

OFFICIAL TRANSCRIPT OF PROCEEDINGS

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DATE: March 10, 1994

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

407TH ACRS MEETING

Nuclear Regulatory Commission
Conference Room P-110
7920 Norfolk Avenue
Bethesda, Maryland

Thursday, March 10, 1994

The above-entitled proceedings commenced at 8:30
a.m., pursuant to notice, J. Wilkins, presiding.

ACRS MEMBERS PRESENT:

- | | |
|------------|--------------|
| J. WILKINS | T. KRESS |
| J. CARROLL | W. LINDBLAD |
| P. DAVIS | R. SEALE |
| W. SHACK | C. MICHELSON |
| C. WYLIE | H. LEWIS |

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PRESENT FROM ACRS STAFF:

J. LARKINS (Staff Director)

H. SCHOFER (Technical Secretary)

M. EL-ZEFTAWY

S. DURAISWAMY

PRESENT FROM NRC/NRR:

J. LEE

F. CONGEL

R. BARRETT

D. CRUTCHFIELD

J. WILSON

C. POSLUSNY

B. BORCHARDT

ALSO PRESENT:

A. BEARD (G.E.)

D. LEAVER (Polostar)

P R O C E E D I N G S

[8:30 a.m.]

1
2
3 MR. WILKINS: The meeting will now come to order.
4 This is the first day of the 407th meeting of the Advisory
5 Committee on Reactor Safeguards. During today's meeting the
6 Committee will discuss and/or hear reports on the following;

7 Advanced light water reactor policy issues,
8 specifically the source term;

9 ABWR review regarding final design approval.

10 In addition, the Committee will meet with the NRC
11 commissioners between 2:00 p.m. and 3:30 p.m. at 1 White
12 Flint North to discuss items of mutual interest.

13 This meeting is being conducted in accordance with
14 the provisions of the Federal Advisory Committee Act.
15 Mr. Sam Duraiswamy is the designated federal official for
16 the initial portion of the meeting.

17 We have received no written statements or requests
18 for time to make oral statements from members of the public
19 regarding today's sessions.

20 A transcript of portions of the meeting is being
21 kept. It is requested that each speaker use one of the
22 microphones, identify himself or herself, and speak with
23 sufficient clarity and volume so that he or she can be
24 readily heard.

25 I will begin with some items of current interest.

1 This year's Regulatory Information Conference,
 2 which I believe is the sixth one, will be held on May 3rd,
 3 4th at the Mayflower Hotel in Washington. I am told that
 4 registration packages with the preliminary agenda will be
 5 mailed to you -- I don't know quite who "you" is.
 6 Presumably it contains all the members of this Committee --
 7 in early March. So maybe it will be on your desk when you
 8 return home or maybe it won't.

9 For your long-range planning, the '95 conference
 10 will be held on May 9th and 10th, 1995, at the Holiday Inn
 11 Crowne Plaza in Rockville, Maryland.

12 I have always found this to be a very interesting
 13 conference. May 3-4 is just prior to our May meeting. So
 14 that those who attend could do so without additional travel
 15 costs, without additional airplane costs to the Commission.

16 Is John here?

17 I would like to call the Committee's attention to
 18 the fact that Dr. Larkins has been presented with the Civil
 19 Rights Award by the NRC Office of Small and Disadvantaged
 20 Business Utilization and Civil Rights, as well as the Blacks
 21 In Government organization for his outstanding contributions
 22 in the area of civil rights and equal opportunity. This is
 23 an honor which he richly deserves, and I think we can
 24 applaud him for it.

25 [Applause.]

1 MR. WILKINS: There will be a discussion by the
2 NRC staff of the Northridge earthquake which some of you
3 remember we asked to have at our last meeting. That will be
4 during the noon break tomorrow in Room P-422. And I was
5 told that it was at noon, but your priority is to attend
6 this meeting, so that it will occur when we finish.

7 Paul, do you have this handout on the naval trip?

8 MR. BOEHNERT: Yes. It's on the table.

9 MR. WILKINS: Paul has passed out some material
10 dealing with the proposed -- not proposed, it's already
11 arranged. It's scheduled, the scheduled trip to
12 Ft. Lauderdale to observe the operations of a certain naval
13 vessel. And my own experience, the last time we did this,
14 was that it was not only enjoyable but we actually learned a
15 good deal about how these plants operate.

16 Those of you who are really mechanical engineers,
17 of course, don't need this. I got degrees in mechanical
18 engineering and I learned about shaft horsepower and all
19 that kind of business. But there is nothing like seeing a
20 shaft rotate. And those are shafts; those are not pencils.
21 Those are real shafts and they really rotate.

22 John's office has a tape that was made of the CBS
23 60 Minutes broadcast dealing with certain events in India.
24 It, of course, will not really address some of the things
25 that might be of the greatest interest to this Committee,

1 but it might give you a fair amount of background
2 information.

3 In that connection, I might say that John has
4 continued to pursue, and the Commission has continued to
5 pursue, ways of getting more detailed technical information.
6 It is my personal judgment that those efforts are not likely
7 to be terribly successful because they get bogged down in
8 "much larger, more global issues."

9 MR. CARROLL: Has anybody checked to find out what
10 WANO knows about the situation?

11 MR. WILKINS: I don't know the answer to that
12 question. WANO is the World Association of Nuclear
13 Operators, I believe, yes. And they might. They might well
14 have it. In fact, the IAA might well have certain kinds of
15 information, or the CIA, yes.

16 MR. SEALE: If you see the 60 Minutes tape, those
17 larger global issues are perhaps a little better defined.

18 MR. WILKINS: I was not attempting to define them
19 this morning.

20 MR. SEALE: I know.

21 MR. WILKINS: And please don't ask me to. I am
22 very reluctant to take a shot at that.

23 MR. CARROLL: Can somebody find out?

24 MR. WILKINS: All right, let's ask John to take
25 that as an action item.

1 MR. CATTON: Jay, do you have specific questions
2 you would like to have addressed? If you could just jot
3 them down, I have a colleague who has a colleague or a
4 schoolmate or something who is reasonably close to the
5 plant.

6 MR. CARROLL: Well, I am interested in some very
7 basic information. Why did they get skunked out of the
8 control room in 12 minutes? Why did this fire result in a
9 complete loss of on-site and off-site power? I guess, in a
10 matter of minutes. Was it a peculiarity of the layout of
11 this particular plant?

12 MR. WILKINS: You want to know the kinds of things
13 that you would also want to know if this had happened in the
14 United States?

15 MR. CARROLL: Yes. Because I really -- I mean, I
16 think this ranks up among the top near-misses from what we
17 know right now in the history of nuclear power.

18 MR. WILKINS: Well, if we do in fact get
19 additional information, it may turn out that it will have to
20 be in the closed session, subject not just -- what do they
21 call that, foreign national information or whatever. There
22 are some correct words that I don't know. Received from
23 foreign countries. It's not proprietary information, but in
24 fact it probably is treated -- there's a security
25 classification for that stuff.

1 Anyway, the agenda that you have in front of you
2 shows a tour of the two White Flint North facilities we
3 would occupy later on this year to occur immediately after
4 our meeting with the commissioners this afternoon. The
5 Policies and Planning and Procedures Committee has decided
6 after hearing what is actually available to see in that
7 building that there isn't enough to see to make that tour
8 worthwhile. So we will return to this building at the
9 conclusion of the meeting with the Commission and get on
10 with the last item of the agenda, which is letter writing.

11 I got a nice little note from Commissioner Remick
12 with a handwritten comment on our diversity letter, which we
13 sent up there last month. And let me read, first, the last
14 paragraph of that letter and then his comment.

15 "We seek no action through this letter, only
16 increased sensitivity of both the Commission and the staff
17 to the fact that it is all too easy to oversimplify the case
18 for diversity." That was our concluding remark.

19 And his remark is, "Earnest, I am sensitive and I
20 agree strongly."

21 And I thought the Committee would appreciate
22 knowing that every now and then somebody reads these
23 letters. I asked Forrest if it would be permissible to
24 share this with the Committee and he said he had no problem
25 with it, so I mention that because when I got this from

1 Bethesda it was in an envelope marked "open by addressee
2 only." I tend to be very sensitive about such letters.

3 All right. I guess that's all that I had to make
4 in the way of general remarks. Do any members of the
5 Committee have any comments to make?

6 [No response.]

7 MR. WILKINS: I guess we are all here except
8 Dr. Lewis. Does anyone know whether he is surely going to
9 be here or surely not going to be? So we are, in fact,
10 expecting him to get here. And I haven't heard of anything
11 out west that would indicate that plane travel has been
12 interfered with.

13 All right, well, he'll probably show up a little
14 bit later then.

15 All right. The next agenda item is a discussion
16 of the advanced light water reactor policy issue concerned
17 with the source term.

18 Oh, you know, I think the --

19 MR. CARROLL: I bet you're going to get this down
20 before you leave.

21 [Laughter.]

22 MR. WILKINS: I think probably at least half the
23 meetings, Sam has had to get up and say, Mr. Chairman.

24 All right, the next item on the agenda is a
25 discussion of the priorities for our letters. And it looks

1 like we have really two letters to discuss. One is on the
2 ABWR and the other is on this source term, the issue which
3 we will hear momentarily.

4 On the ABWR letter, the subcommittee chairman,
5 Carl Michelson, presented to the Committee a draft at its
6 last meeting and requested comments from members of the
7 Committee by February 25. On the basis of whatever comments
8 he had at that time, and his own review of the situation, he
9 prepared a revised draft. And I believe that revised draft
10 has in fact been circulated to all the members. So you all
11 have that now and you have all had an opportunity to read
12 it.

13 It's a long report, even by ACRS standards. It's
14 a long report. And we should try to complete discussion of
15 as much as possible of this during the meeting. At the
16 appropriate time, I'll ask Carl to describe the status of
17 the situation.

18 I would like to get as much as possible done at
19 this meeting. Now, that has an implication which is that we
20 should plan on a Saturday meeting. It may turn out late
21 tomorrow afternoon that we can get away tomorrow afternoon.
22 I do not think it is going to be possible to predict that
23 today, which means that as of now, at least, you need to
24 plan to stay on Saturday.

25 The other letter deals with the source term. Tom,

1 you have prepared a draft of that letter. I have not seen
2 the draft yet, but we will have it available for discussion
3 this afternoon. I would actually propose, if Tom thinks --
4 well, we do not have to judge that. We will see what kind
5 of controversy we have after the presentation today, this
6 morning.

7 If there are no significantly controversial
8 issues, then I would suggest we take that letter up first
9 and dispose of it, and then we can concentrate 100 percent
10 of our efforts and energies on the ABWR letter.

11 Any problems with those priorities? Are there any
12 other letters that any of you think we ought to have out
13 that are not on that list?

14 [No response.]

15 MR. WILKINS: Okay. Now, we will move to the next
16 item on the agenda, which is the source term discussion. I
17 will turn the meeting over to the Subcommittee Chairman, Tom
18 Kress.

19 MR. KRESS: Thank you, Mr. Chairman. I guess it
20 is risky to write a draft letter before you hear the
21 presentations.

22 MR. WILKINS: At worse, you can write two draft
23 letters, one at one extreme and one at the other. Then,
24 depending on what you hear, you can move in one direction or
25 another.

1 MR. KRESS: By way of introduction to this
2 subject, I wanted to remind the Committee that revising the
3 source terms is part of the overall process of decoupling
4 siting from design.

5 The intention is to move the source terms out of
6 10 CFR 100 and put them in 10 CFR 50 where they would apply
7 only to design.

8 The source terms that are in 10 CFR 100 have been
9 based on, loosely based on, TID 14844, and they have some
10 arbitrary aspects to them. They have always thought to have
11 been appropriate but conservative for design basis
12 accidents, but the arbitrary aspects do lead to some, if you
13 will pardon the word, incoherence in design and in
14 application of regulations.

15 So the idea is to revise them, to make them more
16 realistic with respect to severe accidents, put them in 10
17 CFR 50, and get rid of some of these incoherent aspects.

18 Today, we will hear, I presume, the plans and what
19 the revisions will consist of, as well as how these might
20 impact on some issues with respect to evolutionary and
21 passive plants that I think were identified in 90-106 first,
22 but I am not sure, and how the Staff plans to make use of
23 the revised source terms and close these particular issues.

24 If I did not screw that introduction up too badly,
25 I will turn it over to the Staff.

1 MR. CONGEL: I have been up here plenty of times.
2 I remember the days when we, of course, had the Corps
3 trailing us around as we marched up in front of the group.

4 Good morning. My name is Frank Congel. This
5 morning my members of the Staff will be presenting to you
6 Part 2 of our presentation regarding the new source term.

7 If you recall, it was four rather cool weeks ago
8 that we were here and gave you the introduction. What we
9 promised was a continuation, with some of finer points and
10 insights that we have developed over the years as we have
11 been using it.

12 Jay Lee of my staff will make the principle
13 presentation, but I have here with me Len Soffer from the
14 Office of Research who was primarily responsible for the
15 NUREG document, 1465, describing the new source term. I
16 have Rich Barrett from NRR to talk about some of the other
17 system aspects associated with the source term.

18 Just as a quick review, you remember four weeks
19 ago we gave you the overview, and we talked about, in
20 general, what approach we were thinking of in terms of using
21 the new source term.

22 Today, we are going to have a two-part Part 2. We
23 are going to go into a more detailed discussion of the
24 issues that we touched upon last time. I think at least as
25 important, we have structured the presentation to address

1 the questions that Dr. Preston sent to us several weeks ago.
2 I guess some time in January.

3 We used those questions to formulate our
4 presentation, and we intended to weave the answers to those
5 question in our presentation while presenting a broader
6 scope, a bigger picture.

7 MR. WILKINS: Let me interrupt just a minute, Dr.
8 Congel. For the benefit of the Committee who may not have
9 gotten this far back, those questions start on page 35 of
10 tab 2 in your briefing book.

11 MR. CONGEL: The other point I wanted to make
12 right away was a slight restructuring also. When you look
13 at the questions sent to us by Dr. Kress, you notice there
14 is a section entitled "The General Philosophy of the Source
15 Term."

16 What my intention is today is to talk about the
17 specifics, and when the staff is done with the presentation
18 of the specifics, I will come back up and I will have some
19 dialogue regarding what our general philosophy is, and
20 respond as best I can to the questions presented.

21 I believe it is better to wait to the end of the
22 presentation for that because there will be, of course,
23 foundation developed during the staff presentation that will
24 assist in our response of that.

25 I also have some other slides that may or may not

1 be useful. I will decide at the end of the presentation as
2 to whether I can distribute them or not. It depends on the
3 kinds of questions we get into.

4 As a reminder and a review, the old source term
5 has been with us for quite some time. When you read the
6 various Staff documents that use it for implementation, you
7 will find that it was intended to overestimate the actual
8 consequences of an accident, the so-called conservative
9 approach.

10 Very often the conservatism or this intended over-
11 estimation was to make up for any lack of potential detailed
12 knowledge that existed at the time about behavior of either
13 the source terms throughout the systems or the systems
14 during an accident.

15 MR. KRESS: Frank?

16 MR. CONGEL: Yes, sir?

17 MR. KRESS: When you say it was meant to
18 overestimate the consequences of accidents, which accidents
19 do you have in mind?

20 MR. CONGEL: We will go through that in our
21 presentation. These are the design basis accidents.

22 MR. KRESS: Okay.

23 MR. CONGEL: We will attempt to separate out what
24 we call design basis accidents from severe accidents. There
25 is a blurred line between the two, but what the approach was

1 we will talk about, and what I call a philosophical argument
2 when we come to it. But I think that is extremely important
3 to establish, and we will pay attention to that at the end.

4 But the kinds of things that we say were the
5 conservative are listed in the other bullets about the
6 instantaneous appearance of the source term and the
7 containment, and a containment leak rate based on peak
8 pressures. We know, just from our technical background,
9 that in most cases it is going to end up in a manner which
10 you are testing and pushing your systems to an extent beyond
11 which they should actually experience given such an event.

12 Those kinds of things resulted in what the Staff
13 regarded as a sufficient margin of safety, and, in fact,
14 based on, I think, the history of the performance of the
15 industry to date, it has worked as intended. It just hasn't
16 had the degree of elegance I think we can now offer it based
17 on the rather sophisticated models we have to follow the
18 potential courses of an accident. Again, you will hear more
19 as the talk progresses.

20 Well, that leads us directly into why did we want
21 to have a new source term. Since the Three-Mile Island
22 accident in particular, but, of course, well before that in
23 the mid-70s we had Rasmussen Study, WASH 1400, we started to
24 realize that we had a much deeper knowledge and experience
25 base from which to draw: research, insights, and TMI, and,

1 of course, a better modeling, as I referred to earlier, of
2 efficient product behavior.

3 All of these lead to conclusion that it certainly
4 was time to relook at the manner in which we did these kinds
5 of analyses and factor in our new understandings, our new
6 knowledge, with the intent to have, of course, better
7 systems and ultimately systems that we could depend upon in
8 a more confident way.

9 Consequently, a draft commission paper is intended
10 to do exactly that. We are talking about defining the
11 source term itself, including the items checked underneath
12 with explanations for each one of these check marks.

13 Then we are going to describe how the fission
14 products move and the mechanism by which they are removed
15 and, I would say, the degree of accuracy that we could
16 associate with that understanding.

17 Jay Lee is going to come up now and follow the
18 program that I just outlined, namely a detailed discussion
19 of the technical issues. It will be followed by what I
20 anticipate will be a lively give-and-take on the philosophy
21 because therein, I think, lies the essence and the basis for
22 what we are doing.

23 [Slide.]

24 MR. LEE: Good morning. Frank Congel just
25 mentioned about the draft Commission paper. He really is

1 just defining the design basis accident source term. This
2 slide really lists all the design basis accidents that we
3 are considering in the Chapter 15 of the SER.

