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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

544th MEETING

VOLUME II

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THURSDAY, JULY 12, 2007

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The meeting was convened in Room T-2B3
of Two White Flint North, 11545 Rockville Pike,
Rockville, Maryland, at 8:30 a.m., Dr. William J.
Shack, Chairman, presiding.

MEMBERS PRESENT:

WILLIAM J. SHACK	Chairman
MARIO V. BONACA	Vice Chairman
SAID ABDEL-KHALIK	ACRS Member-At-Large
GEORGE E. APOSTOLAKIS	ACRS Member
J. SAM ARMIJO	ACRS Member
MICHAEL CORRADINI	ACRS Member
THOMAS S. KRESS	ACRS Member
OTTO L. MAYNARD	ACRS Member
DANA A. POWERS	ACRS Member
GRAHAM B. WALLIS	ACRS Member
SANJOY BANERJEE	ACRS MEMBER

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1 NRC STAFF PRESENT:

2

3 JOE JONES

4 SHAWN BURNS

5 RANDY SULLIVAN

6 TONY McMURTRAY

7 MALCOLM WIDMANN

8 KATHY HEANY

9 EVA BROWN

10 ALSO PRESENT:

11 DAVID LEAVER

12 STEPHEN HESS

13 MARTY HUG

14 DAVID LANGLEY

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

8:26 a.m.

CHAIRMAN SHACK: The meeting will now
come to order.

This is the second day of the 544th
meeting of the Advisory Committee on Reactor
Safeguards. During today's meeting the Committee
will consider the following:

Draft NUREG-9654 Supplement 3, "Criteria
for Protective Action Recommendations for Severe
Accidents";

Browns Ferry Nuclear Plant Unit 1
Restart Activities;

Future ACRS Activities/Report of the
Planning and Procedures Subcommittee;

Reconciliation of ACRS Comments and
Recommendations;

Subcommittee Report on the State-of-the-
Art Reactor Consequence Analysis (SOARCA) Project;

Status Report on the Quality Assessment
of Selected NRC Research Projects, and;

Preparation of ACRS Reports.

The meeting is being conducted in
accordance with the provisions of the Federal
Advisory Committee Act.

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1 Mr. Cayetana Santos is the Designated
2 Federal Official for the initial portion of the
3 meeting.

4 We have received no written comments
5 from members of the public regarding today's
6 session. We have received a request from Mr. David
7 Leaver representing NEI and EPRI for time to make
8 oral statements regarding draft NUREG-0654.

9 A transcript of portions of the meeting
10 is being made, and it is requested that speakers use
11 one of the microphones, identify themselves and
12 speak with sufficient clarity and volume so that
13 they can be readily heard.

14 Our first topic today is the draft NUREG
15 on the criteria for protective action
16 recommendations. And I would note that Dr. Powers
17 has a conflict of interest in this since he is
18 employed by Sandia National Laboratory.

19 And Mario?

20 VICE CHAIR BONACA: Yes. Good morning.

21 Current guidance for protective action
22 accommodation is contained in Supplement 3 to NUREG-
23 0654. And this guidance right now has a high
24 emphasis on evacuation. And so the Staff is
25 concerned that the emphasis on Supplement 3 on early

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1 evacuation may have added an unintended consequence
2 of not having proper consideration of sheltering at
3 subsurface sits.

4 And therefore, in addition to that,
5 since Supplement 3 was issued there have been
6 significant technological advances in emergency
7 planning and evacuation at facilities and
8 communications and so on and so forth, which really
9 make sheltering an interesting alternative in
10 certain scenarios. Because of all these issues, the
11 Commission issued an SRM in 2003 directing the Staff
12 to evaluate the NRC's prior guidance to assure that
13 it continues to reflect the Staff's current state of
14 knowledge. And what they are presenting to us today
15 is the result of this SRM, started on and conducted
16 by the Staff and Sandia. And we will hear about the
17 results of this particular study.

18 For the purpose of the meeting today
19 since we have a second presentation by the industry
20 of the same subject--and also we need to go around
21 the table and get inputs to me at the end of the
22 presentations so I can go and write a letter. We
23 have scheduled a presentation by the Staff to last
24 until 9:50 approximately this morning. And then we
25 will have a 15 minute presentation by the industry.

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1 Unfortunately, they have an interesting report that
2 the Staff has not had a chance to review, and we
3 have not reviewed. But you will hear from them what
4 their views are. And finally we will go around the
5 table with some inputs to me for this letter, given
6 that time is short.

7 So with that, I'll turn it over to
8 Randy.

9 MR. McMURTRAY: Thank you, Dr. Bonaca.

10 Good morning. I'm Tony McMurtray. I'm
11 the Chief of the Emergency Preparedness Regulatory
12 Approvements and Outresearch Branch.

13 We're here today to present the results
14 of the NRC study of the protective action
15 recommendations or PARs.

16 We undertook this study to find out if
17 alternative protective actions could reduce public
18 dose compared to the current PARs available during a
19 severe accident.

20 The NRC Staff recommended a review of
21 the PAR guidance found in NUREG-0654 Supplement 3
22 several years ago. The Commission directed the Staff
23 to perform the study of PARs and the study began in
24 2004. The results of the study indicated that
25 enhancements to the current PARs could reduce public

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1 dose in certain situations.

2 Following the review by the ACRS we plan
3 to provide the results to the Commission, issue a
4 NUREG providing details regarding this study and
5 eventually hope to review and update NUREG-0654 to
6 incorporate the recommendations from this study.

7 Randy Sullivan and my staff has been the
8 lead technical review of the study from the
9 beginning. I am pleased to introduce Randy
10 Sullivan.

11 MR. SULLIVAN: Thanks. And thank you to
12 the Committee for meeting with us on Thursday
13 morning. I appreciate you accommodating our
14 schedule.

15 Well, we've been through most of the
16 first couple of slides already, I'm happy to say.

17 We began in late 2004 and now we're
18 here. This is the actual SRM that we're working
19 against, and that began the PAR study, as we call
20 it.

21 I want to talk a little bit about
22 background so that we can understand how we got
23 where we are now. If you study nuclear plant
24 emergency preparedness you can tease out of the
25 regulations, the guidance, the technical basis for

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1 it. There is an emergency preparedness planning
2 basis and it really can be summarized in just a few
3 bullets:

4 Accidents are unlikely, no worse than
5 the Commission safety goal.

6 Accidental releases are no greater than
7 those releases identified in WASH-1400, way back in
8 the Rasmussen study from MIT. That's the basis of
9 the emergency planning zones, both the 10 miles and
10 the 50 mile ingestion zone.

11 A little more difficult to tease out is
12 that the fast breaker, we call it, or the large
13 early release is part of the ET planning basis. You
14 find that in the notification regulations that
15 require, essentially, a 30 to 45 minute time frame
16 to be notifying the public of the need to take
17 protective actions. That is a very demanding
18 regulation. It's not so tough on the nuclear plant
19 operator to make their notifications within 15
20 minutes of declaration of an emergency, but the
21 subsequent 15 or so minutes for the state or county
22 to make notifications to the public really is quite
23 a demanding regulation. And we're going to talk
24 about that further.

25 MEMBER WALLIS: Now can I ask you, now

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1 in Figures 3.1., 3.2 in the report you seem to show
2 that some of these short release, short time
3 releases were some of the more frequent ones, which
4 rather surprised me when you have a plot of time in
5 frequencies. And it looks as if some of these early
6 releases were some of the more frequent releases.
7 Is that case or did I misunderstand something?

8 MR. SULLIVAN: I'll defer to Shawn.

9 MR. BURNS: Yes. Well, we'll be going
10 over those.

11 MEMBER WALLIS: You will be going over
12 them? I wondered if you were going to do that or
13 not.

14 MR. BURNS: Yes.

15 MEMBER WALLIS: I wasn't sure. Okay.

16 MR. BURNS: Maybe if we could defer it
17 until --

18 MEMBER WALLIS: Because they seem to be
19 the ones where you have to act quickly. And if they
20 are more frequent, then it means they're more
21 important than we thought, perhaps.

22 MR. BURNS: Well, based on the
23 references that we looked at.

24 MEMBER WALLIS: Okay. You're going to
25 get into that.

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1 MR. BURNS: But we'll give you some more
2 details.

3 MEMBER WALLIS: Thank you.

4 MR. BURNS: Right.

5 MEMBER APOSTOLAKIS: So what is the
6 basis for the first sub-bullet? How do we know, that
7 the accident probabilities are within the bounds?
8 And even if they are not, how do they effect the
9 emergency planning?

10 I mean, the NUREG-1150 studies did only
11 five plants, right?

12 MR. SULLIVAN: My premise is that the
13 Commission's safety goal is met.

14 MEMBER APOSTOLAKIS: But if they are
15 not, how would that affect your work?

16 MR. SULLIVAN: I think we would do
17 something different.

18 MEMBER APOSTOLAKIS: Like?

19 MR. SULLIVAN: We would --

20 (Phone rings).

21 MR. McMURTRAY: That answer is coming
22 in.

23 MR. SULLIVAN: Emergency preparedness is
24 already a very demanding regimen.

25 MEMBER APOSTOLAKIS: Right.

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1 MR. SULLIVAN: If you really believe
2 that the accidents were more frequent than the
3 Commission's safety goal, then I suppose you would
4 do something else. You would increase th low
5 population zone; you would demand that these plants
6 can't exist without a larger owner controlled area;
7 you would do any number of things.

8 MEMBER WALLIS: I think you've made a
9 mistake here. I mean, the Commission's safety goals
10 say nothing about frequency of accidents. They talk
11 about doses and they talk about fatalities, but
12 there could be a huge number of accidents that led
13 to not many consequences. They don't say anything
14 about frequency of accidents in their safety goals.

15 MR. SULLIVAN: Consequences then I
16 should have used. Thank you.

17 MEMBER APOSTOLAKIS: So when you say the
18 probability of accidents, you mean core damage
19 frequency and --

20 MR. SULLIVAN: I really mean the
21 probability of consequences to the public. I
22 believe Dr. Wallis is right.

23 MEMBER APOSTOLAKIS: Deaths?

24 MR. SULLIVAN: Well, the safety includes
25 --

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1 MEMBER APOSTOLAKIS: Safety goal is
2 individual risk?

3 MR. SULLIVAN: Yes.

4 MEMBER APOSTOLAKIS: So you're not
5 really referring to accidents?

6 MR. SULLIVAN: Right.

7 MEMBER APOSTOLAKIS: Then I'm saying
8 that we really don't know whether these are met, the
9 goals are met because we haven't done the analyses.

10 I mean, they would have to be violated
11 in a very provocative way for your work to be
12 changed, I think. I mean, now there is this doubt.

13 MR. SULLIVAN: Really?

14 MEMBER APOSTOLAKIS: Yes.

15 MR. SULLIVAN: That -- that --

16 MEMBER APOSTOLAKIS: Well, first of all,
17 you look at 1150 and even the results they have
18 there, they say they assume evacuation of 90 percent
19 of the population. Thank you very much. Period. No
20 uncertainty whatsoever.

21 MR. SULLIVAN: So --

22 MEMBER APOSTOLAKIS: But I still don't
23 know why you need that bullet. I mean if--

24 MR. SULLIVAN: Okay.

25 MEMBER APOSTOLAKIS: --the individual

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1 risk was one, I can see us doing things. But I
2 don't think that we can argue that some plants
3 probably do and some plants may not. Even core
4 damage frequency, I mean there were a significant
5 number, right?

6 MEMBER WALLIS: Well, maybe if we get to
7 these figures I was talking about, then we can be
8 clearer and it won't be based on the safety goals.
9 It will be based on something detailed.

10 MEMBER APOSTOLAKIS: Okay.

11 VICE CHAIR BONACA: But it seems to me
12 that when it was done, they selected a set of
13 accidents if the different characteristics. I mean,
14 so far as source term, release time and the time
15 between the declaration of emergency --

16 MR. SULLIVAN: That's right.

17 VICE CHAIR BONACA: -- and the plum,
18 okay, coming out of the reactor. And they're
19 covering the span of the possibilities for which the
20 emergency plan has to provide coverage. I mean, the
21 question is what is credible and incredible.

22 MEMBER APOSTOLAKIS: But what I'm saying
23 is that that work and this statement totally have
24 nothing to do with each other.

25 VICE CHAIR BONACA: That's true. It's

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1 probably true.

2 MR. SULLIVAN: Right. That's right.
3 However, I would have thought that this bullet was a
4 pretty safe statement.

5 MEMBER APOSTOLAKIS: No, no. Not before
6 this Committee.

7 MR. SULLIVAN: Yes, I guess not. I mean
8 to say that there are nuclear plants out there that
9 don't meet the safety goal would be--

10 MEMBER APOSTOLAKIS: Oh, yes. Even core
11 damage frequency there were 19 BWRs that went above
12 the ten to the minus 4 --

13 MEMBER WALLIS: Well, I think we should
14 move on.

15 MEMBER APOSTOLAKIS: And that's why
16 they're goals.

17 MEMBER WALLIS: But I don't think it
18 affected your planning.

19 MR. SULLIVAN: No, it hasn't. It has
20 not.

21 This is another uncontroversial slide.
22 The emergency preparedness regimen is not risk-
23 informed. It's basically a deterministic regimen
24 that would establish.

25 MEMBER WALLIS: Should it be?

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1 MR. SULLIVAN: Well, that would be a
2 policy issue. I mean, I think I know how to
3 approach the issue, but it certainly wouldn't be a
4 decision made at the staff level.

5 MR. McMURTRAY: And Randy I will bring
6 up, we have indicated the Commission in our SECY 06-
7 200, and in fact we are going to look at least some
8 performance-based -- I mean we're going to explore
9 some of that.

10 MEMBER WALLIS: And that's my question
11 later on maybe. If it's not risk-informed and
12 performance-based, what's your measure of success?
13 How do you know it's any good.

14 MR. SULLIVAN: Right. Actually that's
15 Commissioner Jaczko's point is that he would like us
16 to have a better measure of success. But to address
17 that issue I would say to you we have a standard of
18 reasonable assurance for approving emergency plans
19 and allowing plant operation. Now, if you want to
20 tease out the basis of that reasonable assurance
21 determination, I mean I suppose it might not be as
22 rigorous as some might prefer. But there is a
23 regulatory basis for it if you want to go into it.

24 It's really a defense-in-depth measure.

25 MEMBER WALLIS: Well, do you have any

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1 sort of measure that without this you would kill so
2 many people and with this you would kill so many,
3 and therefore you've got a success area of so much
4 or something?

5 MR. SULLIVAN: Certainly.

6 MEMBER WALLIS: A thing like this?

7 MR. SULLIVAN: No, certainly not.

8 MEMBER WALLIS: Can't say that?

9 MR. SULLIVAN: No. Reasonable assurance
10 is -- you would have to say it's a judgment
11 standard. It's based on approval of plans and
12 procedures and demonstration of those plans and
13 procedures in biennial exercises, which most of you
14 have seen, right? They're a pretty complicated
15 affair, especially considering they started back in
16 the '80s and have been going on for 20 years.

17 MEMBER WALLIS: So it is a ritual that
18 you perform?

19 MR. SULLIVAN: There are those who might
20 call it a ritual. But there's the possibility of
21 findings. There's the possibility of consequences
22 to plant operations if the ritual is not performed
23 correctly. But I think that that wouldn't --

24 MEMBER MAYNARD: I don't think that
25 would characterize well it at all, being a ritual.

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1 MR. SULLIVAN: No. No.

2 MEMBER MAYNARD: This is very demanding
3 involving state, local, plant --

4 MEMBER APOSTOLAKIS: But they are
5 demanding rituals. And you go through the motion is
6 what I'm saying.

7 Now what's the measure of how well you
8 did, that's what I was getting at?

9 MR. McMURTRAY: Well, there is criteria.
10 I mean both FEMA uses criteria to evaluate the off
11 site using the one site--

12 MEMBER APOSTOLAKIS: So you do have some
13 measure of performance?

14 MR. McMURTRAY: Oh, yes, we do. Of
15 course. And, in fact, there are criteria that the
16 NRC uses under the inspection program. And if the
17 licensees don't perform well, they're put into the
18 ROP process and they can get everything up to a
19 yellow finding with that. So there are consequences
20 for the utility as well as for the states and
21 locals.

22 MEMBER APOSTOLAKIS: Yes.

23 MEMBER MAYNARD: There are other
24 objectives that have to be met and have to be
25 demonstrated.

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1 MR. McMURTRAY: Right. That's correct.

2 MEMBER MAYNARD: And some of those are
3 evaluated by the NRC, some of them are evaluated by
4 FEMA.

5 MR. McMURTRAY: By FEMA, that's correct.

6 MEMBER APOSTOLAKIS: We are the agency
7 that's I think pioneering the use of risk
8 information in regulation. And maybe, you know,
9 what you have done so far is not risk-informed, but
10 I was reading the EPRI report that was submitted was
11 on risk-informed evaluation of protective action
12 strategies and it seems to me that it's fairly
13 straightforward to risk-inform the process. And I
14 understand you have not had a chance to review this.

15 MR. SULLIVAN: Well, no, no. Actually,
16 we did review it. I think it's a nice report.

17 MEMBER APOSTOLAKIS: So we should do the
18 same thing then, shouldn't we?

19 MR. SULLIVAN: Should we?

20 MEMBER APOSTOLAKIS: Yes. Because the
21 metrics are all there. And, again, it will be risk-
22 informed. You don't have to reject everything else
23 you are doing. But I see curves, I see how they
24 change with different strategies. And that is really
25 very valuable, it seems to me.

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1 MR. SULLIVAN: I thought that the report
2 is an interesting piece of work.

3 MEMBER APOSTOLAKIS: Yes.

4 MR. SULLIVAN: However --

5 MEMBER WALLIS: Let's move on.

6 VICE CHAIR BONACA: We haven't had an
7 official review of it, nor have we had an
8 opportunity to review --

9 MEMBER APOSTOLAKIS: Can't hear you,
10 Mario.

11 VICE CHAIR BONACA: I'm saying that the
12 Staff has not officially reviewed it. We have not
13 received any comments from the Staff, nor--

14 MEMBER APOSTOLAKIS: It's not safety
15 evaluation review?

16 VICE CHAIR BONACA: Yes. The other issue
17 is that --

18 MEMBER APOSTOLAKIS: So what?

19 VICE CHAIR BONACA: -- it seems that
20 emergency planning is a defense-in-depth measure.
21 They are taking some scenarios from NUREG-1150.
22 There are many reasons for accidents that may not be
23 covered by 1150. Okay.

24 MEMBER CORRADINI: That's the source of,
25 I think, of the shape of the Figure 3.1 what you

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1 just said. That's my interpretation.

2 VICE CHAIR BONACA: Figure 3.1. Okay.

3 MEMBER KRESS: I would like to know just
4 out of curiosity what it is about emergency planning
5 that characterizes it as a defense-in-depth measure.

6 MR. SULLIVAN: It's quoted that way in
7 the safety goal policy. It's --

8 MEMBER KRESS: Well, does that make it a
9 defense-in-depth measure, though?

10 MR. SULLIVAN: I march to that drummer,
11 yes.

12 MEMBER KRESS: The reason I ask is that
13 if you do the PRAs and if a lot of plants wanted to
14 meet the safety goals as a criteria, then you have
15 to invoke emergency planning to meet it. If you
16 don't, you don't meet it. To me that's not a
17 defense-in-depth measure. That's required to meet
18 the safety goals. And for some plants you don't
19 need it, but you still have it and there it might be
20 a defense-in-depth measure. And that's why I was
21 asking what it is that characterizes it as a
22 defense-in-depth.

23 VICE CHAIR BONACA: Well, what I meant
24 to say before as a defense-in-depth from that
25 perspective is that the site has to be ready to deal

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1 with any event, okay, even for example an early
2 release. Although if you go to 1150, you may find
3 that those accidents like the one using these
4 analyses, ten to the minus eight, you could say is
5 noncredible. Well, we unfortunately in these modern
6 times, you know there are some credible early
7 releases that are not necessarily coming from 1150.
8 So we have in my judgment some representative
9 sequences to cover the span of what the plant may
10 face and once to be prepared for. And I think that
11 was the whole purpose. I don't know how we don't
12 get there, but at some point we'll get there.

13 MR. SULLIVAN: Right.

14 VICE CHAIR BONACA: It seems to me that
15 that was the whole purpose of having the selection
16 of a certain source term and then some scenarios
17 that would cover the gamut of the possibilities. And
18 that's the reason why I used the expression defense-
19 in-depth. I mean, it's the last resort. I mean, you
20 have something happening there, you get the
21 protective -- and you have to be ready to do that.

22 MEMBER KRESS: But if it's something
23 that's required to me a goal, to me it's not
24 defense-in-depth.

25 MEMBER POWERS: There is no requirement

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1 that I'm aware that meet the safety goal.

2 MEMBER KRESS: That's exactly right.

3 MEMBER POWERS: So --

4 MEMBER KRESS: So, yes, but he's talking
5 accidental.

6 MEMBER APOSTOLAKIS: I think, Tom, the
7 thing that makes it defense-in-depth is if you come
8 in and argue that you meet the safety goals simply
9 by reducing the core damage frequency by a factor of
10 X --

11 MEMBER KRESS: Yes, then I would say--

12 MEMBER APOSTOLAKIS: -- the NRC would
13 say no.

14 MEMBER KRESS: Doesn't have an emergency
15 -- yes. I would agree with that.

16 MEMBER APOSTOLAKIS: In that sense it's
17 a defense-in-depth kind of thing.

18 MEMBER KRESS: Yes. But I would say that
19 most plants don't fit that --

20 MEMBER APOSTOLAKIS: But the criterion
21 for declaring something as defense-in-depth is not
22 whether it's necessary to meet the goals.

23 MEMBER KRESS: Unless they want to.

24 MEMBER APOSTOLAKIS: It's a measure that
25 spreads the umbrella, so to speak. And you really

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1 don't want to rely on one thing. And the issue
2 comes up with advanced designs where they may argue
3 that you don't need the emergency planning and
4 officially I don't think the NRC has responded yet,
5 but unofficially you hear about this defense-in-
6 depth.

7 MR. SULLIVAN: I'm not doing anything
8 deeper than quoting the safety goal policy.

9 MEMBER APOSTOLAKIS: Yes.

10 MR. SULLIVAN: When I say that--

11 MEMBER APOSTOLAKIS: You are--

12 MEMBER WALLIS: Why don't we move on.

13 MEMBER APOSTOLAKIS: Let's move on.

14 MR. McMURTRAY: Yes, we haven't got to
15 that.

16 MR. SULLIVAN: However, I know you want
17 to move on, but I just want to say that when it
18 comes to the biennial exercise of nuclear power
19 plants that's about as demanding as exercise that
20 any commercial entity is put through. So while I
21 think that there is some repetitiveness in them that
22 we're addressing now, it is a rather demanding
23 inspection. It's expensive. It involves a couple of
24 hundred people off site and on site. And it is a
25 high bar to pass.

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1 Now, the industry has been doing those
2 for close to 30 years. They've gotten good at it.
3 I don't mean to demean that inspection.

