaling, surrogate debris similitude, data extrapolation, etc. for staff and licensee use.
 - The guidance was discussed in public meetings in 2008.
 - That guidance is incorporated into this RG revision in Regulatory Position 1.3.11.

Chemical Effects

- The effects of chemical reaction products on strainer head loss should be considered. The guidance in the prior revision was brief. This revision provides more details.
- Strainer designs should be validated through plant specific testing that includes chemical effects.
- The staff SE for WCAP-16530-NP-A accepts this industry approach as one method that may be used to evaluate chemical effects that may occur in a post-accident containment sump pool.
- March 2008 letter to NEI provided additional guidance for an overall approach to evaluate the chemical effects on strainer head loss.
- Regulatory Positions 1.3.10, 2.2, and 3.3 incorporate the above staff guidance.

Downstream Effects

- Downstream effects has 2 sub categories, ex-vessel and in-vessel effects.
- The prior revision of the RG stated that debris clogging of flow restrictions downstream of the sump screen should be assessed, but provided no specific methods (RP 1.1.1.12).
- For ex-vessel effects; WCAP-16406-P-A, provides a method, acceptable to the NRC staff, for licensees to use in evaluating the downstream impact of debris that passes through the strainer and enters the ECC systems and components. (abrasion, wear, blockage of flow paths).
- Regulatory Position 1.3.8 was added to endorse topical report WCAP-16406-P-A.
- For in-vessel effects; Core inlet blockage tests were conducted for various mockup fuel assembly designs. The results of the tests are documented in WCAP-16793-NP. This report is still under review by the staff.

Protective Coatings

- Regulatory Position 1.3.5 was added to include guidance for the treatment of protective coatings.
- The prior revision just listed coatings as a possible debris source
- NRC Staff Review Guidance regarding protective coating provides a general approach to conduct plant-specific coating evaluations.
- This guidance covers the failure characteristics of both qualified and unqualified coatings.
- Coating debris transport analysis is acceptable if it is within the scope and parameters of NUREG/CR-6916, (which was presented to ACRS in February 2006).

Latent Debris

- Latent debris is the general area dirt and dust, etc. present in containment. It may contribute significantly to head loss across the suction strainer during post-LOCA recirculation operation.
- Revision 3 of the RG relied on licensees cleanliness programs to minimize this source of debris.
- NEI 02-01 Rev 1 “Condition Assessment Guidelines: Debris Sources Inside PWR Containment,” provides an acceptable approach for determining latent debris quantities and characteristics.
- NEI Guidance Report 04-07 provides methods that can be used to evaluate the impact of latent debris on strainer blockage.
- The staff Safety Evaluation for NEI 04-07 accepts the industry approach in these documents.
- Regulatory Position 1.3.6 was added to address this issue.

Vortexing & Air Ingestion

- Vortex formation and air ingestion may occur depending on strainer submergence, strainer configuration, and fluid field geometry. In the previous revision of the RG, there was a 2% air ingestion criterion as the threshold for pump degradation.
- NPSH(req) adjustment due to air ingestion was maintained from prior revision
- This criterion did not differentiate between transient and steady state conditions and was based on studies conducted many years ago.
- GL 2008-01 “Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems” was issued in January 2008 to address the issue of gas accumulation in the emergency core cooling, decay heat removal and containment spray systems.
- During resolution of GL 2008-01 it became clear that guidance was needed to cover a broader range of pump operating conditions.

Vortexing & Air Ingestion, (cont.)

- Appendix A of this RG has been updated to provide the latest staff guidance for evaluation of the potential for vortex formation and air ingestion.
- These changes also reflect the geometry of the strainers now installed. (box-like strainers made of flat screens are not used anymore).
- Table A-2 “Impact of Ingested Air on Pump Performance” now includes steady state and transient operation information.
- The changes to this Appendix are consistent with the latest staff guidance issued for GL 2008-01 as discussed during public meetings with NEI and licensees.

Public Comments

- The draft RG (DG 1234) was published for public comments in the summer of 2010.
- 84 comments were received from 5 separate organizations.
 - The use of CAP for NPSH, use of the NUREG/CR-6224 correlation, coordination with GL 08-1 criteria, and head loss test methods were the subject of many of the comments.
- The comments were carefully evaluated by the staff. The comments were incorporated into the draft RG 1.82, revision 4, as appropriate.

Conclusion

- This revision of RG 1.82 incorporates the latest staff guidance for evaluating ECCS suction strainer blockage that is contained in a variety of documents such as Safety Evaluations and staff guidance letters. There are no new staff positions that are being promulgated in this revision.