4 Dr. Kress, you asked me which accident we are
5 talking about. Now, these are the accidents. I am sure you
6 have seen me many times reviewing steps, final safety
7 evaluation reports. These are not intended to be a complete
8 list of design basis accidents.

9 For example, in the case of ABWR we also included
10 in addition to this DBA reactor water clean-up system, line
11 break accident, for example. We added that to the ABWR
12 review.

13 MR. CARROLL: Why did you do that?

14 MR. LEE: I think there was your request, if I
15 remember.

16 Then also the off-gas failure, for example, in the
17 BWR, or a gaseous waste storage tank failure for the PWR.
18 Those can be considered also design basis accidents.

19 MR. MICHELSON: Excuse me. What is your
20 definition of small? The next to the last bullet?

21 MR. LEE: That is the small lines, such as the
22 CVCS let-down line failure outside containment, if that line
23 breaks.

24 MR. MICHELSON: The standard review plan, I think,
25 defines small lines. But I thought it was even smaller than

1 that.

2 MR. LEE: Yes, it also includes a small instrument
3 as well.

4 MR. MICHELSON: As I recall, that is all it did
5 include. There was a gap between there and anything else.
6 It only looked at the little breaks outside the containment.
7 It didn't look at the big breaks.

8 MR. LEE: Well, the CVCS line is a two-inch line.

9 MR. MICHELSON: No, that is bigger than an
10 instrument line by a long way. But you can extend the
11 standard if you plan to include that. If you are, then why
12 don't you extend it to include such things as the RCIC
13 steamline as well on the boiling water reactor, which is 4
14 to 6 inches, and which produces a pretty good incident. It
15 comes right off the core.

16 MR. KRESS: Well, I think the answer there is
17 design basis accidents are not supposed to cover the full
18 spectrum.

19 MR. MICHELSON: Gee, I thought design basis
20 covered or bounded the spectrum. This one won't bound it
21 because it only looks at the small.

22 MR. KRESS: It doesn't envelop them in terms of
23 consequences. It envelops them in terms of the risk. You
24 have to keep that in mind.

25 MR. MICHELSON: Yes, people wrote this long before

1 they knew much about risk.

2 MR. KRESS: Yes, but that was the idea.

3 MR. MICHELSON: Now that we know something about
4 risk, there is even a bigger argument for why it is bounded
5 to the instrument lines.

6 Go ahead.

7 MR. CARROLL: Now, in this hierarchy of accidents
8 that we consider, where does ATWS, loss of power -- where do
9 they fit into this scheme of things?

10 MR. LEE: Well, these design basis accidents
11 result in off-site radiological consequences -- any
12 radiological consequences resulting from these accidents
13 listed in these slides. ATWS is not related to those
14 radiological consequences.

15 MR. KRESS: I think we are encroaching upon Frank
16 Congel's philosophical part.

17 MR. CARROLL: All right.

18 MR. DAVIS: Is it your intent to have a different
19 source term for each one of these?

20 MR. LEE: No, we have just two source terms -- one
21 for BWR and one for PWR. We will have one source terms for
22 all these design basis accidents. Obviously, some of the
23 accidents apply only to PWR, and some of them apply to both
24 PWRs and BWRs.

25 MR. WILKINS: Looking somewhat to the future when

1 this Committee may have to consider such matters as CANDU
2 and PRISM, and the like, would you contemplate having
3 another source, a different source term for each of those
4 other reactor types as well?

5 MR. LEE: No, this source term is really light
6 water reactor source term.

7 MR. WILKINS: I understand. What do you do when
8 you have a non-light water reactor? What do think the
9 Commission -- well, maybe that is the philosophy, too.

10 MR. CONGEL: Yes, we could talk about that.
11 Clearly this is for LWRs. Whether we use the same approach
12 when we get to the other advanced reactors has not really
13 been determined yet.

14 MR. WILKINS: Okay.

15 [Slide.]

16 MR. LEE: Following the design basis accident, of
17 course, the next one follows the use of the design basis
18 accident. This is a direct response to one of Dr. Kress'
19 questions, of how we intend to use this revised accident
20 source term in the design basis accident.

21 Now, whether we use the TID source term or the
22 revised accident source term, there is really no change. We
23 are using exactly the same way. We will be using the
24 revised accident source term, of course, for the
25 radiological consequences assessment, off-site.

1 The 10 CFR 100 siting calculation, such as EBA, or
2 LPZ distance -- to make sure that those distances are
3 sufficient that you will meet the requirements of 10 CFR
4 100.

5 You need also to calculate -- we will be using the
6 revised source term for the control room operators -- those
7 assessments to see whether it meets the general design
8 criteria 19. Equipment qualification, for example, in the
9 Reg Guide, 1.89, and the 10 CFR 50.49. It says that we are
10 supposed to use the severe design basis accident.

11 The engineering safety feature design, whether we
12 need a filtration system or not, for example, whether we
13 need the HEPA filter or charcoal absorbers. If we do,
14 whether it needs two inch charcoal absorbers or a four-inch
15 charcoal absorbers or what removable efficiencies, for
16 example, 90 or 95, 99 percent of removable efficiencies.

17 The containment leak rate and isolation time. The
18 containment leak rate such as, for example, ABWR, CE System
19 80-Plus, and SBWR -- they all came in with .5 percent
20 leakage per day from the containment. The AP-600 came in
21 with a .12 percent per day leakage.

22 So, we will be evaluating those leak rates as well
23 as containment isolation time. For example, AP-600 came in
24 for 15 seconds. They will isolate the containment or gather
25 examples, like the main steam isolation valve, whether we

1 should include it within 5 seconds, 10 seconds, 15, or 20
2 seconds.

3 We will be using the accident source terms for
4 that purpose, and also shielding in the vital area access
5 and post-accident sampling, which is specified in 10 CFR
6 50.34-F as an additional TMI-related requirements. So,
7 evaluating those criteria, we will be using an accident
8 source term.

9 Again, this is nothing different from the TID
10 source term. We will be using it the same way we have been
11 doing for the last 20 or 30 years.

12 MR. CARROLL: What does this have to do with
13 security of vital areas in that next to the last bullet?

14 MR. LEE: This is a vital area extra step. We
15 meant that we have to send operator into a particular room
16 or structure.

17 MR. CARROLL: Oh, so it is a different kind of a
18 vital area --

19 MR. LEE: Yes. It's not for security.

20 MR. CARROLL: -- than the one defined in the
21 regulations.

22 MR. LEE: Right.

23 MR. CARROLL: Part 73 - I see.

24 MR. LEE: Now this particular slide is a
25 surmountable place but again Dr. Kress' question has to do

1 with whether we are going to do any rulemaking and the
2 response to that is no.

3 We are not planning any rulemaking for DBA
4 accident source term itself but it will be used however to
5 support an update of 10 CFR 50 for example.

6 Dr. Kress earlier alluded that we will be revising
7 10 CFR 100 siting criteria and removing all the dose
8 calculation into the Part 50 and also the 10 CFR 100
9 footnote has a reference to the TID source term and also 10
10 CFR 50.34 also directly referenced to the TID source term so
11 we have to change those, update and revise, just make a
12 change to read "new revised accident source term" from the
13 TID source term.

14 [Slide.]

15 MR. LEE: Now we'll be discussing 12 issues here,
16 the source term related, technical and the licensing issues.

17 The first issue has to do with the selective use
18 of draft of NUREG-1465. Selective use -- that really means
19 we are not going to use all the source term given the draft
20 1465 but we will be using just the gap release and the in-
21 vessel release portion of draft NUREG-1465.

22 MR. KRESS: Two questions about that. Number one,
23 I would be interested in knowing what the status of 1465 is.
24 I hear you say it is a draft. Is it going to be issued as a
25 final report?

1 MR. LEE: That report is being done by Office of
2 Research. Maybe, Len, you can --

3 MR. SOFFER: This is Len Soffer from the Office of
4 Research. I would like to answer your question.

5 Draft NUREG-1465 is in the process of being
6 finalized. We do intend to issue a final report based on
7 extensive comments that we have received as well as some
8 additional work that has been performed, notably some MELCOR
9 studies that have looked at some additional aspects.

10 We anticipate coming down to the Committee and
11 talking to the Committee about it either May or June, more
12 likely June of this year.

13 MR. KRESS: Thank you, Len. The second question I
14 had is you said that you're using in these revised source
15 terms the in-vessel part of NUREG-1465. Did you have a
16 rationale for that other than just judgment or is there a
17 technical reason that you could say that for these design
18 basis accidents it is most appropriate to use the in-vessel
19 releases? That might be part of the philosophy discussion,
20 I don't know but I was just wondering, was that just a
21 judgment call or was there some good reason that you could
22 give us for that?

23 MR. LEE: That's both judgment as well as
24 technical and these four bullet items are trying to respond
25 that the technical basis for why are going just use

1 selective use.

2 MR. KRESS: Yes. I didn't read the rest of the
3 slide.

4 MR. LEE: When we did NUREG-1465, we Staff, we
5 considered all the accident, severe accident sequence that's
6 considered in the NUREG-1150. As a matter of fact, in
7 addition to that I think we further considered some
8 additional severe accident sequences in the source term code
9 package. Correct me if I am wrong, Len. We selected the
10 most dominant severe accident sequences for this particular
11 purpose and I believe we selected like 15 severe accident
12 sequences for boiling water reactors and 21 severe accident
13 sequences for the PWRs and those are documented in the
14 Brookhaven NUREG report. I think it is 5747 NUREG reports.

15 As a bullet item it stated that the 1465 is indeed
16 derived from several severe accident sequences from the
17 current operating light-water reactors.

18 MR. KRESS: Okay, so the answer is it's consistent
19 with what you have been doing.

20 MR. LEE: Correct.

21 MR. KRESS: To my question.

22 MR. LEE: Pardon?

23 MR. KRESS: The answer to my question about why
24 you use only in-vessel releases is it's consistent with what
25 you have always been doing.

1 MR. LEE: We think so. Like you said, the intact
2 pressure vessel and containment for DBA is consistent with
3 the use of TID source term for current licensing practice,
4 now including ex-vessel for example or including late in-
5 vessel will be perhaps a major departure from the current
6 licensing practice and particularly 10 CFR 100 refers to
7 saying that substantial meltdown of a core with a subsequent
8 release of a pressurable amount of a fission product. It
9 doesn't really state that the reactor pressure vessel
10 failure or subsequent core-concrete interaction and core on
11 the floor is definitely, we would consider it not a design
12 basis accident.

13 MR. KRESS: I was probing for an answer that had
14 some sort of flavor or accidents that proceed on through the
15 vessel and into the floor and the core-concrete interaction
16 are generally of probability levels that you can exclude
17 them from design basis space because you know at those
18 probability levels you have acceptable safety for some
19 reason. That is what I was probing for and I was wondering
20 if that was the kind of consideration that went into
21 selecting just the in-vessel releases.

22 MR. CONGEL: That's correct. I can add a little
23 at this point because this is a good example of the break
24 that the Staff has between DBAs and what we regard as severe
25 accidents. The design basis accidents are, as you

1 mentioned, treated now in a manner in which we have treated
2 them traditionally. The severe accident portion, which are
3 the other columns in the source term that Jay is referring
4 to, are treated as severe accidents but the updated
5 understanding that we have from source term behavior has
6 allowed us during our review of the advanced reactors, for
7 example, to still consider the behavior we understand, but
8 not in the same manner or with the same degree of rigor that
9 we had on the design basis accidents, so this is the first
10 time we see where that line is between the DBAs and the
11 severe accidents.

12 MR. DAVIS: Excuse me a minute. It is still true
13 though that this source term is not consistent with the
14 conditions that you must show exist in the core for all
15 design basis accidents.

16 In other words you still have to meet the 2200
17 degree maximum clad temperature, right, for all of these
18 accidents?

19 MR. LEE: Yes.

20 MR. DAVIS: And that would mean that you wouldn't
21 get this kind of a source term for --

22 MR. LEE: We are assuming for example, that
23 during the LOCA the ECCS system failed. The ECCS system is
24 not available and that therefore you have a complete core
25 melt.

1 MR. DAVIS: That is not a design basis accident.

2 MR. LEE: Your question is why are we using that
3 for the design basis accident.

4 MR. DAVIS: Yes.

5 MR. CARROLL: But they are not.

6 MR. BARRETT: Excuse me, Mr. Davis.

7 MR. DAVIS: Yes?

8 MR. BARRETT: This is Richard Barrett with the NRR
9 Staff. Our practice has been to use different design basis
10 assumptions for different parts of the design and it has
11 been, you are absolutely correct that the design basis for
12 the ECCS is to stay below a certain peak clad temperature
13 below which you would not expect the significant,
14 substantial meltdown of the core, but then when we go on to
15 evaluate the offsite doses, which eventually affects
16 containment leakage and containment performance, we
17 postulate that there is substantial meltdown, so the design
18 basis for different parts of the plant can be different.

19 MR. DAVIS: My point is they are inconsistent and
20 they weren't consistent before when you used TID. So I
21 think --

22 MR. CATTON: Your point is they are still
23 inconsistent. consistency.

24 MR. DAVIS: That's right. They're coming closer.

25 MR. KRESS: But that shouldn't be a problem.

1 MR. DAVIS: I'm not objecting. I'm just saying
2 that -- you were wondering why they didn't use a source term
3 that involved vessel melting and core on the floor. I'm
4 saying that for a design basis accident, you don't even get
5 fuel melting.

6 MR. KRESS: For some design basis accidents, yes.
7 This is a different design basis they're talking about.

8 MR. CONGEL: Remember the intent, again. I'll
9 repeat it in slightly different words. This is to test the
10 equipment, size the equipment, define what the equipment
11 qualifications have to be. Of course, the ultimate goal is
12 that none of this happens anyway. But for these tests,
13 these calculations for design parameters, these are the
14 assumptions that are made.

15 MR. DAVIS: Thank you.

16 MR. LEE: This is the table that came out of the
17 draft NUREG-1465, BWR releases. It's showing the GAP
18 release and early in-vessel release, ex-vessel release, and
19 late in-vessel releases.

20 Now, one thing that should point out for the ex-
21 vessel column is that this is based on assumptions for the
22 dry cavity. In other words, a molten core is not cooled by
23 water. Therefore, if one assumed that there will be some
24 sort of ample floor space available to spread the molten
25 core and also cooling water will be available to cool the

1 molten core, then this particular column, the ex-vessel
2 figures will go down quite a bit.

3 We pointed out that in two SECY papers, SECY 90-
4 016, as well as SECY 93-087. We stated the staff position
5 that ample floor space should be provided in the light water
6 reactor design and also that the cooling water should be
7 available to cool the molten core. But all I'm pointing out
8 is the figures in the ex-vessel column here is for dry
9 cavity.

10 Sandia did some work for us. If we have water
11 there -- for example, three feet or perhaps even as much as
12 nine feet of water in the cavity after reactor pressure
13 vessel failure, these numbers will go down anywhere from the
14 contamination factor of ten-to-one-hundred. If we assume
15 there is three feet of water in the cavity, the contribution
16 from the ex-vessel release will be relatively small to the
17 DBA source term.

18 If you divide all those numbers by ten, for
19 example, the contribution from ex-vessel will be like
20 perhaps ten, 15 to 20 percent range. Now, if you assume DF
21 of 100, the contribution from ex-vessel will be
22 insignificant. I think that is what EPRI is assuming.

23 Therefore, what I'm saying is that even if we
24 assume that -- even if we include ex-vessel release, if we
25 assume that there's enough water coming in to cool the

1 molten core, the contribution will be really insignificant.

2 MR. WILKINS: Excuse me. Before you take that
3 off, this says BWR. These numbers are to be interpreted as
4 averages over the population of existing BWRs in the United
5 States.

6 MR. LEE: No. This really came from, again, the
7 NUREG-1150. I think we used five.

8 MR. WILKINS: I'm familiar with that. So these
9 are representative of those plants.

10 MR. LEE: Yes.

11 MR. WILKINS: That are in the NUREG-1150.

12 MR. LEE: Yes. Currently operating light water
13 reactor.

14 MR. KRESS: They were mean values taken from the
15 distribution.

16 MR. LEE: Correct.

17 MR. KRESS: Out of the NUREG-1150 for the BWRs for
18 the bounding sequences.

19 MR. LEE: Yes.

20 MR. WILKINS: In that case, my next question may
21 be totally unfair. If so, just say so. What do you think
22 they would look like for the ABWR? Carl, has your
23 subcommittee considered that kind of question at all?

24 MR. CARROLL: No, because ABWR, given the timing,
25 opted to use TID.

1 MR. MICHELSON: Yes. And this doesn't affect the
2 old plant. Even this study is not going to be applied back
3 to old plants at all, unless somebody wishes.

4 MR. CONGEL: I figured that question was going to
5 be asked at some point or another. We do have an assignment
6 within NRR to look into exactly that, the feasibility of
7 applying the new source term to existing plants. The
8 schedule we have for doing that is three to four months
9 after the final NUREG is published.

10 MR. MICHELSON: You're really going to do it and
11 you go back to the boilers, then you're going to have to
12 look at things like these HPSI steam lines in the building,
13 which are probably over-bound, even the reactor water
14 cleanup breaks.

15 MR. CONGEL: It very well may be the case.

16 MR. MICHELSON: You can play the game, but you've
17 got to do it right.

18 MR. CONGEL: That's the point. There would be a
19 temptation upon first glancing at this that a significant
20 amount of release could be had by using this new source
21 term. But we can't lose sight of the fact that there are
22 overlapping and intertwined requirements that came with the
23 original TID.

24 MR. MICHELSON: Perhaps the original design didn't
25 receive quite the state-of-the-art examination that we did

1 today on a boiling water reactor.

