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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

OCTOBER 17, 2000

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This transcript has not been reviewed, corrected and edited and it may contain inaccuracies.

1 UNITED STATES

2 NUCLEAR REGULATORY COMMISSION

3 ***

4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 ***

6 FIRE PROTECTION SUBCOMMITTEE

7 ***

8 Room T2-B1

9 White Flint 2

10 11545 Rockville Pike

11 Rockville, Maryland

12

13 Tuesday October 17, 2000

14 The subcommittee met, pursuant to notice, at 8:30

15 a.m.

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1 MEMBERS PRESENT:
2 John D. Sieber, Chairman
3 Dana A. Powers, ACRS Chairman
4
5 ALSO PRESENT:
6 Amarjit Singh, ACRS Staff
7 Robert Kalantari, Engineering Planning and Management, Inc.
8 Mark Schairer, Engineering Planning and Management, Inc.
9 Leon Whitney, Plant Systems Branch, NRC
10 Ed Connell, Office of Nuclear Reactor Regulation, NRC
11 Phil Qualls, Office of Nuclear Reactor Regulation, NRC
12 John Hannon, Office of Nuclear Reactor Regulation, NRC
13 Eric Weiss, Office of Nuclear Reactor Regulation, NRC
14 Stephen Dinsmore, Office of Nuclear Reactor Regulation, NRC
15 J.S. Hyslop, Office of Nuclear Reactor Regulation, NRC
16 Tony Ulsis, Reactor Systems Branch, NRC
17 Fred Emerson, Nuclear Energy Institute
18 Bijan Nijafi, EPRI
19 Tom Gorman, BWR Owners Group
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1 P R O C E E D I N G S

2 [8:30 a.m.]

3 MR. SIEBER: Good morning. The meeting will now
4 come to order. This is the second day of the meeting of the
5 ACRS Subcommittee on Fire Protection.

6 I'm Jack Sieber, Chairman of the Subcommittee on
7 Fire Protection. The other ACRS member in attendance today
8 is Dr. Dana Powers.

9 Today we are going to hear and review information
10 concerning the staff's position on fire protection
11 inspection program, circuit analysis, SRV and low pressure
12 systems, and NFPA-805.

13 Mr. Jit Singh is the cognizant ACRS staff engineer
14 and designated Federal official for this meeting.

15 The rules for participation in today's meeting
16 have been announced as part of the notice of this meeting
17 previously published in the Federal Register on October 2,
18 2000.

19 A transcript of the meeting is being kept and will be made
20 available as stated in the Federal Register notice. It is
21 requested that speakers first identify themselves and speak
22 with sufficient clarity and volume so that they can be
23 readily heard.

24 Speakers should also go to probably this
25 microphone in the front, so that the court reporter will

1 have a record of what they say.

2 We have received no written comments, but we have
3 received a request to make an oral statement from a
4 representative of Engineering Planning and Management,
5 Incorporated. I think we will start the meeting by
6 listening to this statement from Robert Kalantari, from EPM.

7 MR. KALANTARI: Good morning. My name is Bob
8 Kalantari. I'm from Engineering, Planning and Management,
9 known as EPM; again, a consulting firm, heavily involved
10 with fire protection and safe shutdown analysis for the last
11 20 years, from 1980 on.

12 I want to thank the committee members for allowing
13 me to provide this presentation. I think sharing our
14 experience with the committee and the industry would be
15 beneficial to everyone to hear what our experience is.
16 I'm going to do part of the presentation, the up-front
17 portion, and then my colleague, Mark Schairer, will do the
18 second part.

19 About out a year ago, we were invited or
20 challenged to perform a safe shutdown analysis for our
21 neighbors north of the border and having the experience of
22 dealing with Appendix A and Appendix R analysis and also
23 myself being involved with NFPA-805 development,
24 specifically in the area of safe shutdown analysis and
25 circuit selection, we took all that experience and came up

1 with a unique approach to help them with assessing the fire
2 protection safe shutdown capability of the plants up in
3 Canada.
4 And the reason I think this is a very appropriate
5 presentation is we really have used parts of 805 to prove
6 that this could be done and utilized in a very logical
7 manner to address safe shutdown analysis.
8 And with saying that, I want to start covering the
9 presentation slide by slide.
10 As I said, the approach is unique and it utilizes,
11 in part, NFPA-805 techniques and guidelines; specifically,
12 the Appendix B portion of 805 that talks about component
13 selection and circuit selection. We utilize that and you
14 will see later on as far as the processes and methodology.
15 We call it deterministic because we do assume --
16 we do select all the cables, we do not limit the number of
17 failures, we don't use PRA. But, also, we say
18 performance-based, because we don't look for three-hour
19 walls. We look at the hazards. We analyze the hazards and
20 see what's the impact of that hazard on plant safe shutdown.
21 So in that aspect, we say it's performance-based.
22 Appendix R, Section 3G2, I believe that's C, says
23 separate redundant safe shutdown components by 20 feet, with
24 no intervening combustibles, plus suppression and detection.
25 I can't name one plant that has suppression where you don't

1 have any combustibles. I mean, that's not logical.
2 In the performance-based arena, we don't require
3 that suppression and we believe the 20 feet would be
4 adequate. So along those lines, we call this
5 performance-based. But we did not deal with probabilities.
6 We did not say the pump is going to catch fire once every
7 10,000 years or once every 50,000 years.
8 If the pump is there and it's a fire hazard, we
9 say some day this is going to catch on fire and what would
10 be the consequence. So we dealt with that. We did a number
11 of fire modeling, I don't know, 150, 200, 300 fire
12 modelings.
13 So this is not a probabilistic analysis, not at
14 all. We used NFPA-805 approaches, dealing with safe
15 shutdown analysis, deterministically and performance-based,
16 but not probabilistic.
17 Again, it addresses real fires with real
18 engineering evaluations and as I said, it's
19 performance-based, but not risk-informed.
20 And this is a definition from Introduction to
21 Performance-Based Fire Safety, for everybody's benefit,
22 what's performance-based. Basic engineering approach, based
23 on fire safety goals, loss and design objectives, evaluation
24 of fire initiation and growth, physical and chemical
25 properties of fire, and quantitative assessment of design

1 alternatives.

2 Again, this comes from Custer and Meacham,

3 Performance-Based Fire Safety.

4 And, again, a quick term, what's

5 performance-based? No preconceived rules related to

6 separation between redundant. Instead of saying redundant

7 systems shall be separated, these 20 feet, six meters, we

8 say, shall be adequately separated, and that's what

9 NFPA-805, I believe, did.

10 In fact, we were trying to come up with fire area

11 definition and the definition is any area that would contain

12 the fire. Air is a good barrier, as far as we are

13 concerned. If there is nothing to burn in between two

14 areas, then just plain air will be a boundary, for example.

15 DR. POWERS: That would seem to presume there's no

16 radiation heat transfer.

17 MR. KALANTARI: No. In fact, it would say that's

18 part of fire modeling, we do that, too. That's all in

19 there. We don't limit just -- that's a good question, and

20 we'll cover that.

21 This slide is here to cover a few things. Nothing

22 is new. The more things change, the more they stay the

23 same. Why am I saying that?

24 We've been, as I said, involved with Appendix R

25 for 18, 19, 20 years. Utilities have always been able to

1 use deterministic and quantitative risk-informed techniques
2 and the NRC staff, again, in our opinion, reluctantly
3 accepted the same. They never gave credit for, like I said,
4 fire modeling. We used fire modeling in the mid '80s, early
5 '80s to support some exemptions.
6 Although those fire modelings were never credited
7 in writing as part of supporting those exemptions, but they
8 were accepted. In one case, we did CFD fire modeling for a
9 containment to address a reactor coolant pump fire, and,
10 again, that was a heavy duty fire modeling in the mid '80s,
11 with those techniques available back in those days.
12 We also did some other fire modelings in support
13 of some other exemption requests for some other plants.
14 But, again, at least in those days, NRC was not relying on
15 those, but other fire hazards analysis.
16 In my mind, NFPA-805 refines and specifies these
17 longstanding industry techniques.
18 Again, the pain will probably remain. I'm saying
19 this because it's, again, in your opinion, NRC historically
20 was concerned with loss of control, worried about excessive
21 NRC or contractor manpower for review of more sophisticated
22 approaches.
23 The approach we have taken requires more
24 engineering. It's not that difficult, but it requires more
25 detailed engineering approaches and evaluations.