4 This is all we're trying to do. We're
5 just trying to see if there's alternative protective
6 actions that could reduce public dose. Actually we
7 got all the way to consequences during severe
8 accidents.

9 We're simply going to compare the dose
10 consequences for various accident scenarios with the
11 consequences there would be -- with the current
12 regimen, the keyhole radial evacuation that's in --

13 MEMBER APOSTOLAKIS: I noticed also in
14 the report you guys are using a lot of terms that
15 are very familiar to you. But we're not all experts.
16 What's "keyhole evaluation"?

17 MR. SULLIVAN: It is an evacuation of
18 approximately a two mile ring and five mile downwind
19 around the plant. And by five mile downwind, that
20 will be either three or four 22½ degrees sector.

21 MEMBER KRESS: It looks like a keyhole
22 in the picture.

23 MR. SULLIVAN: Exactly.

24 MEMBER WALLIS: The area immediately the
25 plant and then --

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1 MEMBER APOSTOLAKIS: I was sure there
2 was some connection with keyholes, but what I
3 couldn't deduce --

4 MEMBER POWERS: If you just took my
5 course --

6 MEMBER APOSTOLAKIS: Yes?

7 MEMBER POWERS: If you just took my
8 course, you'd be -- it looks like a Latin hyperkey.

9 MR. SULLIVAN: Right. That was a low
10 blow.

11 We are not assessing absolute
12 consequences. We are only doing relative efficacy.

13 Well, if you look at the EP planning
14 basis, in our vision anyway, we felt that we had to
15 do three things.

16 MEMBER WALLIS: I'm sorry. You say
17 relative efficacy is assessed not only -- that it is
18 assessed qualitatively?

19 MR. SULLIVAN: That's right. You'll
20 see--

21 MEMBER WALLIS: Not only do you have no
22 measure of consequences, but even your relatively
23 effectiveness is a qualitative judgment of some
24 sort?

25 MR. SULLIVAN: That's right. Could be.

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1 MEMBER APOSTOLAKIS: Didn't you just say
2 that you will compare public doses?

3 MR. SULLIVAN: Consequences.

4 MEMBER APOSTOLAKIS: Isn't that sort of
5 a metric?

6 MR. SULLIVAN: Well, we thought that we
7 ought to do it qualitatively and look for trends.
8 Since we're not analyzing any single plant, we're
9 using source terms from NUREG-1150, we felt that we
10 ought to be looking for trends rather than exacting
11 differences between one scenario and an accident.
12 So, yes, it's qualitative.

13 If you look at our summary tables,
14 you'll see better, worse --

15 MEMBER POWERS: Beneficial, not
16 beneficial.

17 MR. SULLIVAN: Right. You know,
18 beneficial, not beneficial. This is not--

19 MEMBER APOSTOLAKIS: But you want to
20 know how much. Is it beneficial by an order of
21 magnitude or is it beneficial by a smidgeon or what?

22 MR. SULLIVAN: That's right.

23 VICE CHAIR BONACA: That's an issue that
24 it's important, I think, at some point when we get
25 to the staples to do with what is the uncertainty

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1 that results. I mean, tables are crisp. They seem
2 to give a very clear -- you know, but then on the
3 other side we have implementation which is not crisp
4 at all.

5 MR. SULLIVAN: That's right.

6 VICE CHAIR BONACA: It depends on the
7 site. So, you know, I thought what would be
8 beneficial would have been to have a discussion of
9 uncertainties in the report and how that applied
10 towards implementation because you have uncertainty
11 on both ends. And it's not clear. But anyway, we
12 can talk about it when we get to there.

13 MR. SULLIVAN: Thank you. Yes. Yes.

14 MR. SULLIVAN: Rapidly developing
15 releases. I guess we have a 45 minute release to
16 have the large early releases. More slowly, which of
17 course are much more likely. And we also wanted to
18 look -- I'm not sure, the words are kind of -- you
19 have to stumble over the words. But the most likely
20 of the unlikely events is that containment doesn't
21 fail. So we assess that, too. So we essentially
22 have three kinds of events that we wanted to look
23 at.

24 MEMBER APOSTOLAKIS: And what's slowly
25 development underneath this, you are still focusing

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1 on the dose?

2 MR. SULLIVAN: Consequences.

3 MEMBER APOSTOLAKIS: In terms of what?
4 Consequences in terms of what?

5 MR. SULLIVAN: Early fatalities and
6 latent cancer fatalities.

7 MEMBER APOSTOLAKIS: Under regression
8 that is slowly evolving sequences primarily
9 resulting in environmental damage?

10 MR. SULLIVAN: By slow we mean a three
11 or four hour release after general emergency. I
12 guess that might not be considered slow by some. In
13 emergency preparedness space you can do a lot in
14 three or four hours. So we can that slow.

15 MEMBER APOSTOLAKIS: I guess my question
16 is whether early fatalities is the appropriate
17 method here. Of course, the goal is in terms of
18 fatality so you're doing the right thing. But --

19 MR. SULLIVAN: We struggled with that,
20 too, Doctor. We considered throwing -- you know,
21 not assessing early fatalities. But it seemed to
22 hold information that was valuable to us.

23 WE went back and forth with peak dose,
24 population dose, throw out early fatalities, latent
25 cancer fatalities. The tables that we came up with

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1 seemed to contain the best information for us. But,
2 it was a struggle, frankly.

3 MEMBER APOSTOLAKIS: Okay.

4 MR. SULLIVAN: We used NUREG-11150.
5 Actually, that was a rather controversial decision,
6 too. You know, there are those who would say NUREG-
7 1150 is outdated, the source terms are overly
8 conservative. It was the government endorsed
9 document that we could get our hands on and use.
10 And Shawn's going to talk a little bit more about
11 that. But if --

12 MEMBER APOSTOLAKIS: But it does use
13 Latin hyper--

14 MR. SULLIVAN: Yes. So I'm sure Shawn
15 has a picture of that.

16 MR. BURNS: If not the keyhole.

17 MR. SULLIVAN: And now we switch to
18 Shawn. Okay.

19 MR. BURNS: My name is Shawn Burns from
20 Sandia Labs. I was fortunate enough to help Randy
21 and Joe on selecting some of the source terms for
22 the PAR study. So I'm going to spend just a brief
23 time trying to give you some details on how we came
24 up with Figure 3.1 and so we can get back to the
25 core of the PAR study.

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1 There is some technical challenges in
2 coming up with a term source that we could use or a
3 set of source terms that we could use for the PAR
4 study. Primarily the complexity and the
5 phenomenology associated with developing or that
6 go into the source term itself. Combined that with
7 the limited scope we had for identifying source
8 terms; for example the PAR study didn't have the
9 resources really to go into a detailed accident
10 progression analysis. But yet to maintain the
11 integrity of the program we had to have some kind of
12 source term that did represent what the best
13 thinking at the time was for what a real source term
14 might look like.

15 Next slide, please.

16 So the way we met that challenge is we
17 decided to go back and mine the historical database
18 for source term data. And certainly the primary
19 source is NUREG-1150. But we also looked at the low
20 power and shutdown studies and the studies, and
21 included both internal and external initiators from
22 all those studies.

23 And this is Figure 3.1 that we've been
24 talking about. Basically this is the basis for how
25 we selected our source terms.

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1 MEMBER WALLIS: Now there is no scale on
2 frequency. Are these a log scale?

3 MR. BURNS: Yes. Each division is an
4 order of magnitude.

5 MEMBER WALLIS: So that sort of
6 indicates to me that there are some of them which
7 are far more important than others.

8 MR. BURNS: That's correct. That's
9 correct.

10 MEMBER WALLIS: Because the down on the
11 bottom you can forget.

12 MR. BURNS: Exactly. And I'll go into
13 that.

14 MEMBER WALLIS: And that's where risk
15 analyses would come. I mean, you said some of these
16 you have to worry about more than others.

17 MR. BURNS: And I'll show you that in
18 the slide.

19 MEMBER WALLIS: Okay.

20 MEMBER APOSTOLAKIS: What kind of
21 numbers are we talking about? I appreciate the
22 yellow box, but --

23 MR. BURNS: Yes. That's --

24 MEMBER APOSTOLAKIS: Well, you have a
25 bunch of them between zero and four hours. What

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1 kind of frequency is that?

2 MR. BURNS: The top -- I'll point with
3 my hands.

4 MEMBER APOSTOLAKIS: We have everything
5 here.

6 MR. BURNS: NUREG-1150, this is ten to
7 the minus six.

8 MEMBER APOSTOLAKIS: Okay. And this now
9 what?

10 MEMBER WALLIS: Ten to the minus four on
11 top?

12 MR. BURNS: Ten to the minus six, ten
13 to the minus five, ten to the minus four.

14 MEMBER WALLIS: Okay.

15 MR. BURNS: Ten to the minus seven,
16 right, nine.

17 MEMBER APOSTOLAKIS: And this is a
18 release. I mean, you're showing the warning time.
19 Is that a substantial release.

20 MR. BURNS: I'll show you the details
21 of a couple.

22 MEMBER CORRADINI: So just to be clear,
23 so you gave us numbers but just to be clear all of
24 these involve some form of containment failure from
25 NUREG-1150 analyses or some of these just even

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1 leakage from an intact containment?

2 MR. BURNS: There are source terms in
3 here that correspond to no containment failure.

4 MEMBER CORRADINI: So it's the whole
5 enchilada?

6 MR. BURNS: That's right.

7 MEMBER CORRADINI: And this is only
8 NUREG-1150 data?

9 MR. BURNS: No. It also includes low
10 power and shutdown and the --

11 MEMBER CORRADINI: Oh, excuse me. I'm
12 sorry. I'm sorry.

13 MR. BURNS: From the previous slide.

14 MEMBER CORRADINI: Sorry.

15 VICE CHAIR BONACA: But most of this
16 data is NUREG-1150?

17 MR. BURNS: Predominately, yes.

18 VICE CHAIR BONACA: Now 3.2 is a part of
19 the figure, right?

20 MR. BURNS: Yes, 3.2 is basically --
21 I'll show you. Go back to it, please.

22 MEMBER WALLIS: Actually, it's rather a
23 remarkable figure. I notice that the BWRs releases
24 only occur at either 1½ hour or at 7 hours? Nothing
25 else is allowed.

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1 MR. BURNS: That's the way that the
2 data fell out.

3 VICE CHAIR BONACA: Go back to that
4 question I had before I didn't get, which one is
5 3.2?

6 MR. BURNS: I'm sorry. Yes. So that
7 Figure 3.2 and I'll show you in a moment -- so less
8 than 4 hours, greater than ten to the minus six
9 according to NUREG-1150 circa information.

10 MEMBER BANERJEE: What accounts for the
11 sort of vertical nature of these things?

12 MEMBER MAYNARD: Uncertainty.

13 MEMBER KRESS: Free downstream.

14 MR. BURNS: Similarities in the way the
15 calculations were done between plants.

16 MEMBER KRESS: Downstream.

17 MR. BURNS: If you go through the
18 NUREG-1150 data, one thing that struck me was a lot
19 of those source terms really did lay out very
20 similarly between plants. And I don't know if that
21 represents the way the teams that were doing those
22 simulations were interacting. But basically this is
23 just a regurgitation of the data.

24 MEMBER ARMIJO: So that string of
25 vertical data points at about six hours, that one

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1 there, is that all the same accident analyzed for
2 different plants?

3 MR. BURNS: I'd have to go back and
4 look and look more carefully.

5 MEMBER APOSTOLAKIS: Well, because you
6 didn't have so many plants. There was only five.

7 MR. BURNS: Yes. Right.

8 MEMBER APOSTOLAKIS: There were three
9 PWRs and two BWRs.

10 MEMBER ARMIJO: Okay. So it's got to be
11 something else. Yes.

12 MEMBER APOSTOLAKIS: It has to be
13 something else.

14 MEMBER CORRADINI: But just to reflect
15 back on it, it was a number of accidents and a
16 number of physical events that were analyzed. And a
17 lot of it was essentially estimates by expert panels
18 as to what would be the failure mode and therefore
19 the associated release. So for any one plant you
20 would have a number of failure modes at various
21 times.

22 MEMBER ARMIJO: That controlled the
23 time.

24 MEMBER BANERJEE: It's probably five
25 hours, six hours, seven hours. So estimated five

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1 hours or something.

2 MEMBER ARMIJO: Okay.

3 MR. BURNS: The next slides might
4 answer some of these questions.

5 So the way we came up with the
6 frequencies, now this is conditional containment
7 failure frequencies that I'm showing you. And it's
8 a very straightforward process that we use for
9 coming up with those numbers. First we identified
10 the core damage frequency and simply multiplied
11 that, which is a function of the plant damage state.
12 And multiplied that by the conditional containment
13 failure. And we broke it into simple bins. No
14 containment failure, early containment failure or
15 late containment failure and bypass events. So we
16 could do more frequencies for those.

17 MEMBER APOSTOLAKIS: You used just a
18 point value for the containment failure?

19 MR. BURNS: That's right. Yes. Just a
20 point value. Well --

21 MEMBER APOSTOLAKIS: There's a series of
22 frequency in 1150 that I found extremely interesting
23 there. The results of the Latin hyperkey, by the
24 way. But they really range almost from zero to one,
25 don't they?

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1 MR. BURNS: You'd have to tell me
2 specifically which figures you're referring to.

3 MEMBER APOSTOLAKIS: Well, they
4 condition of containment hyper frequency. I mean,
5 it's almost --

6 MR. BURNS: Yes. What we did for here
7 is NUREG-1150 quotes specific accident progression
8 bins.

9 MEMBER APOSTOLAKIS: Yes.

10 MR. BURNS: What I did is I choose the
11 most frequent accident progression bin that
12 corresponded to a specific sequence. So let me defer
13 that --

14 MEMBER APOSTOLAKIS: So these numbers
15 are typically very close to one? Because the
16 uncertainty range there, I mean you almost get the
17 feeling that the containment is useless. Is that
18 correct?

19 MEMBER KRESS: No.

20 MEMBER APOSTOLAKIS: They were zero to
21 one almost.

22 MEMBER POWERS: The single biggest
23 conclusion I think out of NUREG-1150 was that so
24 many of accidents were actually arrested in vessel.
25 That is the single biggest conclusion.

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1 MEMBER APOSTOLAKIS: But when it came to
2 failure of the containment --

3 MEMBER POWERS: Then you have to fail
4 the vessel first. That's the condition. And when it
5 does that, then yes, the uncertainty range over the
6 span of plan --

7 MEMBER APOSTOLAKIS: Right.

8 MEMBER POWERS: -- is zero to one. Now
9 most people don't look at it in the span of plan.
10 It's most people look at it as BWR versus PWR. And
11 the BWR case essentially you're guaranteed a
12 failure. I mean, essentially.

13 MEMBER CORRADINI: Yes. The 95
14 percentile is like --

15 MEMBER POWERS: Conditional on rupturing
16 the vessel. In fact, many of the BWR sequences
17 actually bust the containment before they go through
18 the vessel.

19 In the PWR situation it depends on which
20 containment you have. And the large dries, I think
21 the large dries conditional failure probability is
22 around .1, .2 someplace like that,

23 MEMBER APOSTOLAKIS: Sure.

24 MEMBER POWERS: It's quite low. And the
25 ice condenser, of course, is low normal.

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1 MEMBER APOSTOLAKIS: Of these, Dana, it
2 says conditional containment failure; I assume the
3 vessel has failed. It's not what the condition is?

4 MR. BURNS: Not necessarily, no. This
5 is our no containment failure, so -- I'm sorry. So
6 you will have core damage, that's the one you could
7 have.

8 MEMBER APOSTOLAKIS: But necessarily
9 containment?

10 MR. BURNS: Not necessarily this.

11 MEMBER KRESS: Yes, but almost all of
12 this going down, it means vessel failure also.

13 MEMBER POWERS: No. No. That's the
14 biggest single conclusion coming out of 1150 is that
15 so many of the accidents were arrested in vessel. I
16 mean, that is the danger.

17 MR. BURNS: So you might have a
18 release, for example, through venting. But you
19 haven't failed the vessel necessarily.

20 So this might make it a little bit more
21 concrete. So if I picked on, for example, the Surry
22 blackout event, that's the initiating event. I know
23 what the core damage frequency for that event. Then
24 from the NUREG-1150 data I can also determine what
25 the conditional containment at failure frequencies

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1 for different containment failures. So there's the
2 red box there, the red point indicates a no
3 containment failure event and the source term
4 associated with that. And the green box is what a
5 late containment failure, it would be a much longer
6 event and lower frequency. And then finally the
7 fast or the early containment failure, which in the
8 NUREG-1150 terminology simply means that the
9 containment fails at or before the vessel fails. So
10 an early containment failure for that same
11 initiating event is the blue point there.

12 MEMBER BANERJEE: And what are the
13 magnitudes of the source terms for these three
14 scenarios?

15 MR. BURNS: I will show on the next
16 slide. I'll show that.

17 MEMBER APOSTOLAKIS: So the main idea of
18 all this presentation is how soon can you have how
19 much, is that it? When you go --

20 MR. BURNS: The main purpose of what
21 I'm presenting here is how we selected the source
22 terms that we selected for this --

23 MEMBER APOSTOLAKIS: Yes, but you
24 selected them for some reason.

25 MR. BURNS: That's right. From--

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1 MEMBER APOSTOLAKIS: To know how soon
2 how much is released, is that correct? Otherwise it
3 doesn't affect emergency planning.

4 MR. BURNS: What we were trying to do
5 is select high frequency -- probably scenarios to
6 add physical reality to the PAR analyses. We wanted
7 to find source terms that we thought were credible
8 rather than incredible source terms.

9 MEMBER APOSTOLAKIS: And since this is
10 not a risk-informed study, why are you doing this?
11 Why aren't you doing all of them?

12 MR. BURNS: Principally the scope of
13 the project.

14 MEMBER APOSTOLAKIS: Because it's risk-
15 informed in some respects? The sense that you are
16 looking at the dominant release --

17 MEMBER POWERS: George, everything in
18 reactor safety is risk-informed.

19 MEMBER APOSTOLAKIS: No.

20 MEMBER POWERS: Everything.

21 MEMBER APOSTOLAKIS: He's going with--

22 MEMBER POWERS: Everything is. The
23 agency does not do things because they have a wild
24 hair to do it. They do it because of some perceived
25 risk. A few things have quantitative risk

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1 assessment. But everything is risk-informed.

2 MEMBER APOSTOLAKIS: But the tradition
3 is when you say risk-informed you mean quantitative.

4 MEMBER POWERS: No.

5 MEMBER APOSTOLAKIS: Of course. Or
6 otherwise we have been risk-informed since 1961.

7 MEMBER POWERS: I agree with that.

8 MEMBER APOSTOLAKIS: On November 3rd.

9 MEMBER POWERS: And we have.

10 MEMBER APOSTOLAKIS: No. That's not
11 true. That's not true. When we say we are becoming
12 risk-informed, we mean quantitative --

13 MR. BURNS: Perhaps I can answer your
14 question this way: We're selecting the high
15 frequency source term.

16 MEMBER APOSTOLAKIS: Right.

17 MR. BURNS: So we're identifying the
18 riskiest source terms.

19 MEMBER APOSTOLAKIS: I understand.

20 MR. BURNS: I that sense --

21 MEMBER APOSTOLAKIS: Yes.

22 MEMBER WALLIS: Well let me ask you,
23 since you're only doing a qualitative comparative
24 study what's sort of level of detail do you need in
25 this source term?

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1 MR. SULLIVAN: Well, it's an interesting
2 question. When we started out, my initial vision for
3 this was to have a normalized source term and vary
4 the time. We could have just had one and then just
5 compare the different emergency response regimens.

6 MEMBER KRESS: And it would have
7 probably worked.

8 MR. SULLIVAN: Well, yes. I thought so.
9 But the Staff working on it felt that we ought to do
10 just what Shawn said. You know, add a bit of
11 reality to the study and pick some source terms
12 through some thought process from NUREG-1150. But
13 we did talk about that exact thing, and it was the
14 original vision.

15 We went down this path because we
16 thought it would be, you know, it would add more--

17 MR. BURNS: Credibility, yes.

18 MR. SULLIVAN: -- credibility. So that's
19 how we got where we got.

20 MR. BURNS: So let me just finish up on
21 the last couple of slides here. Can we go to the
22 next slide.

23 So as I said before, we have a 150
24 source terms on that plot, but we can't analyze them
25 all. So we need to select a couple. And so we

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1 focused on that upper left corner of that plot to
2 identify the source terms that were rapidly breaking
3 or potentially rapidly breaking and the most
4 frequent rather than --

5 MEMBER BANERJEE: But also the magnitude
6 would matter, right?

7 MR. SULLIVAN: Yes.

8 MR. BURNS: Well the magnitude comes
9 along --

10 MEMBER BANERJEE: It doesn't show up
11 here in this. Does it have a dimension to this?

12 MR. BURNS: Correct. Maybe I'll show
13 you that on the next slide.

14 MEMBER WALLIS: You do have other plots
15 in your report of magnitude, too.

16 MR. BURNS: That's right.

17 MEMBER BANERJEE: Yes.

18 MR. BURNS: But the source terms
19 weren't selected on that basis. We're selecting
20 them on --

21 MEMBER BANERJEE: Frequency.

22 MR. BURNS: -- frequency and time to
23 release, and then whatever -- that's why we went
24 down this route. Because the magnitude would just
25 come out of the analyses that went into NUREG-1150.

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1 MEMBER KRESS: Now when you invoke an
2 emergency plan, if you had to invoke one, does this
3 study presume that you know when you're going to
4 have your release?

5 MR. BURNS: But let me wait to the last
6 slide.

7 MEMBER KRESS: Okay.

8 MR. SULLIVAN: Actually, one of the
9 difficulties we had in dealing with NUREG-1150 is
10 they had a thing called a warning time. Well, that
11 doesn't exactly align with how we operate today and
12 post-TMI, really.

13 At the general emergency protective
14 actions are implemented. Whether there is a release
15 or not, whether the core damage is extensive or
16 not--

17 MEMBER KRESS: Well, I would have
18 thought that would have been the way to go.

19 MR. SULLIVAN: Yes.

20 MEMBER KRESS: Because I'm not so sure
21 how confident I would be in a warning time.

22 MR. SULLIVAN: Yes.

23 MEMBER KRESS: When something is going
24 on in my plant and I have to tell you well we got
25 two hours before there is going to be a release.

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1 I'm not sure I'm comfortable with that.

2 MR. SULLIVAN: Right. In these events
3 we assumed in the one case 45 minutes, in the other
4 case three hours between the general emergency and
5 the release.

6 MEMBER APOSTOLAKIS: Would you repeat,
7 please?

8 MR. SULLIVAN: Yes. We assumed 45
9 minutes in the one case and three hours in the other
10 case between the general emergency and the release.
11 So protective actions got moving at the general
12 emergency. There's 15 minutes to notify, 15 minutes
13 to tell the public, some time for them to get moving
14 and we started them moving--

15 MEMBER APOSTOLAKIS: So you're going to
16 do much better than at TMI where there seemed to be
17 a lot of confusion about what was going on and
18 whether or not there should be an emergency?