2 MR. CONGEL: Exactly.

3 MR. MICHELSON: And they found what the problems
4 were.

5 MR. CONGEL: The point of the matter is we have to
6 look at the system and its implications. Once we do that,
7 it may or may not be worthwhile to do it for the operating
8 reactors. I don't know yet. All I know is it's something
9 that we're going to do.

10 MR. KRESS: You're going to have to determine the
11 risk implications of any change for an existing reactor.
12 That appears to me to be fraught with all sorts of
13 difficulties.

14 MR. CONGEL: That, in and of itself, would be
15 difficult and we would never make a decision based just on
16 that in any case.

17 MR. KRESS: Yes, that's correct.

18 MR. CONGEL: What we would like to do is look at
19 what the implications of the new source term were on the
20 plants for which we're doing the application now. The
21 second thing then would be to see what we accomplish using
22 the old source term analysis for the operating reactors, and
23 then look at the systems to see if, at minimum, the same
24 level of safety, based on our best ability, would still
25 exist and then permit changes within the context of the

1 whole analysis. It's not a simple thing.

2 MR. KRESS: But to come in on the question of the
3 applicability of these to the advanced plants, since they're
4 based on existing plants, is a good one. I think what you
5 will find out is some of the advanced plants have core power
6 densities and core geometries and core powers that are very
7 similar to the plants. The thing they have that's different
8 is more water in some of them.

9 So if you're postulating you've lost cooling and
10 you're boiling away the water and you're heating up
11 adiabatically, more or less, or cooling by the steam only,
12 then the only difference you might expect, because it's the
13 same kind of fuel and the same sort of power densities, is
14 in the timing. I think that would be where I would see a
15 difference.

16 Generally, the timing is stretched out, which
17 makes these more conservative.

18 MR. LEE: This is, again, the same DBA source term
19 for the PWR. The previous graph was for the BWR. So we
20 have really two DBA source term specifications, one for BWR
21 and one for PWR.

22 MR. CARROLL: Let me understand what that one
23 means. At the end of a half-hour, five percent of the noble
24 gases have been released from the GAP.

25 MR. LEE: Correct.

1 MR. CARROLL: At the end of 1.3 hours, the
2 remaining 95 percent have been released.

3 MR. LEE: Correct. Well, not exactly. Duration
4 is duration of occurrence for the particular release phase.
5 So let's say GAP release is starting at 30 seconds, for
6 example, from the onset of LOCA, and that means GAP release
7 has started in the 30 seconds. It lasted for half-an-hour.
8 Therefore, early in-vessel will start at 30 minutes and 30
9 seconds and lasting 1.3 hours.

10 MR. KRESS: The significance of the GAP release is
11 that it influences isolation closing times or what?

12 MR. LEE: Also like the fuel handling accident or
13 spent fuel cask draw-back events we're using the GAP
14 release only.

15 MR. LINDBLAD: I'm still confused about what
16 duration means. Do all these numbers here begin at time
17 zero or do you accumulate them as you go across the page?

18 MR. LEE: The duration number in the first line is
19 actual duration of the release phases, not from time zero.

20 MR. KRESS: They are cumulative.

21 MR. LEE: Yes. They are cumulative.

22 MR. LINDBLAD: So time span from zero to .5 is
23 what's meant. The next line is from .5 to 1.8.

24 MR. LEE: That's correct. So ex-vessel will start
25 at 1.8 hours, 30 seconds, and lasting for two hours.

1 MR. LINDBLAD: Thank you.

2 MR. LEE: This slide is in response to the ACRS
3 questions for comparing the TID source term against NUREG-
4 1465. I see here one typo. SBWR is -- really, they are
5 following EPRI specifications. So this particular one
6 should belong to this column.

7 So these are the TID source terms that we've been
8 using. The next column is the one we are proposing for BWR.

9 MR. KRESS: I was under the impression that in TID
10 application, that you allowed the iodine to be only half of
11 that value.

12 MR. LEE: Yes. This is, again, source term coming
13 into the containment from the reactor systems.

14 MR. KRESS: The natural practice, they say that
15 we'll only let half of that go in there, because half of it
16 gets deposited or something. So they just say 25 percent
17 instantaneously goes into the containment. Isn't that the
18 way -- that's not the way it's applied?

19 MR. LEE: We are saying half of .5 percent will be
20 instantaneously plated out inside the containment.

21 MR. KRESS: So, in essence, you are just putting
22 in 25 percent.

23 MR. LEE: Right. This 25 percent is available to
24 the environment, for example, from time zero.

25 MR. KRESS: The rest of it is just gone.

1 MR. LEE: Right. Well, half came out and half of
2 what we have is available now to be released after time
3 zero.

4 MR. KRESS: So it's actually lower than -- in
5 essence, it's lower than the NUREG-1465 rather than higher.

6 MR. LEE: If we assume the time zero, at the time
7 zero, yes. But we will see later in the slide that new
8 revised accident source terms will also plate out inside of
9 containment; not instantaneously, like we assumed in the
10 TID.

11 The last column is EPRI numbers and you will hear
12 from EPRI a bit later, but there are some differences in low
13 volatile areas from strontium through barium, ruthenium,
14 cerium and lanthanum area from here on. You can see maybe a
15 factor of ten or so difference. But we noticed in the
16 design basis accident, again, for the meeting of 10 CFR 100,
17 we find that any contribution from low volatile nuclide is,
18 indeed, insignificance, very small, in the range of less
19 than two percent contribution and most of them are coming
20 from iodine and the cesium.

21 MR. KRESS: A couple of comments about that.
22 Number one, I find it very strange that we're worried about
23 those differences, if we are worried, because to me they're
24 basically the same. There may be some differences in timing
25 between the two, which would be more significant than the

1 difference in the qualities.

2 With respect to source terms, I would have called,
3 for example, your iodine .27 kind of gilding the lily a
4 little. I would have called it .3 anyway. But that's just
5 a comment on this area. We surely don't know those values
6 that closely.

7 MR. LEE: That detail, yes. In fact, I think
8 Research is even considering changing these figures perhaps
9 in the final NUREG-1465.

10 MR. SOFFER: I think I can address some of that a
11 little bit. Although we're not prepared to discuss final
12 numbers at this point, we anticipate changes on the basis of
13 comments that indicate that the in-vessel volatile, like the
14 iodine and cesium, are probably going to go up a little bit.

15 The low volatile in-vessel, as well as ex-vessel,
16 will go down significantly and they'll probably be fairly
17 close to the EPRI numbers; not precisely in agreement, but I
18 think they'll be in better agreement.

19 MR. CONGEL: I'd like to make two comments. First
20 of all, I've been here many a time and listened to what I
21 consider appropriate remarks and criticisms of the staff
22 when we have too many significant figures. You notice that
23 really with the exception of just the two numbers that are
24 up there, they all are one significant figure.

25 I wholeheartedly agree, as a former teacher

1 myself, but it's sometimes so tempting with all the figures
2 that you get on these hand calculators to not go any less
3 than you have to. It's a philosophical issue.

4 The second thing in terms of significance is
5 something that the staff is working on and that you also
6 have heard about. There is no difference in the calculated
7 dose right now simply because the principal contributors to
8 the concept of total body and iodine are from those
9 radionuclides that are on the top of the list.

10 We are certainly considering going to the new ICRP
11 methodology, where the total effective dose equivalent
12 includes contributions from all radionuclides. When we do
13 the Part 50 rulemaking, we will certainly be considering the
14 updated dose methodology. At that time, the differences
15 associated with the lower volatiles could make a difference
16 in the overall dose calculation of total body or the TEDE in
17 this case.

18 We looked quickly at that. In fact, we've had
19 discussions with EPRI about it. It could make a difference
20 of about a factor of two or so, just in the first glance.
21 But the so-called insignificance here based on the present
22 tables would not be insignificant if we updated the dose.

23 I just wanted to let you know that that is a
24 possibility. However, as Len pointed out, if our numbers do
25 decrease in the low volatile area, we'll be the same anyway.

1 But remember right now there's not much difference because
2 there's just thyroid and total body.

3 MR. LEE: This table is the same comparison we
4 made for the BWR in this case. This table compares the PWR
5 numbers. Again, there are quite a bit of differences that
6 exist between EPRI and our numbers for the low volatile
7 nuclide. The CE System 80+, they followed the NUREG-1465,
8 and the AP-600 came in with the EPRI source term.

9 MR. WILKINS: I started to say this on the last
10 slide. Let me say it now. The difference between .002 and
11 .00004 looks terrible. That's a factor of, what, 500 or 50?
12 I don't know if it's 50 or 500.

13 MR. LEE: Factor by 50.

14 MR. WILKINS: Factor of 50. But on the other
15 hand, they're both so close to zero, I'm not sure that it
16 make any difference. I don't know how to phrase my question
17 any other way than that. They're both so close to zero.
18 Does it matter which of the two numbers you really use?

19 MR. DAVIS: The problem is you're multiplying them
20 times numbers like ten-to-the-sixth and ten-to-the-seventh.

21 MR. WILKINS: So that they may well make a
22 difference.

23 MR. DAVIS: Well, not compared to the iodine and
24 cesium, I don't think.

25 MR. KRESS: Just as a test, do you have a quick

1 explanation of why more iodine gets released in PWRs than
2 does in BWRs?

3 MR. LEE: I don't. Len, can you address that?

4 MR. SOFFER: I don't have a good explanation, a
5 good phenomenological explanation for that. It's just the
6 way the data came out, Dr. Kress.

7 MR. KRESS: It's the way the calculation showed.

8 MR. SOFFER: Yes.

9 MR. KRESS: Okay.

10 MR. LEE: The next issue has to do with iodine
11 chemical form. Again, here, we are comparing the TID NUREG
12 and the position we took in the draft SECY paper and EPRI.
13 The NUREG-1465 in the case of organic iodine, we did not
14 address that particular aspect. Again, I understand that
15 the final NUREG-1465 will address the amount of organic in
16 iodine chemical form.

17 MR. DAVIS: Is all of the particulate cesium
18 iodide?

19 MR. LEE: Pardon?

20 MR. DAVIS: Is all of the particulate iodine
21 cesium iodide?

22 MR. LEE: Yes, cesium iodide.

23 MR. DAVIS: Thank you.

24 MR. SEALE: That distribution is independent of
25 PWR or BWR.

1 MR. LEE: Yes. Continuing that issue, the
2 question from the ACRS was, again, the technical basis for
3 five percent of iodine conversion rate. We looked at quite
4 a few references. The first reference data came from
5 Battelle Northwest Laboratory. This work is a bit older, I
6 think in the time of like 1972, work by Postma and
7 Zavadoski. They did like 70 or so containment experiment
8 tests and I think in ten of their tests, they used actual
9 radioactivity in them. It came out with about 3.5 percent
10 organic iodine conversion.

11 MR. KRESS: Where do you think the organic iodine
12 comes from?

13 MR. LEE: Some of them came from originally in the
14 system, in the primary coolant to begin with. Also, once it
15 came out into the containment, possibly it may react with
16 organic material in the containment during an accident
17 period.

18 MR. KRESS: Only the elemental iodine does that.

19 MR. LEE: Pardon?

20 MR. KRESS: Only the elemental iodine does that.

21 MR. LEE: Yes. Here we are saying five percent of
22 iodine in elemental. Actually, Zavadoski's data, over 3.5
23 percent. I think one percent is contributed from the
24 primary coolant and 2.5 percent is contributed within the
25 containment. So really the combination of both.

1 I guess three-point is not quite correct to say.
2 Really it all came from five percent of elemental iodine
3 form. The second data point came from the Oak Ridge NUREG
4 report. The one report is, again, a bit older and was
5 issued like in 1982, authored by Ed Behn and Bill Shockly, I
6 believe. The second Oak Ridge NUREG report was issued in
7 1992, also by Ed Behn and Chuck Weber. I believe, Dr.
8 Kress, you co-authored that report, as well.

9 MR. KRESS: Yes. I probably should declare a
10 conflict of interest on that part of this.

11 MR. LEE: We looked into those two reports very
12 carefully. The 1.25, I calculated that number to be
13 average. You did look into like the Surry station, Surry,
14 Peach Bottom, and a few other -- couple of other power
15 plants for the severe accident sequence and the calculated
16 elemental iodine to be expected in the containment against
17 the organic iodine and just divide it up. That number
18 ranged actually anywhere from .2 to .5 and, averaging those
19 numbers, it came out to approximately 1.25.

20 EPRI is proposing to use five percent based on
21 Battelle Northwest Lab's number. We, the staff, in a draft
22 Commission paper, we took a position to use a five percent
23 conversion factor, which makes it five times five to be .25
24 percent organic.

25 Just for the interest, one of Oak Ridge's NUREG

1 reports pointed out that in the TMI accident, after 72
2 hours, they measured the iodine in the containment and found
3 most of them predominantly in organic form, but they found
4 only .0005 percent of iodine. So it's a very small amount
5 and, nevertheless, it existed mostly in organic form.

6 MR. DAVIS: At one time, one of the fuel vendors
7 was using an organic binder material actually to fabricate
8 the pellets. There was concern for a while that that would
9 be a substantial source of organic material for conversion
10 of the iodine.

11 MR. CARROLL: I think all of them use an organic
12 binder, but it's burned out in the course of centering.
13 They use an organic binder to form the pellet.

14 MR. DAVIS: Well, I think there's some residual
15 left in the pellet that --

16 MR. CARROLL: Not after centering, I don't think.

17 MR. DAVIS: Maybe not.

18 MR. LEE: Going to the issue of -- now, this is
19 the only issue that perhaps is not dealing with the design
20 basis accidents. This is the equipment survivability. What
21 we are saying here is that for the evaluation of the
22 equipment survivability, we proposed the staff position to
23 use all the accident source terms given in the NUREG-1465,
24 including ex-vessel release and in-vessel release.

25 We say that the NUREG-1465 table is acceptable for

1 EQ DBA. For the GAP and the in-vessel release and for the
2 equipment survivability, we will use all columns.

3 This issue is not really directly related to the
4 accident source term, but this is iodine deposition on BWR
5 steam lines and the condenser. This particular issue has
6 been fully addressed in the ABWR SAR and only applies, of
7 course, to ABWR and SBWR. We gave credit for the iodine
8 deposition in the ABWR main steam and the condenser.

9 Also, we are currently evaluating two operating
10 reactor license amendment requests to get credit for the
11 iodine deposition in the main steam line and the condenser.
12 It is true that it requires main steam piping and the
13 condenser to remain structurally intact to give hold-up of
14 volume of iodine decay. This was addressed in SECY 93-087
15 and the Commission approved it. And I believe we got a
16 letter from you, also agreeing with the staff position.

17 This is just typically showing the pathway for the
18 iodine deposition. Here is the main steam isolation valve
19 leaking. This is the main steam shutoff valve. I guess
20 perhaps only BWR-6 has this valve and maybe a few BWR-5s.
21 Not all the BWRs have this valve. Here's a bypass valve and
22 a turbine stop valve and turbine control valve. The leakage
23 pathway will go through the drain line and into the
24 condenser.

25 The off-gas system and seal leaks are all tripped

1 at the time when we isolate this main steam isolation valve
2 due to the LOCA or design basis accident. The condenser
3 will become -- the condenser will lose vacuum and it will
4 become mostly pressure within a relatively short period. It
5 will leak. This diagram shows actually leaks this way, but
6 we expect to take some advantage of the condenser volume and
7 eventually it will leak through the turbine seal, which is
8 in the top of the condenser.

9 So we assume the condenser is open and the leakage
10 pathway will be through that turbine seal. So this diagram
11 just shows the pathway.

12 MR. KRESS: Excuse me, Jay. I hate to slow you
13 down since we're running a little behind, but on your
14 previous slide --

15 MR. LEE: Yes.

16 MR. KRESS: I was preoccupied when you went past
17 the first bullet. Could you explain that bullet to me?

18 MR. LEE: You mean the first bullet item?

19 MR. KRESS: Yes. The first bullet there.

20 MR. LEE: Yes. That was one of your questions, I
21 believe, too. We think the instantaneous and homogeneous
22 mixing is conservative because it will give a shorter time
23 to stay within that main steam line and give less time to
24 plate out. In other words, if you take the steam line as
25 one segment and if you assume this leakage from the main

1 steam isolation valve will mix homogeneously and
2 instantaneously, then at time zero, you have already at the
3 end of the pipe the leakage ready to go into the condenser.

4 MR. KRESS: But you're viewing the whole pipe as
5 one volume.

6 MR. LEE: I'm just picking an example. Actually,
7 our models, staff models, divides that segment into very
8 small segments.

9 MR. KRESS: Little segments. Now, if you treat
10 each segment --

11 MR. LEE: Yes.

12 MR. KRESS: -- as instantaneous and homogeneously
13 mixed as opposed to whatever it really would be, then you
14 will get more plate-out and the same hold-up time.

15 MR. LEE: Mr. Kress, for example, if you assume
16 part flow, let's say, not homogeneously mixing it, it will
17 give a concentrated leakage in a certain part of a pipe.
18 The plate-out is a function of the surface of pipe available
19 to --

20 MR. KRESS: I think we ought to discuss this
21 later, because we are running behind. I just want it on
22 record that I disagree with that statement.

23 MR. LEE: I'll discuss it with you later. This
24 issue is the hold up in the secondary containment. The
25 secondary containment, really we are talking about the

1 safety envelope, according to the definition of GE. This
2 issue applies, of course, only to SBWRs. The reason we
3 brought up this issue is that the safety envelope or
4 secondary containment will be normally in the negative
5 pressure, slightly negative pressure, by quarter-inch or so.