1 So based on that, we believe that in those days,
2 NRC discouraged licensees to use this approach and that
3 became a research project, as we all see today happening and
4 has been happening for years, with all the tests and whatnot
5 that have been done by contractors or whatnot.
6 A quick overview of the processes based on NRC
7 requirements and expectations. Just to clarify this,
8 although we use these techniques north of the border, they
9 really don't have much regulations up there. They have
10 CSA-293-95 that took part of Appendix A and Appendix R and
11 said do A, B, C or D; if you can't do any of them, do
12 something.
13 So we thought our experience, our regulation, if
14 we take that and come up with -- all these were written by
15 very detailed procedures and methodologies -- would be
16 acceptable.
17 And we assume multiple shorts. We don't get
18 bogged down with how many shorts, how many cold shorts, hot
19 shorts, shorts to ground or whatnot. We do not limit the
20 number of failures. We do not limit the number of spurious
21 operations.
22 We go, we select. If the cable is connected to
23 the equipment, if the cable is supporting that equipment
24 operation, or a cable whose failure would affect the
25 component operation, all that is selected. We don't

1 pre-judge if this cable is this construction, it may not
2 fail or whatnot. We take everything and put it in the bin.
3 And then we analyze them based on real fires, real
4 hazards, and see what's the consequence on safe shutdown.
5 And, again, the spurious operation is an area that I think
6 we have an issue in this country. Some people want to limit
7 that to one per fire area, one saying it is one at a time.
8 We cannot deal with more than one at a time spurious
9 operation.
10 If you say more than one, if you say simultaneous.
11 Now, if the same signal causes two spurious ops, we have to
12 deal with it. But if the signals come from different
13 cables, different initiators, then they are two separate
14 spurious ops and we have to deal with them one at a time,
15 and that's how we have done it.
16 And, again, we are utilizing, in part, NFPA-805
17 guidelines, specifically the Appendix B portion with regard
18 to circuit selection, component selection and whatnot, and
19 including the fire modeling techniques that were proposed in
20 NFPA-805.
21 A quick comparison between this and Appendix R.
22 Appendix R requires evaluating the impact, the total loss of
23 safe shutdown equipment in the area. No matter how big, how
24 small, how large, where the hazards are, we kind of assume
25 everything has to be burned and then deal with the

1 consequences.

2 Appendix R requires evaluating the consequences of
3 random fire. That, to me, really adds extra burden when you
4 have areas in the plant that are kept with no combustibles,
5 no fire initiators, and we still have to go postulate this
6 55-gallon lube oil drum somehow appearing in the cable
7 spreading room and burning everything instantly and deal
8 with that. That's not realistic.

9 This approach evaluates only real fires based on
10 real hazards. If there is hazard in the area, we take that
11 hazard and we evaluate the consequence of that hazard being
12 on fire, and Mark is going to talk about the fire modeling
13 techniques we have used. It's not really a paper exercise
14 here. When we do this analysis, we come up with issues,
15 with problems, with modifications, whatnot, but they are
16 very focused.

17 Again, it does not postulate fire if there is no
18 fire hazards or fire initiators. The benefits of this
19 approach is it's a realistic approach to addressing fire
20 hazards and fire hazards analysis, safe shutdown analysis.
21 It focuses on hazards, its flexible use. Again, Canadian
22 plants, the first time I walked in those plants, four units
23 next to each other, I mean, all one, four turbines on one
24 deck, and switch gears on that and then just wide open.
25 They drive bicycles back and forth on the turbine deck.

1 And if you assume these big areas are going to be
2 on fire, there's no way you can cope with that.
3 It allows for more realistic resolutions. It
4 requires more engineering time and analysis, calculation and
5 documentation. However, the results are more focused
6 resolutions and less modifications or the correct
7 modifications.
8 That's why I'm going to stop for now and I'll let
9 Mark cover the methodology section and at the end, I'm just
10 going to have a quick two-minute closing statement. And if
11 you have any questions, we can entertain them.
12 MR. SIEBER: Questions?
13 MR. WHITNEY: Leon Whitney, Plant Systems Branch.
14 Are the cables in the cable spreading room themselves a
15 hazard in terms of ignition of a fire or did you assume that
16 they did not cause a fire?
17 MR. KALANTARI: They would not cause a fire.
18 DR. POWERS: When you discussed the 55-gallon drum
19 model magically appearing, did I take that to mean that you
20 did not consider transient combustibles?
21 MR. KALANTARI: We do. All of these would be
22 covered as part of the methodology section. It's a very
23 detailed approach. If there are transient combustibles,
24 fixed combustibles, possibility of transients, we do all
25 that. Then the plant has designated areas for combustible

1 free zones and specially designated areas or whatnot.
2 It requires, again, the methodology is going to
3 cover it, requires good practices in administrative controls
4 and whatnot, but we do consider transient combustibles.
5 MR. WHITNEY: Leon Whitney, Plant Systems Branch
6 again. Any and all one-at-a-time sets of spurious
7 actuations, I understood what you meant. However, do you
8 ever have multiple sets of spurious actuations that you're
9 going to deal with with personnel actions, where if they did
10 happen simultaneous, you would not have enough personnel?
11 MR. KALANTARI: We don't deal with simultaneous.
12 If the same signal isn't going to cause the simultaneous
13 spurious operations, we cannot deal with that.
14 MR. WHITNEY: So in theory, you could have a room
15 with 20 sets of spurious actuations.
16 MR. KALANTARI: Yes.
17 MR. WHITNEY: All of which are dealt with
18 personnel actions.
19 MR. KALANTARI: Yes.
20 MR. WHITNEY: And there would only be enough
21 people to handle the worst case one in the room.
22 MR. KALANTARI: No, no. You would handle all of
23 them one at a time, taking the worst one, like we do it
24 here.
25 MR. WHITNEY: That's what I mean.

1 MR. KALANTARI: Yes.

2 MR. WHITNEY: You would have enough people for the
3 worst case one, but not enough people to handle the worst
4 case and another one.

5 MR. KALANTARI: No. And another one.

6 MR. WHITNEY: You do not have enough people.

7 MR. KALANTARI: Yes, we do.

8 MR. WHITNEY: So you have another factor in there
9 to add on an extra group of people.

10 MR. KALANTARI: If needed, right. That's correct.

11 MR. WHITNEY: That's important.

12 MR. KALANTARI: Yes, very important. Good
13 question.

14 MR. SINGH: Bob, let me follow-up again with this
15 question here. Did I understand exactly, you said cables
16 you will not take into consideration have a fire?

17 MR. KALANTARI: Cables we do not consider being
18 fire initiators. Now, if they are underneath, let's say,
19 switch gear or whatnot, that's considered. If the cables
20 are not safe shutdown and those cables, let's say, and,
21 again, that's part of the methodology, this is a safe
22 shutdown tray. This is a non-safe shutdown tray crossing
23 this tray, for example. There are no hazards underneath the
24 safe shutdown tray, but somewhere out there, way far away
25 from the safe shutdown tray, there is a hazard.

1 We assume that hazard is going to catch on fire,
2 hit that cable tray, and propagate that fire all the way to
3 this section.
4 But we don't assume cable trays being on fire just
5 randomly, for two reasons. If you assume that nobody is in
6 compliance with Appendix R in this country, because you take
7 credit for associated circuit by common enclosure as having
8 good protection. If you rely on that protection, that means
9 your cables are going to survive. Your protection device,
10 either it's going to work or it's not going to work.
11 If it's not going to work, then every fire is
12 going to give you 50 secondary fires. So that's very
13 important to know that. You detect for it or not and if you
14 don't, I don't think you can do this analysis.
15 Now, again, if you have power cables or whatnot
16 coming out of switch gear, it's one thing. But when you do
17 this, also taken into account -- now, if you are thinking
18 about this country, Reg Guide 1.75, separated three feet,
19 five feet; IEEE.273, separated. You have all these
20 requirements built into the design of the plant.
21 Again, I know where you're coming from, but my
22 answer is your protection device has to work. If it's not
23 going to work, we have not addressed associated circuits by
24 common enclosure.
25 MR. SINGH: Let me ask another question. If what

1 you say is true, why NEI and everybody else here yesterday
2 said they're going to do the testing on these cables?
3 MR. KALANTARI: Very good.
4 MR. SINGH: Why are they wasting their time for
5 that?
6 MR. KALANTARI: I think so, I think so. Let me
7 tell you why. I think if anybody thinks they're going to do
8 testing and come back with a result of, hey, when I put this
9 cable on fire, the two conductors aren't going to melt and
10 connect together, who are you going to sell that to.
11 I mean, the French guy came and gave a
12 presentation at the NEI conference and he says this is what
13 we did, this was the consequence. My question is, can you
14 repeat that test? If you take the same test the second
15 time, would you come up with the same result?
16 The answer is no. Now, the testing has a place
17 for it. Now, if you are doing testing to, say, for example,
18 armored jacketed cables aren't going to have an external hot
19 short, I'd buy that, because you have some protection and
20 there's no way you're going to have a hot short, because
21 that cable is protected.
22 If you are trying to do a test to say internally
23 it isn't going to short together, you can't sell that to
24 anybody. That insulation is going to melt and you're going
25 to have that short.