19 MR. SULLIVAN: The answer is yes. Yes.

20 MEMBER APOSTOLAKIS: And this went on
21 for many hours.

22 MR. SULLIVAN: We would do much better
23 than TMI.

24 MR. BURNS: Yes. Yes.

25 MEMBER KRESS: What is the

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1 characteristics that constitute declaring a general
2 emergency?

3 MR. SULLIVAN: Well, they're various.
4 I'll go through two for you.

5 The simplest one is at the BWR if water
6 level is top of active fuel, you have a general
7 emergency. Now there's been no core damage, right?
8 I mean, most probably water is going down.

9 MEMBER KRESS: Right. Yes, I like that.
10 What's the PWR one?

11 MR. SULLIVAN: I believe it's the same,
12 but let me go to station blackout because I know
13 that one better.

14 At station blackout when you lose off
15 site power and diesels and you have a site area
16 emergency.

17 MEMBER KRESS: Yes, that's pretty
18 obvious, I'd say, yes, for that.

19 MR. SULLIVAN: When you exceed the
20 committed SBO coping time you have the general
21 emergency. Now the committed coping time is the one
22 in procedures, it may be 2 or 4 hours and the
23 batteries may really last for 7 or for 12, for all I
24 know.

25 MEMBER KRESS: Yes.

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1 MR. SULLIVAN: But that is the general
2 emergency. People would be evacuated at that point.

3 For instance, at Peach Bottom --

4 MEMBER CORRADINI: Could I just clarify?
5 Could I just clarify?

6 So site area I think I understood. The
7 general emergency, is that when you start this clock
8 of 15 minutes, 15 minutes and et cetera?

9 MR. SULLIVAN: Yes.

10 MEMBER CORRADINI: Okay. Fine.

11 MEMBER KRESS: So if I would
12 characterize it, we're having some sort of incident
13 going on that symptoms are such that it's severe
14 enough to declare a site emergency. There's been no
15 release, no core melt or anything. The strategy is
16 we're going to evacuate.

17 MR. SULLIVAN: That's right.

18 MEMBER KRESS: Now, that can't be a
19 keyhole evacuation; that's got to be everybody --

20 MR. SULLIVAN: No, no. It's a keyhole.
21 Right.

22 MEMBER KRESS: It's a keyhole? Because
23 you know what wind is blowing right then?

24 MR. SULLIVAN: Yes, you do.

25 MEMBER KRESS: Okay.

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1 MR. SULLIVAN: Everywhere but -- well,
2 I'm sorry. I don't mean to get too deep into
3 details.

4 We expect the license to give a
5 technical protective action recommendation of two
6 and five miles.

7 MEMBER KRESS: Okay.

8 MR. SULLIVAN: The state and country may
9 do something completely different. For instance, in
10 Pennsylvania they will do nothing but a ten mile
11 360.

12 MEMBER KRESS: Okay. And I like that
13 strategy.

14 Now the second case is we have a really
15 fast developing accident and we've already released
16 fission products long before you have warning time
17 and stuff. And this is the second type of accident.
18 I mean, I'm going to talk about two types of that
19 thing. That's one.

20 MR. SULLIVAN: I'm with you.

21 MEMBER KRESS: Now it seems to me like
22 your strategy there has to be completely different.

23 MR. SULLIVAN: It should be.

24 MEMBER KRESS: Oh, okay. You're going
25 to talk about that one?

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1 MR. SULLIVAN: That's the finding of the
2 study.

3 MEMBER KRESS: Okay.

4 MEMBER CORRADINI: So is that one of --
5 what he just said, is that one of the cases --

6 MR. SULLIVAN: Yes.

7 MEMBER CORRADINI: -- where before you
8 even declare the general emergency there is a
9 release?

10 MR. SULLIVAN: Well, no, we don't--

11 MEMBER CORRADINI: Isn't that what you
12 just said?

13 MEMBER KRESS: Yes, but maybe you're
14 getting close --

15 MR. SULLIVAN: Maybe. But what we
16 expect to have happen, the fast breaker or the large
17 early release that we used was 45 minute release
18 after general emergency.

19 MEMBER BANERJEE: That was the real
20 severe.

21 MR. SULLIVAN: All right. So that's
22 pretty quick. That's essentially zero, because the
23 15/15 and something is essentially --

24 MEMBER CORRADINI: That's something.

25 MR. SULLIVAN: Right.

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1 MEMBER CORRADINI: So the people are
2 just beginning to move when the release starts.

3 MEMBER BANERJEE: This gives you the
4 halogen release corresponding I guess to the -- in
5 the previous slide --

6 MR. BURNS: Yes. Go back to the
7 previous slide. We looked at that top left hand
8 Figure 3.1 and we choose these two source terms.
9 The one in the lower left hand corner we choose
10 because it was the fastest breaking --

11 MEMBER BANERJEE: Use the pointer.

12 MR. BURNS: Excuse me. I'm sorry.

13 So choose this source term in the lower
14 left hand corner based on its rapid release time.
15 Now, this is the point that Randy was making; this
16 is all relative to warning time as far as NUREG-1150
17 quoted it, which really corresponds to the onset of
18 core damage. So this assumes perfect knowledge of
19 what's going on within the reactor.

20 And the last slide we'll talk about the
21 implications of that.

22 MEMBER BANERJEE: Now just to clarify
23 this, that point may or may not have a much larger
24 release than, let's say, the adjacent -- no -- no --

25 MR. BURNS: That's right.

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1 MEMBER BANERJEE: Or the one above that.

2 MR. BURNS: Right.

3 MEMBER BANERJEE: So, I mean, is this
4 sort of a bounding case then or not?

5 MR. BURNS: The order of effect we're
6 looking for is this time you have to evacuate. This
7 release time relative to warning time is the time
8 you have to get people moving. So that's the zero
9 order effect we were trying to capture here.

10 MR. SULLIVAN: Dr. Banerjee, let me also
11 remind you that we're doing a comparative study
12 rather than an absolute study. So if we choose a
13 source term that was a little bit north or south of
14 this one, we're still going to normalize it against
15 the standard PAR and our ideas for new PARs and look
16 at is better or worse.

17 MEMBER KRESS: You're going to look at a
18 percent change.

19 MEMBER BANERJEE: Yes. As long as the
20 release is large enough --

21 MR. SULLIVAN: Well, yes.

22 VICE CHAIR BONACA: Yes. You're going
23 through a lot of details here, which is good, but
24 I'm saying that the dependency on estimated
25 evacuation time, it's so fundamental. I mean, if

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1 you take a release like this, in 45 minutes you have
2 a release.

3 MR. SULLIVAN: Yes.

4 VICE CHAIR BONACA: And yet evacuation
5 time is six hours.

6 MR. SULLIVAN: Yes.

7 VICE CHAIR BONACA: It's a no-brainer.
8 I mean, you don't need to do -- just Supplement 3
9 has to be modified because you need to have -- the
10 only thing you can do is shelter. And you have no
11 other option.

12 So some of these sensitivities are not
13 so -- you know --

14 MEMBER BANERJEE: Those are iodine
15 tablets.

16 VICE CHAIR BONACA: It depends very much
17 on those times.

18 MR. SULLIVAN: Are you from Princeton?

19 VICE CHAIR BONACA: You could go on
20 without any specific information on that.

21 MR. SULLIVAN: Well, what you described
22 is actually in the statement of work, you know,
23 because that was the Staff's suspicion before we got
24 started. It's kind of a no-brainer.

25 VICE CHAIR BONACA: But the whole issue

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1 is, you know, do you have that as a credible
2 accident? Well, I think that at the present time we
3 have to cope with a gambit of credible accidents or
4 all accidents, it seems to me. And that 45 minutes.

5 MEMBER MAYNARD: Well, I can't speak for
6 all plants, but most plants do have sheltering as
7 one of the options for corrective action, corrective
8 states.

9 MR. SULLIVAN: Yes. Yes, they do.

10 MEMBER MAYNARD: Depending on the
11 release, the timing and also weather and other
12 conditions and stuff.

13 MR. SULLIVAN: That's right. Right.

14 MEMBER KRESS: Yes, but do they have a
15 combination? If you know where the plume is going
16 and you know you've already got a release before you
17 have time to fully evacuate, can you get the people
18 out of the way of the plume but shelter everybody
19 else? That's a sort of a combination.

20 MR. SULLIVAN: You know, those options
21 are available to the plants, and that's true, but
22 we're practicing something differently. What we're
23 practicing is immediate two miles and five miles
24 downwind. That's what we practice.

25 Now if somebody were to say, whoa, wait

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1 a second, hold on they have the tools and they're
2 allowed to do something different and, hopefully
3 they would. We think our PARs ought to be a bit
4 more sophisticated.

5 MEMBER MAYNARD: Most plants have the
6 ability. In fact, the PARs that you put out will
7 typically be divided into your pie shape, the two
8 and the five, and you can have a different
9 recommendation in one area than what you give for
10 another.

11 MR. SULLIVAN: That's right. Sure you
12 can. Right. Sure you can.

13 VICE CHAIR BONACA: But you have tested
14 that in the report. You have tested a number of
15 strategies, a combination of evacuation and
16 sheltering?

17 MEMBER MAYNARD: But I think the
18 emphasis has been on evacuation more than
19 sheltering.

20 MR. SULLIVAN: It really has.

21 VICE CHAIR BONACA: Exactly.

22 MEMBER MAYNARD: And that's where the
23 emphasis has been.

24 MR. SULLIVAN: And that may not be right
25 in every case.

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1 MEMBER CORRADINI: So maybe this is
2 going to happen later night. I guess I'm not
3 exactly sure how to ask it. So you're talking about
4 tie-ins. The other two things that are obvious to
5 me are population density and geometric terrain.

6 MR. SULLIVAN: Yes.

7 MEMBER CORRADINI: So have you picked a
8 location or are these locations the plant sites--

9 MR. BURNS: We'll get to that.

10 MR. SULLIVAN: You're going to come to
11 that.

12 MR. BURNS: Yes, we're going to come to
13 that.

14 MR. BURNS: So now go back to the last
15 slide just one more brief second. So to bracket the
16 time sensitivity, the other source term we choose
17 was a later release. And just simply because the
18 frequency seemed to be the obvious choice.

19 MEMBER KRESS: Now the answer to that
20 one is evacuate, right?

21 MEMBER MAYNARD: Right.

22 MR. BURNS: Yes, we're trying to
23 identify of efficacy of evacuation versus
24 sheltering. So we're trying to bracket it. It's,
25 we feel, it's somewhere in the range. So getting on

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1 either side of this --

2 MEMBER KRESS: You're on the inside of
3 it probably.

4 MR. BURNS: Yes. So on the next slide
5 what I've done here is just put the halogen release
6 corresponding to each of those --

7 MEMBER WALLIS: Now that's mostly
8 iodine, you say?

9 MR. BURNS: That's mostly iodine,
10 that's right.

11 MEMBER WALLIS: So if we said iodine, it
12 would be almost the same?

13 MR. BURNS: Yes. That's the core
14 inventory number I quote in here.

15 So the first source term, that one in
16 the lower left hand corner, is characterized by
17 early release time and a rapid rise. This is
18 actually an interfacing system LOCA accident is what
19 it really is.

20 The other source term had a later
21 release combined with a slower rate of release as
22 well. So there's still this nagging doubt about what
23 is -- we know the time has a zero order effect; what
24 is the effect of these details of how the release
25 occurs over time? So the handle in that fairly ad

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1 hoc approach, we simply transposed these two source
2 terms and created two more ad hoc source terms where
3 we just took the release time for this first guy and
4 it applied it to the second release.

5 MEMBER BANERJEE: Surely you could have
6 found in those many accidents a more realistic--

7 MR. BURNS: Probably we could have.
8 But we were thinking also that the details -- what
9 we're really interested in is the efficacy of the
10 evacuation, not the details of the source terms. And
11 it seemed like this was a quick way of just--

12 MEMBER KRESS: As long as you get up to
13 that -0

14 MEMBER WALLIS: I think you're probably
15 assuming it doesn't matter too much how well you
16 define these, as we discussed earlier.

17 MEMBER BANERJEE: Well, they're trying
18 to get two bounding scenarios; one goes this way and
19 one goes that way.

20 MR. BURNS: That was the other next
21 thing about these source terms; they did have
22 different slopes after release.

23 MEMBER WALLIS: Yes, right.

24 MR. BURNS: So by transposing them we
25 felt we were kind of --

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1 MEMBER WALLIS: Right. You're going to
2 look at your results and say do they make much
3 difference, and then if it did make a big
4 difference, you might want to go back and change
5 your initial assumption.

6 MR. BURNS: I don't think we went back
7 to analyze it.

8 MEMBER BANERJEE: If the shape makes a
9 difference, then that needs to be explored further.
10 But if the shape doesn't make too much of a
11 difference.

12 MR. BURNS: I'm not sure that we looked
13 and analyzed the effect of the shape. We just used
14 these. We now have four source terms to analyze--

15 MEMBER BANERJEE: Anyway we can see what
16 happens.

17 MR. SULLIVAN: The way it came out was
18 really the only source term that was different was
19 the large early release. You know, the other three
20 -- I mean, it's two source terms and then they're
21 just simply reversed, but --

22 MR. BURNS: Could I have the pointer.

23 MR. SULLIVAN: Sure. This source term
24 ended up being a special case. Everything else kind
25 of flowed together. It didn't make a lit of

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1 difference as might be expected. And then, of
2 course, when we used the no containment failure
3 source term, you have time to do most anything you
4 want.

5 Now, a large source in containment will
6 result in a general emergency and could,
7 theoretically, result in exceeding the protective
8 action guides off site. But you have hours and
9 hours, you know, 20 hours or something. And the
10 wind might not blow in the same direction for 20
11 hours anyway. But --

12 MEMBER BANERJEE: But what happens?
13 Because the typically the wind does shift depending
14 on the time of the day and stuff like that?

15 MR. SULLIVAN: That's right.

16 MEMBER BANERJEE: So if you do this
17 keyhole thing and then the wind shifts, then you do
18 another keyhole or --

19 MR. SULLIVAN: We just had that
20 discussion today. In fact, the emergency response
21 organization can activate in about an hour. You'll
22 have a good organization controlling the
23 organization -- you know, controlling the response
24 in about an hour. So the operators are on their own
25 for the first hour or so.

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1 The operators will come up -- if the
2 accident really moves that rapidly that you're at
3 general emergency in the first hour, perhaps
4 unlikely in most scenarios, but the large early
5 release could be this. They'll make an initial
6 protective action recommendation two and five
7 downwind.

8 As the organization comes in we have
9 people cognizant of meteorology, dose projection
10 analysts, engineering specialists, on and on and on.
11 They look at the weather forecast to see if the wind
12 is going to shift. They have a met tower, they see
13 if the wind has shifted. Then they change their
14 protective action recommendation.

15 MEMBER BANERJEE: And they have,
16 presumably, downwind monitors.

17 MR. SULLIVAN: They have at least a
18 couple of monitors in the first couple of hours.

19 MEMBER BANERJEE: Yes, so they can
20 validate these things.

21 MEMBER MAYNARD: And you're required if
22 the conditions change to revisit the protective
23 action recommendations.

24 MR. SULLIVAN: That's right.

25 MEMBER MAYNARD: And then periodically

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1 you have to revisit it even if they haven't changed.
2 So there are requirements.

3 MR. SULLIVAN: So we would see either --
4 if the wind didn't change and it was a bad source
5 term, they might go out further with the evacuation.
6 If the wind did change, they might add additional
7 segments two to five miles.

8 VICE CHAIR BONACA: It depends also the
9 roads and, you know, what kind of situation you
10 have.

11 MEMBER WALLIS: It's the wind. I mean,
12 if you think of Vermont Yankee, you could easily
13 have two feet of snow that fell the night before.

14 MR. SULLIVAN: That's right.

15 MEMBER WALLIS: In which case you'd
16 probably change your response.

17 MR. SULLIVAN: Yes, you would.

18 MEMBER APOSTOLAKIS: Now let me
19 understand--

20 MEMBER WALLIS: Okay. We need to move
21 on.

22 MEMBER APOSTOLAKIS: you said earlier
23 that the rapid early release is the one that really
24 matters.

25 MR. SULLIVAN: It's different than the

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1 other three in terms of results, yes.

2 MEMBER APOSTOLAKIS: Yes. In more
3 severe results?

4 MR. SULLIVAN: Yes.

5 MEMBER APOSTOLAKIS: And this is
6 primarily interfacing system LOCA?

7 MR. BURNS: That's right. Bypass.

8 MEMBER APOSTOLAKIS: Bypass frequency
9 being around --

10 MR. BURNS: Ten to the minus six
11 according to NUREG-1150. Now there's reason to hold
12 that suspect.

13 MEMBER APOSTOLAKIS: So when I see
14 results for this one?

15 MR. SULLIVAN: We're going to discuss it
16 a bit more.

17 MEMBER APOSTOLAKIS: Okay.

18 MR. SULLIVAN: It's actually a very
19 interesting --

20 MEMBER APOSTOLAKIS: I'll wait until
21 then.

22 MEMBER WALLIS: Yes. We need to move on
23 because we have --

24 MEMBER APOSTOLAKIS: Did you consider at
25 all external events here?

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1 MR. BURNS: I am sorry?

2 MEMBER MAYNARD: External and internal.

3 MR. BURNS: Internal and external
4 events are represented in Figure 3.1.

5 MEMBER BANERJEE: Let me just ask --

6 MEMBER APOSTOLAKIS: I'm trying to
7 understand why yesterday in the SOARCA evaluation it
8 was the seismic contribution that was considered --

9 MR. BURNS: The differences between
10 this study and SOARCA might be because the
11 references. There's more recent data that's being
12 used in the SOARCA analyses, SOARCA selection
13 process. This is all purely NUREG-1150 data.

14 MEMBER APOSTOLAKIS: Did they go with
15 NUREG-1150, too?

16 MR. BURNS: No.

17 MEMBER APOSTOLAKIS: How do they --

18 CHAIRMAN SHACK: They cut off at ten to
19 the minus six. They are reexamining the frequencies
20 of the events which shift that axis up and down. You
21 know, they might look the same, except you just
22 moved everything up and down a few --

23 MEMBER CORRADINI: That's why their
24 graph early on had no numbers. Those numbers could
25 be two orders of magnitude lower, although the

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1 source terms might be the same.

2 CHAIRMAN SHACK: And remember, we were
3 at a closed session there, George. We don't want to
4 get too -- when we discuss the results that you may
5 be talking of, just remember --

6 MEMBER APOSTOLAKIS: But didn't they
7 tell us that they looked at 1150 yesterday?

8 MR. BURNS: There was some data that
9 was --

10 MEMBER APOSTOLAKIS: It was 1150.

11 MEMBER BANERJEE: Some data.

12 MEMBER APOSTOLAKIS: For Peach Bottom.

13 MR. BURNS: They did look at NUREG-
14 1150, but in addition they looked at IPEEE --

15 MEMBER MAYNARD: IPEEE and the SPAR.

16 MR. BURNS: -- and the enhanced SPAR
17 models were also used.

18 MEMBER MAYNARD: Yes.

19 MR. BURNS: So there's new data that
20 has been put into the SOARCA analysis.

21 MEMBER APOSTOLAKIS: I mean why did they
22 choose to look at the seismic and you not?

23 MR. BURNS: We do. There are
24 seismically initiated events in Figure 3.1. In that
25 collection of that 150 source terms we have

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1 internally and externally initiated events drawn
2 directly from NUREG-1150 and the study.

3 MEMBER APOSTOLAKIS: So you're not going
4 strictly by the frequency of release over --

5 VICE CHAIR BONACA: They wanted to get a
6 representative of a rapidly developing event with a
7 typical source term to test the strategies.

8 MEMBER APOSTOLAKIS: So the seismic was
9 not rapid?

10 VICE CHAIR BONACA: Well, I mean, it
11 could be. Seismic certainly would be one that--

12 CHAIRMAN SHACK: He's not worried about
13 frequency. You know, he thinks that a rapidly
14 developing event is credible, and that's almost all
15 he needs to know in terms of frequency. He needs a
16 slow release as a credible event. So he's got two
17 credible events he has to deal with to sort of
18 bound--

19 MEMBER APOSTOLAKIS: But in terms of
20 emergency planning whether you have had an
21 earthquake or not makes a big different. That's
22 release. And that's why I'm confused now.

23 Yesterday we had the seismic as being
24 the chosen one, and today we have the bypass of the
25 containment. And I'm trying to understand why.

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1 It would seem to me that the seismic,
2 especially when it comes to corrective actions,
3 would be really the big one. Because you may have
4 had damage on the emergency services and all that
5 stuff.

6 MEMBER WALLIS: It depends where you
7 are.

8 MEMBER APOSTOLAKIS:

9 These earthquakes are pretty serious.
10 They don't just damage the plant and everything else
11 is fine.

12 MEMBER BANERJEE: As long as it happens
13 in California, the state vanishes the plant keeps
14 operating.

15 MEMBER CORRADINI: Let me ask Professor
16 Apostolakis a question differently, which is if you
17 went back to the crew you had without numbers and
18 those numbers changed from ten to the minus four,
19 ten to the minus five, ten to the minus six to two
20 orders of magnitude lower and all the external
21 events remained the same, so you had a shift of the
22 population of all the greens be internal and all the
23 reds being external and it did this, would your
24 results change as to how you did protective action?
25 That's kind of what he's asking. My expectation is

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1 yes.

2 MR. BURNS: It would change the source
3 terms that we selected using this procedure that we
4 described.

5 MEMBER CORRADINI: But might it also
6 change how you even choose to say what to do outside
7 of the site? Because with an external event you
8 could damage all the infrastructure that you're
9 going to start using to move people and you can't
10 move them after three hours, because there ain't
11 nothing there to move them to. That's my way of
12 thinking about what he's asking.

13 MEMBER BANERJEE: Should there be
14 another strategy that he's --

15
16 MR. JONES: I think you have to look at
17 seismic as a separate. Otherwise you cannot compare
18 alternative protective actions.

19 MEMBER APOSTOLAKIS: So are you looking
20 at?

21 MR. SULLIVAN: No, we're not. But we
22 heard your message from yesterday in SOARCA, and in
23 fact --

24 MEMBER APOSTOLAKIS: You'll think about
25 it.

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1 MR. BURNS: That's right.

2 MR. SULLIVAN: Although not that I'm the
3 whole Staff, but yes. We'll definitely think about
4 it.

5 MEMBER BANERJEE: But is there anything
6 you can do in such a situation?

7 MEMBER MAYNARD: But seismic is like
8 weather and other things. They're considerations
9 that you have to take into account when you're
10 actually given protective action recommendations.
11 That's the point.

12 MR. McMURTRAY: And the state ultimately
13 makes the protective action guidance out there to
14 the public

15 MR. SULLIVAN: Okay. WE used the MACCS2
16 code. The model that predates what you heard about
17 in SOARCA --

18 MEMBER WALLIS: In your previous slide
19 seemed to indicate that you're going to evacuate a
20 1,000 times more likely than they're going to have a
21 major release.