6 But after LOCA or a design basis accident, the
7 pressure inside that safety envelope or secondary
8 containment will become positive. Previously, staff never
9 gave any credit for hold-up for the structure or building
10 which is not in negative pressure after an accident. So
11 this is a section to past practice and even though secondary
12 containment will become slightly positive pressure following
13 a DBA, we will give credit just for the hold-up, not plate-
14 out, based on -- they will verify design leakage for less
15 than 25 percent, leakage by test, just like perhaps a
16 containment test. They will verify that periodically and
17 based on that, the staff position is, yes, we will give
18 credit for hold-up for decay.

19 MR. KRESS: The question I had about that was the
20 25 percent leakage per day is associated with what thermal
21 hydraulic conditions, what pressure?

22 MR. LEE: The pressure is just atmospheric
23 pressure, I believe. We are not giving -- this credit only
24 applies to the design basis accident. No credit is taken
25 for a severe accident at all. This is not applicable to the

1 severe accident.

2 MR. KRESS: Is it the leakage -- see, I'm trying
3 to figure out how the COL is going to verify this, because
4 he has to do something --

5 MR. LEE: Some tests, perhaps like containment
6 leakage tests to verify that number.

7 MR. KRESS: So he's going to --

8 MR. LEE: Pressurize.

9 MR. KRESS: He's going to pressurize that
10 containment and hold it at some pressure.

11 MR. LEE: Right.

12 MR. KRESS: And determine the leak rate by how
13 much he has to put into hold it at a pressure. See, that
14 was my question. What is that pressure you're talking
15 about?

16 MR. LEE: You mean testing pressure to verify 25
17 percent leakage.

18 MR. KRESS: Yes. And, of course, that --

19 MR. LEE: Yes. We're still reviewing that SBWR at
20 this time. We're not that far to find how actually they're
21 going to verify that test. This is a COL item, but we will
22 be discussing it with GE when we come more closer to
23 reviewing SBWR.

24 The release timing we briefly discussed earlier
25 and this is the starting time now. This is not the

1 duration. Our GAP release in the NUREG-1465 is based on
2 large break LOCA, the 30 seconds, and EPRI's number is one
3 hour. There's a significant difference and this is perhaps
4 the major difference between staff and EPRI on the timing of
5 a release of a fission product into the containment.

6 Now, we'd say, though, the staff position is even
7 though we didn't make it clear in the draft Commission
8 paper, we will review the passive plant design timing as
9 they proposed.

10 Continuing with timing, I'd just say the CE
11 system, they proposed consistent timing with NUREG-1465.
12 Again, the staff will consider design-specific accident
13 sequence timing for the SBWR and AP-600. That one thing is
14 that we probably misspoke in the last presentation, that
15 really there is no impact on diesel generator startup time.
16 We are thinking about that time, startup time for the
17 mitigation of the accident, but for the prevention of the
18 LOCA, for example, that we cannot really relax these general
19 startup times because that deals with cladding temperature
20 and the Appendix K to 10 CFR 50.

21 This is aerosol deposition in the containment.
22 This is a big issue for the AP-600 because they don't have
23 any spray in the containment. They have no filter, and the
24 SBWR doesn't either. So they are solely dependent on the
25 aerosol deposition in the containment.

1 The TID source term, like we discussed, we are
2 assuming 50 percent plate-out instantaneously. Now, here,
3 this credit for deposition, we will be -- it will be
4 determined in each test for design application for their
5 containment design. We don't have a number yet for the SBWR
6 or the AP-600. At this time, we are saying yes, we will
7 give credit, but what credit, how much will be decided
8 later. The Sandia Lab is helping us to determine that
9 credit.

10 This is just the transfer, the ACRS question for
11 the containment pressure loading. We just want to say that
12 the source term is not effective for determining containment
13 peak pressure. It has nothing to do with containment design
14 or containment pressure rating, because no fission product
15 energy is ever accounted for the containment heating.
16 Therefore, there will be no change in the DBA specification
17 for containment pressure loading. It just talks about the
18 source term itself.

19 MR. KRESS: I hate to slow you down again, but one
20 question about that. If an applicant is going to take some
21 credit for depletion in the containment and is going to look
22 at the time variation and fission product effects on certain
23 equipment or doses to control rooms and so forth, that time
24 variation will be intimately related to the rates at which
25 things leak out of containment, which is a function of the

1 thermal hydraulics.

2 What you're telling me now is you're going to
3 couple the same thermal hydraulic specification of a large
4 break LOCA peak pressure for 24 hours that you had before.
5 That seems a little inconsistent to me to the needs for
6 using realistic values for determining equipment
7 qualification and doses and so forth.

8 I just wondered what your comment might be on that
9 particular aspect of it.

10 MR. LEE: We have pre-determined already the leak
11 rate, such as .5 percent of the leak rate from the
12 containment. The equipment qualification itself inside the
13 containment, I don't understand how that will effect
14 pressure rating inside the containment. Maybe I don't quite
15 understand your question yet.

16 MR. BARRETT: Excuse me, Jay. I think we
17 misunderstood your question. I think when we originally saw
18 your question, we thought that you were asking us whether
19 the differences in the suspended aerosols would have an
20 impact on our calculations of peak pressures for the design
21 basis of the containment.

22 MR. KRESS: It really was the other way around.
23 Does that specification of the peak pressure -- is it
24 consistent with the use of the source terms you have in
25 terms of making things more realistic in the calculations?

1 MR. BARRETT: I don't know how we've treated that
2 for the advanced reactors, personally, but I do understand
3 the question now.

4 MR. CONGEL: We will get you that answer. The
5 person or the group responsible for that part of the
6 containment evaluation is not here, but I will get you that
7 in writing.

8 MR. LEE: The next issue has to do with the BWR
9 suppression pool. The ACRS question was to giving a credit
10 for the currently operating reactors; for example, Mark II
11 and III containment BWR, we are giving a DF of ten and a
12 Mark I containment BWR we are giving a credit of five.
13 That's in the SRP.

14 Now, I couldn't find any technical justification
15 for how we did it. Probably, I'm guessing it, but we used a
16 certain conservative bypass to the containment following a
17 design basis accident, and that's how we arrived at the
18 conservative DF number. We used a DF of two in the case of
19 ABWR and GE requested no DF for the SBWR because in the case
20 of the design of the SBWR, the function of the suppression
21 pool is taken over by isolation condenser and primary
22 containment cooling system will cool the dry well steam and
23 air mixture, not really depending on the suppression pool to
24 reduce the pressure. Therefore, they did not ask for any DF
25 for the SBWR.

1 Containment spray system. The AP-600 design does
2 not have any spray system. Like I said earlier, they are
3 solely dependent on the containment. Here, we just wanted
4 to point out some design features for the light water
5 reactor design and the ABWR design, of course, is designed
6 to the TID source term. The System 80+ is designed to the
7 new source term and the SBWR design provides a spray system,
8 but that's not the -- that is a non-safety related spray
9 system and AP-600 provides no spray system.

10 The staff position is that so long as they meet 10
11 CFR 100, those criteria, we will consider that containment
12 is fine without spray, but we are not that far yet. We are
13 still under -- the design is still under the staff's review.

14 Use of atmospheric cleanup system. This is a
15 filtration system. Again, here, the staff position is that
16 so long as the advanced light water reactor design meets the
17 10 CFR 100, those requirements, those criteria, why, we'll
18 accept a system without a filtration system.

19 Now, the only thing we're mentioning here is that
20 this system will face additional demand on the HEPA filter
21 to the iodine in particulate form and the non-radioactive
22 aerosol. I think a question that came out in the last
23 presentation was whether we were considering non-radioactive
24 aerosol. Yes, we do.

25 In the draft NUREG-1465, we have a number like 700

1 kilograms for the PWR and 350 kilograms for the PWR. We
2 also looked into, in the case of the CE System 80+, to make
3 sure our HEPA can handle that type of -- that range of --

4 MR. KRESS: Will that be an explicit part of the
5 source term specification when you get around to 10 CFR 50?

6 MR. LEE: Len, would you address that?

7 MR. SOFFER: We are contemplating -- we are
8 looking at the estimation of non-radioactive aerosols,
9 again, for final NUREG-1465. We have received a number of
10 comments that the numbers that were in the draft were quite
11 high. We looked at some additional evaluations and, indeed,
12 they do appear to be high.

13 Our thinking at the present time is to put in a
14 general statement in NUREG-1465 to the extent that non-
15 radioactive aerosols should be considered, but we may take
16 specific numbers out because at this point, I'm not sure
17 that we can come up with a good number that should be carved
18 in stone; that sort of thing.

19 So I think what we will do is to point out a
20 general precaution and point people to various references.

21 MR. KRESS: Then review them on a case-by-case
22 basis when it comes up.

23 MR. SOFFER: I think so, although that's a
24 decision that I think has yet to be made.

25 MR. KRESS: Okay.

1 MR. LEE: This particular issue is also not really
2 directly related to the source term, but we did develop,
3 with the help of our contractor, a new model dealing with
4 the atmospheric dispersion coefficient chi over Q for the
5 control room operator dose assessment. This is a new --
6 this is different from the old model in that we are using
7 actual measured data, hourly chi over Q, at the existing
8 site for the building, how this particular --

9 MR. KRESS: I think this would be a subject for a
10 good future meeting.

11 MR. LEE: Yes.

12 MR. WILKINS: Why don't we go on to the next
13 slide.

14 MR. DAVIS: Allow me one question. Is this the
15 HABIT code you're talking about?

16 MR. LEE: Yes. I think that --

17 MR. DAVIS: Is there a reference for that?

18 MR. LEE: Yes. We do have --

19 MR. WILKINS: Let's move on.

20 MR. CATTON: If you could, supply the document.

21 MR. LEE: Yes.

22 MR. CARROLL: On Issue 12, I'm still troubled by
23 the PCCS loops are an extension of the containment and do
24 not have isolation valves issue. We will no doubt get to
25 that when we begin reviewing SBWR.

1 MR. LEE: I'm sorry. What was the question again?

2 MR. CONGEL: That's the point. I was just trying
3 to buy some time and I do believe we'll have another
4 opportunity to discuss that. I'd be more than happy to
5 accommodate anything the Committee would want.

6 MR. WILKINS: SBWR is downstream.

7 MR. KRESS: How much time do you need, Frank?

8 MR. CONGEL: I have just one slide to speak from.

9 MR. KRESS: Why don't we do it, please.

10 MR. CONGEL: Just to wrap up, the question that
11 was asked in what we call the general philosophical area was
12 related to risk significance of the source term
13 implementation. The reason I delayed this until the end is
14 because hopefully it is apparent now how risk played a role
15 in this. The fact is risk did not play a direct role. It
16 was an extension of the philosophy that the staff followed
17 back 20 to 30 years ago, but with updated understandings of
18 the source term behavior and systems behaviors during
19 accidents.

20 The intent is to improve our understanding so that
21 the designs can reflect this improved understanding and lead
22 to a better plant. The quantitative change is difficult, if
23 not impossible to characterize, because quantitative changes
24 are reflected in end results of PRAs. We all know what
25 ranges of uncertainty PRA conclusions have.

1 PRAs are used by the staff as indicators, as
2 general indicators, as qualitative indicators of safety.
3 But the important points, I think, are summarized on these
4 bullets and, as I said, it reflects earlier discussion.
5 They don't directly effect core damage frequency and they,
6 of course, have nothing to do directly with containment
7 failure probability.

8 Arguments can be made that there are effects, but
9 they are clearly second order or less. I would just mention
10 that we don't have any direct reflection of risk in those.
11 It's a reflection of the staff's best understanding of what
12 mechanisms actually take place.

13 We use it here and we use it to test equipment.
14 It's a surrogate for other design requirements. Ultimately,
15 when we run the PRAs and come up with bottom line numbers
16 and understanding how systems behave, especially during
17 severe accidents, that will be the ultimate determination of
18 our success.

19 I know we're running short on time. I have some
20 other information, but I hope that summarizes the position.

21 MR. KRESS: I think that is an excellent set of
22 points that the Committee may or may not have thought of.
23 Personally, I agree with those and I'm glad you were able to
24 have the time to put those up.

25 The thing I wanted to mention is this is true when

1 you design a plant or use these source terms in designing a
2 plant. With a plant that exists and is already designed,
3 like the existing plants, if you go back and now start
4 relaxing requirements because of the difference in source
5 terms, I think there can be some risk significance. That's
6 just a caution that I wanted to throw in, but I think you're
7 exactly right on these items.

8 MR. CONGEL: Thank you. I appreciate that. That
9 was also what I had tried to capture during the discussion
10 when the question was asked about applicability to operating
11 plants. There is more to it than initially meets the eye.

12 MR. CARROLL: Do we have that slide?

13 MR. CONGEL: You will.

14 MR. KRESS: With that, I guess we would like to
15 see if there's any -- there's a presentation from the
16 vendor, from EPRI. David Leaver is going to do that.

17 MR. LEAVER: I just have a few minutes, I guess
18 about seven or eight minutes. I appreciate the opportunity
19 to address the Committee very briefly. I have about half-
20 a-dozen or so viewgraphs which I think you have copies of.
21 We passed them out. I probably won't have time to go
22 through all of them.

23 What these are is a summary of areas of the source
24 term in which EPRI and the ALWR designers have some issue or
25 some amount of disagreement, in all cases not significant,

1 but in some cases significant, with the staff. We have
2 given this information to the staff over the last two years
3 or so since draft NUREG-1465 came out in June of 1992 in the
4 form of letters and reports and whatnot.

5 So none of this is new, but we felt it would be of
6 benefit to the ACRS in terms of their understanding of
7 what's going on to at least get a brief summary of these
8 issues.

9 By way of general comments, we commend the staff
10 for their work on the source term. We think it's going to
11 ultimately improve the design of the advanced light water
12 reactors from the standpoint of having a more physically
13 correct representation of the source term and, therefore, a
14 better design basis for mitigation systems.

15 I want to also point out in this bottom bullet
16 that generally, as you know, draft NUREG-1465 is based on
17 operating plants. There are a number of ALWR design
18 features that we think will have an important effect on
19 source term and we would like to see the regulations and the
20 regulatory guidance that results from this effort that the
21 staff is going through explicitly recognize the fact that
22 there are plant-specific variations or, should I say,
23 variations from one standard family of plants to another
24 under the Part 52 nomenclature and that the regulations
25 allow for variations in the source term in accordance with

1 these design features.

2 In the past, people say that reg guides aren't the
3 law and you can make changes, but from a practical
4 standpoint, it's very, very difficult and very expensive to
5 do. We'd like to see that process improved.

6 MR. KRESS: Do you want to tell us what those
7 features that are most strongly effecting the source terms
8 are?

9 MR. LEAVER: I will mention a couple of them,
10 which is about all I will have time to, Tom. This is the
11 list of issues that we divided up, categorized these
12 differences into. In parentheses is the issue number which
13 corresponds to the draft Commission paper, which the staff
14 has talked about. I'll just probably only have time to talk
15 about these two, which I think are probably the most
16 important ones, the timing and containment natural aerosol
17 removal.

18 . With regard to timing, the draft SECY stated that
19 as a guideline, the staff proposes to start with GAP release
20 -- it's either 30 seconds or with credit for leak before
21 break no later than ten minutes. What we're finding in the
22 passive plants is this initial -- the time to GAP release is
23 more like an hour to an hour-and-a-half after the beginning
24 of the accident.

25 We would like to see some kind of recognition of

1 the fact that different plant designs will be different with
2 regard to timing in the Commission paper and in subsequent
3 regulations and regulatory guidelines that evolve from the
4 source term effort.

5 On containment natural aerosol removal, let me
6 just say that this is an area -- this is a new --
7 consideration of this phenomenon has not been done up to
8 this point for licensing. To do this properly, one has to
9 consider the thermal hydraulic conditions in the
10 containment. In a sense, this is, I think, a fundamental
11 difference between what we're doing with the new source term
12 and what was done with TID, and that is that I think you now
13 have to couple the accident that produces the fission
14 products from the core with the thermal hydraulic effects in
15 the containment, to some extent. Otherwise, you can't do
16 this aerosol calculation properly.

17 What we've done on containment natural aerosol
18 removal is we have looked at several different types of
19 accidents and the conditions in containment and we've chosen
20 the one that tends to make it most difficult for the aerosol
21 to be removed, and we said, okay, that's what we're going to
22 use, trying to have a little bit of conservatism in the
23 process.

24 So there is this coupling that one must consider,
25 which has not been done up to this point. There are some

1 numbers in draft NUREG-1465. I don't know what the final
2 will say on this. We've heard in meetings that they may end
3 up not including removal numbers. But they are based on
4 operating plant sequences and based on dry conditions.

5 These conditions are not applicable to ALWRs and
6 what we would like to see, if coefficients are included,
7 that they be representative of ALWR design. So the timing
8 in this is two examples of the question that you're asking.

9 MR. KRESS: That impacted on -- that's the nature
10 of my question. I was asking about the thermal hydraulics.

11 MR. LEAVER: I thought that was what you were
12 getting at with your question.

13 MR. KRESS: You do really -- if you're going to
14 give credit for that, you do really have to give some sort
15 of guidance on what the thermal hydraulic conditions would
16 be.

17 MR. LEAVER: Exactly.

18 MR. KRESS: That is a function of the design of
19 the containment itself and the design of the plant.

20 MR. LEAVER: Absolutely. And it's also a function
21 of what accident you look at.

22 MR. KRESS: And that, I agree, you should try to
23 look at some sort of bounding worst conditions for that.

24 MR. LEAVER: Right.

25 MR. KRESS: But it ought to be specific for the

1 containment and the design.