1 MR. SCHAIRER: Good morning. My name is Mark
2 Schairer. My background is basically fire protection. I
3 was part of a group that did this approach at several
4 Canadian plants, for, in fact, and two of them have been
5 complete and we're working on the third one and the fourth
6 one is scheduled to be worked on early next year.
7 So basically I'm going to run down the methodology
8 of what our approach was and that begins with determining
9 the plant performance goals. From there, we select the safe
10 shutdown equipment, safe systems, cables and components to
11 support those goals.
12 We then have engineers who locate the cables and
13 components in the plant. The set of -- a group of fire
14 protection engineers identify the hazards in the plant,
15 evaluate the potential impact of those hazards on the
16 cables, and we identify issues and problem areas and propose
17 solutions.
18 Before we do this, we need to make certain
19 assumptions and to reiterate what was said earlier, the
20 plant needs to have a solid electrical protection system, so
21 adequate fuse, breaker, and coordination. We assume that.
22 Good administrative control programs. We also
23 assume that transient combustibles are controlled
24 adequately, the cutting and welding program is sufficient,
25 and that the plant has a good housekeeping program.

1 Thirdly, we do not evaluate the capability of the
2 fire brigade or the -- in Canada, it's referred to as the
3 emergency response team. So we assume that they are able to
4 respond.
5 I'm going to quickly go over this slide. This is
6 similar to performance goals here in the U.S. We just want
7 to demonstrate capability of the plant to achieve fire safe
8 shutdown. So reactor shutdown, decay heat removal,
9 monitoring of plant parameters, the barrier to fission
10 product release, and any other supporting functions that the
11 engineers see.
12 The group of systems engineers identify the set of
13 plant systems, functions and equipment that can be used to
14 satisfy those performance goals and that is based on strict
15 requirements, similar to those of NFPA-805.
16 I'm going through this part quickly, Bob has
17 already covered some of it. We use a computer model and
18 that maintains the information on the performance goals,
19 systems, any of the cables, equipment that we've credited
20 and their association to fire zone locations.
21 The computer model logically creates a
22 relationship that establishes which cables in which fire
23 zone, basically, and we'll use that later.
24 Based on drawings or architectural drawings or
25 engineering drawings, we divide the plant into smaller fire

1 zones, and these fire zones might not be what is referred to
2 here in the U.S. They're not necessarily separated by a
3 three-hour barrier. They might just be an arbitrary area in
4 the plant that's just been designated for a purpose.
5 It's just a way to basically locate and analyze a
6 smaller area in the plant to focus our evaluation. So
7 again, we locate the cables and equipment in that fire zone.
8 The data is put into a software program and the next step is
9 to screen the fire zones based on the computer-assisted
10 analysis.
11 That's basically done where we burn everything in
12 those fire zones and anything that does not have equipment
13 or cable is screened out. That's a screen one zone.
14 Anything after the analysis where performance goals can
15 still be met, that's referred to as a screen two zone and
16 anywhere where the performance goals are challenged due to
17 the complete burnout of the room, that's considered a screen
18 three zone.
19 DR. POWERS: I guess in your screen one, things
20 depend a little bit on what you call equipment.
21 MR. SCHAIRER: Anything that's been credited by
22 the system engineers to support the performance goals would
23 be considered equipment or cable. So there might be
24 equipment or cable that's in the room, but it's not depended
25 upon for shutdown.

1 Does that answer your question?

2 DR. POWERS: I guess it just raises other

3 questions.

4 MR. KALANTARI: What is your question now?

5 DR. POWERS: Well, suppose there is equipment that

6 I haven't credited in the analysis, but it could catch fire

7 and it could propagate from one zone to the next.

8 MR. SCHAIRER: Exactly. I'm going to get to that

9 in one second. You're one step ahead of me.

10 MR. KALANTARI: I thought he was asking that.

11 MR. SCHAIRER: Okay. Here is the answer to your

12 question. The screen one zone, there may be no credited

13 equipment or cable, but there might be fire hazards in the

14 area. So we want to postulate the potential impact of those

15 fires on adjacent screen two or screen there zones, and that

16 may or may not involve evaluating the boundaries of the

17 screen one zone, its capability to contain a fire in that

18 area.

19 If there are no hazards in the area, there's no

20 equipment, the room is removed for further analysis, there

21 is no necessary action and all the work for a screen one

22 zone is performed via walk-downs or plant drawings.

23 DR. POWERS: I'm working on hypotheticals here,

24 but suppose that I have three zones just in a series and for

25 some reason, I look at the middle of those zones and I say,

1 oh, there's nothing there. Literally, nothing there. So I
2 screen it out.
3 Is it still possible to consider the propagation
4 of the fire from the first of the zones to the last of the
5 zones in the series?
6 MR. KALANTARI: Yes.
7 MR. SCHAIRER: Yes.
8 DR. POWERS: So it's just deleted, it's not a wall
9 or anything like that.
10 MR. SCHAIRER: Right. It might be an open area.
11 DR. POWERS: That's what I'm thinking of.
12 MR. KALANTARI: Let me answer this. I think as
13 far as zones really are meaningless, as Mark said. We go
14 define the hazard and then we do the fire modeling and we
15 see the envelope of the fire modeling, whether it's going to
16 hit any target.
17 DR. POWERS: Yes. I'm getting that impression
18 here. Thanks.
19 MR. SCHAIRER: Quickly, over the screen two zone,
20 we go and identify the fire sources and hazards and we
21 evaluate -- and I'm going to get into more detail on how we
22 evaluate the potential to spread to adjacent screen three or
23 two zones.
24 Of course, the overall goal is to show that no
25 single fire can impact redundant safe shutdown systems or

1 performance goals.

2 In some cases, we will combine screen two fire

3 zones, where it's applicable. It might be easier to

4 maintain or secure that area if it's larger. Again,

5 walk-downs or plant drawings are used.

6 The screen three fire zone analysis is the most

7 complicated. This is where, of course, the performance

8 goals are challenged due to a fire in the room. So we need

9 to walk down the area and use plant drawings, identify the

10 fire sources and hazards; again, postulate those fires to

11 evaluate their impact, and we need to evaluate the

12 potential, again, to spread to adjacent screen two or screen

13 three zones, and we're assuring that no single fire could

14 impact shutdown systems.

15 This slide just quickly breaks down the type of

16 information we collect on our walk-downs. We look at

17 building construction type, the general plant layout, any

18 combustible materials and ignition sources, the type and the

19 quantity of those.

20 We locate the major plant equipment, any installed

21 fire protection features, and we need to also look at all

22 the credited cables and equipment. And the targets are, of

23 course, the cables and equipment.

24 So we actually go down into the plant. We're

25 using drawings first to kind of lead us to where they are,

1 and we look at every cable, we look at every piece of
2 equipment that's been credited, and we can do this from
3 architectural and plant layout drawings. We use our FHA
4 pre-fire plan drawings.
5 Most plants have a database that some of the work
6 has already been done for us, so we can use that. If we
7 need to, we'll seek assistance from system engineers and all
8 this is verified by walk-down. So we do go into every room.
9 More detail on the fire protection features. We
10 may credit some of these systems as assisting us in these
11 areas, any sort of water supply system that's used in fire
12 protection, fire detection and alarm systems have been
13 credited in some cases.
14 Automatic fire suppression systems, of course;
15 manual fire suppression, as well, and fire barriers.
16 When we identify the hazards, we have a
17 methodology in doing that and there's a lot of assumptions.
18 I don't want to say a lot of assumptions, but there are
19 assumptions. So we have a specific type of hazard that
20 we're looking at and some of those are based on -- most of
21 them are based on EPRI FIVE.
22 Pumps, of course, are a major fire source due to
23 the lubricating oil, an oil spill and a pool fire. Any sort
24 of electrical motor that's ventilated is considered a fire
25 source. Electrical cabinets that are ventilated. Any

1 grouping of combustibles, such as a storage or laydown area
2 that's permanently stored there, we consider a fire hazard.
3 In some cases, transients -- and by this, I mean
4 transients that we believe are going to be situated in that
5 room for long periods of time and could create a fire
6 hazard, this could be a trash collection are or a designated
7 storage area, something to that effect.
8 DR. POWERS: Let me ask. That means that they're
9 not transients. You only look at relatively permanent sorts
10 of collections of combustibles here.
11 MR. SCHAIRER: I think the trash collection area
12 is a good example, because on any given -- any phase acting.
13 It is, by definition, transient, but it is going to be there
14 permanently.
15 DR. POWERS: Does this mean that you don't look at
16 shutdown sequences where there can be a build-up of things
17 that increase the fire lading of the zone for a short period
18 of time?
19 MR. KALANTARI: It it's a designated laydown area.
20 MR. SCHAIRER: Right. If it's been designated as
21 a storage area or laydown area, we are going to look at it
22 and evaluate and postulate a fire for that area. Otherwise,
23 we are crediting their combustible control program.
24 MR. WHITNEY: Leon Whitney, Plant Systems Branch.
25 One of the oddball transient situations that we've seen was