22 MEMBER KRESS: Yes, I mean --

23 MR. SULLIVAN: Those are the initiating
24 events. Unfortunately, I would have had liked to
25 have had that be general emergencies.

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1 MEMBER WALLIS: It's a bit like crying
2 wolf, isn't it? I mean, you have all these
3 evacuations for no purpose.

4 MR. SULLIVAN: A general emergency is a
5 pretty serious event. And there hasn't been one
6 since TMI. There's has --

7 MEMBER WALLIS: That wasn't an
8 evacuation event.

9 MR. SULLIVAN: I'm sorry?

10 MEMBER WALLIS: That was not an
11 evacuation event, right?

12 MEMBER KRESS: No, but it was --

13 MEMBER WALLIS: But it was not an
14 evacuation.

15 MR. SULLIVAN: Well the term general
16 emergency I don't think existed at TMI. The whole
17 regimen is post-TMI that we're talking about.

18 So there's been no general emergencies.
19 General emergency is a fairly serious event. Yes,
20 indeed, if you ended up with reactor coolant level
21 at TAF, you would evacuate people. And, yes, indeed
22 you might not even have core damage if you recover.

23 We haven't cried wolf too many times
24 yet, so we haven't sought to change those kind of
25 criteria.

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1 MEMBER BANERJEE: But your evacuation is
2 not weather dependent, whether it's process or class
3 A or --

4 MR. SULLIVAN: It is weather dependent.
5 That's why we insist that our licensee have the
6 ability to recommend sheltering. Should the weather
7 be so terrible that evacuation is more dangerous
8 than staying put, then we would expect sheltering to
9 take place. But I have to tell you --

10 VICE CHAIR BONACA: All these issues are
11 covered by the observation you made, Bill. I mean--
12 yes, go ahead.

13 CHAIRMAN SHACK: Your ETE covers in a
14 way some of these considerations that, you know,
15 obviously with an event --

16 VICE CHAIR BONACA: The weather,
17 seismic, whatever.

18 CHAIRMAN SHACK: -- would lead to a very
19 large ETE.

20 VICE CHAIR BONACA: Very large ETE.

21 MR. SULLIVAN: Yes. Evacuation time
22 estimate.

23 CHAIRMAN SHACK: And so it is indirectly
24 within your sort of parametric study to certain
25 extent.

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1 MEMBER APOSTOLAKIS: So let's look at
2 some results.

3 MR. SULLIVAN: Okay.

4 VICE CHAIR BONACA: In a way this case,
5 for example, for a rapid event like that clearly
6 will lay forth the need for sheltering simply
7 because you can't move people. So some of it is,
8 again, it's common sense.

9 MR. SULLIVAN: We used a generic site.
10 Actually, we used a vanilla site. You know there's
11 62 sites. So what we did was we took not quite a
12 median population density. We simply picked a 100
13 people in a square kilometer. And it ends up being
14 80,000. You know, we're trying to do a national
15 level study.

16 Our vision was that perhaps site
17 specific studies, you know, could flow from this by
18 the licensee. But from our point of view our options
19 were either model the top 15, which would be a very
20 expensive process, or do a national level study that
21 will show you trends. And then if necessary, go on
22 to site specific where you are. So that's how we got
23 to where we are.

24 Now we took that same 80,000 people and
25 we varied the evacuation time from four hours to ten

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1 hours. Evacuation time is an artifact of both the
2 pop density and the infrastructure and, I suppose,
3 the geology, the mountains and hills and bridges and
4 that sort of thing.

5 MEMBER WALLIS: These are people within
6 ten miles of the plant?

7 MR. SULLIVAN: Yes, that's right.

8 MEMBER WALLIS: 80,000 people?

9 MR. SULLIVAN: Is pretty much median.

10 MEMBER WALLIS: Wow.

11 MR. SULLIVAN: Maybe it's not median.
12 Maybe it's on the high end.

13 MEMBER WALLIS: It seems high to me.

14 MEMBER BANERJEE: Indian Point.

15 MR. SULLIVAN: Yes, it's pretty close to
16 median. Indian Point are much higher.

17 MEMBER BANERJEE: I'm saying biased, but
18 in point.

19 CHAIRMAN SHACK: No, but median isn't
20 biased. That's why you use median.

21 MR. SULLIVAN: That's not an exact
22 median, folks. But, you know, we are in the middle
23 of the span.

24 We also varied travel speed.

25 Here's what we tested? Of course

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1 shelter in place, which is within the regimen. We
2 thought about using preferred shelter; large
3 buildings, schools, gymnasium. A lot of problems
4 with that. But, you know, we thought if you have a
5 high pop density, most probably there's large
6 buildings close to you. And maybe they could be used
7 in an effective manner. It turns out to be not such
8 a good idea --

9 MEMBER BANERJEE: So why is that? In
10 the old days there were bomb shelters.

11 MR. SULLIVAN: Yes. There are several
12 reasons. Compliance of the public is one. Once
13 they get in their cars are they really going to stop
14 at the school? The logistics of getting somebody
15 there to open the facility before the public arrives
16 is not easy. In fact, you have to have ventilation.
17 If you're going to have a thousand people in a
18 building, there must be ventilation. And if you
19 have ventilation in a plume, you're almost defeating
20 your whole purpose.

21 In a house, you can shelter, you can
22 close windows, turn off ventilation and you're not
23 going to suffocate.

24 If you put a 1,000 people in a gymnasium
25 and you turn off ventilation, it's not a safe

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1 environment.

2 So there's a thing that we found called
3 lateral evaluation. It's really quite effective. You
4 move perpendicular to the plume. Sometimes you can
5 reduce dose.

6 There's sort of an ironic thing. We
7 talked to several states about doing this and the
8 states with the big populations said we're already
9 using every road we got. Will you please look at
10 our map? You know, there are no alternate routes
11 that can be used.

12 And the sites where this would have been
13 useful, like out in the midwest where there's a road
14 every 160 acres, they have low population. They
15 don't need it. They could just flow.

16 So although it's a good idea on paper,
17 and there may be sites where it's applicable. I
18 mean, this could be possible at certain sites, it's
19 not universal.

20 Then we tried to model staged evacuation
21 where you evacuate the inner ring first and then
22 further out. And that showed some promise.

23 MEMBER APOSTOLAKIS: Now sheltering in
24 place includes staying in your house?

25 MR. SULLIVAN: That is what it is. In

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1 your house or in school --

2 MR. BURNS: That's the next one,
3 preferred shelter at various times.

4 MR. SULLIVAN: The second bullet is
5 preferred shelter.

6 MEMBER APOSTOLAKIS: And why is not --

7 MR. SULLIVAN: Shelter in place is stay
8 in your house or stay in your house or stay in the
9 shopping mall.

10 MEMBER APOSTOLAKIS: Okay. That's what
11 I think. Right.

12 MR. SULLIVAN: The second one is leave
13 your house and go to the high school.

14 MEMBER APOSTOLAKIS: And why would I do
15 that?

16 MR. SULLIVAN: Because if you had a long
17 evacuation time, if you were going to be on the road
18 for ten hours it might reduce consequences if
19 instead you went to a substantial building and got
20 sheltered rather than get in your car for ten hours.

21 MEMBER BANERJEE: Provided you could
22 control the ventilation and take out the iodine. We
23 concluded at the end that that was not advisable.

24 MEMBER APOSTOLAKIS: What is not
25 advisable?

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1 MEMBER BANERJEE: This preferred
2 sheltering in special events there. They concluded
3 at the end that it really was not advisable. Look
4 through their reasons.

5 MR. SULLIVAN: -- in large buildings it
6 turns out to be a bad idea.

7 MEMBER APOSTOLAKIS: A bad idea?

8 MR. SULLIVAN: We thought it might have
9 merit. When you study it, it doesn't.

10 MEMBER APOSTOLAKIS: Right. Right.

11 MR. SULLIVAN: We chatted with three
12 states and asked their advice so we could get off of
13 the technical paper and talk to the people who
14 actually would have to implement these plans. And
15 they gave us the benefit of their views. It was
16 really quite instructive to be brought back down to
17 earth.

18 We did a sociological review. I found
19 that particularly interesting. There's actually a
20 field of disaster response sociology and there's
21 dozens of sociologists who do this for a living.

22 You know, we've come to several
23 conclusions. The public will do what they're asked
24 to do as long as you can convince them that it's
25 convinced for them. So there's messaging issues,

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1 there's credibility issues.

2 If, like at TMI that Dr. Wallis brings
3 up, you have conflicting messages and an information
4 vacuum, you will get confusion. I don't think chaos
5 is the right word, but there will be confusion.
6 However, if you message it properly, you're
7 consistent and you give the public information, they
8 will do what they're asked to do as long as they are
9 convinced that it improves their safety.

10 We learned a lot of other sociological
11 stuff. If we publish this report, we would probably
12 have a lot of advice on how to message --

13 MEMBER APOSTOLAKIS: Now when we say
14 "public" in this case, we mean a majority of people,
15 I suppose?

16 MR. SULLIVAN: Well, you know that's
17 interesting, Dr. Apostolakis.

18 MEMBER APOSTOLAKIS: I don't know what
19 the public is. Who they are.

20 MR. SULLIVAN: It's always a majority.
21 It's most. Some are going to do what they're going
22 to do. There's always a shadow evacuation. Some
23 are going to leave, you know, as soon as they catch
24 wind of the problem. Some are going to stay.

25 For the purposes of our study those

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1 people normalize out. Because if they're going to
2 stay, no matter what we tell them to do, we don't
3 have to consider them. If they're going to leave
4 early, that doesn't matter either. You know, we're
5 just looking like what's better or worse.

6 Now in SOARCA we have to address those
7 issues. And I hope Joe told you what we figured out
8 yesterday.

9 But this is what our data looks like. I
10 just picked an interesting slide. This is source
11 term 2. Really what it shows is we end up with a
12 lot of zeros when you --

13 MEMBER APOSTOLAKIS: Well, let me
14 understand. This is rapid-early or what?

15 MR. SULLIVAN: This is the three hour
16 release, and it's a ten hour ETE. So it's a long
17 ETE, but it's the release that takes longer--

18 MEMBER BANERJEE: It's a slowly
19 developing release.

20 MR. SULLIVAN: Yes. Thank you.

21 MEMBER KRESS: These are the differences
22 in this --

23 MR. SULLIVAN: Early fatalities and
24 latent cancer fatalities.

25 MEMBER KRESS: Yes, but 30 fatalities

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1 for this condition versus the standard?

2 MR. SULLIVAN: Perhaps I put the wrong
3 slide up. I thought --

4 MEMBER APOSTOLAKIS: We'll discuss it
5 anyway, though.

6 MR. SULLIVAN: Yes. I thought you would
7 be more interested in the normalized. Our report
8 has --

9 MEMBER WALLIS: This is just fractions
10 of some total then?

11 MR. SULLIVAN: Yes.

12 MEMBER WALLIS: Up to one.

13 MR. SULLIVAN: Our report has several
14 tables of qualitative comparisons. I thought the
15 Committee would be more interested in this
16 normalized comparison.

17 MEMBER CORRADINI: We are.

18 MEMBER APOSTOLAKIS: Normalized means
19 again?

20 MR. SULLIVAN: This is normalized
21 against the total sum. So in this case there was
22 only four early fatalities maybe against forty.

23 MEMBER APOSTOLAKIS: Okay.

24 MR. SULLIVAN: And so you get 25 percent
25 of them and 74 percent of them as shown.

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1 MEMBER APOSTOLAKIS: This is a late
2 release.

3 MR. SULLIVAN: And the second column is
4 latent cancer fatalities. You get more of those.
5 We just used linear no threshold --

6 MEMBER ARMIJO: But what was the total
7 for that?

8 MR. SULLIVAN: I don't know.

9 MEMBER BANERJEE: Thousands? Hundreds?
10 Tens? Total what?

11 MR. SULLIVAN: Total consequences.

12 MEMBER ARMIJO: Thirty fatalities is the
13 example.

14 MR. JONES: It really varied for every
15 source term and every evacuation time estimate. And
16 every alternative protective action.

17 MEMBER CORRADINI: Oh, I see. Can I
18 just say it back to you because everybody else seems
19 to be quicker on this one.

20 So you took the nominal and that was the
21 EF and the LCF. And then these are all the
22 variations off of it given a timing, given a source
23 term?

24 MR. SULLIVAN: Let me say it a different
25 way. We have time and source and term on this

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1 slide. It's source term two, the slowly developing
2 release.

3 MEMBER CORRADINI: Right. That I got.

4 MR. SULLIVAN: This is a ten hour
5 evacuation time, the longest that we analyzed.

6 MEMBER CORRADINI: Got that.

7 MR. SULLIVAN: We then analyzed several
8 different options for protective actions. The radial
9 evacuation there in the middle is the standard
10 keyhole, where we're at right now. All right. And
11 those are the results --

12 MEMBER WALLIS: And SIP is in place.

13 MR. SULLIVAN: So the first one is a
14 shelter in place for two hours followed by lateral
15 evacuation away from the plume. You'll see
16 normalizes out to zero.

17 Preferred sheltering for two hours
18 followed by lateral evacuation has the same result.

19 And then shelter in place for four hours
20 is till good. Preferred sheltering for four hours.

21 Finally you get to staged evacuation,
22 that's where it's the initial two mile ring followed
23 by further out later. And then you have the base
24 case radial evacuation. Now --

25 MEMBER BANERJEE: And why does preferred

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1 sheltering for eight hours have such a large impact?

2 MR. SULLIVAN: You know, that was a bit
3 of a mystery. But it seemed -- you know, we didn't
4 pay attention to that because walk with me for a
5 second.

6 We've already got radial evacuation is
7 our basis right now. Anything below that we're
8 certainly not going to change our policy to. So
9 perhaps we didn't spend as much time on that as we
10 needed to.

11 MEMBER BANERJEE: But also stay in place
12 for eight hours followed by radial --

13 MR. SULLIVAN: Would be a bad thing to
14 do.

15 MEMBER BANERJEE: Yes.

16 MR. JONES: The reason for that is there
17 is some delay time associated with the preferred
18 shelter. For instance, we assumed it takes an hour
19 to get to the preferred shelter, so that's included
20 in the time line.

21 MEMBER WALLIS: Of course, it's lateral
22 it makes a difference. I mean, you can PS for eight
23 hours and then laterally evacuate, and there's no
24 result.

25 MR. SULLIVAN: That's right. Correct.

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1 MEMBER WALLIS: So it's the lateral
2 versus radial is the biggest action here.

3 MR. SULLIVAN: Lateral is successful--

4 MEMBER WALLIS: Know which to go, that's
5 the most important thing, right.

6 MR. SULLIVAN: That's the difficulty.
7 Which way to go, will there be a wind shift and is
8 there roads to accommodate. The locals were telling
9 us there's not roads to accommodate it.

10 We're almost done.

11 MEMBER ARMIJO: Well, the only thing
12 that was better than your current recommend is the
13 staged, is that right?

14 MR. SULLIVAN: Staged is better.

15 MEMBER ARMIJO: But not much better?

16 MR. SULLIVAN: Not by much in all cases.
17 Initial sheltering followed by evacuation for the
18 large early release is better.

19 MEMBER ARMIJO: But, you don't want
20 people out there in the middle of a plume?

21 MR. SULLIVAN: Right.

22 MEMBER KRESS: When you did the staged,
23 what did you do? Use a different time?

24 MR. SULLIVAN: We used a different
25 speed.

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1 MEMBER KRESS: A different speed. Okay.

2 MR. SULLIVAN: So we felt given our
3 limitations of the computer model, we thought the
4 best way to -- the only way we could represent it is
5 the people in the two miles moved fast and then,
6 perhaps they slow down when they get further out.

7 So here's our recommendations:

8 We think NUREG-0654 Sup 3 should be
9 changed. Now that's a recommendation we'll make to
10 the Commission and the Commission will tell us what
11 they want us to do.

12 VICE CHAIR BONACA: Yes. All the other
13 recommendations below that really they are just a
14 subset.

15 MR. SULLIVAN: That's right.

16 VICE CHAIR BONACA: What you learned
17 from the study and that's the basis for the --
18 that's the big recommendation that should be
19 changed?

20 MR. SULLIVAN: Right.

21 MEMBER APOSTOLAKIS: The purpose of this
22 study is to decide whether to make the first
23 recommendation, right?

24 MR. SULLIVAN: That's right.

25 VICE CHAIR BONACA: Right.

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1 MEMBER APOSTOLAKIS: So if the
2 Commission decides that yes it should be revised,
3 then the way to revise it might be doing a study
4 like this but in a risk-informed way?

5 MR. SULLIVAN: Well, I believe that
6 where we sit right now we would be able to make
7 recommendations and those recommendations follow--

8 MEMBER APOSTOLAKIS: But these
9 recommendations are based on one possible release or
10 two. Two actually. Rapid early and then late. And
11 I don't know. I mean, you got too many zeros. And
12 the EPRI report, which we'll hear about soon, say
13 that you really have to include all the sequences to
14 get a better picture.

15 VICE CHAIR BONACA: Certainly they would
16 have to -- if you went in to modify NUREG-0654, you
17 would have to consider stakeholders' comments --

18 MR. SULLIVAN: Yes. Yes.

19 VICE CHAIR BONACA: -- which would
20 include, it seems to me, the EPRI report.

21 MR. SULLIVAN: Yes. Exactly.

22 VICE CHAIR BONACA: I mean they would
23 have to really look at what --

24 MEMBER APOSTOLAKIS: But you wouldn't
25 rely only on two typical sequences, would you?

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1 VICE CHAIR BONACA: I don't think --
2 that's why I asked the question about -- I think
3 that, you know, when I look at this work it seems to
4 me, yes, I agree with the first recommendation.

5 MEMBER APOSTOLAKIS: That's fine as far
6 as this recommendation is concerned.

7 VICE CHAIR BONACA: Now how it's being
8 supported is not clear from what you told us that it
9 will be the only source of information that is risk-
10 informed.

11 MEMBER KRESS: I think I would rely on
12 two, George. And one condition would be I've got a
13 problem that leads to an emergency. And I would
14 evacuate. That's one strategy.

15 Then I've got another problem; it's
16 already happened and I've started releasing stuff
17 into containment, I would have a different strategy
18 there. I would rely on the RASCAL and track the
19 plume and move people as best I can out of the way
20 in shelter, and things. What else did you need?

21 VICE CHAIR BONACA: Yes, I agree with
22 that 100 percent.

23 MEMBER KRESS: And that covers the whole
24 -- right.

25 VICE CHAIR BONACA: I mean I think there

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1 is information here. Now, the other thing again that
2 you have to think about is the releases I saw
3 briefly in the EPRI report, they start in two hours
4 or three or whatever, but I think we're facing other
5 conditions that are not covered by the analyses of
6 NUREG-1150 or other analyses of that kind. I mean
7 there are safeguard issues that say you should be
8 prepared for all kinds of accidents, it seems to me.
9 And that's why I thought that it was prudent to
10 simply pick up from somewhere some representative
11 limiting events that will drive in the emergency
12 plan.

13 MEMBER BANERJEE: But from what you're
14 showing us it seems to me that every site, you know
15 the plan they make is very site specific, if they
16 can use the lateral and then followed by radial that
17 would be really a good way to do it.

18 MR. SULLIVAN: Yes. We would make the
19 recommendation. However, that's got to be a site
20 specific.

21 MEMBER BANERJEE: Yes.

22 MR. SULLIVAN: It's a complicated thing
23 to implement. But if you preplan it --

24 MEMBER BANERJEE: Yes.

25 MR. SULLIVAN: -- it's doable at some

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1 sites, so we wouldn't take it off the table.

2 But, for instance, we studied Oyster
3 Creek. Oyster Creek is using every road they got.
4 Now there are no roads for them -- there's the
5 Pines, the bay, the ocean so it wouldn't work for
6 Oyster Creek even though they're a big population.

7 MEMBER BANERJEE: What would they do at
8 Indian Point?

9 MR. SULLIVAN: I didn't study Indian
10 Point.

11 MR. JONES: They're pretty much using
12 every road.

13 MR. SULLIVAN: They use every road that
14 they have.

15 VICE CHAIR BONACA: It seems to me,
16 however, going back to the report, is that again all
17 the strategies are being discussed in the report,
18 all the basis of the report results. And when you
19 look at them in a qualitative fashion as they're
20 presented, it gives you a level of crispness about
21 the outcomes that really is not supported by the
22 uncertainties. I mean, you have uncertainties
23 there. So I think it's important that, it seems to
24 me, the report there should be some discussion of
25 how that plays against the uncertainty in the

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1 implementation. Because you may have a strategy
2 that on paper looks great. And then when you go to
3 implement it at a specific site, it looks very lousy
4 and it cannot be implemented. I think those are
5 issues that should be left to the site to consider
6 to have a justification for maybe. But still, I
7 mean to consider.

8 MR. SULLIVAN: We believe that, too.

9 VICE CHAIR BONACA: And I think that
10 the--

11 MEMBER APOSTOLAKIS: We do have the
12 results for the early rapid release?

13 MR. SULLIVAN: Sure. We sent you the
14 study.

15 MEMBER APOSTOLAKIS: Well, you have a
16 slide?

17 MR. SULLIVAN: No, I sure don't.

18 MEMBER ARMIJO: Well, could you put that
19 chart with the numbers on it, the EF and LCF?

20 MR. SULLIVAN: Yes.

21 MEMBER ARMIJO: On that same thing, just
22 for comparison, what if nothing was done for these
23 events? Absolutely nothing? What would the
24 normalized numbers be?

25 MR. SULLIVAN: Not good.

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1 MEMBER ARMIJO: Yes, just show the
2 benefit. I'm not recommending it. I'm just saying
3 just if nothing actually --

4 MR. SULLIVAN: If people would
5 actually--

6 MEMBER ARMIJO: Numbers. For example,
7 early fatalities would that be --

8 MR. SULLIVAN: This is normalized. But
9 are you looking for numbers? You can injure and
10 kill people with a large release from a power plant
11 if they simply sit there for 30 minutes.

12 MEMBER ARMIJO: For these events.

13 MEMBER MAYNARD: These aren't events.
14 These are different protective action strategies.

15 MR. SULLIVAN: Or for particular events.

16 MEMBER MAYNARD: Or one event.

17 MR. SULLIVAN: For one release in time.

18 MEMBER KRESS: If the source there was
19 big enough to --

20 MEMBER BANERJEE: The question is if you
21 did not do anything, what would that be? Would it
22 be .9 --

23 MEMBER KRESS: Nine, nine, nine.

24 MEMBER CORRADINI: It wouldn't be -- but
25 it would be pretty big.

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1 MEMBER KRESS: It would be pretty big.

2 MR. SULLIVAN: Yes, you can --

3 MEMBER CORRADINI: To show the benefit,
4 yes.

5 MEMBER MAYNARD: I would like to echo
6 Mario's comment and expand a little. I believe there
7 is a lot of good information here and I would like
8 to see a little less emphasis on evacuation and a
9 little bit more sheltering in place and use of that.
10 However, I think we have to be careful in how do we
11 do revise the documents or change any requirements.
12 Because if we make this too complex, too many
13 options, too complex and then we try to evaluate to
14 a specific criteria with hundreds of people, many
15 states, different -- we're going to create, really,
16 a bigger problem than what we're solving here.