2 MR. LEAVER: Right. Dr. Wilkins, should I stop
3 now?

4 MR. WILKINS: I think we could -- if you've got
5 one more point that you would just --

6 MR. LEAVER: All right. One more.

7 MR. WILKINS: I'd hate for you to walk out of here
8 without --

9 MR. LEAVER: I'll do the next one. On this one
10 here, this is -- that doesn't mean -- these words aren't
11 what's important. This issue is the issue of low volatiles.
12 Generally, we agree with the release fractions for the
13 volatiles that Jay Lee showed and completely agree with this
14 business of first significant figure. We don't know in
15 these accidents, and so rounding off is the right thing to
16 do. There were some modest differences in the volatile
17 releases, but those are not really significant.

18 We do think that on the low volatiles that it is
19 important to get those to the right order of magnitude and
20 we think that draft NUREG-1465 was way too high based on the
21 experimental evidence that's available, and there's quite a
22 bit now that's available.

23 We have made that comment. I believe that the
24 staff has reviewed the information that we provided and
25 according to Research, they are considering changes to that.

1 So hopefully that will go in the right direction.

2 That does not effect the whole body dose
3 calculation, but it would effect the effective dose
4 calculation, which is the way the world is going. ICRP,
5 EPA, 10 CFR 20 all use effective dose. So if your low
6 volatiles are off by a factor of ten to a hundred, you will
7 get on the order of a factor of two higher effective dose.

8 MR. WILKINS: You heard my question.

9 MR. LEAVER: I did hear your question, yes, sir.

10 MR. WILKINS: And this is your response.

11 MR. LEAVER: Yes, sir. It does make a difference.
12 Iodine still dominates, but if you're off on low volatiles
13 by a factor of ten to a hundred, you'll see a factor of one-
14 and-a-half to two on effective dose.

15 MR. KRESS: Particularly lanthanum, right?

16 MR. LEAVER: Yes, sir. That's right. Okay. Let
17 me not run over.

18 MR. WILKINS: Are there any questions any of the
19 members would like to ask?

20 [No response.]

21 MR. KRESS: I'd like to thank the staff for an
22 excellent presentation and EPRI for their presentation,
23 also, which was also good.

24 MR. WILKINS: I'd like to echo those sentiments
25 and additionally add my personal thanks to the speakers for

1 enabling the Committee to recess and take its break on time.
2 We will reconvene at 10:30 for the next agenda item.

3 [Recess.]

4 MR. WILKINS: Let us reconvene, please. Members
5 please take their seats. I saw Ivan upstairs, so I presume
6 he'll be down here momentarily. The next agenda item is
7 ABWR review regarding the final design approval. I gather
8 we'll have some presentations from the NRC staff, with
9 appropriate participation from GE Nuclear Energy. I will
10 turn the meeting over to the Subcommittee Chairman, Mr.
11 Michelson.

12 MR. MICHELSON: Thank you, Mr. Chairman. The
13 staff wanted to come in today to make any final remarks
14 concerning their safety evaluation, mostly for the benefit
15 of those who may not have been able to attend many or most
16 of the subcommittee meetings over the past several months.

17 If you find that you're hearing everything for the
18 fourth time, by all means, we can get through that part
19 quicker. Some of the members have not been here for any of
20 it and those may want to hear the full version.

21 I think our plan is just to have a staff
22 presentation, to be supported by GE Nuclear Energy as may be
23 needed. Is that correct? And you're planning on about how
24 long?

25 MR. WILSON: This is Jerry Wilson, Mr. Michelson.

1 I think I can finish within a half-hour.

2 MR. MICHELSON: So we will just proceed on that
3 basis and then, as time permits, after you're finished, if
4 there is any time, we'll discuss the report and so forth.
5 Thank you. Jerry?

6 MR. WILSON: Thank you. This presentation was
7 originally scheduled for February, as you can see from my
8 slide. Unfortunately, we couldn't make it then.

9 MR. WILKINS: I wonder why.

10 MR. WILSON: Nature got involved. The site
11 parameters were out of bounds, I think. Mr. Michelson had
12 asked that we give an overview of the ABWR design review for
13 the Full Committee's benefit. Since this review has been
14 underway for about seven years now, in order for me to paint
15 this picture, I'm going to have to use very broad brush
16 strokes.

17 I'm not going to cover any of the design features
18 of the ABWR. I know the Committee has heard that many times
19 before. But I will discuss, in general terms, the
20 development and implementation of the requirements for Part
21 52, along with the ABWR review. Since these events were
22 interwoven, in order to understand them, you should see how
23 they were both ongoing.

24 So I'm going to cover where we've been, where we
25 are, and where we're going. I'm sure that everyone is awake

1 for this meeting after that last one you had to go through.

2 Now, let me go through what happened in the
3 development and implementation of Part 52. This effort
4 started in the issuance of the standardization policy
5 statement in 1987 and that's where the Commission set out
6 the goals and limits of design certification. Primarily,
7 they wanted to reduce the uncertainty in the licensing
8 process, but not require as-built and as-procured
9 information.

10 It took us about two years to develop and issue
11 Part 52 and right after the issuance of the rule, we
12 immediately began to work on implementation because we had
13 two applications that were in-house at that point in time;
14 namely, the ABWR application and the System 80+.

15 One of the first areas that the staff worked on
16 was developing additional design requirements to achieve the
17 goals of enhanced safety that were in the standardization
18 and the severe accident policy statements, and the Committee
19 has seen those. We've sent a number of papers down, the
20 last of which was SECY 93-087.

21 We worked on the level of detail. That concluded
22 that we need sufficient detail in the application to resolve
23 safety issues and we recognized that that level of detail
24 would vary depending on the particular system, structure or
25 component we're talking about. Then we went on to

1 developing ITAAC. That was quite an involved process and in
2 that process, this idea of evolving technology came out and,
3 from that, we have what are commonly referred to as design
4 acceptance criteria, which are a part of the ITAAC, but
5 cover those areas where there's either evolving technology
6 or we're lacking as-built, as-procured information.

7 Finally, we developed procedures on how to do a
8 design certification rulemaking and then a surprise came
9 along. The Congress passed the Energy Policy Act of 1992
10 and that codified Part 52 and also it provided some
11 additional flexibility regarding the timing and format of
12 hearings for a combined license. So the NRC modified Part
13 52 in the end of 1992 to conform with that change by
14 Congress.

15 Also in this time, the staff worked on the form
16 and content of a design certification rule itself and that
17 focused primarily on the changed process for changing
18 information that was either certified or approved during the
19 design certification process. Most recently, we issued an
20 advanced notice of proposed rulemaking for the first
21 evolutionary design that will be ready for design
22 certification. We had a workshop on that in November of
23 1993. In that ANPR, we have incorporated Commission and
24 ACRS guidance on the design certification rule based on our
25 prior interactions.

1 The staff is currently working on guidance on how
2 to prepare a design control document. We're in the midst of
3 meetings with industry on that right now. Then we will
4 complete our analyses of comments on the ANPR and prepare a
5 proposed design certification rule and we'll submit that to
6 the Commission after the first design receives an FDA and is
7 ready for certification.

8 So that's a very quick outline of the
9 implementation of design certification. Are there any
10 questions on that before I get into the ABWR design review
11 itself?

12 [No response.]

13 MR. WILSON: As I said, while the certification
14 implementation was going on, we were also reviewing these
15 designs. In fact, many times, the process for implementing
16 the rule, we worked it out as part of our review of the
17 first design. In ABWR, they initially came in with modular
18 submittal of their application and that was submitted under
19 Appendix O to Part 50 and the standardization policy
20 statements, because they came in before Part 52 was passed.

21 Later, we started the review and, as I said, we
22 were implementing design certification and we reviewed ABWR
23 as it was to be certified. In 1991, we issued six draft
24 SERs and then in 1992 we issued a draft final SER and that
25 was reviewed by the Committee. We had over 300 open items

1 in that.

2 Then in 1993, a lot of information was submitted,
3 the certified design material, what we commonly refer to as
4 Tier 1, which includes the design descriptions and the
5 ITAAC, the site parameters and the interface requirements.
6 Also, the technical specifications came in and, at that
7 time, the latter part of the year, we issued an advanced
8 copy of the SER. That had 14 open items.

9 Now, the advanced copy of the SER was written up
10 to Amendment 32 of GE's application. In December of last
11 year -- is that correct? Amendment 33 was submitted. Is
12 that correct, Chet?

13 MR. POSLUSNY: Yes.

14 MR. WILSON: At that time, we set out to do three
15 reviews in parallel on Amendment 33. First of all, we asked
16 the reviewers to verify that Amendment 33 is consistent with
17 the findings they made in the advanced copy of the SER. We
18 also had an independent review group look at the certified
19 design material and, in particular, the ITAACs and the SSAR
20 to be sure that they were internally consistent.

21 Also, we had another group that did an audit of
22 the technical specifications. As you see on my slide, those
23 consistency reviews have been completed. The results of the
24 review were transmitted to GE and they're working on
25 resolving and incorporating that information in their SSAR.

1 While those reviews were going on, we had some
2 editorial reviews and legal reviews of our SER. Those have
3 been completed and the project staff is incorporating those
4 comments in the SER.

5 That gets us to where we are today. We provided a
6 letter dated yesterday that addressed 13 of the open items.
7 I believe everyone has a copy of those. Those are provided
8 as inserts into the advanced copy of the SER. The remaining
9 item the staff is still working on. We hope to have that
10 resolved quickly and as soon as we do, we will provide an
11 SER insert on that item to the Committee.

12 MR. WILKINS: Can you, in 30 seconds, what's the
13 title of the remaining item?

14 MR. WILSON: It has to do with QA of the design.

15 MR. MICHELSON: When did you say we would see
16 that?

17 MR. WILSON: Excuse me?

18 MR. MICHELSON: When will we see that one?

19 MR. WILSON: As soon as we can get it resolved, we
20 will prepare a revision of the SER addressing that item and
21 submit that to the Committee. I can't predict the timing,
22 though.

23 MR. POSLUSNY: A couple of weeks is a reasonable
24 estimate.

25 MR. MICHELSON: A couple of weeks. Before our

1 April meeting. We'll look for it by April, then.

2 MR. WILKINS: That's the key question. We come
3 back here in April and if you don't have it early enough for
4 that, then there's a discount annuity of significant
5 proportions.

6 MR. WILSON: Now, that gets to the important item.
7 What we see as the next item on the schedule and the pacing
8 item in this review is the ACRS letter on the ABWR review.
9 We're hopeful that in the April meeting the Committee can
10 issue that letter.

11 As you've seen from this, we've issued several
12 versions of the SER and we've had several reviews of what we
13 were anticipating was the last amendment to the application.
14 We're trying to get to that point as efficiently as we can.
15 So what we'd like to do and what we're encouraging GE to do
16 is be sure that all of these comments we've provided and the
17 resolution of the open items are all correctly disposed in
18 their SSAR and that the next amendment, Amendment 34, is the
19 final amendment.

20 Now, in order to do that and to assure that we
21 won't have to do an additional loop through the process,
22 we'd ask the Committee to issue their letter as soon as they
23 can and then when we have seen the letter, GE will know for
24 sure what the Committee expects to see from them and they
25 can complete Amendment 34 and submit it.

1 MR. MICHELSON: This is something the Committee
2 will have to decide, but Amendment 34, in my understanding,
3 is going to be about 6,000 pages. It will answer most -- it
4 will finally document most of the resolutions that we've
5 chatted about, but never have seen committed to in finality.
6 I don't see how we can issue a report until we've seen
7 Amendment 34. So already we have a catch 22 problem.

8 It's up to the Committee. I, for one, would
9 recommend against writing a final report if we don't have
10 Amendment 34, unless we wish to address only through
11 Amendment 32 and cut it off there. Then I think you've got
12 a certification process problem.

13 MR. WILKINS: You said 32. You meant 32 and not
14 33.

15 MR. MICHELSON: I meant 32. Thirty-two is the
16 last complete evaluation.

17 MR. WILKINS: Thirty-three is just --

18 MR. MICHELSON: It will come after that, as well
19 34 will come pretty soon. Thirty-three came in December.
20 We've looked at the material, but a lot of things are still
21 hanging. Obviously, there's a few things hanging to give us
22 that big a revision. I'd like to see what's hanging before
23 I would sign the check. I don't sign checks without filling
24 in the amounts first.

25 MR. CARROLL: Not very often.

1 MR. MICHELSON: Not very often.

2 MR. CARROLL: So what is the timing for this last
3 amendment?

4 MR. MICHELSON: The staff is suggesting that we
5 write our report and then they issue the amendment. I have
6 a problem with that.

7 MR. POSLUSNY: The reason for that is there may be
8 some action items for GE to include in that.

9 MR. MICHELSON: I understand the problem and I'm
10 just trying to highlight it to the Committee. We're in a
11 loop that there's no way to get out of. I would like to see
12 Amendment 34, because it's so big, and I might be willing to
13 not look at Amendment 35, which hopefully is a few pages.
14 But I'd like to see 6,000 pages first.

15 MR. BEARD: Alan Beard, GE. I'd like to comment
16 on that. One reason the amendment is so large is when we
17 issued out the new revised SSAR, we stopped putting in
18 partial pages. So if we get a change that causes a section
19 to spill over onto existing or following pages, we re-issue
20 out that whole section so that we maintain the legibility.

21 The other reason the amendment is going to be so
22 large is as part of this final amendment, with the staff's
23 concurrence, we have agreed that the issue of metrification,
24 putting everything in SI units will be undertaken and
25 completed for this amendment.

1 But I would characterize that the number of page
2 changes due to technical issues is a very small portion of
3 that 5,000.

4 MR. MICHELSON: I hope so, because we're not going
5 to have time to look at 6,000. But, however, finding what
6 we're looking for in 6,000, particularly when they change
7 the pagination of the whole thing, it's just going to be
8 kind of time consuming to find the needle in the haystack.

9 MR. CARROLL: Maybe they can provide us a road
10 map.

11 MR. MICHELSON: Now, if they provide an
12 underlining or something that shows every change provided
13 for our benefit, that would help. However, you have to look
14 at the other changes they made, as well.

15 MR. BEARD: I would like to ask that the Committee
16 consider this. In previous meetings, we have met and
17 discussed this and we asked late on in the process that if
18 there were elements of our presentations that we provided to
19 you that you felt needed to be or had to be incorporated in
20 the SAR, to identify those. To the best of my recollection,
21 I think the only issue in that category was the cleanup
22 water issue.

23 MR. MICHELSON: No. I think you're quite a ways
24 off there. We asked that you be sure that the answers you
25 gave us during the meetings, many of which were in very good

1 written form, but not necessarily what would be in an
2 amendment, but we asked only that you prepare -- change the
3 SAR to reflect those answers. That was the agreement. And
4 now we're going to see if the SAR reflects the answers.
5 That's it. I hope you haven't changed a thing. I hope
6 everything you've said is going to be verified, but I don't
7 think we can sign off on the basis of written material which
8 we have received which is not a part of the docket and which
9 is not a part of anything but the minutes of our meeting.

10 MR. CARROLL: As a practical matter, though, Carl,
11 I think the thing that's concerning GE and the staff are
12 some showstoppers that may be in our Committee letter.
13 Maybe the problem goes away if, after we review the letter
14 at this meeting, we're able to tell them no, there are no
15 showstoppers; there is a need for confirmation that it's
16 been documented, but there are no real showstoppers.

17 MR. MICHELSON: I think that's a fair statement
18 and I don't believe there are.

19 MR. WILKINS: I would say, quite frankly, I'd be
20 appalled if there were any showstoppers right now.

21 MR. MICHELSON: Absolutely. We're not talking
22 about things that are going to stop the show. We're just
23 simply talking about seeing in an SAR what was promised at
24 meetings, but we haven't yet seen documented. That's all
25 we're dealing with.

1 MR. CARROLL: So I think we have the best of all
2 worlds for everybody concerned.

3 MR. MICHELSON: But until we see Amendment 34, we
4 can't say that that has happened.

5 MR. BORCHARDT: This is Bill Borchardt of NRR
6 staff. We see an obvious benefit to receiving a letter.
7 One possible option would be if the ACRS could issue the
8 letter in April and if you needed to place a condition on it
9 to complete your review of Amendment 34, that's certainly an
10 option that's available to you.

11 MR. MICHELSON: But what good is that letter going
12 to do? You can't go to certification with a letter that
13 says, well, we think it's okay, but we want to see Amendment
14 34.

15 MR. BORCHARDT: But we could review and address
16 any concerns that you had to the staff regarding portions of
17 the SER. It allows us to proceed all the way up through
18 completing the SER into a final form that's ready for
19 publication, awaiting receipt of your final conclusion.

20 MR. CARROLL: But the point I'm making, Bill, is
21 that I don't think there are any such items.

22 MR. MICHELSON: I don't either.

23 MR. WILSON: Mr. Chairman, if I could make a --

24 MR. MICHELSON: If there were, they should have
25 been settled before this.

1 MR. WILSON: If I could make a suggestion. As I
2 said earlier, we believe that the advanced SER with these
3 inserts we're providing the Committee will be consistent
4 with this final amendment. That will be the completion of
5 the staff's review. Then if the Committee wants the staff
6 to do some verifications, they could state that in their
7 letter, because we will address any comments the Committee
8 makes in our final SER.

9 MR. MICHELSON: We could write a letter to the
10 effect that we have verified ourselves through Amendment 32
11 and it's subject to the staff verifying that everything that
12 was ever promised in our Subcommittee meetings and in all
13 this writing actually came true in 33 and 34. But you've
14 told me more than once you didn't want to be put in that
15 policing position. If you do, that's great.

16 MR. BORCHARDT: We certainly don't want to -- we'd
17 be happy to verify any specific items that the ACRS
18 identified for us, but I'm very nervous about committing to
19 verifying that everything ever discussed at an ACRS meeting
20 is properly addressed in the SAR.