1 a painting evolution going on in a space, with rags,
2 paint-soaked rags and wood, et cetera. And where would that
3 fit in your descriptions?
4 MR. SCHAIRER: That almost falls under the
5 category of not necessarily hot work, but it is a work in
6 progress, and they have certain controls in the plant, at
7 least in the Canadian plants, that monitor and surveillance
8 those areas. So we're crediting, again, their control
9 programs.
10 All right. This is where we're getting to the
11 meat of the fire modeling. We're evaluating using this sort
12 of model and it is based on EPRI's FIVE. So we calculate a
13 critical distance range for each specific fire.
14 So if we have a pump, we basically used the
15 mathematical equations. We put them into sort of a
16 spreadsheet formula and we are able to calculate a critical
17 distance range for each specific fire.
18 And if that's not possible, then we calculate the
19 hot gas layer, if it's an enclosed room. We then determine
20 which targets fall within that range and they are considered
21 to be failed.
22 And these fire models are conservative and they're
23 based on research done, that we are assuming EPRI's FIVE
24 research. I believe that was done mutually.
25 I'm just going to go into a little more detail on

1 EPRI FIVE, without going into too much detail. Some of the
2 input parameters of the damaged threshold of the target.
3 For cable, there's, I believe, 450 degrees Fahrenheit and
4 that is any fire that creates an environment around that
5 cable that's beyond that, we considered damaged.
6 We look at the ambient room temperature, that
7 affects it slightly. The peak heat release rate of the
8 fuel, and this comes out of some of the tables in the back
9 of FIVE. Any of this can also be researched in the NFPA.
10 The total heat release of the fuel. So if we have
11 a pool fire, again, we're going to have a peak heat release
12 rate and depending upon how much fuel there is, we're going
13 to determine the total heat release.
14 Room dimensions come into play, mostly for hot gas
15 layer, if there is a contained environment. The location
16 factor of the fire is also an issue. If we have a fire in
17 the center of the room, it's going to have a different
18 effect than if it's along the wall or in the corner of a
19 room.
20 And the configuration of the target is also a
21 factor. If it's directly above the fire, there's a
22 different type of failure than if it's outside of the plume.
23 And that brings us into the types of failures that
24 we can see. Again, if the cable or cable tray is directly
25 above the fire, the failure would be direct plume

1 impingement, if it does fall within the failure range. If
2 it's outside of the fire, but it's still close to the
3 ceiling, there could be a ceiling jet impingement failure.
4 And if it's outside of the plume and outside the ceiling
5 jet, but within the thermal radiation exposure range, it
6 could fail that way and that's a horizontal distance.
7 The hot gas layer in a room, such as the room
8 we're in, basically, the hot gas layer is anything above the
9 top of the fire and if the failure of that cable -- if the
10 location of that cable is within that hot gas layer, then it
11 will fail. Target is hazard. This is if the actual target
12 or the piece of equipment that we need is a hazard in
13 itself, then that piece of equipment will fail.
14 And propagation along cable trays, we've come up
15 with a burning rate ten feet per hour, and I think that's a
16 -- I'm sorry.
17 MR. KALANTARI: That's fine.
18 MR. SCHAIRER: I think that's a pretty accepted
19 rule of thumb, ten feet per hour. So basically if something
20 is within a certain range, if we have a cable in one zone
21 and we feel that it could spread to cables in another zone
22 that cross over it, that could be means of failure.
23 So after we have gone through and done this, we
24 have identified -- and the fire protection engineers who go
25 into the plant, collect the data, they will put it into sort

1 of a report that tells the system engineers, you know, this
2 certain fire is going to impact these cables.
3 So they're going to document -- we document that
4 failure. They use a computer system analysis to rerun the
5 scenarios; with this specific fire, these set of cables are
6 going to fail. If there's a problem with that, then the
7 issues only arise in that case.
8 So we might have a screen three area, where,
9 before, if we burn the entire area, we would have a problem.
10 Now we go and kind of dissect that area and locate the
11 hazards individually, they might only impact a smaller
12 number of cables and we can deal with that failure
13 specifically.
14 So those specific scenarios, if there is an issue,
15 then we need to look at those only.
16 I threw up some of the example resolutions that we
17 have used at the plants so far and sometimes it's as easy as
18 removing the hazard. If we can remove a storage area or
19 something like that rather easily, then that's a fairly
20 cheap resolution. Even if we can reduce the hazard, if
21 there's a pump fire where a large oil spill is impacting a
22 large amount of cables, then maybe just putting up a dyke
23 around the pump will limit that fire spread.
24 If we need to provide protection to the cable
25 tray, that's usually a rather inexpensive, comparatively

1 inexpensive resolution. Sometimes just putting up a
2 radiation barrier or something around the cable tray.
3 We have detection systems basically by you more --
4 they basically alert the ERT faster, if you're going to rely
5 on your ERT to get to an area, and this basically we go into
6 -- I'm thinking of an area, where it's sort of a remote area
7 where you might have a hazard and a fire would go undetected
8 for a long period of time.
9 So going with the ten foot an hour rule on the
10 cable tray, you might have a cable tray that burns for
11 several hours and spreads to an area.
12 If that's the case, then by putting detection
13 there, we can detect that fire in its incipient stages.
14 If we need to upgrade or install suppression, then
15 that's one of the biggest resolutions, and providing barrier
16 protection is probably one of the last resorts.
17 Operator actions were used in almost probably half
18 of the issues. This would mean that if we can just send a
19 operator out to an area after detecting a fire to flip a
20 break open or a valve, that might be just changing a
21 procedure or something like that.
22 So in conclusion, this approach is
23 performance-based. It is deterministic. We're looking at
24 realistic fire scenarios, real fires that could happen, and
25 they create realistic issues, something that we can deal

1 with, and we can deal with that realistically. We can
2 actually say this fire could potentially happen, let's deal
3 with it this way.
4 And, of course, the goal is to share that no
5 single fire could compromise safe shutdown performance
6 goals.
7 I'll turn it over to Bob, if he has anything more
8 to say.
9 MR. KALANTARI: I just want to summarize what we
10 said. Again, this is based on our experience company-wide
11 and including myself, being in the industry for 20 years or
12 so.
13 We have had this Appendix R issue for the last
14 18-20 years and we had Appendix A before that. It is our
15 opinion that Appendix A fixed a lot. Appendix R also fixed
16 a lot. And, actually, Appendix R proved that those fixes
17 performed in Appendix A really addressed a lot of issues.
18 We believe the problem is that some utilities did
19 not spend the time to prove that by doing a detailed
20 analysis and they have had problems.
21 We believe that plants are inherently safe based
22 on the original design and the Appendix A fixes and Appendix
23 R fixes, and all the controls and whatnot that we have put
24 on these plants after the Brown's Ferry fire.
25 We have just proven that this issue, also, doing

1 the analysis in the Canadian plants. I don't want to say
2 anything bad about them, but when I walked through those
3 plants, they were pre-Brown's Ferry. I mean, the fire
4 protection was nonexistent. I've walked every single
5 Canadian plant, including the single-loop at Point LePreau
6 and the Gentilly, Hydro Quebec, and fire protection
7 practices are not that good, although they are improving.
8 The regulators are on their case.
9 But we proved that even in those plants, we've
10 already completed eight plants, eight units, and we didn't
11 come up with any major issues. We did come up with
12 modifications. We did come up with problems and whatnot,
13 but if you want to focus, based on the hazards and based on
14 the real fires or whatnot, these plants, with a little bit
15 of modifications, can definitely achieve safe shutdown in
16 case of a plant fire.
17 And we use NFPA-805 guidance and I think with good
18 quality engineering analysis and good evaluation tools, I
19 think you can achieve that.
20 Appendix R did that. IPEEE came out and
21 identified additional vulnerabilities for the plant. Now
22 I'm hearing that we want to go do another three years of
23 research projects, trying to PRA cable failures and whatnot.
24 We don't believe that's the best way to spend a buck these
25 days. We believe plants can prove they can achieve safe

1 shutdown based on the proposed guidance.

2 MR. SIEBER: Thank you very much. Dana, do you

3 have any questions you'd like to ask?

4 DR. POWERS: I guess one of the questions is, I

5 mean, you've given us a sketch on this overall strategy that

6 you're pursuing as a company. Is there anything documented

7 that we could redo the study on this overall?

8 MR. KALANTARI: Yes. WE can give you the

9 methodologies, actually. I'm going to provide this

10 presentation in the upcoming fire safety conference in

11 London, also. I was asked to do that.

12 DR. POWERS: That's the one you're attending.

13 MR. KALANTARI: It would be a little bit different

14 and I will give out handouts, but I can give those to you,

15 that describes the methodology.

16 DR. POWERS: He's going to be attending and he can

17 bring that material back to us. That would be useful,

18 because you've given me a sketch here and I have a feeling

19 for it, but it would be useful to have something I can

20 really pour over a little bit and whatnot.

21 It had some differences in approach, but the

22 attraction is, to my mind, it's kind of a fresh look at

23 those kind of overall uniform rational approaches.

24 I think you can probably couple this with some of our ideas

25 on probabilistics to good advantage.