17 I think the options are good. I think
18 we have to be careful about being too prescriptive
19 about what has to be done and then how to evaluate
20 it.

21 CHAIRMAN SHACK: Well, I thought that's
22 why they did that bidding, then you would look at
23 the strategies that gave you roughly equivalent
24 benefit and you decided which of those was the one
25 that was easier to implement. And that's the

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1 judgment that you would make in a particular
2 situation.

3 MEMBER MAYNARD: The problem comes in on
4 how this gets put out is that in the exercises that
5 you have, the NRC has to evaluate, FEMA has to
6 evaluate. They're looking for criteria.

7 It's very easy to go to these things and
8 say, you know, this is what we would have expected
9 you to do in this case. And you can't do that in
10 all cases.

11 VICE CHAIR BONACA: Yes. I would like to
12 move a moment to the number 20, because I think it
13 may answer George's question. If you could move to
14 that slide.

15 MR. SULLIVAN: Because.

16 VICE CHAIR BONACA: Because the rest I
17 mean --

18 MR. SULLIVAN: Number 20?

19 VICE CHAIR BONACA: No, no.

20 MR. SULLIVAN: I'm sorry, Doctor.

21 VICE CHAIR BONACA: Yes, yes. That one.
22 I'm sorry. You were right. This one here.

23 MR. SULLIVAN: Okay. Yes. If I could
24 just talk about this for a little while. It's the
25 same crew that's doing the emergency response in

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1 SOARCA that did this project. Now this project
2 predates SOARCA by a couple of years and the power
3 study informed the work that we're doing in SOARCA.
4 Joe and I have been working together now for three
5 years. We're also working on SOARCA together.

6 There's obviously a nexus between the
7 two studies. And SOARCA is the more sophisticated
8 study. We're modifying our computer program to be
9 able to better model emergency response. The source
10 terms are more realistic in SOARCA than these source
11 terms that we used in NUREG-1150.

12 VICE CHAIR BONACA: Absolutely.

13 MR. SULLIVAN: There's a possibility
14 that SOARCA may determine that the large early
15 release is not credible. Now should that be the
16 case, and it would have to be fully examined, the
17 Staff would be prepared to recommend that the
18 Commission consider changing the EP planning basis.

19 MEMBER CORRADINI: Just so I am clear
20 about your use of that terminology, your use of
21 large early release is essentially the way Tom
22 described it, which is it occurred so quickly that
23 you used up your less than an hour time and already
24 we have releases to the environment? Is that what
25 your definition is? I'm trying to understand your

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1 definition versus the SOARCA definition.

2 MR. SULLIVAN: My definition is simply
3 that there's a serious release before evacuation can
4 be effected close into the plant.

5 MEMBER BANERJEE: But how could that--

6 MR. SULLIVAN: And that would be on the
7 order of less than hour.

8 MEMBER BANERJEE: -- equivalence with an
9 earthquake or something? I mean, it seems like a
10 long shot. If SOARCA did that, I would say you know
11 you have to reexamine SOARCA.

12 VICE CHAIR BONACA: The other thing is
13 that SOARCA is only looking at the same sources of
14 accidents. I mean internal events, external events.
15 I believe the emergency planning covers other
16 possibilities.

17 MR. SULLIVAN: That's exactly right.

18 VICE CHAIR BONACA: Okay. And we have
19 to be aware of those, I mean even if we don't talk
20 about them. But we have be aware of those, and we
21 don't know what they are --

22 MEMBER BANERJEE: It seems a long shot.

23 VICE CHAIR BONACA: Yes.

24 MR. SULLIVAN: Before there's any change
25 to the EP planning basis that would have to be

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1 addressed. You cannot ignore those other
2 possibilities.

3 VICE CHAIR BONACA: Right.

4 MR. SULLIVAN: And so as a matter of
5 fact when we did our post-911 analyses we were
6 comfortable in saying that a terrorist event cannot
7 create a larger source term or a source term that
8 develops more quickly than the ones we are already
9 considering in the EP planning basis. Now, I don't
10 mean to say that we've analyzed every situation, but
11 we felt that the EP planning basis remained valid.
12 It remained credible.

13 VICE CHAIR BONACA: It seems to me that
14 those considerations that are the one that are
15 important. George for, you know, this confirming
16 means that you have a clear understanding of
17 probably a dozen consequences of certain limiting
18 events and --

19 MEMBER APOSTOLAKIS: You mentioned
20 earlier the uncertainties. I mean it seems to me
21 the uncertainties that would could to mind, of
22 course, are litigate whether people will do this and
23 that. But also the sequences themselves, isn't that
24 an uncertainty, too? I mean, when you pick one, and
25 then if you pick five you will have some different

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1 thing.

2 MR. SULLIVAN: Right. Right.

3 MEMBER APOSTOLAKIS: That's what I'm
4 saying. Yes. So this idea that there is something
5 that's bounding is not convincing to me.

6 MEMBER KRESS: I think an LER due to the
7 terrorist thing is probably the reason you would
8 still keep it in your emergency plan.

9 MR. SULLIVAN: Could be.

10 MEMBER KRESS: It's a defense-in-depth
11 issue.

12 MR. SULLIVAN: True.

13 MEMBER KRESS: So, you know, whether
14 it's credible from the normal accidents or not, it
15 probably wouldn't matter. You'd probably need it in
16 the plan anyway.

17 MEMBER CORRADINI: I was going to modify
18 -- I was going to ask if you would modify your
19 statement from the SOARCA discussion we had on
20 whatever day it was.

21 MEMBER APOSTOLAKIS: Yesterday.

22 MEMBER CORRADINI: Was it yesterday?

23 MEMBER BANERJEE: The day before.

24 MEMBER CORRADINI: That in the absence
25 of some sort of security or terrorist event, in the

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1 absence of a large seismic event probably what
2 you're saying, I keep on hearing from the Staff
3 fairly consistently. But when you start rolling
4 those in, then I think Tom's point is important to
5 consider.

6 VICE CHAIR BONACA: Okay. I think we
7 need to move on to the next presentation.

8 MR. SULLIVAN: Yes. Thank you so much.

9 VICE CHAIR BONACA: Yes. Thank you.

10 MEMBER BANERJEE: Because even that
11 French plan which had a storm surge come and --

12 MEMBER CORRADINI: You talking about the
13 one that could have flooded? Yes, but that's for
14 this location, that would be the equivalent of a
15 seismic. But I don't think that would be a large
16 early release, though. It would be a release.

17 (Whereupon, a short recess)

18 VICE CHAIR BONACA: Come on now. We have
19 short time and we would like to hear. We didn't
20 really have the time to give you for making a
21 presentation that will be sufficient, I guess, for a
22 whole report.

23 MR. HESS: Thank you, Dr. Bonaca. And
24 we will be brief. And our intent is to provide a
25 very summary level presentation for the ACRS. And

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1 we appreciate your time in letting us do so.

2 For those who don't know me, I'm Stephen
3 Hess. I'm with the Electric Power Research
4 Institute. I am the Project Manager for the work
5 that was performed here. It was also sponsored by
6 the Nuclear Energy Institute. And Marty Hug is
7 representing them today.

8 Dr. David Leaver was the principal
9 investigator who performed the work, and I'll let
10 him provide the technical presentation. But to get
11 to the end, I guess, we appreciate the time to do
12 this.

13 We have a report that is going in
14 publication that you have a draft copy. I realize
15 you have not had, certainly, a close to sufficient
16 time to look at it. We also need to interact with
17 the Staff. And we'd like to put out for
18 consideration after this high level view is as we
19 get the report published, we would like to interact
20 with the Staff. And offer up we would be willing to
21 come back and do a more in depth presentation at a
22 later time.

23 VICE CHAIR BONACA: And we would like to
24 very much to support that.

25 MR. HESS: With that, I'll turn it over

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1 to Dave. And we realize we're short of time, so
2 we'll try to get through this rather quickly. And
3 it is a summary level presentation.

4 DR. LEAVER: Okay.

5 MEMBER APOSTOLAKIS: I don't know why
6 we're short of time. I think this is a very
7 important piece of information for the Committee.

8 VICE CHAIR BONACA: It was not provided
9 in time. This was a meeting to review 0654, okay.
10 And then --

11 MEMBER APOSTOLAKIS: We were notified--

12 VICE CHAIR BONACA: -- the industry
13 asked for time to make comments with us on 0564.
14 And then at the last minute came out that there was
15 a report being issued that the Staff has not
16 reviewed. We have not reviewed. A review today
17 recommendations are going to be on 0654 on what the
18 Staff has done. So just there wasn't time.

19 I mean, we could have --

20 MEMBER APOSTOLAKIS: I understand that.
21 But it seems to me this is an important piece of
22 work.

23 DR. LEAVER: We have given the time that
24 we've need.

25 MEMBER APOSTOLAKIS: Well, keep going.

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1 Welcome to the --

2 DR. LEAVER: Okay. In our work in
3 considering protective action strategies and the
4 central question was how do we measure their
5 effectiveness to try to get some insights on what
6 works well and doesn't, we decided to take a bit of
7 a different approach than what is embodied in 0396,
8 0396 as, I'm sure you know, utilizes technology and
9 a state of knowledge that was basically early '70s,
10 WASH-1400 sequences that we believe that the results
11 significantly overestimate the risks associated with
12 nuclear plant accidents. The 0396 approach is not
13 risk-informed. It's a little bit risk-informed, but
14 not very much risk-informed.

15 It uses condition probability of core
16 melt of unity. There's been an awful lot of PRA work
17 done, particularly since TMI, the last 30 years,
18 that's not reflected in it. The source terms are
19 out of date. It uses a MAX 2 or a MAX -- actually it
20 was a CRAC, but the same thing that exists on MAX 2
21 today. It's a peak dose, which is completely
22 realistic. And the impact protective actions is not
23 in there.

24 So when you look at the information in
25 0396 it gives you a grossly exaggerated sense of the

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1 risk of nuclear power plant accidents. So that led
2 us to want to look at this problem from a more risk-
3 informed standpoint.

4 We had three objectives in this work.
5 One was to quantify the relative effectiveness of
6 various protective strategies using on some kind of
7 a risk-informed basis. Our idea here was that this
8 could provide a framework for the off site agencies
9 to implement in their emergency planning process.
10 We recognize that there are a lot of practicalities
11 that need to be considered in that, and you
12 discussed some of that a moment ago with the NRC
13 presentation. But nonetheless, we think that needs
14 to be addressed and put on the table when you start
15 debating it.

16 Secondly, we believe and I think
17 everyone recognizes there's a need to clarify the
18 guidance that is given to both the plants and the
19 off sites. The plants make the protective action
20 recommendations, the off site make the decision. The
21 guidance is fuzzy, ambiguous that exists today. And
22 I think we can do a better job of that.

23 And finally, there's just been a
24 revolution in communication technologies just in the
25 last few years. And it's just going to keep

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1 accelerating. And I think it presents opportunities
2 to do things in the way of notifying the public with
3 a bit more intelligence on protective actions
4 compared to what we do today.

5 Our second objective was going back to
6 the 0396 and the basis for the 10 mile EPZs. We
7 believe that the time has come to update the basis
8 for emergency planning and to understand. And what
9 we've tried to do is look at one approach for doing
10 that that we think is a risk-informed approach. And
11 also, we're interested in looking at the margin in
12 the ten mile EPZ.

13 And finally we looked --

14 MEMBER WALLIS: Presumably risk-informed
15 might lead to a desire to modify this ten mile
16 emergency planning zone.

17 DR. LEAVER: I beg your pardon?

18 MEMBER WALLIS: Presumably if you risk-
19 informed and then you looked at what you could
20 achieve, you might want to redefine your definition
21 of the emergency planning zone.

22 MR. HESS: That's a possibility.

23 DR. LEAVER: We didn't go there --

24 MEMBER WALLIS: I'm saying that if you
25 get enough insights, it might lead to something --

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1 DR. LEAVER: It's possible. I think at
2 a minimum it would behoove us to understand the
3 margin in the ten mile frame for sure. And the new
4 plants are very interested in the question that you
5 are asking, we know that.

6 Finally, we would welcome the
7 opportunity to provide input and insights to the
8 Supplement 3 revision which Randy Sullivan and the
9 NRC are considering.

10 Our approach was we used generic source
11 terms. We developed what I would characterize as a
12 representative set of accident sequences for a
13 variety of plant types and a spectrum of accidents.
14 We looked at NUREG-1150. We looked at the IPEs. We
15 looked at more recent information. And then we took
16 our best shot at coming up with a set of sequence
17 types that covered a spectrum of release magnitudes,
18 timing and that sort of thing. We think probably
19 one could refine it more if you spent more time and
20 effort, but we think it's not a bad representative
21 set of sequences that would cover pretty much all
22 plant types and a spectrum of different kinds of
23 events.

24 Our risk-informed approach, the central
25 thing there was risk metrics. That's what you need.

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1 You need a measurable metric, risk metric. We looked
2 at early fatality risk. We looked at early injury
3 risk. And we look at latent cancer fatality risk.

4 MEMBER KRESS: When you talk about early
5 fatality risk, was this the individual risk or --

6 DR. LEAVER: Yes.

7 MEMBER KRESS: -- a total known?

8 DR. LEAVER: Individual.

9 MEMBER KRESS: It's individual?

10 DR. LEAVER: Right.

11 MEMBER KRESS: Like the safety goals?

12 DR. LEAVER: Right.

13 MEMBER KRESS: Okay.

14 DR. LEAVER: We wanted to be able to
15 make comparisons to the safety goals. It's
16 certainly an interesting thing to do.

17 MEMBER APOSTOLAKIS: That's true. But in
18 this kind of evaluation, Tom, don't you think that
19 an F-M curve would be more appropriate when you're
20 dealing with people and evacuation and all that? Do
21 we really have to stick to the individual risk?

22 MEMBER KRESS: Well I think there are
23 other risks that are of interest, yes.

24 DR. LEAVER: One could do the type of
25 study we did for a number of different risk metrics.

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1 Just to get on with it, we choose early fatality
2 risk and, as I said, latent cancer risk and early
3 injury risk. We also looked at thyroid cancer risk.
4 That's an interesting one because it plays into the
5 whole question of KI and how far out you might need
6 it. We have that data, we just didn't have time to
7 process it.

8 MEMBER BANERJEE: So how do you model
9 the early? Do you use PROBITs for the risk? Or how
10 is the actual modeling done? How do they do their
11 calculations. Are there PROBITs?

12 DR. LEAVER: Yes. We used the health
13 risk models from MAX, that's what we used.

14 MEMBER BANERJEE: What are those models?

15 VICE CHAIR BONACA: PROBIT.

16 MEMBER BANERJEE: PROBIT. Okay.

17 MEMBER APOSTOLAKIS: Why do you decide
18 to consider injury? I mean, that's kind of unusual,
19 isn't it?

20 DR. LEAVER: We did it because we felt
21 that possibly in understanding better the margin
22 that exists in ten miles that stakeholders might be
23 interested in that, early injury being a symptom
24 from radiation exposure that occurs quickly.
25 Actually, that injuries I believe are quantified in

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1 0396 as well. So you wouldn't have to, but we just
2 thought it would be interesting to have that
3 information.

4 MEMBER APOSTOLAKIS: So they are not
5 essential to drawing conclusions?

6 DR. LEAVER: Well it depends on what
7 conclusions you want to draw.

8 MEMBER APOSTOLAKIS: Would the
9 conclusions we saw ten minutes ago from the Staff
10 change if they --

11 DR. LEAVER: Probably not. Our
12 conclusions don't change. But what you do see if
13 you're looking, for example, if you are interested
14 in the margins that exists in ten miles, you see the
15 effects from early injuries are seen further away
16 from the site than from early fatalities. That could
17 be of interest to the public.

18 We developed --

19 MEMBER APOSTOLAKIS: But would be of
20 interest to the public to the degree that it would
21 effect our decisions regarding evacuation?

22 DR. LEAVER: My guess is that the
23 decisions that we would reach with this type of an
24 approach on protective action strategies and what's
25 effective would not be different --

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1 MEMBER APOSTOLAKIS: Okay.

2 DR. LEAVER: -- between early fatality
3 and early injury.

4 To do this work we developed a model
5 which we used the acronym DoRMET, which stands for
6 dose rate mapping and evaluation tracking. This is
7 basically an extension of MAX. The MAX 2 plume
8 dispersion modeling to do a couple of things. It
9 gives us a more detailed and realistic distribution
10 of activity. Pretty much a continuous distribution
11 activity throughout the ten mile EPZ.

12 It gives us more realistic movement of
13 population. We move -- MAX is a polar coordinate
14 based system. We used the MAX plume dispersion
15 model, but we have imposed on that a cartesian
16 coordinate system for evacuation tracking so we have
17 the ability, though this is work that we're hoping
18 to do later this year and early next, for a
19 representative, an individual, to actually follow at
20 least a course road network around a site so that
21 one could do this type of work based on the actual
22 paths that people would follow when they move,
23 evacuees.

24 Also the DoRMET model allows coupling of
25 the protective action strategy to conditions at the

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1 time of the accident. Perhaps the most interesting
2 one which Randy and his people discussed is in
3 regard to wind direction. What our model can do is
4 it can allow you to select a strategy in which you
5 move people in a direction lateral to the wind
6 direction at some time. For example, at the time
7 that the order to -- the decision to evacuate is
8 made or at the time that the accident starts or
9 whatever time you want to pick. And certainly the
10 wind can change, and so the wind calculation takes
11 that into account in its results. But it turns out,
12 as I'll say in a moment, the most effective strategy
13 particularly for people close to the site is to move
14 away from lateral to the wind.

15 MEMBER WALLIS: Does this weather
16 conditioning include snow and ice and that kind of
17 thing?

18 DR. LEAVER: Well, we didn't try to get
19 into to those sorts of things. Let me get to the
20 end because we have such a short time and we can
21 talk about that a little bit.

22 So then we evaluated protective action
23 strategies on the basis of relative risk. So we're
24 comparing strategies. We can say, for example, one
25 strategy is an order of magnitude more effective

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1 than another strategy on the basis of reducing early
2 fatality risk or latent cancer fatality risk or
3 whatever.

4 And finally we looked at the ten mile
5 EPZ and the margin in the ten miles on the basis of
6 absolute risk. And we recognized this is a bit of a
7 slippery slope because there certainly are
8 uncertainties in all these numbers, but we believe
9 that's the kind of thing that one would need to do
10 to quantify the margin that exists in the ten miles
11 or possibly to look at a distance inside ten miles.

12 These are the four primary strategies we
13 looked at. We looked at shelter in place, we looked
14 at what I call away from reactor evacuation which is
15 evacuation along radial stream lines emanating out
16 from the site. We looked at away from plume
17 evacuation, which is lateral to the wind direction.
18 And finally we looked at keyhole.

19 This diagram here shows the keyhole,
20 which is this -- I believe this diagram came from --
21 it may not be the exact diagram on the NRC website,
22 but there is a keyhole picture on the NRC website.

23 MEMBER BANERJEE: Does the cone angle
24 there or whatever the angle of that keyhole depend
25 on the wind conditions?

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1 DR. LEAVER: Well, the keyhole strategy,
2 I don't remember. I think it's probably maybe
3 defined different from side-to-side. But the general
4 idea is you evacuate all around out to some
5 distance, say two miles. And then downwind for
6 perhaps three or four 22½ degree sectors you
7 evacuate. And then everybody else stays put.

8 MEMBER MAYNARD: Well, that typically
9 depends on the dispersion of the plume.

10 DR. LEAVER: Right.

11 MEMBER MAYNARD: There's stability
12 factors there as to how wide that keyhole is.

13 DR. LEAVER: But I think the idea that
14 we could --

15 MEMBER BANERJEE: That's whether it's
16 different from weather.

17 DR. LEAVER: One of the things we
18 learned from our work, or at least this is kind of
19 where I am on it, is I think the idea that you could
20 refine a keyhole to add a sector or subtract a
21 sector, that somehow that that's going to make it
22 better is, I think, overdoing. Our conclusion is
23 the keyhole isn't a very good approach. Because
24 people in this area --

25 MEMBER APOSTOLAKIS: No, no. You have to

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1 just sit down.

2 DR. LEAVER: The people in the two to
3 five mile region outside of the three sectors that
4 evacuate, the risk goes up dramatically for those
5 people relative to any other evacuation strategy. So
6 one of our conclusions was it doesn't look like a
7 great strategy.

8 Next slide.

9 So these are the conclusions we came to.
10 This is not new information, but it's important.
11 There is a dramatic reduction in risk as a function
12 of distance. It varies depending on -- for early
13 fatality risk what we found depending on the
14 protective action strategy used, we found from one
15 to two or even three orders of magnitude per mile
16 distance from the reactor.

17 MEMBER WALLIS: What does that mean?
18 That means if you're 10 miles away, it's 20 orders
19 of magnitude? I don't think I quite understand.
20 That's what it means?

21 DR. LEAVER: That tends to be in the
22 first few miles. I'm not sure that it would apply
23 all the way up.

24 MEMBER WALLIS: You multiple it by
25 miles?

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1 DR. LEAVER: But from zero to five miles
2 is what we're saying, out to five miles.

3 MEMBER WALLIS: You got ten orders of
4 magnitude?

5 DR. LEAVER: You get ten orders of
6 magnitude for certain strategies, yes.

7 VICE CHAIR BONACA: If I remember, your
8 fastest release is --

9 DR. LEAVER: The one that gives you that
10 is away from the plume where you're evacuating
11 laterally to plume. The shelter in place is the
12 least effected, but that's giving you about one
13 order of magnitude per mile.

14 VICE CHAIR BONACA: But the point I
15 wanted to make is that if I remember, your earliest
16 release, I mean the fastest release is two hours
17 after the determination of general --

18 DR. LEAVER: Yes, I can show a slide on
19 the source terms. Let me get through these
20 conclusions.

21 VICE CHAIR BONACA: Because I mean one
22 of the main conclusions of the Staff is that the
23 dependency between the timing of release and the
24 estimated --

25 DR. LEAVER: The single most important--

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1 MR. HESS: This is the slide that's
2 subject to your comment.

3 DR. LEAVER: Go back to the one before.

4 MR. HESS: Oh, the one before?

5 DR. LEAVER: The single most important
6 parameter along those lines, Mario, is the
7 difference between the number in this column and
8 this column.

9 VICE CHAIR BONACA: Yes.

10 DR. LEAVER: It's not the absolute
11 number. It's the difference. So the sequence that
12 was the toughest for us is this one. We had a
13 declaration of general at 1.5 hours and the
14 beginning of release at 3 hours. So you have an hour
15 and a half.