21 MR. MICHELSON: That's perhaps pushing it a little
22 bit, but, however, there are as many as 50 or 100 questions
23 that were answered for a given -- for the next Subcommittee
24 meeting. If you want to go through and police all those
25 that's fine. I didn't think you'd want to take that

1 responsibility. So we will have to, as best we can,
2 determine that we can sign the check. But to do that,
3 you've got to see the amount filled in first.

4 MR. WILKINS: Why don't you go on, Mr. Wilson?
5 We've identified an area where there's a clear disconnect
6 between what the staff wants and what the Subcommittee
7 wants.

8 MR. WILSON: Right. We want to make the Committee
9 understand our concern that we don't get into several --
10 we're trying to get to the end.

11 MR. WILKINS: It could even be an end to the loop,
12 and that would be even worse.

13 MR. CATTON: There's nothing wrong with a do loop,
14 as long as the integer isn't too big.

15 MR. WILSON: The staff plans to verify Amendment
16 34, just as we have done with Amendment 33, to be sure that
17 all of the consistency problems we've identified to GE are
18 appropriately taken care of and all the issues that -- the
19 resolutions they have provided are, in fact, incorporated.
20 Then we plan to issue the final SER as a NUREG document that
21 will resolve all the safety issues, incorporate all of these
22 legal and editorial comments, and address the ACRS letter.

23 Once we have the final SER published, we'll be
24 ready to proceed with the preparation of a final design
25 approval. That's the next step in the process. Then, at

1 that time, the review of the design control document. Now,
2 at the moment, it hasn't been decided whether that will be
3 done either before or after the FDA. We're awaiting a
4 statement from GE as to which they would prefer. The
5 Commission has relinquished backfit restrictions on the
6 staff if we do it post-FDA. So the staff is ready to
7 proceed either way.

8 Finally, once we have the FDA issued, we'll be
9 ready to start the administrative process of design
10 certification, and that begins with a notice of proposed
11 rulemaking. We'll be preparing a paper that will come up to
12 the Commission that analyzes the ANPR comments, sets forth
13 the proposed rule. We'll come before the Committee and
14 brief the Committee on that and take that to the Commission.
15 I estimate that sometime this summer, presuming that this
16 process with the letter gets worked out, we'll be able to
17 have that up to the Commission.

18 MR. MICHELSON: Clarification. I think you said
19 it before, but make sure I understand, as well. That is by
20 the April Full Committee meeting, there will be no open
21 items in your SER.

22 MR. WILSON: That is our goal. And as I said,
23 we're --

24 MR. MICHELSON: You've got a goal and then the
25 Committee has to decide --

1 MR. WILSON: We're working this last item --

2 MR. MICHELSON: -- write a letter.

3 MR. WILSON: -- and we'll provide an insert as
4 soon as we can.

5 MR. MICHELSON: But your goal right now is to tell
6 us by April that everything is done. Now, we don't look for
7 the editorial changes and stuff. We're looking for the
8 policy and open item issues.

9 MR. WILSON: Yes. That should be the last
10 significant . m.

11 MR. MICHELSON: Yes.

12 MR. WILSON: With that, that's seven years of
13 staff review. Any questions?

14 [No response.]

15 MR. WILSON: Let me just summarize. On both the
16 ABWR review and the System 80+ review, the stage now is that
17 ACRS letters are the pacing item. That's going to have the
18 most impact on the schedule as we go forward.

19 MR. MICHELSON: I'd like to emphasize again that
20 Amendment 34 is the pacing item. We have to get it, I
21 think, to finish our work. So Amendment 34 is the pacing
22 item. We could write off this month perhaps if we had the
23 amendment.

24 MR. CATTON: It will take a month to collate 6,000
25 pages.

1 MR. MICHELSON: It's going to take a while just
2 find all those needles in the haystack that we need to
3 verify were taken care of.

4 MR. WILKINS: And to be sure that in the course of
5 modifying things, they haven't buried some needles that we
6 didn't see.

7 MR. MICHELSON: Some new ones, that's right. I
8 have found on more than one occasion where they've made one
9 fix and they've introduced an even bigger problem in the
10 fix. And now what do you do with those? Well, I think we
11 have to go blind on those.

12 MR. WILKINS: And not in any way denigrating the
13 competence and the efficiency of the General Electric
14 engineers. Human beings do that all the time.

15 MR. MICHELSON: Yes, because they fix your
16 problem, but they introduce another even bigger problem and
17 didn't recognize it. It's not that they did it for another
18 reason.

19 MR. POSLUSNY: Let me add something briefly here.
20 GE, to help the final review, is providing a set of comments
21 that were generated by the Committee with sort of a road map
22 as to where the changes either exist today or will exist in
23 Amendment 34.

24 MR. MICHELSON: We haven't seen that yet.

25 MR. POSLUSNY: It should be coming shortly.

1 MR. MICHELSON: Is that a road map of chapter and
2 verse to where to find the change?

3 MR. EL-ZEFTAWY: It's not exactly a road map.
4 It's just some audit of the things that --

5 MR. MICHELSON: I've seen the preliminary of that.
6 That's just an audit. That doesn't tell me where to find
7 it. It's just got single check marks and double check
8 marks. That doesn't tell you where to find anything. It
9 just says we think we've taken care of it, we being GENE in
10 that case.

11 That doesn't tell us anything. We just now have
12 to find out, well, did they and where do I even look.

13 MR. WILKINS: It tells us the GE things they've
14 taken care of.

15 MR. MICHELSON: Yes.

16 MR. WILKINS: And that's useful information.

17 MR. MICHELSON: It's useful, yes.

18 MR. WILKINS: If GE says we haven't taken care of
19 it, by God, you can be sure they haven't taken care of it.

20 MR. MICHELSON: Some of these that have single
21 check marks on them, I'm anxious to see Amendment 34 because
22 I thought they should be double check marks. I thought, if
23 I understood what they were going to do, there would be no
24 doubt of the answer. But now they put a single check that
25 says, well, we didn't treat it like they wanted, but we

1 treated it in a general -- I forgot the exact nomenclature
2 for those single check marks.

3 MR. WILKINS: I haven't been able to read this. I
4 got it, what, five minutes, ten minutes ago. There's also a
5 single check with a circle around it. What does that mean?

6 MR. MICHELSON: That has a little different
7 connotation.

8 MR. WILKINS: I don't know that we need to answer
9 that question right now.

10 MR. MICHELSON: I think that this is all useful
11 and helpful, but the amendment is what counts.

12 MR. WILKINS: There's the answers.

13 MR. CATTON: Well, there's not many of those.
14 There's only one or two of those, aren't there?

15 MR. WILKINS: I found the page here where those
16 symbols are defined. So I can read that page.

17 MR. MICHELSON: And there are quite a few. I
18 think GE has tried to do a good job of keeping up with
19 what's going on. It's just that we haven't seen the
20 product. We know it's going on. We think it's all going to
21 come out right, but we haven't seen it.

22 MR. CATTON: Do they have this on a word
23 processor?

24 MR. MICHELSON: I'm sure they must.

25 MR. CATTON: If they have the word search, that

1 might help you, Carl.

2 MR. MICHELSON: I don't know that that would be
3 too fruitful. You'll end up with thousands of pages with
4 some of these words. The most helpful thing would be, of
5 course, a road map of here's the issue and here is the
6 section that we think it was taken care of in, and the
7 section being a fairly narrow section and not the whole
8 chapter, for instance. That would have been very helpful.
9 I have not seen that product, but maybe it's here in this
10 new one. I don't know. I just don't see numbers around
11 anything.

12 MR. WILKINS: Particularly, these checks with
13 circles, that's defined as provided elsewhere. I presume
14 that means elsewhere not in in the SAR.

15 MR. MICHELSON: Then they have to tell me where
16 elsewhere is.

17 MR. WILKINS: Yes. It's not the same answer for
18 every one.

19 MR. MICHELSON: It's a little helpful, but not a
20 lot. I think we just have to dig it out. Each member has
21 got certain areas that he has a particular interest in and
22 he ought to go back and look at the amendment to see if the
23 concerns were taken care of. I don't know how we can sign
24 off on a report without doing that.

25 MR. BEARD: And to that effort, GE is certainly

1 willing to, if there are items identified that you are
2 looking for where we specifically incorporated responses,
3 we're willing to do that. However, that list you have is an
4 extremely comprehensive list, representing I don't know how
5 many handfults of meetings. But to undertake that when we
6 still haven't printed out the SSAR in final form is --

7 MR. MICHELSON: I think the problem has been that
8 the drawings show one thing, the words say another. We
9 weren't sure which was right, so we asked you to check it
10 and change one or the other. Now, we've got to go back and
11 see what the right answer was.

12 Generally, they've indicated what the right answer
13 is. So now we're going to go back to see if the drawings
14 and the words now match.

15 MR. CARROLL: Why do we care?

16 MR. MICHELSON: You care on some certain essential
17 things. Watertight doors in the basement, for instance,
18 it's very important to know which ones are and which ones
19 aren't. The drawings were inconsistent with the ITAAC and
20 the ITAAC and the drawings were inconsistent with the words.
21 Clearly, there's got to be a story.

22 They said, yeah, we'll fix it. I even showed them
23 a bunch of doors that weren't right.

24 MR. CARROLL: But why -- that's kind of a staff
25 level of detail, it almost sounds to me like. Why wouldn't

1 we be happy if we knew or if we said we understand that
2 there are appropriate watertight doors from elevation such-
3 and-such down in our letter and it's up to GE and the staff
4 to -- if they disagree with that, they ought to tell us.
5 But if they agree with it, why do we care about some drawing
6 screw-ups. That's something GE and the staff ought to be
7 doing.

8 MR. MICHELSON: It is possible to write such a
9 letter. What you have in front of you so far is not that
10 letter. That letter would be 150 pages long to cover all
11 these items and I didn't think we wanted to get into that.
12 It can be done. There are ways to do it. We can fill in
13 the amount and we expect it to be there on the check, if you
14 wish. But to do that, you've got to cover every item that
15 you had any significant concern on and indicate what you
16 want to see as the answer, and that's being very particular.

17 MR. CARROLL: So what you're saying, Carl, is that
18 a lot of these things you want to check in Amendments 33 and
19 34.

20 MR. MICHELSON: I would like to check on those
21 things of --

22 MR. CARROLL: Or not included in the letter
23 because you're assuming they're going to be taken care of.

24 MR. MICHELSON: In most cases, it only says that
25 we looked at it, we looked at the resolution and we agree.

1 That's what the letter says. Now, you can only do that
2 after you look at the resolution. The letter is written on
3 the assumption that we've seen Amendment 34. If it isn't,
4 it's a new letter.

5 MR. CARROLL: Okay.

6 MR. CATTON: Is there no way that there couldn't
7 be section numbers written in this table?

8 MR. MICHELSON: Could be.

9 MR. CATTON: Would that be possible to do that?

10 MR. BEARD: If there are certain items identified,
11 we can certainly do that. We tried to do that with the
12 latter stage questions that came up. Earlier stuff --
13 that's a very comprehensive list.

14 MR. CATTON: I understand that, but if you just
15 had another column that said SSAR section --

16 MR. CARROLL: I think your point is that a bunch
17 of them you don't think we --

18 MR. BEARD: Rise to that threshold of
19 significance.

20 MR. CARROLL: Yes.

21 MR. WILKINS: I think I also heard him say that
22 they don't have a hard copy of the whole document yet.

23 MR. CARROLL: Yet.

24 MR. CATTON: But people address these issues and
25 somebody typed it with a number at the top of it. So they

1 had to know where they're going.

2 MR. BEARD: From a section number standpoint, we
3 could do that if there are certain questions that people
4 want to ask. The other difficulty we run into, though, is
5 the response may be spread out amongst three or four
6 different sections.

7 MR. MICHELSON: That's the difficulty.

8 MR. CATTON: Then just give the most relevant one.

9 MR. MICHELSON: No. You've got to -- that way,
10 you'll come back and say they didn't take care of my
11 problem, because only part of it was taken care of. If you
12 had looked at all the sections, you would have found that
13 the whole problem was taken care.

14 MR. CATTON: I just thought I was offering a
15 suggestion that went a long way in helping.

16 MR. MICHELSON: I thought that when they issued
17 Amendment 34, we would be done. We would have everything
18 documented. We would have been ready to go. But now we're
19 saying no, you don't get Amendment 34, if that's the case.
20 Then I say that's a whole new consideration, in my mind, at
21 least. It's the Committee's report and it's going to be the
22 Committee's decision how they want to move.

23 You can write the letter and bring a lot more
24 issues in because a lot of things have been resolved since
25 then, we think, and they aren't even in the letter because I

1 had expected to see the resolutions.

2 MR. CARROLL: I don't think that is an option.

3 MR. MICHELSON: I don't think it is either.

4 MR. WILKINS: Well, it's certainly not very
5 helpful to the Commission.

6 MR. MICHELSON: No.

7 MR. CARROLL: Well, I guess I want to think about
8 our letter in the context of what we heard this morning when
9 we actually get into the details of it. There may be a way
10 of resolving a lot of this.

11 MR. BORCHARDT: Regardless of what the committee
12 decides about the letter, I would just like to repeat myself
13 and say that if there are any ACRS concerns or comments that
14 would cause the Staff to have to modify the SER, the earlier
15 we get those comments the better for us.

16 We are in the final stages, as Jerry mentioned, of
17 incorporating the last changes resulting from the OGC review
18 and once that is completed, we will be essentially complete
19 with the SER, so if there are any things that we would need
20 to modify based on the Committee's concerns or comments, we
21 have time to work on that now and it would be most efficient
22 for all of us.

23 MR. WILKINS: Look, you haven't seen Amendment 34
24 either.

25 MR. MICHELSON: They are negotiating it.

1 MR. POSLUSNY: Let me clarify that we spent about
2 almost 10 Staff days last week looking at markups of
3 Amendment 34.

4 MR. WILKINS: Then you are way ahead of us, way
5 ahead of us in that area.

6 MR. POSLUSNY: I would say close to 100 percent of
7 every one of our changes has been incorporated, all from the
8 CDMN and --

9 MR. MICHELSON: We have in front of us a Staff
10 evaluation with insert pages which presumably will cover
11 Amendment 34, so that part -- I think we have got everything
12 we need from the Staff. We never had a whole lot of issues
13 with the Staff to begin with but I think that takes care of
14 the Staff's obligation. I think it is GE's obligation to
15 give us Amendment 34 so we can verify those.

16 I don't care if there is an Amendment 35 that has
17 nothing but typos in it. That's fine. That wouldn't give
18 anybody a problem but this massive amendment certainly can't
19 be written off as typos, I don't think. If it is then they
20 haven't made the changes that we thought they were going to
21 make by now.

22 MR. WILKINS: Well, the changes we thought they
23 would make are buried in 5900 pages of --

24 MR. MICHELSON: Many of them we have yet be
25 confirmed as being a part of the SAR and it is the SAR we

1 are certifying, not the things that we have been told or
2 things we received in writing but never became part of the
3 docket.

4 MR. WILKINS: I wish I could get a better feel for
5 when Amendment 34 might be available.

6 MR. BEARD: The schedule right now, if everything
7 else holds, Amendment 34 will be issued at the end of the
8 month.

9 MR. WILKINS: March 31st?

10 MR. BEARD: March 31st.

11 MR. MICHELSON: So it is going to be in our hands
12 how far after that?

13 MR. BEARD: We will Fed Ex, overnight delivery
14 whatever copies are necessary to support the ACRS.

15 MR. WILKINS: Our April meetings is April what? 5
16 is it or 6? April 6th through the 8th.

17 MR. MICHELSON: Don't forget, the members are gone
18 Thursday and Friday of the week before.

19 MR. WILKINS: Yes, that's correct.

20 MR. MICHELSON: With a travel day of May 31st --

21 MR. WILKINS: No, March 31st.

22 MR. MICHELSON: So March 31st and April 1 are kind
23 of out for most people. I'll stay home if I have to, but--

24 MR. WILKINS: You don't really want to.

25 MR. MICHELSON: I don't really want to stay home

1 for this. Then it is the weekend and then it's full
2 Committee week. Now full committee for April so far I don't
3 know --

4 MR. CARROLL: We start on Tuesday.

5 MR. WILKINS: You've got the System 80-Plus on
6 Tuesday.

7 MR. MICHELSON: I've got a travel day on Monday
8 then so I mean there is no time unless it gets here the
9 early part of the week before. March 31st is probably too
10 late already.

11 MR. WILKINS: Some of these questions, Jerry and
12 maybe if you don't want to address it, we'll kick it up to
13 Mr. Crutchfield, who I see is sitting over here on the side.

14 What are the consequences of our letter coming out
15 in May?

16 MR. CARROLL: Well, let me tell you a problem
17 before you --

18 MR. WILKINS: I know. Those are his consequences.
19 We have got some consequences too.

20 MR. CARROLL: The System 80-Plus letter is going
21 to go out in May hopefully.

22 MR. MICHELSON: I thought June was --

23 MR. CARROLL: Well, our commitment is June but if
24 they can get it in May, let's shoot for it.

25 MR. WILSON: As I said earlier, at this point the

1 ACRS letter is the pacing item in both reviews so when we
2 have that letter on both the reviews we will address them
3 and finalize our SERs and then we will be ready to start the
4 FDA preparation stage so it's the pacing items.

5 MR. WILKINS: I would like to concur with Mr.
6 Michelson's statement that it is not the ACRS letter that is
7 the pacing item. It is the receipt of Amendment 34 that is
8 the pacing item.

9 MR. MICHELSON: Which is what we told the Chairman
10 in our last letter to him. We said if we get 34 in time,
11 we'll do it in April; if we don't, we won't.

12 MR. WILSON: And that is why we are suggesting
13 that you empower the Staff to do that verification and we'll
14 address it in the SER and that will keep things moving
15 along.