1 MR. SIEBER: WE are going to wait just a little
2 bit, to fix the lights back here.
3 DR. POWERS: Well, they're not bothering me.
4 MR. SIEBER: They're not bothering me either, but
5 Jit left. I'm not allowed to do anything if he's gone.
6 I think while we're working with the lighting, the
7 order in which we are going to do the remaining
8 presentations today from the NRC staff is we will talk about
9 NFPA-805 first, then go to fire protection inspections, then
10 circuit analysis, and then SRV/low pressure system safe
11 shutdown.
12 So we're going to begin with NFPA-805, Mr.
13 Connell.
14 MR. HANNON: Can we use that microphone there?
15 MR. SINGH: Absolutely.
16 MR. SIEBER: Yes.
17 MR. HANNON: Good morning. I'm John Hannon, Chief
18 of the Plant Systems Branch in NRR. We appreciate this
19 opportunity to brief the ACRS Subcommittee on Fire
20 Protection on selected aspects of our ongoing fire
21 protection program.
22 We are very interested in getting your insights
23 and feedback on our reports. In a minute, I will turn to
24 Eric Weiss, the Section Chief for Fire Protection and
25 Engineering, Special Projects Section, to introduce our

1 staff and begin the presentations.

2 But before I do, I just want to mention that our
3 staff has been working very hard over the last year to
4 improve our fire protection guidance, help implement the new
5 reactor oversight program in fire protection, and bring
6 closure to several technical issues, one of which you heard
7 about yesterday, the BWR Owners Group topical report on SRV
8 LOCAs.

9 We've faced a number of challenges as we attempt
10 to understand the risk implications of our regulatory
11 actions and we're getting important help from our SRAs in
12 the region and in headquarters and our risk analyst in the
13 Division, DSSA.

14 But I have found that employing the NRC's outcome
15 goals, the ones that are in our strategic plan, in the fire
16 protection area is difficult. We continue to have to devote
17 a considerable amount of attention to the balance between
18 maintaining safety and achieving -- minimizing unnecessary
19 regulatory burden.

20 We also feel there is a certain sense of urgency
21 to bring closure to longstanding regulatory issues in the
22 repository area, such as the circuit analysis resolution
23 plan, that, as you know, has been ongoing for over two years
24 now, and we want to resolve this matter soon, because it has
25 important ramifications in our enforcement and our oversight

1 programs.

2 Again, we look forward to your input today. Now,

3 let me ask Eric to begin the presentation.

4 MR. WEISS: Good morning. Our first speaker is

5 going to be Mr. Edward Connell, who is going to speak to the

6 issue of NFPA-805 and NRC's perspective on that standard.

7 DR. POWERS: I've just got to ask.

8 MR. CONNELL: Go ahead. Fire away.

9 DR. POWERS: What in the world are these leaves?

10 Is this an acknowledgement of the Canadians or something

11 like that?

12 MR. CONNELL: It's October. What's not to like?

13 DR. POWERS: Are we making these guys feel

14 comfortable back here?

15 MR. CONNELL: I had this all electronically

16 arranged.

17 DR. POWERS: And we heard about it and we said

18 let's see how bright Ed is on his feet.

19 MR. CONNELL: Once again, I'm Ed Connell, from the

20 staff and it's a pleasure to be here today, and I want to

21 talk a little bit, kind of as a follow-on to the

22 presentations you heard yesterday afternoon regarding

23 NFPA-805 and the staff's activities regarding that.

24 This was covered pretty much yesterday, I'll go

25 over it briefly. The standard is very comprehensive. It

1 does go beyond the general design criteria and Appendix R
2 and 50.48. It does address life safety, property
3 protection. It does have guidance for all modes of reactor
4 operation, operating shutdown, and D-and-D.
5 The history on this starts basically with
6 SECY-98-058, where the staff proposed and the Commission
7 approved this process to work with industry and develop this
8 consensus standard. There's been several Commission papers
9 since that -- since 98-058, 99-152, status reactor fire
10 protection projects and the rulemaking plan that was issued
11 in January of this year.
12 This is the third briefing that the subcommittee
13 has had. I notice the numbers of people going down, that
14 I've given on this topic.
15 So an update from when I briefed you January of
16 last year.
17 DR. POWERS: What occurs is the standard changes
18 every time you talk.
19 MR. CONNELL: Yes. Some of the technical
20 requirements change. The basic goals and objectives and
21 that kind of stuff have stayed pretty much the same.
22 You heard this yesterday. The second draft was
23 issued for public comment. There was a limited scope pilot
24 at Salem that was discussed yesterday. I mentioned the
25 rulemaking plan.

1 The technical committee had an affirmative ballot
2 to forward the standard for membership. Of course, we had a
3 nice letter from the ACRS in February of last year that we
4 responded to and forwarded that letter to the committee.
5 For the second draft that was issued in January of
6 2000, there were 126 public comments received. Most of them
7 were from the committee members on the pilot.
8 It didn't result in a major change to the standard
9 and on the ballot, the staff had seven negative votes out of
10 the 126.
11 Okay. I'm not going to go into a whole lot of
12 this. Most of it was covered yesterday. The ones I do want
13 to note is that the -- which I didn't see in the
14 presentation materials yesterday are the last two bullets.
15 The risk assessment is only -- a risk assessment
16 under 805 is only required for changes that are made under
17 the standard, so there is no -- at one time, there was a
18 baseline risk assessment. That has been deleted from the
19 standard.
20 And there is a monitoring feature to feed back
21 into the program to see how we're doing. Sort of like a
22 performance indicator thing, but not quite as sophisticated
23 as that.
24 Something that wasn't addressed yesterday is, all
25 right, what's different in 805 specifically from what we

1 have in Appendix R. The big one is -- of course, this is
2 related to the other issue that was discussed yesterday, the
3 performance criteria for nuclear safety allows the use of
4 ADS or SRVs and the low pressure systems for boiling water
5 reactors and will allow feed-and-bleed for PWRs as the only
6 protected fire resistant safe shutdown method. That's a
7 substantial change from Appendix R.
8 The performance-based risk-informed approach does
9 allow recovery of structures, systems and components that
10 are needed for safe shutdown, whereas in Appendix R, those
11 have to be demonstrated to be free of fire damage. So
12 that's a substantial change.
13 The requirement to achieve cold shutdown in 72
14 hours, either by protecting equipment or being able to
15 repair equipment and achieve cold shutdown, has also been
16 deleted.
17 There are no differentiations any longer between
18 redundant, alternate and dedicated shutdown capability. The
19 alternate dedicated shutdown capability has been deleted.
20 The Appendix R requirement for eight-hour
21 emergency lighting has been eliminated. The requirement for
22 a lube oil collection system has been eliminated and we did
23 add specific criteria to address radiological release that
24 was not related to fuel, nuclear fuel, or a rad waste
25 building fire or something like that would be addressed

1 under the standard. It's currently not addressed in the
2 NRC's regulations specifically.
3 The outstanding technical issues, a lot of these
4 tie back to the seven negative votes that the staff
5 submitted, and I want to mention we had a lot of
6 interagency, intraagency participation. Dr. Nathan Siu,
7 from the Office of Research, participated very extensively
8 in the effort and that was appreciated.
9 Myself and Pat Madden, and we also had other
10 people from NRR's PRA branch and others that assisted in the
11 development and commenting on the standard. One other is
12 also Sandia National Laboratories also participated and that
13 was very, very helpful, especially with circuit analysis.
14 As I mentioned before, the nuclear safety
15 performance criteria, as I said, low pressure systems for
16 the BWRs and feed-and-bleed for the PWRs is an outstanding
17 technical issue. As you're aware, the circuit analysis
18 approach, as you heard yesterday, does not mesh well with
19 the approach fostered by the BWR Owners Group and NEI.
20 I mentioned the recovery versus the fire damage of
21 safe shutdown capability. Another one that was mentioned
22 yesterday is the fire protection capability following an
23 earthquake. The current, most current staff guidance
24 requires -- the guidance states that two manual hose
25 stations, with a manual flow rate of 75 gallons a minute,

1 should be provided for -- that would survive an earthquake
2 in areas that contain safety-related equipment.
3 That was originally put in the standard and based
4 on some industry input, it was deleted. So right now there
5 is no specific criteria for fire suppression capability,
6 manual suppression capability following an earthquake.
7 Another issue is the spent fuel pool circuits are
8 not required to be identified in the standard. That was
9 also in there at one point. That has been subsequently
10 deleted. So there is nothing that would drive a licensee to
11 know where those particular circuits are located in the
12 plant.
13 I think this was mentioned yesterday, the bundling
14 of changes for risk impact and how we deal with existing
15 plant configurations.
16 DR. POWERS: What is the discrepancy between the
17 standard? I mean, why is this a technical issue? It looks
18 like they took the wording straight out of 1.174.
19 MR. CONNELL: Well, it's how do you -- there is no
20 specific guidance in 1.174 about what is an acceptable
21 bundle. Can you bundle stuff within a fire area? Probably.
22 Can you bundle stuff from separate fire areas? In other
23 words, if I relax the protection in this area, increase it
24 someplace else, can I put that all together and get a net
25 change?