16 VICE CHAIR BONACA: Yes.

17 DR. LEAVER: And that's really not
18 enough time to get the word from the plant to the
19 off sites and for the off sites to figure out what
20 they want to do, put that word out. And then the
21 people who receive this, it takes them some time to
22 get organized and do what they're going to do. So
23 that's where you tend to -- it's that delta that
24 tends to really control --

25 VICE CHAIR BONACA: Yes, the point I was

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1 making is that the Staff most severe release was the
2 one which happened 45 minutes after the declaration
3 of general emergency. So that they have even less
4 time. So for that scenario and for significant
5 evacuation times clearly sheltering looks like the
6 only solution for that scenario. You don't have
7 that scenario here. You have as a minimum 1½ hour.

8 DR. LEAVER: The scenario that was most
9 demanding from the standpoint of timing was the one
10 that I showed you.

11 VICE CHAIR BONACA: Yes, that's right.

12 DR. LEAVER: Which was an hour and a
13 half from the time of declaration of general to when
14 the release begins.

15 VICE CHAIR BONACA: So my comment was
16 that would affect your conclusion in a way? I mean,
17 the fact that you have these timing differences
18 between --

19 MR. HESS: That's correct. If it's a
20 shorter time to release.

21 DR. LEAVER: I'm not sure how much it
22 would affect these conclusions. If anything, it
23 would make the away from plus the lateral
24 evacuation, even more important that's probably
25 true. But it's quite important as it is, as you'll

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1 see.

2 The second bullet is an interesting one.
3 What that says is that evacuation provides about two
4 orders of magnitude lower early fatality risk than
5 shelter in place for the region inside five miles.
6 That says to me -- I mean, I think one would need to
7 kind of mentally process all of this and think about
8 it. And I think it gets into the comment that one
9 of the members made about implement weather
10 conditions, for example, snow and ice in the middle
11 of the night, you know, what do you tell people to
12 do. But our data is pretty clear that it's just not
13 a good idea for people close to the site to hang
14 around.

15 So I think we need to be thinking about
16 that in terms of whatever provisions we make to
17 Supplement 3 of 0654.

18 The third bullet is that the away from
19 plume strategy that is lateral to the wind provides
20 one to two orders of magnitude lower early fatality
21 risk than the away from reactor, the away from
22 reactor being the model that's at max, which is
23 along the radial streamline.

24 Now, probably --

25 CHAIRMAN SHACK: Excuse me. When you do

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1 shelter in place, when do you do an evacuation
2 together with that?

3 DR. LEAVER: Well, we looked at
4 different combinations to those things. But the
5 conclusion on the second bullet is strictly
6 evacuation versus sheltering in place and staying
7 there.

8 I mean, you could look for example at a
9 shelter in place for two hours and then evacuate.
10 There's all kinds of things you could do. And we
11 did a number of those things, but we clearly don't
12 have time to go into that here. But it's in our
13 report. But we're really trying to do is just get
14 some insights here as to how to begin to think about
15 this problem. Because it's a complicated problem
16 because there's a lot of different options and
17 different things that need to be considered. But I
18 completely agree with one of the comments I believe
19 Otto Maynard made that ultimately what we need to do
20 is translate this information, these insights we get
21 about protective action strategies and the relative
22 effect to a simple metrics of possibilities that an
23 off site person who is under the gun to make a
24 decision quickly when all hell is breaking loose can
25 maybe look at the weather and the time of day and

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1 commute and no commute and those sorts of things and
2 say okay, this what we're going to do. And put the
3 word out. That's where I think we need to head.

4 VICE CHAIR BONACA: You seem to differ
5 in your recommendation from the one that we received
6 in the previous presentation. That is, that for an
7 early release and long estimated time of evacuation,
8 sheltering in place is better than evacuating
9 immediately; you seem to disagree with that?

10 MR. HESS: Well, I think, Dr. Bonoca,
11 that we need to engage in talk with the Staff and
12 understand.,

13 VICE CHAIR BONACA: Yes, okay.

14 MR. HESS: On the surface it may appear
15 that way. I'm not sure that that's true or not.

16 VICE CHAIR BONACA: That's right.

17 MR. HESS: We need to have those
18 discussions.

19 DR. LEAVER: The evacuation that we
20 looked at here in preparing with shelter in place
21 assumes that people delay. And some portion of their
22 delay time is shelter.

23 VICE CHAIR BONACA: Yes.

24 DR. LEAVER: This is not a shelter in
25 place where they're told to shelter for some number

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1 of hours and then go. The sheltering occurs because
2 they go inside and they gather their things up and
3 so we take some credit for modest sheltering during
4 the delay time.

5 VICE CHAIR BONACA: Right.

6 DR. LEAVER: Next slide. Keyhole
7 strategy. I'm on the top bullet now.

8 We see that as relatively ineffective
9 from two to five miles compared to other evacuation
10 strategies due to wind shift. This is a bit of a
11 surprise to us. And, you know, the keyhole strategy
12 is out there everywhere. It's in 0654, its on the
13 NRC website. It's a number plants and off site
14 agencies have it as kind of their basic strategy.
15 It's possible that it could be made to be more
16 effective by expanding the number off azimuthal
17 sectors that you include in the down wind, but I
18 guess this sort of reflects my view of it is what we
19 say here.

20 MEMBER WALLIS: How does this keyhole
21 differ from away from plume strategy? I mean, they
22 both seem to depend on knowing where the plume is.

23 DR. LEAVER: Well, you need to know the
24 wind direction at some point in time. That's all
25 you really know. I think it would be way too

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1 complicated to try to update wind direction. And so
2 you say wind direction, for example, at the time of
3 the beginning of release. That was the one we used
4 in most of our work.

5 The lateral strategy, if the wind is
6 blowing this way at the time of release, lateral
7 strategy would say generally tell people to go that
8 way. The keyhole strategy is different. What it
9 says is people who are sectors that are centered
10 around the direction of the wind, and choose the
11 number of sectors you want, you people go.

12 MEMBER WALLIS: And you don't tell them
13 which direction to go.

14 DR. LEAVER: Yes, that's right. You
15 don't tell which direction. Yes. Yes. And it isn't
16 those people that have high risk. It's the people
17 who are outside of the two mile all around a
18 pattern, but who are outside the sector that is
19 supposed to evacuate. They're the ones that are at
20 risk.

21 Another interesting conclusion we came
22 to was, and I believe this is similar to a
23 conclusion to Randy Sullivan's conclusion was the
24 idea of a delayed evaluations -- we call it delayed
25 evacuation skirt for the far field. What's this is

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1 is it's the people inside close to the site, and we
2 used four miles, evacuate immediately or as quickly
3 as they can. And we believe that if one were to
4 develop the system's communication systems and
5 management systems to implement something like this,
6 that that could be done. That people closer to the
7 site could be alerted faster. Those people go
8 immediately. Don't wait around to see what's going
9 to happen. And then outside four miles people
10 shelter.

11 The calculation we did is we evacuated
12 people inside four miles quickly. People outside
13 four miles sheltered until two hours after the
14 release began. So for each of the sequences we
15 adjusted the time of evacuation for the people
16 outside four miles to start. Their trip started two
17 hours after the release began. We figured that as a
18 sort of a conservative approach.

19 And what we found is that the overall
20 risk of this delayed evacuation start for the far
21 field was comparable to and no greater than the
22 risks of where other execution strategies were used
23 where you were evacuating the entire ten miles.

24 MEMBER WALLIS: It's different risks for
25 different people. I mean, the overall risk may be

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1 the same, but some people think --

2 DR. LEAVER: Well, not as much as you
3 think. It definitely helped the people inside four
4 miles because the roads are less clogged and the
5 speed increases. The people outside four miles you
6 have the benefit of time from the time it takes the
7 plume to get out there. And you have intelligence
8 about the wind direction so you can tell them what
9 direction to go.

10 So I think this is worth looking at, or
11 that was our conclusion.

12 Breathing masks we looked at. We found
13 some reduction in health risk. I think it's a
14 matter of high practical it would be, but probably
15 worth thinking about. We found about a factor of
16 three reduction in early fatality and a factor of
17 ten reduction in latent cancer, which is important.
18 I think latent cancer risk is going to turn out to
19 be a very important part of this whole story and we
20 need to pay attention to it in whatever we end up
21 doing here.

22 Finally, we looked at preferred shelters
23 and came I think to the same conclusion that Randy
24 did. WE looked at four hardened -- not hardened but
25 higher DF type shelters such as you'd get in a large

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1 public building. One in each quadrant located one
2 mile from the site. And we had people inside two
3 miles walk to these shelters. And it just doesn't
4 work very well.

5 MEMBER ARMIJO: Is it the same
6 fundamental problem that it's ventilation that makes
7 --

8 DR. LEAVER: No. It's the dose they're
9 getting there.

10 MEMBER ARMIJO: Okay. But once they're
11 there, there's a ventilation problem?

12 DR. LEAVER: We didn't model the
13 ventilation problem. We just assumed the DF. A
14 higher DF. It's in our report. A higher DF than what
15 you'd get, for example, in a residential structure.

16 Okay. This is the slide, this is
17 intended to just give you a rough idea, an example,
18 of what we did on evaluating the margin in the ten
19 mile EPZ with a risk informed approach.

20 This graph plots absolute early fatality
21 risk i the Y axis, that's per year. And then the X
22 axis is distance from the reactor.

23 MEMBER CORRADINI: This is for an
24 individual, is that correct?

25 MR. HESS: Yes.

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1 DR. LEAVER: Right. Individual risk.
2 Yes. Well, it's different kinds of risk.

3 There are six curves in the legend, but
4 only four of them show up. The first two, which are
5 early fatality risk and early injury risk, we
6 imposed a cut off in frequency. Because we were
7 interested in understanding what the effect of a
8 frequency cut off would be, and the frequency cut
9 off is a very interesting subject in itself, one
10 which I think we should talk about. And what we
11 found is that there is zero early fatality risk and
12 zero early injury risk if you cut off the accident
13 sequence frequency at ten to the minus seven for the
14 set of representative frequencies that we used.

15 MEMBER APOSTOLAKIS: Now these are the
16 frequencies of sequences all the way to deaths? Or
17 which frequencies are these? The ten to the minus
18 seven applies to core damage frequencies?

19 DR. LEAVER: It applies to the --

20 MEMBER APOSTOLAKIS: The total?

21 DR. LEAVER: -- total.

22 MEMBER APOSTOLAKIS: All the way to the
23 consequences?

24 DR. LEAVER: No. To the release.

25 MEMBER APOSTOLAKIS: From the initiating

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1 even to the release?

2 DR. LEAVER: To the release, yes.

3 MEMBER WALLIS: So what you've said
4 really is that this is a very rare big event --

5 MR. HESS: That's right.

6 MEMBER WALLIS: -- which are the risk?

7 MR. HESS: Right.

8 MEMBER WALLIS: And you shouldn't cut
9 them off. Or maybe once you --

10 DR. LEAVER: I am not saying one way or
11 the other.

12 MEMBER WALLIS: Well if you do cut them
13 off, the risk goes away, that's what you said?

14 DR. LEAVER: The early fatality and
15 early -- well, let me finish because this is -- you
16 can't forget about latent cancer fatality. We are
17 going to be held -- I mean the nuclear community,
18 you guys, the Staff, the Commission, the industry by
19 the public for latent cancer fatality risk. We need
20 to pay attention to that.

21 It's true for early fatality risk and
22 early injury risk. For latent cancer fatality risk
23 what we find is that as the curves -- one of these
24 is no cut off, the purple one. And then the light
25 blue one has a cut off. And it doesn't make much of

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1 a difference.

2 MEMBER BANERJEE: No cut off gives you
3 that square early fatalities, right? The square
4 symbols up there? The top curve is the no cut off
5 early fatality?

6 DR. LEAVER: Yes, that's right.

7 MR. HESS: No, latent cancer.

8 DR. LEAVER: No. The top curve is latent
9 cancer.

10 MEMBER APOSTOLAKIS: The problem, David,
11 is that, and that confused the hell out of me when I
12 read the report, these little boxes there. People
13 think that you are labeling --

14 MEMBER KRESS: Curves.

15 MEMBER APOSTOLAKIS: -- the curves.

16 MEMBER KRESS: What you're labeling.

17 MEMBER APOSTOLAKIS: And what you mean
18 is, you know, that this is the safety goal and you
19 are, in fact, over a 100 --

20 DR. LEAVER: Oh, these boxes here?

21 MEMBER APOSTOLAKIS: Yes.

22 MEMBER CORRADINI: Yes, that's what I
23 understand.

24 MEMBER APOSTOLAKIS: Really, they are so
25 confusing.

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1 DR. LEAVER: Okay. All right. Well, let
2 me try to --

3 MEMBER APOSTOLAKIS: And I struggled to
4 understand and then I --

5 DR. LEAVER: Let me try to clarify.
6 This line is the latent cancer --

7 MEMBER APOSTOLAKIS: Right.

8 DR. LEAVER: -- safety goal divided by
9 1,000.

10 MEMBER APOSTOLAKIS: By a 1,000. It has
11 nothing to do with the curve?

12 DR. LEAVER: Right. So the point --

13 MEMBER CORRADINI: It just happened to
14 be near the curve.

15 MEMBER APOSTOLAKIS: That's right.

16 MEMBER BANERJEE: That was a legend.

17 DR. LEAVER: I could have selected--

18 MEMBER APOSTOLAKIS: Yes, put it
19 somewhere else. Put it somewhere else. Because--

20 DR. LEAVER: The point I wanted to make
21 is while latent cancer fatality risk extends -- that
22 you don't have the dramatic drop off that you do for
23 the early fatality and early injury, the numbers are
24 so small --

25 MEMBER APOSTOLAKIS: Yes, but it's --

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1 you're right. You're right.

2 DR. LEAVER: Yes. Now it turns out that
3 if you can -- this was for a rather slow evacuation,
4 it was 1.5 miles an hour which is a meandering walk.
5 But if it's a little bit faster, these curves start
6 to come down at about three, four or five miles.

7 MEMBER APOSTOLAKIS: By the way, when
8 you're saying "no cut off," do you really mean no
9 cut off? I mean, how did you --

10 DR. LEAVER: When I say "no cut off," I
11 mean we considered all of the accident sequence, the
12 seven that I showed you on the graph, which we feel
13 is representative in a generic sense of what we
14 had--

15 MEMBER APOSTOLAKIS: So you went down a
16 couple of orders from -- down to three to the minus
17 nine?

18 DR. LEAVER: I think we have one that's
19 a few times ten to the minus to the eight and one
20 that's five or six ten to the minus nine. So those
21 were screened out. With -- without the cut off --

22 MEMBER APOSTOLAKIS: So without cut off
23 you meant the table that you have these things?

24 DR. LEAVER: That's correct.

25 MR. HESS: Right. That's correct.

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1 MEMBER APOSTOLAKIS: Okay. Okay.

2 DR. LEAVER: That's correct. Yes.

3 MEMBER APOSTOLAKIS: So if one included
4 all the sequences then with a real no cut off, then
5 you would move a little bit higher, but it maybe
6 just a little bit?

7 DR. LEAVER: So, you know, one
8 conclusion that one could come to here is that
9 without the cut off, that is if you consider all the
10 sequences, your early fatality risk and early injury
11 risk are pretty much over at about three miles are
12 so. Latent cancer doesn't have this dramatic drop
13 off, but the risks are very, very low, three orders
14 of magnitude lower than the safety goal. I think
15 that's a significant thing that maybe would be a way
16 to --

17 MEMBER WALLIS: Let's go back to your --
18 this is a person in the open walking at 1.5 miles an
19 hour away from the reactor?

20 MEMBER BANERJEE: Radial evacuation.

21 MEMBER WALLIS: No suits or anything No
22 vehicles or --

23 DR. LEAVER: No, this person, this is
24 the lateral.

25 DR. LEAVER: This is away from the

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1 plume.

2 MEMBER BANERJEE: Oh, lateral.

3 DR. LEAVER: Away from the plume. And
4 they're walking at 1.5 miles an hour.

5 MEMBER BANERJEE: Well lateral.

6 DR. LEAVER: Yes, away from the plume.
7 When I say away from plume, I mean they're walking i
8 a direction that is perpendicular to the wind
9 direction at the time the release begins. And the
10 wind --

11 MEMBER BANERJEE: You assumed the wind
12 shifts a lot?

13 DR. LEAVER: And shift, and that's taken
14 into account in the calculation.

15 MEMBER BANERJEE: How much can the wind
16 shift?

17 DR. LEAVER: The wind shifts per the
18 meteorological data for the site. It can shift--

19 MEMBER APOSTOLAKIS: This is a genetic
20 site?

21 DR. LEAVER: This site I can't -- don't
22 know if I can tell you what it is, but it is a U.S.
23 site.

24 MEMBER APOSTOLAKIS: It's a real site?

25 DR. LEAVER: It's a real site. And we

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1 had two years --

2 MEMBER APOSTOLAKIS: One can touch it?

3 DR. LEAVER: You could touch it.

4 MEMBER KRESS: You can go and visit.

5 MEMBER BANERJEE: So you have

6 meteorological data for that site?

7 DR. LEAVER: We do. We have

8 meteorological data for this site, that's correct.

9 For most sites, I don't think that our results would
10 be sensitive to the weather at the site. I mean,
11 the wind shifts; we know that, and the risk results
12 reflect that.

13 MEMBER WALLIS: This guy is going to
14 walk at this speed in two or three minutes, no?

15 DR. LEAVER: Well, yes. Maybe --

16 MEMBER BANERJEE: Maybe with cross
17 country skies on.

18 VICE CHAIR BONACA: WE need to move on.

19 Because right now he's ready --

20 CHAIRMAN SHACK: Right. We are already
21 behind schedule here, so --

22 MEMBER APOSTOLAKIS: So what have we
23 learned from all this that is different --

24 MEMBER BANERJEE: Lateral evacuation --

25 MEMBER APOSTOLAKIS: Well, let's hear

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1 the conclusions.

2 MEMBER WALLIS: We have the conclusions
3 already.

4 DR. LEAVER: We've gone through the
5 conclusions.

6 MR. HESS: Our next steps will be to
7 finalize the report in August and we're looking at
8 possibly partnering with some utilities to develop a
9 more realistic model to take into account roadmaps--
10 in the area of a nuclear power plant.

11 And look forward to furthering our
12 research on this risk-informed protective action
13 strategy study and presenting our work with the
14 Staff in detail. And then we'd look forward to
15 going back and doing a little bit longer session
16 with this Committee.

17 Thank you.

18 MEMBER APOSTOLAKIS: I heard so many
19 conclusions today, so many bullets. So would
20 someone tell me did industry disagree with what the
21 NRC Staff said half an hour ago?

22 DR. LEAVER: I would say, no, we don't
23 disagree. I think that we need to read the report
24 and understand it better. But --

25 MEMBER APOSTOLAKIS: Yes. But if the

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1 Staff goes and recommends --

2 DR. LEAVER: For example, do we disagree
3 with revising Supplement 3?

4 MEMBER APOSTOLAKIS: No, you don't.

5 DR. LEAVER: We don't. No.

6 VICE CHAIR BONACA: Yes. In fact, that's
7 the message I get.

8 DR. LEAVER: Well part of it.

9 MEMBER APOSTOLAKIS: Was there any
10 benefit to doing this in a risk-informed way. Let me
11 put it that way.

12 MEMBER CORRADINI: That's not a leading
13 question, though.

14 MEMBER APOSTOLAKIS: No. I'm willing to
15 go along with the Staff did if these gentlemen say,
16 you know, we gained more insights. I know what the
17 insights mean.

18 VICE CHAIR BONACA: The way I see it,
19 George, is this, okay, Supplement 3 in my judgment
20 has to be amended. Okay? It has to be modified.

21 MEMBER APOSTOLAKIS: They all agree and
22 I do agree.

23 VICE CHAIR BONACA: Okay. Second, the
24 basis for the amendments shouldn't be only what we
25 have seen before, but there will be interaction with

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1 stakeholders, including EPRI, NEI and this report.
2 And I think this material should be reviewed to
3 assure that there is a lot of inconsistency that we
4 -- in fact this is very useful because it comes at
5 the time unfortunately the Staff hasn't had yet the
6 time to review it, but it should.

7 MEMBER APOSTOLAKIS: I understand.

8 VICE CHAIR BONACA: And we should also--
9 I would be very interested in seeing how that report
10 will effect the conclusions that you use as a basis
11 for the modification to Supplement 3.

12 DR. LEAVER: George, I think that the
13 NRC's approach to revising Supplement 3 is a good
14 approach. The reason that we went more strongly to
15 risk-informed was, I guess, because we think that
16 there would be some benefit to considering the
17 question of protective action strategies with risk-
18 informed. That's not to say that the NRC approach
19 isn't a good approach. But perhaps even more
20 importantly we're also interested in the basis for
21 the EPZ.

22 We think that the basis that exists
23 today does not properly characterize the risk from
24 reactor accidents. That it can create unfounded
25 fears on the part of the public. And it's 40 years

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1 old. And I think it's time to update it. And so we
2 think the question --

3 MEMBER APOSTOLAKIS: The question is do
4 you update it to this level or to the level we heard
5 half an hour ago? That's my question to you?

6 DR. LEAVER: Well, what the NRC
7 presented a half an hour ago was not a process for
8 updating the basis. What they were trying to do is
9 fix Supplement 3, that's my understanding.

10 MEMBER APOSTOLAKIS: When I said that
11 people objected. I said I agreed with that, but
12 then if we decide to update it, we should do it in a
13 risk informed way. And I heard some people say no.
14 And that's what bothers me now.

15 Anyway, it's going to come to that.

16 VICE CHAIR BONACA: My meaning was it
17 depends on the range of events to consider. You
18 know, if you review all the accident analyses
19 performed to date for severe accidents and you
20 conclude that really you should not consider a
21 release that is earlier than two hours after the
22 declaration of emergency or three hours, or
23 whatever, I would have a problem with that because
24 it may be a security event of some nature that, in
25 fact, may need that. And so I see the importance of

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1 having a spectrum of scenarios including maybe some
2 which seem by this analyses realistic not covered.
3 That was my only comment.

4 And so far as the risk-informing or the
5 basis of the --

6 MEMBER APOSTOLAKIS: But we will hear if
7 they decide to update it, we will have other
8 opportunities to comment on how they will update it.

9 VICE CHAIR BONACA: And I think that as
10 part of the technical basis to date, they should
11 consider this material.

12 MEMBER APOSTOLAKIS: I mean, what they
13 did should have an impact on the SOARCA, too. The
14 SOARCA doesn't do it that way.

15 DR. LEAVER: I hope so, yes. We were
16 thinking about that as were doing --

17 MEMBER APOSTOLAKIS: But we're not
18 writing the letter.

19 VICE CHAIR BONACA: On this.

20 MEMBER BANERJEE: This suggests that we
21 should give everybody a bicycle within a three mile-
22 -

23 MEMBER CORRADINI: They'd probably live
24 longer anyway.

25 VICE CHAIR BONACA: Talking about a

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1 letter, because I need to go and write it. I have a
2 draft, but I want to clearly we can recommend that
3 as a technical basis is being developed for
4 modifying Supplement 3, this information be
5 considered?