16 MR. WILKINS: I suspect we are going to have to
17 discuss this among ourselves Mr. Wilson, Mr. Crutchfield.

18 Do you want to comment on it?

19 MR. CRUTCHFIELD: If I may. This is Denny
20 Crutchfield, with the Staff. If I may offer perhaps an
21 alterative, one of the things tnat the Staff is concerned
22 about is there may be some items that the ACRS feels are
23 important but not show-stoppers.

24 The Staff has to address those. EDO has directed
25 that. The Chairman has directed that. We need to get back

1 to you. We need to address them in the SER. It would be
2 very helpful if we had those up-front, as Bill mentioned.

3 If you wanted to give us a letter in the April
4 timeframe that said as far as we are concerned the technical
5 issues are resolved, we've seen what the Staff has said, we
6 have seen through Amendment 32 what GE has said, we feel
7 that the technical issues are resolved, pending the ACRS
8 verification of looking at Amendment 34.

9 That allows us to proceed and go forward and
10 finalize everything and then if in the May timeframe you
11 need to supplement and say we have looked at Amendment 34,
12 it's clean or there's one or two issues, that makes our job
13 a little easier.

14 If we stack up two ACRS letters together I start
15 to have resource problems.

16 MR. WILKINS: So do we.

17 MR. CRUTCHFIELD: I understand that.

18 MR. WILKINS: All right. What you are suggesting
19 is that we might be able to say in the April timeframe, that
20 we almost make a commitment to say that we are not going to
21 tell you anything new.

22 MR. CRUTCHFIELD: Unless Amendment 34 points out
23 something new, and then tell us, and that's not a problem.

24 MR. MICHELSON: Even many of the technical issues
25 were not even covered in Amendment 32. Some of these GE

1 technical issues have been going on quite a while and they
2 keep promising by Amendment 34 it will be taken care of. It
3 used to be Amendment 33 was going to do it; now Amendment
4 34 is going to do it.

5 MR. CRUTCHFIELD: It used to be Amendment 31 was
6 going to do it.

7 MR. MICHELSON: Yes, we thought it was all done at
8 32 and I would have to go back to even search out to see if
9 I could commit to Amendment 32 on some of them but I mean
10 with enough research we could have started identifying. You
11 are talking about a few days work, to report the whole
12 thing.

13 MR. CARROLL: The letter Denny is suggesting is a
14 short and sweet letter addressed to Taylor, I guess.

15 MR. WILKINS: And it does not meet our statutory
16 obligations.

17 MR. CARROLL: Oh, no, it doesn't.

18 MR. CRUTCHFIELD: And that letter won't come until
19 you have seen Amendment 34 but it tips your hand from a
20 technical standpoint as to what issues you feel are still
21 out there, whether they are show-stoppers or important.

22 MR. MICHELSON: You'll know that pretty soon
23 today, what are still out there in our minds, I believe, but
24 our letter, our report is being written on the assumption
25 that everything we thought GE was going to do turns out to

1 be done in 34. Now we can give you that kind of letter
2 perhaps, even the committee might be willing to give you a
3 preliminary draft to just show you what the issues are or
4 you will hear them today anyhow and the next thing is just
5 give them a copy. It's not unknown to give Staff a copy of
6 what we are dealing with. It's all subject to possible
7 change, but I don't think that will help you any because it
8 is all predicated on everything turning out right in 34.

9 MR. CATTON: Carl, are you suggesting maybe that
10 they get a copy of the attachment?

11 MR. MICHELSON: Yes. That is what I had in mind.

12 MR. CATTON: I think that's a good idea.

13 MR. MICHELSON: However, I don't know if that will
14 help them a lot except it would allow them to sit down and
15 draft everything for their FSAR like everything was going to
16 come out all right and I hope everything is coming out all
17 right.

18 MR. WILKINS: After listening to Mr. Wilson and -
19 - I have forgotten your name, I'm sorry --

20 MR. BEARD: Beard.

21 MR. WILKINS: -- Mr. Beard, I think the
22 probability that everything comes out all right is pretty
23 high, but let me be very blunt about it. I am unwilling to
24 sign a letter which says to the Commission and to the world
25 that everything did come out all right when I don't know

1 that that is the case and if we wait till May I don't have
2 to sign it but I think Tom would probably be just as
3 unwilling to sign such a letter.

4 MR. MICHELSON: I think the Committee can get
5 through the enclosure this session and probably we can vote
6 final on the enclosure, I guess, and send it out, you know,
7 as a preliminary of our thoughts when the final report comes
8 out.

9 MR. CATTON: I think it would be better to send it
10 as a draft.

11 MR. MICHELSON: Well, yes.

12 MR. WILKINS: Labelled as a draft.

13 MR. CATTON: Preliminary draft or something really

14 --

15 MR. CARROLL: Subject to change without notice.

16 MR. MICHELSON: Because we haven't seen Amendment
17 34.

18 MR. CATTON: We do have to go through it because
19 there are a few things about it.

20 MR. BEARD: Let me make an offer on the part of GE
21 to help move this forward.

22 One, if there are items of particular concern for
23 any of the ACRS Staff members, if they will identify those
24 to us, we will get you early draft versions of what will
25 show up in Amendment 34 for your perusal.

1 The second item would be we would be willing to
2 meet, if we can make time, the Wednesday before full
3 Committee next month to sit down with one of the amendment,
4 with full Amendment 34 and if there are any outstanding
5 questions we will point to you where we can do that.

6 MR. CARROLL: That gets in the way of System 80-
7 Plus review.

8 MR. MICHELSON: The Wednesday before he said. He
9 said Wednesday the week before.

10 MR. CARROLL: For a whole week before?

11 MR. BEARD: No, I meant in the afternoon possibly
12 of that day, if there is room for it.

13 MR. MICHELSON: Oh, he is talking about the day
14 before. No, that's no good. No, you can't.

15 MR. WILKINS: To the extent that that is the first
16 time that any members of the Subcommittee will have seen it,
17 that's probably not --

18 MR. MICHELSON: -- not fruitful.

19 MR. WILKINS: -- not fruitful.

20 MR. MICHELSON: To put 6000 sheets of paper on the
21 table and say your needles are in there somewhere.

22 MR. CARROLL: You didn't hear the first part of
23 his offer.

24 MR. WILKINS: The first part of his offer says you
25 tell me what views you want and we'll give you an early

1 versions and we can do that maybe by the middle of March.
2 The middle of March is here already.

3 MR. BEARD: What is extending the process right
4 now is the metrification of the SSAR. We have basically
5 completed all of the technical issue resolution but the
6 metrification is taking, because it is throughout the SSAR
7 and we want to make sure when we make the transition on one
8 that we go back and find out every other place that that
9 number has been moved through the SSAR. It's taking a
10 substantial effort.

11 MR. CATTON: Does that mean that the SSAR is
12 essentially new?

13 MR. BEARD: When I say metrification, we feel,
14 it's GE's position we are in metric units. However, the
15 Staff has taken the position that it needs to be in SI units
16 for the AASTM standard so we are going back in those areas
17 where our units are not in agreement with the SI standards.

18 MR. MICHELSON: It sounds like Amendment 35 and we
19 wouldn't worry about it.

20 MR. WILKINS: Yes. That sounds like a non-problem
21 for us.

22 MR. MICHELSON: I don't know what it was put into
23 getting this thing done. That's editorial, in my opinion
24 and should have been done after our letter. That is an easy
25 one to review.

1 MR. BEARD: The point I am trying to make if there
2 are technical issues that you would like to see how it going
3 to show up in the SAR, we can provide that right now,
4 recognizing that the SAI units may not be in there yet.

5 MR. MICHELSON: You mean you can provide Amendment
6 34 right now?

7 MR. BEARD: No, I do not mean that. Amendment 34
8 will have SAI units in it.

9 MR. MICHELSON: Well, I have to see Amendment 34
10 on those items. I think other members on their items want
11 to see Amendment 34 on their items. When can you get those?
12 It is a big burden on our part. We have to go down now and
13 identify which needles we want them to pull out of the
14 haystack and tell us where they are.

15 MR. WILKINS: It is unfortunate that the
16 metrification question got into this so late. In any case,
17 there is nothing like just jumping on somebody or some
18 group, or company, or staff, or anybody else.

19 But I must say that it would have been a whole lot
20 better if Amendment 34 had been restricted to the technical
21 issues, and that the time and effort that GE is putting into
22 the metrication changes was not delayed until after they got
23 these other things out of the way.

24 I agree with Carl. I think the Committee could
25 have signed off on Amendment 34 and said, "We understand

1 that the units will be cleaned up." Fine, we have no
2 problem. We will have to clean up the units.

3 MR. CATTON: The units have nothing to do with
4 safety. Who cares?

5 MR. WILKINS: Well, they can, but not the SAI
6 units.

7 MR. MICHELSON: They will screw it up worse.

8 MR. WILKINS: They can indeed, and screw threads
9 is the way they get screwed up, too.

10 MR. DAVIS: There was a plane crash because of
11 that unit.

12 MR. MICHELSON: That is all after the fact. We
13 are dealing with the fact that I think we need to see
14 Amendment 34. If we don't see it in April in a sufficiently
15 timely fashion, we have told the Chairman already that we
16 will won't issue a report in April, unless we do some other
17 kind of report. That is a re-write job now. That is a
18 massive thing because many of the items there have been
19 written off as "we agree."

20 Now, that is because we think we know what
21 Amendment 34 will say and we have no problem with it. If it
22 turns out that it doesn't say that, then we have a problem,
23 or if it turns out that we haven't even seen it, then I
24 think there is an ethical problem. You can't make those
25 statements without having seen the material.

1 I, for one, at least, will not sign off on
2 material I haven't seen. I hope no body else does either.

3 MR. WILKINS: All right. Gentlemen, I think the
4 Committee has probably got all the advice they can get from
5 the staff and from GE. We will have to wrestle with this
6 issue. The time which we will wrestle with it will be at
7 4:00 this afternoon when we shall have returned from our
8 meeting.

9 MR. MICHELSON: Do you think we have wrestled
10 enough to get some guidance to the Subcommittee guidance to
11 the Subcommittee Chairman and what to tell the Chairman of
12 the Commission.

13 MR. WILKINS: Oh, yes. We are going to have to
14 discuss that almost immediately.

15 MR. MICHELSON: We have to do that right after
16 lunch. That is why I am protracting this discussion right
17 now.

18 MR. WILKINS: In case you don't know what he is
19 talking about, gentlemen, the Committee is supposed to meet
20 with the Commission at 2:00 this afternoon. We have a
21 period of time set aside late this morning to discuss among
22 ourselves what we are going to say to the Commission on a
23 number of topics, who is going to say it, get it organized,
24 and so on.

25 Carl is absolutely right. The Committee will have

1 to decide this morning what it is going to say to the
2 Commission this afternoon.

3 MR. CARROLL: It sounds like both about ABWR and
4 the System 80.

5 MR. WILKINS: Yes, and the System 80. Yes, that,
6 in fact, is on the agent.

7 MR. CARROLL: And what are our priorities.

8 MR. WILKINS: Or more accurately, what are their
9 priorities because we may have to sacrifice ABWR in order to
10 finish System 80-Plus, or have to sacrifice 80-Plus in order
11 to finish ABWR. In that sort of situation, the Commission
12 ought to be saying which they would prefer. They don't like
13 either of them. It is a very unhappy situation.

14 MR. MICHELSON: I think it is all because we
15 didn't get Amendment 34 on time. It was originally promised
16 for late February, as you recall. Now it is promised for
17 late March. That is already becoming untimely for an April
18 final report.

19 MR. SHACK: Excuse me, could I just clarify Mr.
20 Beard's offer? Did he offer a sort of Amendment 33-1/2
21 which would be Amendment 34 without metrification?

22 MR. BEARD: For selected portions, yes.

23 MR. WILKINS: If he had offered that, I think we
24 could accept it and proceed. But he didn't quite offer
25 that.

1 MR. MICHELSON: This is not anything that is
2 docketed, even. It is just mark-ups of what you would
3 expect to see in 34.

4 MR. WILKINS: And for selected portions, which we
5 have identified.

6 MR. CATTON: We don't know how to identify them.

7 MR. WILKINS: Okay. Does the NRC staff have any
8 other additional words of wisdom?

9 MR. WILSON: I would just say that I think the
10 title of my presentation was appropriate, given this
11 discussion.

12 MR. WILKINS: No, as a matter of fact, in view of
13 Carl's introduction of the purpose of it, which was to bring
14 up to speed some of the members of the full Committee who
15 had not been attending all the Subcommittee meetings.

16 Since I am one of those people, I would like to
17 say thank you. It was helpful and constructive to hear that
18 overview.

19 I also want to thank Mr. Beard from GE for his
20 remarks. Do you have anything further you would like to say
21 on this?

22 MR. BEARD: Not at this time.

23 MR. WILKINS: Okay.

24 MR. CARROLL: What I want to know from Jerry is
25 this cartoon he has. Is it the staff that has its head

1 screwed on straight or the ACRS members?

2 MR. WILSON: No comment.

3 [Laughter.]

4 MR. WILKINS: All right. I regret, incidentally,
5 the snowstorm. I mean, that really wiped out the entire
6 Government -- almost the entire Government.

7 MR. CARROLL: Not the ACRS.

8 MR. WILKINS: But, of course, the ACRS was ready
9 here. We could walk to the building.

10 MR. CARROLL: But not GE.

11 MR. WILKINS: GE was already heard. You fellows
12 who have to get out and shovel your driveways, and who
13 didn't get out in the street and slip and slide to get onto
14 a parking lot called a freeway --

15 MR. MICHELSON: I don't think that would have made
16 any difference. Their being here this once took care of our
17 needs. I don't their being here last month would have
18 changed the schedule one bit.

19 MR. WILKINS: It doesn't sound like it would have.

20 MR. MICHELSON: No, it is a GE schedule that I
21 think is the problem.

22 MR. WILKINS: In that connection, I would remind
23 the Committee members that Dr. Murley did send us the slides
24 that he would have presented had he been able to show up.
25 You all have received those. You look dubious, Ivan.

1 MR. CATTON: I receive a lot of stuff.

2 MR. SEALE: I got two sets, Ivan. You can have
3 one of mine.

4 MR. CATTON: Well, sometimes I receive mine and
5 somebody else's.

6 MR. WILKINS: All possibilities have occurred,
7 yes.

8 But in any case, Dr. Murley has done that. So we
9 do have that material available to us.

10 Well, let me thank the Staff and thank GE for
11 their remarks.

12 We will move into our next agenda item, which is
13 preparation for our meeting with the Commissioners.

14 [Whereupon, at 11:35 a.m., the meeting was
15 adjourned until 8:30 a.m., Friday, March 11, 1994.]

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REPORTER'S CERTIFICATE

This is to certify that the attached proceedings
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NAME OF PROCEEDING: 407th ACRS

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, MD

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Jon Hundley
Official Reporter
Ann Riley & Associates, Ltd.

New Accident Source Terms for Advanced Light Water Reactors

Part II: Detailed Technical Discussion of Key Implementation

Issues and Responses to ACRS Questions

Dr. Frank J. Congel, Director, DRSS/NRR

and

Jay Y. Lee, PRPB/DRSS/NRR

March 10, 1994

SCOPE OF BRIEFING

- **Part I (February 10, 1994 briefing)**
 - ✓ **Overview of draft Commission paper**
 - ✓ **General approach to application of source term parameters**

- **Part II (Today's briefing)**
 - ✓ **Detailed technical discussion of key implementation issues**
 - ✓ **Responses to ACRS questions**

TID-14844 LED TO SAFE DESIGNS

- Intended to over estimate consequences
- Instantaneous fission-product release into containment
- Constant containment leak rate based on its peak pressure
- Sufficient margin of safety (defense-in-depth) in fission-product removal system design

WHY IMPLEMENT A NEW SOURCE TERM ?

- 30 years of research
- Insights from TMI accident
- Better understanding of fission-product transport behavior and removal mechanisms

DRAFT COMMISSION PAPER ON NEW SOURCE TERMS

- Defines design basis accident source term
 - ✓ fission-product release magnitudes into containment
 - ✓ fission-product release timing
 - ✓ fission-product chemical forms

- Describes fission-product transport behavior and removal mechanisms

DESIGN BASIS ACCIDENTS (CHAPTER 15 OF SSAR/SER)

- Loss-of-coolant accident
- Fuel handling accident
- Steam generator tube rupture accident
- Spent fuel cask drop accident
- Main steam line failure outside containment
- Control rod drop accident
- Failure of small lines outside containment
- Feedwater system pipe break outside containment

USE OF DESIGN BASIS ACCIDENT SOURCE TERM

- Radiological consequence assessments
- 10 CFR 100 siting calculations
- Control room habitability evaluations
- Equipment qualification
- Engineered safety features system design
- Containment leak rate and isolation time
- Shielding and vital area access
- Post-accident sampling

DBA SOURCE TERM RULEMAKING

- No rulemaking for DBA accident source term
- Will be used to support an update of 10 CFR Part 50

ISSUE #1: SELECTIVE USE OF NUREG-1465

Technical Bases for the Selective Use of NUREG-1465

- NUREG-1465 derived from a set of severe accident sequences for current LWR designs
- NUREG-1465 used complete core-melt scenarios resulting in reactor pressure vessel failure and core-concrete interaction
- Intact pressure vessel and containment for DBA consistent with use of TID source term for licensing current operating plants
- 10 CFR 100 refers to "...substantial meltdown of core with subsequent release of appreciable quantities of fission-products"

BWR RELEASES INTO CONTAINMENT*

	<u>DBA SOURCE TERM</u>		<u>EX-VESSEL</u>	<u>LATE IN-VESSEL</u>
	<u>GAP RELEASE</u>	<u>EARLY IN-VESSEL</u>		
Duration (hrs)	1.0	1.5	3.0	10.0
Noble Gases	0.05	0.95	0	0
Iodine	0.05	0.22	0.37	0.07
Cesium	0.05	0.15	0.45	0.03
Tellurium	0	0.11	0.38	0.01
Strontium	0	0.03	0.24	0
Barium	0	0.03	0.21	0
Ruthenium	0	0.007	0.004	0
Cerium	0	0.009	0.01	0
Lanthanum	0	0.002	0.01	0

*Values shown are fractions of core inventory.