1 DR. POWERS: When I read the explicit words, it
2 says a change has to be separately evaluated out of the
3 standard.
4 MR. CONNELL: Separately evaluated for? There's
5 not a lot of guidance about bundling in the standard.
6 DR. POWERS: Well, it says you can't.
7 MR. CONNELL: That's why it's an issue.
8 DR. POWERS: That makes it an issue, to my mind.
9 MR. CONNELL: It's an issue, and I'm identifying
10 this as an issue. I didn't say I had a solution for all
11 these things. I said these are all issues that need to be
12 resolved and they will be resolved through the rulemaking
13 process, one way or the other. And you understand the
14 grandfathering issue. That was covered yesterday a little
15 bit.
16 DR. POWERS: Well, the grandfathering you're
17 speaking of I think is that strange word on -- strange
18 discussion on how to handle past license acceptance.
19 MR. CONNELL: That's right.
20 DR. POWERS: And whether it's extrapolatable.
21 MR. CONNELL: That's correct. I mean, stuff that
22 was specifically reviewed and approved by the staff is
23 fairly straightforward. It's the stuff that was not
24 specifically -- the deviations, if you will, that were not
25 specifically identified or reviewed by the staff, how are

1 those going to be carried forward or dealt with with a new
2 licensing basis and everything.
3 DR. POWERS: I got the impression from the pilot
4 plant, at least those people interpreted it in a very
5 conservative fashion.
6 MR. CONNELL: Yes.
7 DR. POWERS: But there's no guarantee everybody
8 will. There's virtually guarantee that they won't.
9 MR. CONNELL: That's correct. So that's something
10 that the industry is going to develop the implementing
11 guidance and that's going to need to be addressed in the
12 implementing guidance, how you deal with stuff like that.
13 Okay. Stuff that's -- regarding implementation, a
14 lot of these have been addressed in the staff papers and
15 we've had some feedback from the Office of the General
16 Counsel and the Commission on can you adopt to 805
17 partially. I want to keep my existing licensing basis for
18 these fire areas, but for some reason, I want to use 805 and
19 change my licensing basis in this area, how are you going to
20 deal with that; can we inspect and enforce against this
21 hodgepodge of licensing basis.
22 Can licensees do a reactive adoption? If we have
23 an inspection and an issue is identified, can the licensee
24 resolve that by saying, oh, well, I'm going to run this fire
25 model and that shows I don't have a problem, or whatever the

1 solution is.

2 I mentioned before that industry, specifically

3 NEI, has agreed to develop the implementing guidance. So

4 that will be done by industry, not by the staff.

5 Of course, we'll be involved and I'm sure the ACRS

6 will, as well, be involved in the review of that guidance.

7 DR. POWERS: Do you have any idea how widespread

8 adoption of 805 will be?

9 MR. CONNELL: I don't expect it to be very

10 widespread.

11 DR. POWERS: I had written in my notes "when hell

12 freezes over." But it seems to me that this is a most

13 interesting dilemma that the high paid managers in the

14 organization get paid to solve.

15 There's a cost-effectiveness. It looks to me like

16 it's extremely expensive for NRC to respond to adoption of

17 805. There's training issues, just going through the review

18 and evaluations and things like that, and if very few

19 licensees adopt this, should they make that investment at

20 the expensive of other activities.

21 MR. CONNELL: And that's a decision they're going

22 to have to make. Of course, this is going to be voluntary.

23 They can elect to maintain their existing licensing basis if

24 they so desire. For those that see it as some benefit,

25 cost-benefit, maybe the plants that are undergoing license

1 renewal would be more likely to do so.

2 But a plant has three, four, five years left,

3 doesn't plan to renew their license, I don't think -- I

4 think the hell freezes over applies at least to them.

5 The oversight by the regions is going to be an

6 issue, and you mentioned the SRAs are screaming for help.

7 When 805 comes out, they're really going to be screaming.

8 DR. POWERS: Well, we're going to have, as I

9 indicated yesterday, we're going to have BTP plants, we're

10 going to have Appendix R plants, we're going to have --

11 MR. SINGH: License conditions.

12 DR. POWERS: License condition plants, then we're

13 going to have 805 deterministic plants, 805 performance

14 plants, 805 mixed plants. It's going to be very

15 challenging.

16 MR. SIEBER: And if you allow partial adoption,

17 you're going to have all that in one plant.

18 MR. CONNELL: That's right. This is going to be a

19 -- this is not easy. This is not easy.

20 MR. SIEBER: Well, I'm not sure how you can

21 regulate that when they can jump in and jump out on specific

22 issues or specific areas, because obviously both the

23 licensee and the staff has to have a way of knowing what has

24 been applied where.

25 MR. CONNELL: And that goes back to the

1 documentation and the level of effort that the licensee puts
2 into it and what gets submitted to the staff to change the
3 licensing basis, either totally, in part, or whatever the
4 configuration comes out to be.
5 MR. SIEBER: I guess, to me, technically, I think
6 that it's probably okay to do that. On the other hand, from
7 an administration standpoint, it would be a nightmare.
8 MR. CONNELL: Right. That's why this is an
9 implementation issue. It's oversight. It's going to be
10 done by the regions. How is that going to work out? And
11 that's going to be a big effort.
12 DR. POWERS: One of the characteristics that I've
13 seen in the regions when I've visited is kind of a universal
14 level of, gee, we don't have a whole lot of competence in
15 the area of fire protection and we don't have specialists
16 dealing with that on a day-to-day operation.
17 Does that mean they're going to have to have an
18 augmentation of their staff?
19 MR. CONNELL: Well, I don't know what the
20 management is -- the management is going to make a decision
21 on how we support the oversight program. I can tell you
22 that I do get a lot of phone calls every week from the
23 residents from the regional inspectors asking, hey, what
24 about this, I saw this, is that a problem. Licensees
25 telling me this, what's our history on this.

1 So as long as we have a central staff, as you
2 will, there will be some level, at least a resource for them
3 to go to.
4 DR. POWERS: They're even complaining that they
5 can't get enough of your time.
6 MR. CONNELL: Because there's lots of them out
7 there.
8 DR. POWERS: Lots of them and one of you and you
9 have other things to do. They are crying in fire protection
10 as it stands now, and now we're going to talk about doubling
11 the problem.
12 MR. CONNELL: It's not easy, but we never thought
13 it was going to be.
14 DR. POWERS: I know. That's why the managers get
15 the big bucks.
16 MR. CONNELL: That's right.
17 MR. WHITNEY: As we learned earlier, Appendix R
18 first inspection program, licensees have a lot of capability
19 for being creative in applying rules and regulations and
20 during the adoption process, there also should be another
21 rule under creativity.
22 DR. POWERS: It seems to me that if the standard
23 is an endorsement of creativity because of the -- it allows
24 you to -- it's not entirely clear to me whether you go
25 deterministic in one fire zone and you can go probabilistic

1 in another, or you can go deterministic on one set of
2 systems and probabilistic on others.
3 I mean, but it permits that kind of mix and match.
4 MR. WHITNEY: I think my comment is coming from
5 the poor inspectors.
6 MR. CONNELL: There is a lot of flexibility in the
7 standard to use a combination deterministic or
8 performance-based or a risk-based approach. So it does give
9 a lot of flexibility. There was flexibility in the past.
10 This provides even more flexibility.
11 DR. POWERS: It seems to me that the ground state
12 is a continuation of what we're seeing now, is that the
13 routine inspection becomes a much more routine inspection of
14 those aspects of fire protection that are comprehensible.
15 The existence of equipment, the existence of fire
16 extinguishers, the existence of things that you can check
17 off.
18 And the triennial inspection, where it's
19 equivalent, just becomes all that much more important,
20 because that's really the only examination of the fire
21 protection strategy.
22 MR. CONNELL: And that's what we found when we
23 stopped doing the triennial inspections and we went -- the
24 regions were basically checking the fire extinguishers and
25 the combustible loading permits and that kind of stuff, and

1 we kind of let the safe shutdown aspect get away from us and
2 we had a lot of problems.
3 FPFI identified that as an issue.
4 DR. POWERS: Anyway, I mean, what we found is
5 there's not just a regulatory problem. The licensee itself
6 found that he had lost control of his design basis strategy.
7 MR. CONNELL: Okay. My last slide. This is a lot
8 of stuff you already heard. Of course, the vote is next
9 month by NFPA membership. The staff owes the Commission a
10 status report in December and as you know, the standard is
11 going to get published in the March/April timeframe.
12 Right now, in the rulemaking plan, these are all
13 tentative dates. We are proposing a public meeting on
14 rulemaking next April and then the proposed and final rules
15 up there. That schedule is subject to change, but that's
16 the current one that we have. It will be longer than that,
17 it won't be shorter.
18 DR. POWERS: Do you think that your public meeting
19 will be held here in Washington?
20 MR. CONNELL: Yes.
21 DR. POWERS: It would be an interesting one to
22 attend.
23 MR. CONNELL: I'll make sure as soon as we get a
24 date, I'll let you know. Any other questions? That's the
25 end of my prepared presentation.