6 MEMBER APOSTOLAKIS: Yes.

7 VICE CHAIR BONACA: Right.

8 MEMBER APOSTOLAKIS: Yes.

9 VICE CHAIR BONACA: I have no problem
10 with that at all. And I would think that you and
11 Randy wouldn't have a problem with that.

12 MR. SULLIVAN: In the brief time I've
13 had to look at the EPRI report I find it very
14 interesting. I mean, of course we would consider
15 it.

16 MR. HESS: I think all we're asking for
17 consideration is that we actually interact with the
18 Staff and look at their work in detail and they look
19 at our work in detail. And I think as Dave said, we
20 may find there's an awful lot of common ground here.
21 And I think superficially there is. And I think
22 where there's differences, they may just be because
23 -- they may be very understandable and --

24 VICE CHAIR BONACA: You know, maybe once
25 we have developed the final technical basis for the

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1 update of Supplement 3, it would be worthwhile for
2 you to come back here and have an understanding. We
3 could review this report in detail, get those views
4 and see what final technical basis for the
5 Supplement 3 modifications are.

6 MR. HESS: Thank you.

7 DR. LEAVER: Thank you very much.

8 CHAIRMAN SHACK: Thank you.

9 We're running a little behind schedule.
10 So if we can be back at 11:00 after our break.

11 (Whereupon, at 10:47 a.m. a recess until
12 11:01 a.m.)

13 CHAIRMAN SHACK: We can come back into
14 session.

15 We're going to be discussing the Browns
16 Ferry Nuclear Plant Unit 1 Restart Activities, and
17 Otto's going to be leading this in this discussion.

18 MEMBER MAYNARD: Well, thank you.

19 First of all, let me tell you what this
20 is not. This is not about the Browns Ferry power
21 uprates. This is about the regulatory activities
22 associated with the restart of Browns Ferry 1 after
23 it was shutdown for a number of years and they're
24 bringing it back. And it's the regulatory aspects
25 associated with that.

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1 Some of the reasons it may be of
2 interest to us, this is an informational briefing.
3 This is not something that we have any actions that
4 we're required to take or need to take on it. It's
5 an informational briefing for us. It's of interest
6 because there is a potential of another plant, a
7 near finished plant being completed and that being
8 brought on line in a few years.

9 We also have with the new plants
10 potentially coming in for construction the NRC's
11 going to have to gear up again for the inspection
12 process and the activities that they need to go
13 through to evaluate the plant and the licensee and
14 everything before the plant starts up. So it does
15 have some applicability, a little bit like the
16 ITAACs that we talked about yesterday. So I think
17 it would be of interest to hear what the Staff, the
18 process they went through and everything. And
19 without taking away all their introduction, I'll
20 turn it over to Kathy Heany to introduce the Staff
21 and the subject.

22 MS. HEANY: Sure. My name is Kathy
23 Heany. I'm the Division Director in NRR that's
24 responsible for licensing the operating fleet.

25 With me today I have Malcolm Widmann who

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1 has been our point of contact in Region II relative
2 to the Browns Ferry restart activity. And then Eva
3 Brown, who is a Project Manager in NRR for the
4 Browns Ferry restart.

5 What we'd like to do today is really, as
6 Dr. Maynard said, is bring you up to date on what's
7 gone on with the Browns Ferry restart. The last
8 time we were sitting up here we were talking to you
9 about the 5 percent uprate. Since that time the
10 licensee has gone on line. And just from the
11 standpoint of an informational brief, tell you some
12 of the activities which have been primarily in the
13 inspection area which is why we'll have Malcolm do
14 the majority of the presentation. But if you do
15 have questions on the licensing, Eva and I are
16 prepared to do.

17 I'll keep my opening remarks short and
18 turn it over Malcolm.

19 MR. WIDMANN: Thank you. Good morning,
20 gentlemen.

21 MEMBER MAYNARD: One thing we might
22 mention. We do have an individual for TVA that's
23 here, but there's not going to be a presentation
24 from TVA.

25 MS. HEANY: Correct.

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1 MR. WIDMANN: That's right.

2 MEMBER MAYNARD: But there is somebody
3 here.

4 MR. WIDMANN: Yes. Tony Langley is
5 supporting me from TVA. He's the licensing manager
6 currently at Browns Ferry and wanted to come up in
7 case there was questions for TVA. I didn't want to
8 speak for them.

9 With that, next slide.

10 I just wanted to go through a little bit
11 of how we got where we're at with the restart
12 history and how we did the oversight program, a
13 little bit. How we went through the licensing and
14 the amount of inspection, which was quite large, as
15 well as the licensing. I will talk a little bit
16 more about that. How we actually got through the
17 recommendation. And then I also understand you guys
18 would like to hear a little bit about the current
19 status and some issues that they have. So I've
20 added that as well.

21 The restart history, as you're all well
22 aware of, that all three units did shut down in
23 March of '85. They had a number of performance
24 issues. They had successive SALP periods with
25 category 3 ratings. The management there made the

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1 decision to shut it down voluntarily back in '05.

2 They had a number of escalated
3 enforcement actions and a number of significant
4 events. And with that they shutdown all three
5 units.

6 As far as Unit 1 was concerned, they
7 made the decision to bring back Unit 1 much later
8 after bringing Unit 2 up first in '91 and then Unit
9 3 in '95. After Unit 2 had started up, they had
10 come to us with the regulatory framework of how they
11 wanted to approach Unit 1 and Unit 3. And we
12 accepted that. Then they established how they would
13 go about addressing Unit 1 after Unit 3 was
14 restarted.

15 So we reviewed all that, and that's what
16 that time line is laying out for you. And you can
17 see there that in May they were shooting for a May
18 restart, which they did make. And then we authorized
19 the actual restate on May 15th of this year.

20 The agreement we had with TVA, which was
21 quite unique, was a verbal agreement that was
22 documented in a SALP report back in 1985. That is
23 the only documentation there is that TVA agreed to
24 get our concurrence prior to restarting this unit,
25 which is quite unique nowadays. But that's what

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1 there was. And that quote that's up there is what
2 came out of the SALP report, and TVA did do that.

3 As I had mentioned a second ago, the
4 restart regulatory framework was established back in
5 August of '03. The Staff did review that and did
6 adopt that regulatory framework. It identified the
7 things that TVA needed to do before we would
8 consider restart. And it included things like the
9 special programs, of which there were 27 special
10 programs. There was NRC generic communications,
11 obviously we would want to know how TVA
12 dispositioned those generic communications before
13 the unit would come back, as well as the action
14 items and any licensing amendments. And I believe
15 there was something like over 18 licensing
16 amendments that they needed to bring the unit up to
17 speed.

18 The actual restart oversight we decided
19 to issue a manual chapter of 2509, which was
20 specific to the Browns Ferry restart project
21 inspection program. That issued in September of '03.
22 And it laid out how we were going to go about
23 reviewing Unit 1 for restart and how we would
24 implement the inspection program.

25 It parallels very much what you may be

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1 familiar with the Manual Chapter 350. But there were
2 some exceptions to it because 350 did not take into
3 consideration this was a nonoperating unit. 350 only
4 recognized operating units. 2509 allowed us to
5 craft it more specific Browns Ferry Unit 1.

6 It had a number of objectives, ten
7 specifically laid out in 2509. And it touched all
8 the things you would expect it to touch. You know,
9 reviewing calculations to design changes, some
10 modifications, look at open issues that were
11 remaining on Unit 1 prior to allowing it to restart
12 and verified that they had in fact addressed those
13 open items.

14 It also required us to do an ORAT and
15 establish what I consider to be an important aspect,
16 which was the NRC Restart Oversight Panel which I
17 was a member of, as well as Kathy as a co-chair and
18 Joe Shea from Region II, the head of Division
19 Reactor Safety as the Chair.

20 We had five members on that panel.

21
22 So that 2509 allowed us to have the
23 authority to have that oversight panel, which we
24 were the panel that recommended to the Regional
25 Administrator and the NRR Director and EDO to allow

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1 the unit to restart.

2 The basis for the recommendation for the
3 restart took in a number of different areas. We had
4 to, obviously, consider the NRC licensing reviews
5 that we had to do. The numerous amount of
6 inspections that were required to be performed, as
7 well as the TVA actions and their commitments and
8 their completion of those actions, as well as
9 complete the ORAT that was required. And I'll talk
10 more about the ORAT. And then, obviously, keeping
11 stakeholders informed. So it was those five
12 elements that we felt that would be important to
13 consider before the panel would recommend restart.

14 As far as the licensing reviews,
15 obviously the status of that is complete and the
16 Staff spent an enormous amount of hours reviewing
17 the license amendments and a lot of other
18 commitments that were put before the Staff as well
19 as exemptions and different conditions.

20 Responses to generic communications took
21 a lot of effort. And I think there was other
22 licensing actions that happened as a result of Staff
23 reviewing what TVA submitted. And TVA did that and
24 completed that.

25 The restart inspections. We touched on

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1 many of the same things that NRR had to do but from
2 an inspection standpoint and looking at their
3 generic communications and special programs, as well
4 as something you may not be familiar with, the
5 system turnover and preoperability checklist, as TVA
6 referred to it as SPOC turnover where they took
7 system and made it preoperational. It wasn't turned
8 over to Operations. It was a construction turnover.
9 And then we would inspect that. And then after it
10 was turned over to Operations we would complete
11 inspection of it for operability. As well as doing
12 the plant turnover, as they turned over the plant
13 back to Operations to keep it in an operational
14 mode. So there was a lot of effort that had to go
15 into the restart inspections to verify how the
16 licensee went about getting the plant ready.

17 The status of that, obviously, is
18 complete again. And the post-restart inspections
19 are still ongoing, and I'll talk a little bit more
20 about that.

21 And like NRR spent, the Region spent
22 about 30,000 hours, a little more, on inspections
23 over the five year period.

24 The resident inspectors continue to
25 monitor what TVA does. I'll talk about some of the

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1 issues that they had bringing the unit back and
2 where they plant stands now.

3 MEMBER WALLIS: That's 15-man years, is
4 that what that is?

5 MR. WIDMANN: Yes, sir.

6 MS. HEANY: Sure.

7 MEMBER WALLIS: That's an awful lot of
8 time.

9 MR. WIDMANN: Yes, sir, it is. You're
10 correct. And the last count I had, I had a 119
11 inspectors touched the plant over that period of
12 time.

13 MEMBER MAYNARD: Now is this all
14 inspection at the plant or does this also include a
15 lot of the reviews that were done back here?

16 MS. HEANY: No. The reviews done back
17 here were in themselves about 30,000 hours. So the
18 NRR staff --

19 MEMBER MAYNARD: So 60,000 hours?

20 MR. WIDMANN: Over 60,000 hours was
21 spent on Browns Ferry Unit 1. Now we did do a
22 comparison of that to the other units, what we
23 spent. It was not out of line with that at all.
24 But it's an enormous amount of staff time.
25 Inspection-wise, it may be unprecedented. I'm not

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1 sure.

2 MEMBER WALLIS: It may be what?

3 MEMBER BANERJEE: Unprecedented.

4 MR. WIDMANN: It may be unprecedented as
5 far as inspection. I'm sure TVA would gladly admit
6 we touched them a lot of times.

7 CHAIRMAN SHACK: Now some of this is
8 almost like a construction inspection. I mean, you
9 know they did a significant amount of repiping and--

10 MR. WIDMANN: Oh, absolutely.

11 MEMBER CORRADINI: So from a
12 construction standpoint, was this also equivalent in
13 terms of inspections and --

14 MR. WIDMANN: Well, we kept it focused
15 on operations because it was a Part D
16 construction/reconstruction, the piping as you
17 talked about. All the primary piping was pulled
18 out, replaced. All of the electrical, all of the
19 cables were repulled.

20 And, Tony, if you have any specifics on
21 that, you can offer them up.

22 MR. LANGLEY: Like you said, all the
23 cable for the program -- all instrumentation was
24 replaced, all the cabling was replaced, the majority
25 of the equipment, pumps, valves were replaced as

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1 well. The piping on the balance-of-plant side like
2 Malcolm referred to was replaced.

3 Not only were we going for an uprate --
4 I may be jumping ahead here, but we also went and
5 did our license renewal at the same time. So that
6 exacerbated the inspections for them as well.

7 MEMBER CORRADINI: So at the risk of
8 going in -- so how did you determine what to
9 inspect?

10 MR. WIDMANN: Well, as the systems would
11 come back, we treated it like any other operational
12 inspection. We treated the piping, the seismic
13 upgrades, all of that as plant modifications. We did
14 all of that under the operational inspection.

15 MEMBER WALLIS: An 100 percent
16 inspection?

17 MR. WIDMANN: No, sir. It would be
18 sampling. But there was a lot of programs that was
19 100 percent completed.

20 MEMBER CORRADINI: So how did you
21 sample?

22 MR. WIDMANN: You'd look at the risk-
23 significant systems. When we talk about the SPOC
24 systems that we looked, we picked the ten most risk-
25 significant systems that we felt --

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1 MEMBER CORRADINI: Okay. I'm feeling
2 better. Thank you.

3 MR. WIDMANN: Okay.

4 VICE CHAIRMAN BONACA: You said all the
5 cabling has been replaced.

6 MEMBER APOSTOLAKIS: The golden
7 question.

8 MR. LANGLEY: Yes, sir. All the safety
9 related cabling.

10 CHAIRMAN SHACK: Now is the old cabling
11 gone?

12 MR. LANGLEY: No. If it was in conduit,
13 the answer is yes it is gone. Some of the old cable
14 trays and stuff we elected to leave the cabling in
15 there and actually put in trays in a lot of cases
16 and routed the new cabling on those new trays.

17 MEMBER WALLIS: So it's still as
18 flammable as it was?

19 MR. WIDMANN: That's a loaded question.

20 MEMBER CORRADINI: We'll get to that one
21 in the afternoon.

22 MEMBER CORRADINI: No less flammable
23 than --

24 MEMBER WALLIS: Someone decided that it
25 was riskier to take it out than to leave it there or

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1 something?

2 MR. LANGLEY: It was actually -- as part
3 of the fire recovery plan, we actually put a
4 Flamastic material over the cabling associated with
5 the cables in question. And as a result, it makes
6 it more difficult to actually remove it.

7 MEMBER WALLIS: Yes.

8 MR. LANGLEY: By removing the Flamastic
9 and then the cabling. As such, it was simpler and
10 there were more straightforward by new tray systems.

11 MR. WIDMANN: Any questions on that for
12 now? I understand.

13 MEMBER MAYNARD: Are you going to be
14 getting into -- I'm sure there were a number of open
15 items, a number of things that TVA had yet to
16 complete. Are you going to be going over how you
17 guys reviewed that, prioritized that, what things
18 were okay to leave maybe open until later in the
19 process.

20 MR. WIDMANN: The short answer to that
21 is we didn't leave anything open. We went back and
22 looked at every program. Any open item that had been
23 on the books prior to the decision by TVA to bring
24 the unit back, we went back and pulled out old open
25 items lists. We looked at including items like the

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1 IPEEE open items. Everything that we felt that was
2 important was addressed and closed at one point.

3 MEMBER MAYNARD: Now a little bit of a
4 shift here.

5 MR. WIDMANN: Yes.

6 MEMBER MAYNARD: Not talking necessarily
7 about the regulatory identified or hit list of
8 things to look at. In any of these plants you never
9 have everything completely a 100 percent at anytime.
10 You always have some open items. Was there a review
11 of TVA's open items list that to make sure there
12 wasn't really something on their list that wasn't on
13 your list that needed to be completed?

14 MR. WIDMANN: Yes, we did do that. And
15 we would compare lists on a very frequent basis. And
16 as the unit got closer to restart, we compared that
17 list. We started on a quarterly basis and then we
18 moved it to a monthly basis and literally at the end
19 there we were weekly and daily basis. So, yes, we
20 did do that. And we wanted to be comfortable with
21 that. What we felt that we dispositioned was the
22 things that mattered. The other nonsafety-
23 significant administrative items, of course, we
24 didn't touch those. We separated those out. And
25 they still have those.

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1 Yes, sir.

2 MEMBER CORRADINI: So this is just more,
3 again, to learn. So as Otto mentioned the potential
4 for other plants that would come back and be
5 reconstructed.

6 MR. WIDMANN: Yes.

7 MEMBER CORRADINI: But for the new
8 plants are you taking away lessons learned that
9 you're passing it to other parts of Staff? And are
10 you going to address that, or is this not the
11 appropriate time to address that?

12 MR. WIDMANN: Well, I was only going to
13 touch on the fact that as an activity we're
14 undertaking now and that we're currently building
15 that lessons learned so that we can, on the short
16 term, pass it along to Watts Bar Unit 2.

17 MEMBER CORRADINI: Okay.

18 MR. WIDMANN: People, Staff that will be
19 involved in that certainly because that's certainly
20 very, very similar to what we did here. Watts Bar 2
21 will be a major deconstruction/reconstruction
22 project where this is more recovery.

23 For the new plants, you know, I'll leave
24 it to the Watts Bar people. Hopefully be able to
25 pass our lessons learned on and whatever they learn

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1 to the people that are dealing with new
2 construction.

3 MEMBER CORRADINI: Okay.

4 MS. HEANY: And one thing I would add to
5 what Malcolm said is at least here in NRR and to a
6 certain extent in the Region, there is a very large
7 overlap between the people that were involved with
8 Browns Ferry moving on to the Watts Bar project. I
9 would say it's close to 100 percent of my staff
10 that's moving from one project right over to the
11 next. I don't think it's that high a percentage in
12 the Region, but it is fairly high. The timing,
13 actually, is working out nice for us. We can move
14 from one to the next.

15 MR. WIDMANN: We're going to give other
16 people opportunities in the Region.

17 MS. HEANY: Okay.

18 MR. WIDMANN: And I did want to mention,
19 just for the benefit of the type of staff we kept at
20 Browns Ferry for the last five years, we've had --
21 let's see, in the last four years we've had five
22 residents at that site. That's unlike any other
23 resident site where you have the same number of
24 residents as you do units.

25 We had three residents assigned to Unit

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1 1 only. And then two residents assigned to the two
2 operating units for this duration so that the
3 operating resident staff wasn't burdened with trying
4 to do construction. And, as I mentioned earlier,
5 over the years I went back and looked at how many
6 inspectors actually come to the site. We've had a
7 lot of help from a lot of the regions. All the
8 regions supported us. I just wanted to put --

9 CHAIRMAN SHACK: Do you ever just hire
10 contractors to help with specialized inspections or
11 is this really all done internally with NRC people?

12 MR. WIDMANN: It was done internally. I
13 can't speak for the NRR side of it. But it was done
14 internally. In the Region we used our own people.
15 We did have some retired that we brought back. We
16 had some really good expertise in the Region. And,
17 obviously, when you touch on something like a unit
18 that once operated that wants to operate again, the
19 guys that had that experience as that unit was
20 built, fortunately we were able to touch some of
21 those. But none of those were, if you will, outside
22 the contractors. Former NRC employees. Okay.

23 The next slide.

24 As I mentioned in the Manual Chapter
25 2509 charter we had the need to do an ORAT. We

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1 approached this operationally in the assessment team
2 a little differently, which was a good lessons
3 learned coming from other inspections. The approach
4 being that we would make a multi-disciplined team
5 multi-regional team. It was lead by Region IV out of
6 Texas. As Region II we did not want to be the lead
7 on our own effort. So we thought it best if we
8 built a team that was largely of other regions and
9 other people that had not touched the plant. So we
10 then again went out and got inspectors that hadn't
11 contributed to the previous years inspections to
12 come in and look at it. And we were very lucky to
13 build a team the way we were.

14 They completed that inspection. It was
15 narrowly focused. We eliminated issues like fire
16 protection from the ORAT team because fire
17 protection was something that we were doing lots of
18 independent inspections of separate to what the tea
19 would do.

20 We took out things like power ascension
21 activities because the team would be focused on
22 operational readiness, not startup and post-startup
23 type things. So we changed the way the team would be
24 constructed and the things they would look at and
25 keep them focused on what we felt was necessary for

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1 a restart decision.

2 MEMBER WALLIS: How much of this
3 inspection is what I call a paperwork inspection and
4 how much of it is a hardware type of inspection?

5 MR. WIDMANN: On the ORAT, sir? On the
6 ORAT or all of this inspection?

7 MEMBER WALLIS: Yes, on the overall
8 thing here. I mean, how much of it is mostly
9 paperwork and how much of it is actually devoted to
10 really looking at what's there and how --

11 MR. WIDMANN: Oh, I would say --
12 confidentially I would tell you 85 to 90 percent was
13 in the field.

14 MEMBER WALLIS: Was in the field?

15 MR. WIDMANN: Yes. It was very little --

16 MEMBER WALLIS: It's not just like going
17 to an office and being reassured with some
18 paperwork?

19 MR. WIDMANN: Absolutely not. Just to
20 give you an idea, we had three different offices at
21 Browns Ferry for resident inspectors because they
22 would be out in the field, they would be out with
23 the craft, out in some shops --

24 MEMBER WALLIS: Okay. That's all right.

25 MR. WIDMANN: Okay.

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1 MEMBER ABDEL-KHALIK: Two extra resident
2 inspectors --

3 MR. WIDMANN: Yes, sir?

4 MEMBER ABDEL-KHALIK: -- time five
5 years, that's 20,000 hours. Is that part of the
6 30,000 hours that you're reporting?

7 MR. WIDMANN: No, sir. Well, of course--
8 excuse me. Yes. Their time would be included in the
9 30,000 hours of inspection because it would be
10 charged Unit 1. The 30,000 hours I told you is
11 anybody that charged to Unit 1.

12 Now those two extra inspectors were not
13 there for the entire five years. If I said that, I
14 misspoke. They were not there for the entire five
15 years. Two years ago the additional inspector was
16 added to double encumber. So for the last two years
17 you've had the two extra inspectors.

18 If I said that wrong, I apologize.

19 MEMBER ABDEL-KHALIK: Okay.

20 MR. WIDMANN: But the 30,000 is people
21 who charged to the Unit 1 docket. That's how we
22 came up with that number.

23 MEMBER MAYNARD: But those three were
24 doing some of the required inspections, too?

25 MR. WIDMANN: Absolutely. Oh,

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1 absolutely.

2 On the ORAT team the licensee, we issued
3 a prerequisite letter to the licensee to charge them
4 with letting us know when they thought they were
5 ready for the ORAT. We delayed this ORAT almost
6 four months -- three months from the original date
7 because they were not ready and we were working very
8 closely with TVA to bring this team in the right
9 time so that we didn't waste an effort.

10 Some lessons learned from the other unit
11 restarts showed that we can go in too early and be
12 looking at the wrong things and end up wasting a lot
13 of man effort. So we specifically wrote a very
14 detailed letter asking them to tell us when they're
15 ready. They did that and the team came in in April
16 and did this inspection.

17 And as I mentioned, we did eliminate a
18 number of things from what the team would look at.
19 Okay.

20 The fourth piece of the restart decision
21 was the TVA implementation of their actions and what
22 they had to do, you know including the modifications
23 and extensive testing that they had to perform, the
24 inspections we would have to do observing the type
25 of work they were doing. TVA completed that in May.