PWR RELEASES INTO CONTAINMENT*

	DBA SOURCE TERM			
	GAP RELEASE	EARLY IN-VESSEL	EX-VESSEL	LATE IN-VESSEL
Duration (Hrs)	0.5	1.3	2.0	10.0
Noble Gases	0.05	0.95	0	0
Iodine	0.05	0.35	0.29	0.07
Cesium	0.05	0.25	0.39	0.06
Tellurium	0	0.15	0.29	0.025
Strontium	0	0.03	0.12	0
Barium	0	0.04	0.10	0
Ruthenium	0	0.008	0.004	0
Cerium	0	0.01	0.02	0
Lanthanum	0	0.002	0.015	0

*Values shown are fractions of core inventory.

**COMPARISON OF NUREG-1465 VS TID-14844
SOURCE TERM FOR BWRs
(RELEASE FRACTIONS OF CORE INVENTORY)**

<u>Nuclides</u>	<u>TID-14844</u>	<u>NUREG-1465 (SBWR)</u>	<u>EPRI</u>
Noble Gases	1.0	1.0	1.0
Iodine	0.5	0.27	0.30
Cesium	< 0.01	0.20	0.23
Tellurium	< 0.01	0.11	0.06
Strontium	< 0.01	0.03	0.003
Barium	< 0.01	0.03	0.003
Ruthenium	< 0.01	0.007	0.003
Cerium	< 0.01	0.009	< 0.0003
Lanthanum	< 0.01	0.002	< 0.0003

**COMPARISON OF NUREG-1465 VS TID-14844 SOURCE
TERM FOR PWRs
(RELEASE FRACTIONS OF CORE INVENTORY)**

<u>Nuclides</u>	<u>TID-14844</u>	<u>NUREG-1465</u> (CE System 80 +)	<u>EPRI</u> (AP600)
Noble Gases	1.0	1.0	1.0
Iodine	0.5	0.4	0.38
Cesium	< 0.01	0.3	0.30
Tellurium	< 0.01	0.15	0.08
Strontium	< 0.01	0.03	0.004
Barium	< 0.01	0.04	0.004
Ruthenium	< 0.01	0.008	0.004
Cerium	< 0.01	0.01	0.00004
Lanthanum	< 0.01	0.002	0.00004

ISSUE #2: IODINE CHEMICAL FORM

(percent)

	TID-14844	NUREG-1465	SECY	EPRI
Elemental	91	5	4.75	2.85
Particulate	4	95	95	97
Organic	5	*	0.25	0.15

* Not Addressed

ISSUE #2 IODINE CHEMICAL FORM CONT'D

Technical Basis for 0.25 percent organic iodine

5 percent of iodine in elemental form (5%)
converted to organic form

	BNWL	EPRI	ORNL	SECY
Organic Iodine Conversion	3.5%	5.0%	1.25%	5.0%

ISSUE #3: EQUIPMENT SURVIVABILITY

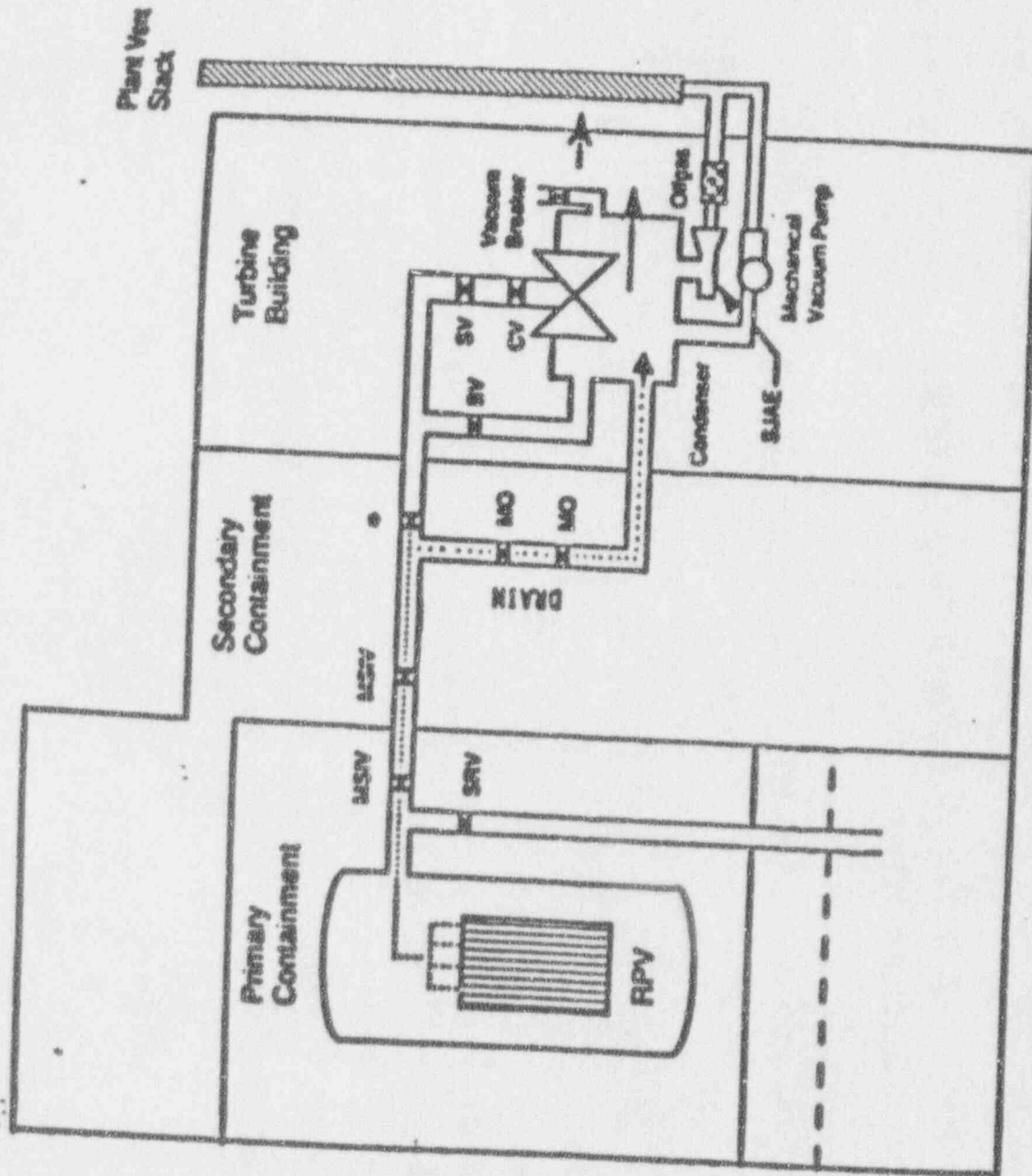
- Radiation environment based on severe accident releases (RPV failure and core-concrete interaction)
- Evaluation of survivability must also consider temperature, pressure, and humidity
- Acceptance based on reasonable assurance that equipment will operate in severe accident environment for which they are intended and over the timespan for which they are needed
- In reviewing ABWR and CE System 80 + , the staff concluded that
 - NUREG-1465 acceptable for EQ/DBA (gap and in-vessel releases) and for equipment survivability (gap, in-vessel, ex-vessel, and late in-vessel releases).

IODINE DEPOSITION ON BWR STEAMLINES

- Instantaneous and homogeneous mixing is conservative because it provides less plate-out and shorter hold-up time.
- Applied to GE/ABWR and one operating BWR

	<u>ABWR</u>	<u>BWR</u>
Maximum allowable MSIV leak rates	140 cfh	250 cfh
Current limit	NA	45 cfh

- Requires main steam piping and condenser to remain structurally intact after SSE to act only as holdup volume (7/21/93 SRM approved)
- Determined on case-by-case basis using site meteorological data and design specifics using the staff's model.



ISSUE #5

HOLDUP IN SECONDARY CONTAINMENT (SC)

(only applicable to SBWR)

- **Design leak rate < 25 w/o per day; to be verified by COL holder's Technical Specifications (primary containment leak rate assumed to be 0.5 w/o per day)**
- **SC has slightly positive pressure ($\frac{1}{4}$ " WG) following a DBA**
- **Applicant (GE) is requesting credit for fission product holdup (for decay) only for DBA.**
- **SC is not assumed to maintain integrity under severe accident; no credit is taken**

ISSUE #6: FP RELEASE TIMING

	<u>TID</u>	<u>NUREG-1465</u>	<u>EPRI</u>	<u>SBWR</u>
● BWR				
Gap Release	0	30s	1h	
In-Vessel Release	0	1.0h	1 to 3h	0.27h
Ex-Vessel Release	0	2.5h	3 to 24h	2.28h
● PWR				
Gap Release	0	30s	1h	
In-Vessel Release	0	0.5h	1 to 5h	1 to 5h
Ex-Vessel Release	0	1.8h	5 to 24h	5 to 24h

ISSUE # 6: FP RELEASE TIMING (cont.)

- CE System 80 + consistent with draft NUREG-1465 timing
- Staff to consider design-specific accident sequence timing if sufficiently justified by applicant (AP600, SBWR)
- No impact on diesel generator start-up time for the purpose of DBA prevention
- No effect on containment design; may affect containment isolation time
- Late in-vessel release timing derived from NUREG-1150

ISSUE #7: AEROSOL DEPOSITION IN CONTAINMENT

- Current staff position considers two natural processes for aerosol removal within containment:
 - ✓ Sedimentation (gravitational settling and agglomeration)
 - ✓ Diffusion mechanisms
 - Diffusiophoresis (condensing on heat sink)
 - Thermophoresis (deposition due to thermal gradients)
- Credit for deposition is essential when no spray system provided
- Well-mixed assumption is not conservative due to potential direct leakage pathway

CONTAINMENT PRESSURE LOAD

- **Source term is not a factor for determining containment peak pressure**
- **No fission-product energy accounted for containment heating**
- **No change in DBA specification for containment pressure loading**

ISSUE #8
AEROSOL REMOVAL BY BWR SUPPRESSION POOL

- SRP 6.5.5 (ca. 1988) credits removal of particulate and elemental iodine by scrubbing in pool
- Instantaneous fission-product releases in conjunction with initial containment pressure surge following a DBA
- DF of 2 credited for ABWR (TID source term)
- GE requested no DF for SBWR design

ISSUE #9: USE OF CONTAINMENT SPRAY SYSTEMS

- Spray systems faced with different fission-product chemical species (primarily particulates) relative to the TID source term
- Evolutionary designs (ABWR & System 80+) provide safety grade spray systems
 - ✓ ABWR designed to TID source term (no credit requested by GE)
 - ✓ System 80+ designed to new source term
- Passive designs have not provided safety grade spray systems
 - ✓ SBWR design provides non-safety spray
 - ✓ AP600 design provides no spray system

ISSUE #10
USE OF ESF ATMOSPHERE CLEANUP SYSTEMS

- Engineered safety feature (ESF) atmosphere cleanup systems include:
 - ✓ High efficiency particulate air (HEPA) filters
 - ✓ Charcoal adsorbers

- Additional demands on HEPA filters
 - ✓ Iodines in particulate form
 - ✓ Non-radioactive aerosols

ISSUE #11

ONSITE ATMOSPHERIC DIFFUSION MODEL

- New model not related to source term efforts
- Produces estimates of airborne activity at control room air intake which result from leakage from various in-plant sources
- New model is more realistic, can be used for operating plants and ALWR designs

ISSUE #12: TUBE FAILURE IN SBWR PCCS

- SBWR passive containment cooling system (PCCS) removes decay heat from containment after a LOCA
- PCCS loops are an extension of containment and do not have isolation valves
- In draft source term Commission paper, staff considered and proposed their failure to be a new DBA, as it would result in containment bypass. Final staff position will be addressed later.

**ALWR Program Comments on
NRC Source Term**

Presented to ACRS

David E.W. Leaver
John Trotter

March 10, 1994

General Comments

- NRC's work on the source term has been high quality and will be of significant benefit to nuclear plant safety since it provides a more rational basis for fission product mitigation system design
- A few areas of the source term are still unresolved between industry and NRC as discussed below
- Draft NUREG 1465 is based on operating plants; industry notes that plant specific ALWR design features will have an important effect on source term, and that regulations should explicitly allow for plant specific source term variations based on such features

Unresolved Source Term Issues (from 1/27/94 meeting between NRC and industry)

- Timing (NRC #6)
- Containment Natural Aerosol Removal (NRC #7)
- Selective Use of Draft NUREG 1465 (NRC #1)
- Iodine Chemical Form (NRC #2)
- Secondary Building Holdup (NRC #5)
- Containment Spray (NRC #9)
- Failure of Heat Exchanger Tubes in SBWR PCCS (NRC #12)
- Non-Fission Product Aerosol Quantity

All of these issues, if not properly resolved, could significantly (and unnecessarily) complicate the ALWR designs

Positions on Unresolved Issues

- Timing
 - Draft SECY states that as a guideline the staff proposes to start the gap release no later than 10 minutes into the accident (with credit for leak before break) and the early in-vessel release no later than 30 minutes (PWR) and 60 minutes (BWR)
 - Passive plant designers do not agree with this guideline since it significantly underestimates the time to the beginning of gap and fuel release in both passive plants
 - A more meaningful, useful guideline would be to start the gap release at approximately 1 hour, with a requirement for plant specific justification
- Containment natural aerosol removal
 - Draft NUREG 1465 includes natural aerosol removal coefficients for operating plants (NUREG 1150), based on dry conditions late in the accident sequence
 - Passive plant designers do not agree with these coefficients since they are not applicable to ALWRs; if coefficients are to be included, they should be representative of ALWR designs

Positions on Unresolved Issues (continued)

- Selective use of draft NUREG 1465
 - EPRI agrees with use of gap and early in-vessel releases for DBA
 - EPRI generally agrees with volatile release fractions
 - EPRI does not agree with the draft NUREG 1465 in-vessel and ex-vessel low volatile release fractions since they are much larger than warranted based on experiment and TMI-2 data
- Iodine chemical form
 - Draft SECY specifies 0.25% organic I for PWR and BWR
 - For BWRs, organic I fraction is much lower (0.05% was suggested by industry) since the gaseous I₂ fraction is much lower due to larger water volumes
- Secondary building holdup
 - Draft SECY states that AP600 is not crediting secondary building holdup
 - AP600 does want credit for secondary building holdup in PAG dose calculation

Positions on Unresolved Issues (continued)

- Containment spray
 - Draft NUREG 1465 notes that existing SRP guidance on spray removal coefficients needs to be reevaluated; an RES contractor report provides a reevaluation, but does not consider the effect of hygroscopic aerosols and has limited discussion of mixing of sprayed and unsprayed regions
 - Hygroscopicity is an important (and real) phenomenon for aerosols, especially in a spray environment where humidity is high; mixing rates are significantly higher than SRP guidance; industry has provided information to NRC on these matters and believes it should be factored into the regulatory guidance
- Failure of Heat Exchanger Tubes in SBWR PCCS
 - The draft SECY states that PCCS tube failure is a new DBA for SBWR
 - Industry does not agree that this should be a DBA; GE will be providing additional information on this in response to RAI 470.10

Positions on Unresolved Issues (continued)

- Non-Fission Product Aerosol Quantity
 - Draft NUREG 1465 specifies a fixed amount of non-fission product (inert) aerosol mass released as part of the source term; this greatly overestimates the inert release for SBWR (and would complicate the design from the standpoint of heat exchanger tube fouling)
 - Industry has provided information to NRC which supports a ratio of about 1:1 for inert to fission product aerosol mass for BWRs; for SBWR, this results in a number that is less than the NUREG 1465 number by a factor of about 13 (780 kg vs. 60 kg)

Staff presentation on the
Design Certification
review of ABWR

The Saga Continues

by Jerry N. Wilson
NRR/ADAR
February 11, 1994

ACRS



DESIGN CERTIFICATION RULEMAKING

1987 - Standardization Policy Statement

1988 - Draft 10 CFR Part 52

1989 - 10 CFR Part 52 Issued

1989-'93 - Additional Design Requirements

1990 - Level of Detail for Design Certification

1991-'92 - ITAAC for Design Certification

1992 - Rulemaking Procedures for Design Cert.

1992 - Energy Policy Act

1992-'93 - Form and Content for a DC Rule

1993 - ANPR for Design Certification Rule

1993-'94 - Guidance for a Design Control Document

1994 - Draft Design Certification Rule and
Environmental Assessment for SAMDAs

ABWR DESIGN REVIEW

1987-'89 - Application submitted in Modules

1988 - Application Docketed as STN 50-605

1991 - Six "draft" SERs issued by staff

1992 - Application Re-docketed as 52-001
"draft-final" SER issued (> 300 open items)

1993 - Certified Design Material (Tier 1) submitted
Technical Specifications submitted (STS)
Advance copy of SER issued (14 open items)

1994 - SSAR Amendment #33 consistency reviews - C
Editorial review - C
Legal review - C

-
- Staff issues "SER inserts" for open items
 - ACRS issues letter on ABWR review

Staff performs SSAR Amendment #34 review

Issue "Final" SER (NUREG version) which:
-resolves all safety issues
-incorporates legal & editorial comments
-addresses ACRS letter

Prepare Final Design Approval (Cond. or Cert.)
Perform Design Control Document review
Issue proposed rule for Design Certification