1 DR. POWERS: I guess I have been reminded that
2 there is this comprehensive reg guide that you guys have
3 been putting together to systematize what, for me, is two
4 drawers of various guidance and, for some of my compatriots,
5 even more.
6 Have you thought at all about what happens to that
7 with 805?
8 MR. CONNELL: Actually, I have my presentation on
9 the comprehensive reg guide. I know it wasn't included in
10 the agenda, but if you want to go over it, if we have time,
11 we can do it. Can't do it.
12 DR. POWERS: No. I'm just asking about it.
13 MR. CONNELL: Well, the reg guide, the
14 comprehensive reg guide was intended for plants that elect
15 to maintain their existing license condition, as we expect a
16 large number will do that, and we've been very successful in
17 compiling all of the guidance documents into something
18 that's a little more manageable.
19 We got a lot of feedback from industry. Some of
20 it's very, very good, and we're revising it right now and
21 expect to have that out the first quarter of next year.
22 DR. POWERS: I think it's going to prove to be
23 useful to have that all stuck in one place.
24 MR. CONNELL: If nothing else, Doug Brandes, from
25 Duke Power, has been doing this a long, long time, said is a

1 textbook in fire protection for nuclear power plants, if
2 nothing else. He doesn't agree with everything that's in
3 it, but he did note that.
4 MR. SIEBER: Any further questions?
5 MR. CONNELL: Thanks.
6 MR. SIEBER: Thank you very much. If not, what
7 I'd like to do is take a 15-minute break at this point in
8 time. So we'll come back at five minutes to ten.
9 [Recess.]
10 MR. SIEBER: I'd like to call the meeting back to
11 order. At this time, Leon Whitney, from the staff, is going
12 to discuss fire protection and inspection.
13 MR. WHITNEY: I'm Leon Whitney, from the Plant
14 Systems Branch, NRR. I'd like to talk about our baseline
15 fire protection inspection program, which commenced in April
16 2000 in accordance with SECY-99-40, the FPFI final report,
17 after three pilots were conducted over the winter.
18 The basic tenet in 99-40 is that fire risk is
19 comparable to total risk from internal events and,
20 therefore, something that ought to be well inspected.
21 Baseline inspection techniques were derived from
22 the FPFI program.
23 DR. POWERS: This second bullet you have here, the
24 fire risk comparable to total risk from internal events,
25 that's been a hint that's been emerging out of the IPEEEs

1 that we've seen, but it's been some time since I've had an
2 update.
3 Not asking for exact numerical equality, but
4 comparability, commensurability, is that still being
5 preserved as we go through the process?
6 MR. WHITNEY: Ed Connell is here. He is our IPEEE
7 reviewer. Could you answer that, Ed?
8 MR. CONNELL: I'm sorry. The question?
9 DR. POWERS: Ed, what I'm wondering, it's been
10 well over a year since we've had any update on the status of
11 the IPEEE insight. When we did last get some insights on
12 how the IPEEE results were coming, we had this view that
13 fire risk was proving to be comparable, commensurate with
14 risk from internal events that came out of the IPEs.
15 I wondered, as we progress through those IPEEE
16 reviews, is that general view being sustained?
17 MR. CONNELL: Generally, yes. Of course, we've
18 had some requantification, Quad Cities redid theirs, a bunch
19 of other plants have redone, and, generally, when they redo
20 it, the numbers go down, with a couple of exceptions,
21 Susquehanna redid theirs and the number went up
22 substantially.
23 DR. POWERS: Really? Oh, yes, that's right. They
24 were ten-to-the-minus --
25 MR. CONNELL: They were ten-to-the-minus-nine.

1 But the range is actually narrowing and that's pretty much
2 what we expected.
3 DR. POWERS: But comparable. It all remains
4 remarkable to me that we have that and suggests, as you
5 probably are intimating here, that there's lots of work to
6 do in fire protection.
7 MR. WHITNEY: There's certainly a lot of rationale
8 for doing it. The significance determination process is
9 being used in this inspection program. The equation that
10 they use in that SDP is based on fire protection
11 defense-in-depth. You can look at the various terms and
12 equate them to the fire protection defense-in-depth.
13 They must develop a fire scenario. You can't find
14 the significance of a finding use the wall-to-wall fire
15 assumption the way the Appendix R regulation is structured,
16 and that shows you a major difference between the assessment
17 of significance and the actual structure of the rule.
18 In the SDP, the risk significance of fire
19 protection feature degradations is assessed term-by-term,
20 based on hopefully information developed during the
21 inspection.
22 If the fire brigade is given a certain level of
23 credit, hopefully it's based on direct observation of fire
24 brigade performance, for example. And the delta CDF is
25 computed in that SDP process.

1 DR. POWERS: Let me ask. We haven't had a
2 detailed presentation on the significance determination
3 process, but it's been given to us in one of its
4 incarnations as a point of interest.
5 When I look at the fire protection significance
6 determination process, there's this process of going through
7 and saying, gee, is the degradation severe or maybe it's
8 high, medium and low, I can't remember what the words are,
9 and, based on that, then you select a bunch of numbers that
10 prove to be exponents.
11 What I didn't understand is, and it may be because
12 of the limited, that how one came about saying is the
13 degradation high, medium or low. Is that strictly a matter
14 of judgment or is there guidance on that?
15 MR. WHITNEY: Well, it's my lucky day. J.S.
16 Hyslop, one of the co-developers of the SDP, is here and I'm
17 sure he'll be glad to answer.
18 MR. HYSLOP: I'm J.S. Hyslop, from NRR/PRA. The
19 judgments about high, medium and low were made by Pat
20 Madden, the co-developer of this methodology. In that, he
21 -- actually, it wasn't called low. It was called normal
22 operating state.
23 And in that, the normal operating state, as I
24 recall, was based on the code of record that the utilities
25 were held to and the high degradation was a degradation

1 where minimal credit could be given to that element of
2 defense-in-depth.
3 But it was his judgment to form the basis for
4 determining what would be a high degradation, what would be
5 a medium degradation.
6 MR. QUALLS: In addition -- excuse me. My name is
7 Phil Qualls. In addition, the inspection procedure gives
8 some example definitions of what would comprise normal
9 operating state, medium and high degradation.
10 DR. POWERS: Now, that part I haven't seen.
11 MR. QUALLS: That's not in the SDP process, in the
12 SDP procedure. It's in a different inspection procedure.
13 DR. POWERS: Okay.
14 MR. HYSLOP: That particular guidance document is
15 going to be included in the next revision as Attachment 2 to
16 Appendix F of Inspection Manual Chapter 0609. The
17 Attachment 1 is the fire SDP and it is the later version.
18 It is undergoing a modification right now, and I think
19 that's March or something.
20 DR. POWERS: Yes. I look forward to seeing that,
21 because the first one just provoked more questions than it
22 answered.
23 MR. HYSLOP: Yes. I guess what I'd like to do is
24 respond to one of those questions from yesterday. There was
25 a question about the -- I guess, the values on which the

1 fire SDP were dependent and the fire SDP does document the
2 references from which that data was taken for the normal
3 operating state, and those references are industry guides,
4 such as FIVE and the EPRI PSA guide, and NUREG studies, the
5 NUREG-1150, the LaSalle study, which was done by NRC in the,
6 I'd say, 1993 range.
7 And so they've been widely used in the IPEEEs and
8 they're widely accepted through the industry.
9 DR. POWERS: My reading of the version I read,
10 and, of course, it's obvious I'm at least a version out of
11 date and maybe two.
12 MR. HYSLOP: I think so.
13 DR. POWERS: That for the life of me, I could not
14 ascertain where those numbers came from, even though I had
15 access to, I believe, every one of the documents that you've
16 cited.
17 MR. HYSLOP: I don't know if you were looking at a
18 version that gives the references, first of all. The
19 references are cited in the version that's currently in the
20 inspection manual chapter.
21 DR. POWERS: But can I go in and say, ah, from
22 table number 6-2, they took this number?
23 MR. HYSLOP: Yes, you can do that. The references
24 -- I'm not sure if the references give the page number of
25 the documents from which the data was selected, though. I

1 think it just gives the document itself. So you would need
2 to use the table of contents or the index in that document.
3 DR. POWERS: And most of them would not be very
4 helpful in that regard.
5 MR. HYSLOP: That will be changed in the next
6 update then.
7 DR. POWERS: Good.
8 MR. HYSLOP: The page number will be included.
9 DR. POWERS: That would be helpful.
10 MR. WHITNEY: So to summarize that, no longer is
11 the SDP going to be spread between different documents.
12 It's going to be in Appendix F of 0609.
13 The baseline procedure content, speaking
14 specifically of the monthly and annual and resident
15 inspector activities, look at combustibles and ignition
16 sources, detection and suppression, manual fire-fighting,
17 passive fire protection features, and fire barrier
18 condition, fire brigade capability and performance,
19 compensatory measure adequacy and reactor coolant pump oil
20 collection.
21 The triennial team, which is doing the third leg
22 of defense-in-depth, say, of shutdown largely, with other
23 items, too, has an electrical, a reactor systems/mechanical
24 systems, and a fire protection inspector, as a minimum
25 complement of inspectors.