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1 They sent us a letter telling us they completed
2 everything. Obviously, we had been working with
3 them. We knew where they were. But this was their
4 official way to tell us they had completed
5 everything. They had a restart checklist, as they
6 referred to it, that annotated and there was some
7 questions as to what open items there were. That
8 list contained what they had as open, and they would
9 report to us that they had addressed it, completed
10 it and closed the items. And we would go in and
11 inspect those items. That's a large part of that.

12 Questions on that?

13 MEMBER MAYNARD: That's really an
14 important letter, and it's a tough one to sign from
15 the utility.

16 MR. WIDMANN: Absolutely.

17 MEMBER MAYNARD: I mean, you put a lot
18 of effort in making sure things really are done
19 before you certify that they're done.

20 MR. WIDMANN: That's correct. Yes. And
21 Tony would own up to that. That letter was -- each
22 letter came out, to give you an idea, in the
23 neighborhood of 150 pages every time?

24 MR. LANGLEY: Right. The letters were
25 extensive.

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1 MR. WIDMANN: Very extensive telling us
2 what they did. And our inspectors would be closely
3 integrated with TVA and know exactly what that
4 letter was going to say and what the status was.
5 Because our guys were going out and touching that
6 plant. So you're right. So that May 12th letter
7 was all important.

8 The fifth piece of the decision was the
9 interactions and our efforts to make sure that we
10 reached out to the public as well as internal
11 stakeholders. We conducted a number of meetings. We
12 had eight public meetings on Browns Ferry Unit 1,
13 and we would change the locations of where we did
14 those meetings. We did those in Washington. We did
15 them in Atlanta. We did them at the site. We did
16 them in the day. We did them in the evenings. We
17 also did 13 internal panel meetings. It was all an
18 effort to make sure that we were touching the plant,
19 the needs of the stakeholder so that we tried to
20 make ourselves available to them so they knew what
21 we were doing.

22 We also created our own website to stay
23 up with and show the amount of reports out of there.
24 I think we, at last count, had 30 inspection reports
25 that dealt with Unit 1 only.

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1 And then we also reached out to people
2 like Department of Homeland Security and FEMA and
3 looked for their buy-in as well as touch base with
4 the local officials and state officials who attend
5 one of the last public meetings near the site.

6 MEMBER MAYNARD: In general what was the
7 public reaction to restarting Unit 1?

8 MR. WIDMANN: In the South it was very
9 respective. We had hardly any intervenors of
10 negative assent. We would have a couple show up at
11 just a couple of meetings. For the most part the
12 sentiment is when are you going to build the next
13 one kind of thought. I don't know if that would be
14 true in the Northwest, but it was in the South.

15 MEMBER CORRADINI: Doubtful.

16 MEMBER BANERJEE: Not in Brattleboro.

17 MR. WIDMANN: I just got back from
18 Indian Point, and I can tell you wouldn't happen
19 there. Very respective.

20 MEMBER ARMIJO: Why?

21 MR. WIDMANN: Why is that?

22 MEMBER ARMIJO: Yes.

23 MR. WIDMANN: The South welcomes the
24 work, the energy. They look at the resources.
25 They're just not against it. They're just not

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1 against nuclear power. I mean, there's more of--

2 MEMBER WALLIS: There are various other
3 hypothesis we won't go into.

4 MR. WIDMANN: Okay.

5 MEMBER KRESS: Please don't. We know
6 what those are.

7 MR. WIDMANN: Okay.

8 MEMBER BANERJEE: He's a Vermonter.

9 MR. WIDMANN: Right. The current status
10 of the plant is that, obviously, the plant is
11 operating now and we did authorize that back in May.
12 The first time they went critical was May 22nd. And
13 I say "first time," because there was a number of
14 planned evolutions. As they brought the unit back,
15 they would take it offline to do a number of
16 testing. And I'll speak to that in a second.

17 All three units are currently operating.
18 And all of the cornerstones have been transitioned
19 to the reactor oversight process as it now. Prior to
20 the restart, that was not the case. There were
21 three cornerstones remained. Four were under the
22 ROP since 2004, December of 2004. And as of the
23 restart here, they're in the reactor oversight
24 process.

25 And as I put there, there's three

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1 resident inspectors. And I'll speak to it a little
2 bit more about how we're offsetting that also. But
3 three resident inspectors will be permanently
4 assigned when the unit's back and operating at a 100
5 percent.

6 MEMBER ABDEL-KHALIK: So what was done
7 between May first and May 15th?

8 MR. WIDMANN: Between May 1st and May
9 15th? The internal panel meetings and public
10 meetings on May 2nd and --

11 MEMBER ABDEL-KHALIK: No. Between the
12 issuance of the inspection report and the
13 authorization to restart?

14 MR. WIDMANN: The authorization happened
15 on the 15th. If you were saying the issuance of the
16 report, of the ORAT report?

17 MEMBER ABDEL-KHALIK: Right.

18 MR. WIDMANN: It was TVA having to
19 complete a short list of, I believe it was 11 items
20 that we had from their open items list that we
21 considered to be important enough for us to hold up
22 our decision. So until we got that certification
23 from TVA that they were done on May 12th, we were
24 not going to go forward with a decision. And then it
25 took us a couple of days to get our decision and get

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1 the right aligned before we gave that okay. So we
2 stayed, if you will, on top of that issue until we
3 felt comfortable that what they said was closed were
4 closed.

5 MEMBER MAYNARD: How far were they
6 allowed to go before the restart was operating? I
7 take it by this they probably had loaded the fuel?

8 MR. WIDMANN: Oh, yes, sir. They
9 loaded the fuel -- if you will, technically speaking
10 it was an operating unit back in December.

11 MEMBER MAYNARD: So they loaded fuel,
12 they'd done a lot of the pre-op tests or --

13 MR. WIDMANN: As systems came back, they
14 did the pre-op tests. That was part of the system
15 preoperability checklist that we would do, the SPOC
16 reviews.

17 December of '06 they loaded fuel. We
18 did a special inspection for that, if you will. Not
19 special, a specific inspection for that fuel reload.
20 And then they had to maintain certain systems. That
21 put them in tech specs. So they were an operating
22 unit at that point. And then we would verify
23 compliance. And as they brought other systems back,
24 they had a minimum amount of systems obviously they
25 had to have operational at that time. We would

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1 maintain oversight of those as well as the new ones
2 they brought back to make sure there was no impact.

3 So it was a significant decision by them
4 to put fuel in the pot so early. Does that answer
5 the question?

6 MEMBER MAYNARD: Yes.

7 MEMBER ABDEL-KHALIK: So it took you
8 only three days between May 12th and May 15th to
9 verify that everything they said they had done was
10 indeed done?

11 MR. WIDMANN: That's not exactly true.
12 We were working with them day in and day out. We
13 literally had inspectors on site darn near 24 hours
14 a day looking at what they looked at. At any one
15 time I could have anywhere from 12 to 15 inspectors
16 on site. I was going to look to TVA to say I can't
17 remember all the numbers. But we had guys there
18 until the last hour verifying what they were telling
19 us so that we knew when we got that letter that we
20 were confident where they were.

21 Yes, sir.

22 MEMBER ABDEL-KHALIK: Thank you.

23 MR. WIDMANN: Okay. Just to give you a
24 perspective of issues, they had two issues in
25 bringing the unit back that were not planned. They

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1 did have a number of issues that they planned to
2 take the unit offline. Two causing them to offline
3 that was unanticipated, one being a manual scram
4 back in May right after the startup at 3 percent
5 power. They had a fitting, a tubing fitting separate
6 on them on a combined intercept that caused them a
7 300 gallon spill and for them to go back and do a
8 100 percent sample of those kind of fitups, make
9 sure they didn't have other issues. They did that,
10 found some other issues and solved this problem and
11 then restarted the unit.

12 A second transient happened in June. As
13 they were bringing the unit back from some other
14 testing they were at 80 percent power and they had a
15 false indication on the drain tank. A moisture
16 separator drain tank which caused them to get an
17 automatic trip. They have subsequently redesigned
18 that level switch that caused the failure and that
19 has brought the unit back.

20 Other than that, those are the only
21 transients that have happened to bring this unit
22 back after 22 years and 3 months. So we thought that
23 was a little bit remarkable and a testament to the
24 job they do, the job we did inspecting it.

25 MEMBER MAYNARD: You said they

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1 redesigned that switch.

2 MR. WIDMANN: Yes, sir.

3 MEMBER MAYNARD: Was that something that
4 was unique or different that Unit 2 and 3? I'm kind
5 of wondering why this wasn't the same as 2 and 3.

6 MR. LANGLEY: I'll answer that. This is
7 Tony Langley with Browns Ferry.

8 The difference between the units was the
9 support arrangement. They were a little bit
10 geometrically different. As a result, we had some
11 vibration that was causing this scram to occur on
12 the instrumentation. Went and added some additional
13 time back supports and that choose to be very
14 successful at this time.

15 MR. WIDMANN: Thanks. Any other
16 questions on those?

17 And to give the ACRS just a feel of the
18 type of testing they've done since they started up
19 the unit, they have successfully completed the first
20 five I've listed there or the turbine overspeed
21 testing in early June and then a couple of very
22 important core injection full flow test as well as
23 secondary pump tests that they had a trip off line
24 one at a time and then an all important MSIV closure
25 test, which they completed successfully and

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1 recovered from. The remaining post art of test that
2 they had to do was a load reject test which they are
3 currently asking the Staff to review based on the 80
4 percent trip they had as a transient to take credit
5 for that transient and not do this particular test.
6 Of course, this test is not as severe as the MSIV
7 closure, so --

8 MEMBER WALLIS: When they do this MSIV
9 closure, they do this at reduced power, do they?

10 MR. WIDMANN: No, sir.

11 MEMBER WALLIS: It's full power?

12 MR. WIDMANN: Yes, sir.

13 MEMBER WALLIS: And then they bypass the
14 condenser, is that what they do?

15 MR. WIDMANN: Yes, sir.

16 MEMBER WALLIS: Okay.

17 MR. WIDMANN: They did.

18 MEMBER BANERJEE: Do they have
19 instrumentation related to the steam dryer
20 vibration?

21 MR. WIDMANN: Yes, sir, they did. And I
22 continue to collect data off of that. So they had--
23 was it 16 strain gauges?

24 MR. LANGLEY: That's correct. As well as
25 some instrumentation off of some of the stand paps.

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1 MR. WIDMANN: So they had welded strang
2 gauges on the pipes --

3 MEMBER WALLIS: So what happens when you
4 do MSIV closure to those strain gauges?

5 MEMBER CORRADINI: They wiggle. They
6 see a transient.

7 MR. WIDMANN: Yes, sir, they do. You're
8 correct. It's a impressive test --

9 MEMBER BANERJEE: What are these spin
10 gauges showing right now? Is a quiet plant or is it
11 going to be --

12 MR. LANGLEY: What the initial
13 information shows at low frequencies we do have some
14 noise, but in the upper frequencies it shows to be
15 fairly quiet.

16 MEMBER ABDEL-KHALIK: What is low? When
17 you say low frequency.

18 MR. LANGLEY: Low frequencies in the 124
19 hertz range. 124 or less.

20 MR. WIDMANN: Okay. Any other
21 questions?

22 Upcoming activities. We have -- out of
23 the Region as one of the members asked is documented
24 lessons learned. We are having a two day meeting to
25 collect about 75 of the more important contributors

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1 to the overall inspections to gather those lessons
2 learned. We've been working on that all along, but
3 we're going to actually have a concentrated meeting
4 on trying to gather that so we can pass that along
5 to our Unit 2 staff.

6 We also have -- we have yet -- the
7 Restart Oversight Panel, which Kathy and I are still
8 members of and we still need to bring closure to
9 that following the startup and successful testing.
10 At some point we will disband the Restart Oversight
11 Panel.

12 And as I mentioned earlier, we'll
13 continue to do performance assessment under the ROP
14 of all cornerstones now. And the additional item is
15 enhanced performance indicator inspectors. Because
16 the unit hasn't been operating, there isn't
17 performance data to collect and review. So we've
18 offset that with additional inspections which
19 required to us to assign a temporary inspector to
20 the site for additional one year. So there's
21 actually going to be four inspectors there for one
22 year until those PI inspections are complete and the
23 licensee has had an opportunity to collect enough
24 data to call it valid PIs. And that's the plan.

25 With that, that's what I have for my

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1 prepared remarks. Is there additional questions?

2 MEMBER POWERS: Can you tell me --

3 MR. WIDMANN: Sir?

4 MEMBER POWERS: Can you tell me what
5 lesson you learned from this manual scram due to the
6 electrohydraulic control fitting separating and the
7 subsequent examinations which you indicated that
8 additional APs you're planning.

9 MR. WIDMANN: Yes, sir.

10 MEMBER POWERS: Besides all these
11 thousands of hour of extra and you still had this
12 problem, and apparently additional problems that had
13 not been found?

14 MR. WIDMANN: Well, in looking at the
15 type of failure that this was on this tubing, the
16 fitup of those tubings, you're familiar with how a
17 flared tubing mates up. This particular one was
18 cross threaded. And until you have that system
19 under the 1500 pounds of pressure that's required to
20 operate that system, that fitting will not show you
21 it has a problem.

22 The other issues I mentioned was a
23 matter of them taking apart some additional fittings
24 and looking to see if they had bottomed out any of
25 those fittings and see if they had caused some other

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1 problems. They saw ones that they do not believe
2 would have separated but they didn't like, so they
3 decided to refit them.

4 So it was just part of their extended
5 condition that they decided to do to verify for
6 themselves that they had no additional problems.
7 None were really found, but they were just being
8 cautious, I felt and conservative. But this one
9 fitting did in fact separate.

10 And I would even go as far to say that
11 the original arrangement wasn't understand it was
12 under stress and caused the flare fitting to fail.
13 Otherwise, I don't think it would have separate.

14 MEMBER POWERS: And as long as we're on
15 that slide, we're frequently assured that this plant
16 will be much like Units 2 and 3, but obviously it is
17 not.

18 MR. WIDMANN: In what respect, Dr.
19 Powers?

20 MEMBER POWERS: Well, this auto trip
21 from 80 percent power due to a false high level
22 indication on the moisture separator and we're told
23 the reason for that is that it's mounted
24 differently.

25 MR. WIDMANN: Yes. You're talking about

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1 the units being the same and operating the same,
2 that is a true statement. Configurations like a
3 seismic arrangement of a particular of a particular
4 instrument, that kind of subtly small differences is
5 not something that's part of what they said would be
6 -- the unit would be the same. That would have
7 separated. But that's not the level I would think
8 that they would feel that that would be worth noting
9 and saying this unit is different because this
10 seismic fitting is different. I don't think that
11 level is the same.

12 MEMBER POWERS: Well, they're the same
13 or redid the same?

14 MR. WIDMANN: They're the same in
15 operationally they're the same.

16 MEMBER POWERS: But manifestly it's not
17 the same for Units 1 and 2 because control rooms are
18 different. Things are on the left on one, on the
19 right on the other.

20 MR. WIDMANN: That's correct.

21 MEMBER POWERS: And so they're
22 manifestly are not the same.

23 MR. WIDMANN: Yes, sir.

24 MEMBER MAYNARD: Well, nothing is ever
25 identical. If they replaced a lot of piping even if

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1 you replace something with like piping to the same
2 design, you can end up with different areas where
3 you have vibration levels and --

4 MEMBER POWERS: No. See, the problem I
5 have is what does it mean to be the same?

6 MEMBER MAYNARD: Yes.

7 MEMBER POWERS: I can't -- it's not
8 evident to me I could draw any comfort from that at
9 all.

10 MR. WIDMANN: Well, I'm not going to
11 speak for TVA, Tony. You can speak up if you'd like.
12 But the Staff's view was it was operationally the
13 same. Not necessarily physically the same.

14 MEMBER POWERS: Yes, but it's even that
15 I don't agree with you on.

16 MR. WIDMANN: Okay.

17 MEMBER POWERS: Because in the control
18 room if I operate Unit 2 with my right hand, I got
19 to use my left hand when I'm in Unit 1.

20 MEMBER MAYNARD: Well, I think you have
21 to be careful in any of these that you rely too
22 heavily on it being the same. Because even something
23 that is very close, there can be subtle differences
24 that make it -- so you have to look at each one of
25 these for its own thing, too.

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1 MEMBER POWERS: I mean, I agree with you
2 on that a 100 percent. I'm just trying to understand
3 why some people tell me to derive some comfort out
4 of the sameness of these when they manifestly are
5 not.

6 MEMBER ARMIJO: Were any of the items
7 replaced after the May 24th on your original list of
8 items to be inspected?

9 MR. WIDMANN: Were anything replaced,
10 sir?

11 MEMBER ABDEL-KHALIK: Right. Were any
12 of the changes made after this trip on May 24th on
13 your list of items to be inspected?

14 MR. WIDMANN: No, sir. That list
15 remained the same. Nothing is added as a result of
16 that. And we did go back and ask that question of
17 ourselves.

18 MEMBER BANERJEE: This remind me. Do
19 these units have the DSSCD system for stability
20 control or is it solution 3?

21 MR. LANGLEY: No, it's solution 3.
22 DSSCD is in on Unit 1, the software's available. But
23 it's been jumpered out. We used the option 3 based
24 on because we're not MELLA+.

25 MEMBER BANERJEE: No, but for EPU are

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1 you going to just use --

2 MR. LANGLEY: We will use option 3 until
3 -- one of my future plans is to come in with MELLA+.
4 And as part of that, we would go to DSSCD for the
5 oscillations power into monitor.

6 MEMBER BANERJEE: And how would that be
7 effected?

8 MR. WIDMANN: I couldn't answer that. I
9 don't have the answer for that.

10 MEMBER BANERJEE: What's your answer?

11 MR. LANGLEY: Obviously, we would go
12 through and do a -- it's a firmware situation. The
13 software would be obviously validated and verified
14 as well as we would monitor the system for a while.
15 It's actually in monitoring now. It doesn't have
16 the ability to strip. So if there any problems
17 associated with it, we could recognize it before we
18 allowed it to initiate a trip.

19 MEMBER BANERJEE: Okay. Thank you.

20 MEMBER MAYNARD: You may not have the
21 people here to answer this in detail, but the fire
22 protection. One of the -- we heard yesterday that
23 Browns Ferry was allowed to startup with a large
24 number of manual operator actions under enforcement
25 discretion, which I don't think is probably an exact

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1 characterization. But just comment on how fire
2 protection, was there anything unique with Unit 1
3 compared to the fire protection and use of manual
4 operator actions different from 1 than what for 2
5 and were there any special considerations for this
6 startup for operator manual actions for fire
7 protection.

8 MR. WIDMANN: And, Tony, you can put our
9 two cents in also.

10 MR. LANGLEY: Yes, sir. You want to go
11 ahead? I'm sorry.

12 The manual actions are consistent
13 between the units. There wasn't any uniqueness
14 associated with Unit 1. A lot of cases it would be,
15 you know, as simple as maybe taking the HPCI system
16 and ensuring it didn't operate for a spurious
17 operation, or attributes such as tripping loads to
18 ensure that there wasn't an exceedence of the board
19 limits associated with the electrical equipment.
20 Those kind of things. But there wasn't a uniqueness
21 associated with Unit 1 with respect to those type of
22 manual actions.

23 MR. WIDMANN: Does that answer your
24 question?

25 MEMBER ABDEL-KHALIK: The decision to

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1 retain the old cabling side-by-side with the new
2 cabling, obviously that was done a long time ago.
3 And the question is was that done in consultation
4 with the Staff?

5 MR. LANGLEY: The Staff was cognizant of
6 our decisions. Obviously then -- when we go through
7 this and we elect to put in new tray systems, we
8 have criteria that we're going to follow with
9 regards to seismic, with regards to separations.
10 And if we meet those criteria, they're going to
11 inspect those criteria to make sure I don't -- I
12 have not done anything that's inappropriate.

13 MEMBER MAYNARD: Typically -- you have
14 to be careful in terminology because you don't work
15 together on these.

16 Typically the licensee will propose,
17 they will identify what they're doing and they will
18 propose an item and then it's up to the NRC to
19 decide whether they inspect that, review it further
20 or approve it or not.

21 MEMBER ABDEL-KHALIK: That's what I
22 meant.

23 MR. WIDMANN: We spent a lot -- I can't
24 give you exact hours, but the Staff spent a number
25 of dedicated inspections. I want to say it was four

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1 or five. Phil, do you remember how many inspections
2 we did? It was four or five inspections that were
3 dedicated to fire protection alone and looking at
4 the count measures as well as fire loadings,
5 separations, cable separation. And cable separation
6 by itself was a separate special program that was
7 reviewed. And we did have some issues, and TVA
8 resolved those before that restart occurred.

9 CHAIRMAN SHACK: Yes, I was going to say
10 I mean if your manual actions are consistent, you
11 weren't able to get better separation or pass the
12 fire barriers as you did the rewiring of the plant?

13 MR. LANGLEY: Obviously, on the
14 modifications that we did, yes, we did meet that
15 criteria. But in some cases with the physical
16 makeup of the plant there is going to be those same
17 type of manual actions.

18 MEMBER MAYNARD: Are there any other
19 questions?

20 Well, I believe that, personally, I look
21 at this as a success for the Staff. I think they
22 have a big job to do. I think this is something that
23 hadn't been done for some time. It's been a long
24 time since we completed a plant and brought a new
25 plant on line. So I think the Staff did an admiral

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1 job of putting together their program, meeting the
2 requirements and putting the effort in it to assure
3 that the licensee had done what they were supposed
4 to do.

5 And so I would say that this was a good
6 job by the Staff. And I really hope that the lessons
7 learned are passed along. Because I think they're
8 not only applicable to the other TVA plant, I think
9 it's also applicable somewhat to the new generation
10 of plants that may be coming on line later on.

11 So, with that I'll turn it back over to
12 you, Mr. Chairman.

13 CHAIRMAN SHACK: All right. Thank you
14 very much. It was a very good presentation.

15 Before you take off, Mario would like to
16 get some input about the PAR.

17 VICE CHAIRMAN BONACA: Yes. Just to get
18 an input about the PAR.

19 CHAIRMAN SHACK: We're finished. So
20 thank you very much.

21 VICE CHAIRMAN BONACA So if you can give
22 me some input and see if that has changed.

23 MEMBER APOSTOLAKIS: Do you need the
24 reporter?

25 VICE CHAIR BONACA: Don't need the

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1 reporter.

2 MEMBER APOSTOLAKIS: Comments or you
3 want us to read the draft.

4 VICE CHAIRMAN BONACA: I read it over.

5 MEMBER APOSTOLAKIS: You have a draft
6 letter?

7 VICE CHAIRMAN BONACA: Yes.

8 MEMBER APOSTOLAKIS: Where is it?

9 VICE CHAIRMAN BONACA: I mean if we're
10 together, so I want to make sure there's some
11 feedback from your guys.

12 CHAIRMAN SHACK: We're finished.

13 (Whereupon, at 11:48 a.m. the meeting
14 was adjourned.)

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