1 Two to three-day information-gathering visit and
2 one to two weeks of on-site inspection within design and
3 licensing bases.
4 Why it varies is some regions put less people
5 on-site for a longer time. Other regions, vice versa.
6 DR. POWERS: It seems that in this inventory of
7 the inspectors participating, in the past, and I guess I'm
8 referring to the functional pilot.
9 MR. WHITNEY: The FPFI.
10 DR. POWERS: Right. That there was a risk expert
11 on this and that doesn't seem to be here anymore.
12 MR. WHITNEY: What happens with that is that the
13 SRAs and others work in advance, as described in the
14 inspection procedure, which, by the way, was provided to the
15 committee. It's described in there the support in terms of
16 identifying high risk areas and also it turns out there's a
17 lot of support in the application of the SDP, we're finding.
18 That does exist. Triennial team lines of inquiry, it's
19 quite extensive.
20 There's a number of slides here. Fire area
21 boundary design, safe shutdown system selection adequacy,
22 capability, hot shutdown systems separation, safe shutdown
23 circuit protection analysis, and alternative shutdown. And
24 we've only just begun.
25 Communications, emergency lighting, fire

1 protection systems, equipment and features, fire suppression
2 damage assessment.
3 Operator recovery actions, such smoke removal,
4 dewatering, control reenergization and return to service of
5 equipment.
6 Associated circuits of concern; that is,
7 interfering circuits as opposed to integral safe shutdown
8 circuits, an important distinction for our discussions
9 today.
10 Note that circuit analysis enforcement has been
11 suspended indefinitely by EGM-98-002, Rev. 2 of the 2nd of
12 February of this year, awaiting industry resolution efforts.
13 MR. SIEBER: How long do you think that will take?
14 MR. WHITNEY: The industry resolution efforts?
15 MR. SIEBER: Yes. Until you reestablish
16 inspection of associated circuits.
17 MR. WHITNEY: We expect that if industry meets
18 their schedule of springtime for submitting their document,
19 then by the end of the physical year, we might be able to
20 write an SER on that document. That's wholly dependent on
21 the necessity to request additional information, any time to
22 respond. It depends on the quality, of course, of the
23 document and the questions we have about it. It's hard to
24 say.
25 But all that pivots on completion of this

1 voluntary industry initiative.

2 MR. SIEBER: Do you feel uncomfortable about

3 suspending enforcement to that area for a long period of

4 time?

5 MR. WEISS: I think we can say that we're not

6 uncomfortable about it, because we have so much to inspect

7 that has a big impact on plant safety. We're inspecting

8 important areas and we're coming up with findings and we're

9 making a brief interlude in this inspection.

10 Our triennial team inspections will go out every

11 three years. We have about 200 hours, is my understanding,

12 of inspection time per site and we could use that 200 hours

13 up on a fraction of the list of things that are still in

14 play and make very significant contributions to the safety

15 of the industry by inspecting in those areas.

16 So a brief interlude while we allow industry to

17 help us sort out an issue, which, to be frank, hasn't been

18 very well dealt with up until now, seems appropriate.

19 MR. SIEBER: On the other -- now, 200 hours per

20 year is --

21 MR. WHITNEY: No, every third year.

22 MR. SIEBER: Every third year.

23 MR. WHITNEY: Triennial.

24 MR. SIEBER: So that's three percent of the total

25 inspection time at the site, right? For things that

1 represent half the risk. Interesting.

2 DR. POWERS: Not exactly risk-informed.

3 MR. SIEBER: No, really.

4 DR. POWERS: We really need to have the IPEEE

5 insights on it.

6 MR. SIEBER: Well, the resident is doing things,

7 too, on the other hand. He's going around and looking at

8 fire extinguisher tags.

9 MR. WHITNEY: He's doing the items which we

10 discuss here, which are rather -- he's looking at the

11 general condition of fire protection equipment and features

12 throughout the plant on almost a daily basis, whether he

13 wants to or not.

14 DR. POWERS: Or whether he intends to.

15 MR. WHITNEY: Let me clarify something. We

16 started this discussion talking about the enforcement

17 hiatus. Later on, we're going to talk about the inspection

18 hiatus for associated circuits, which I believe is a subject

19 of discussion we just had. So just for clarification

20 purposes, we kind of jumped the gun a little bit there.

21 MR. SINGH: Leon, do you have a copy of the

22 EGM-98-002?

23 MR. WHITNEY: I don't know.

24 MR. SINGH: Can I get a copy, please?

25 MR. WHITNEY: I have a copy. I'll get it to you.

1 MR. SINGH: Please. Thank you.

2 MR. WHITNEY: Going on with the triennial team
3 associated circuits lines of inquiry, there are, again,
4 three types; common power supply concern, which has two
5 components; multiple high impedance faults and fuse-breaker
6 coordination.

7 There's the common enclosure concern, which is
8 electrical fault protection from non-essential circuits.
9 And spurious signal concern, hot shorts, shorts to ground,
10 and open circuits, as defined in Appendix R.

11 Continuing. Safe shutdown system selection
12 adequacy, independence of the remote shutdown panel from the
13 main control room, safe shutdown capability with and without
14 off-site power, there are words in the rule that require, in
15 some cases, both capabilities. Effect of fire-induced
16 circuit faults on transfer of control to that remote
17 shutdown panel.

18 Operator training and if there is an alternative
19 shutdown simulator, the team would like to observe that.
20 Shutdown staffing, on-site staff exclusive of fire brigade
21 available to conduct the procedures.

22 Periodic operational tests of alternative transfer
23 capability. We're talking here the physical capability of
24 that switch and circuits. And, of course, the procedures
25 that are put in place for alternative shutdown.

1 The inspectors look at the time line; that is, a
2 thermal hydraulic analysis to ensure that the procedures and
3 the amount of people available and the manual actions, et
4 cetera, et cetera, reflect the realities and requirements of
5 that thermal hydraulic analysis.
6 The team looks at the communication plans on how
7 people will be communicating and objects, such as keys, will
8 be moved around the plant.
9 And human factors, numbers of manual actions, the
10 feasibility of the actions, the habitability of the spaces,
11 and the independence of the access routes from the fire
12 effects.
13 The team will be looking at the periodic
14 operational tests of the remote shutdown panel
15 instrumentation and control features. Okay. It's on-line,
16 but does it actually operate the plant? And portable and
17 fixed communications, are they operable, available, and
18 reliable, do they give clear sound with full coverage
19 throughout the plant.
20 And the cold shutdown repairs. There should be
21 damage-specific repair procedures, dedicated on-site repair
22 equipment and materials, and repairs should be feasible
23 within the applicable time requirements specified in the
24 rule.
25 I'd like to talk about the training that we

1 conducted to initiate the program in April. We conducted a
2 one-week BNL and NRR regional inspector training classes at
3 Brookhaven in March and in June for two groups of regional
4 inspectors.
5 We also, this past September, conducted a one-day
6 regional inspector refresher training, which half of it was
7 given over questions and answers from the inspectors based
8 on their experiences.
9 DR. POWERS: That question and answer period get
10 fully subscribed?
11 MR. WHITNEY: We were on a rather tight flight
12 schedule and it was questionable that we would make our
13 flights every day. There was plenty of good questions and
14 people had come up against -- you know, there was a lot of
15 comments on the procedure, which I tried to reflect when I
16 came back.
17 When the rubber hits the road, the practicalities
18 come out.
19 DR. POWERS: I think these guys are really just
20 crying for more help.
21 MR. WHITNEY: They are, very much so. You
22 mentioned the risk area, but in various areas, they would
23 appreciate more assistance.
24 DR. POWERS: We have a regular program of visiting
25 -- this particular subcommittee visits plants every year and

1 we're getting that -- I mean, that's a consistent theme. We
2 haven't had a single region not make that comment to us.
3 MR. WHITNEY: I received that feedback during the
4 September training, also.
5 MR. WEISS: And as a manager in the area, we're
6 looking for ways to reduce that burden. One of the ideas
7 that has come to us from a member of our staff is to look at
8 a solution to the fire modeling problem. This has been
9 time-consuming and somewhat difficult for the teams to
10 accomplish.
11 A member of our staff has identified some
12 resources in another Federal agency. It turns out that
13 we're initiating efforts to go visit that agency and see the
14 tools that they have developed for their fire inspectors
15 that reduce the burden imposed by fire modeling by using
16 spreadsheets that have been constructed with the knowledge
17 of people who understand fire modeling in a very detailed
18 way and then permit the inspector to do things in a more
19 cookbook fashion to get repeatable results, results that are
20 more easily obtainable in the field.
21 And I don't know how well that's going to work,
22 but we're certainly looking at that and other ways to reduce
23 the burden on inspectors and make it more manageable.
24 MR. HYSLOP: This is J.S. Hyslop, from PRA/NRR,
25 again. I talk to the SRAs and some say, yeah, I have

1 concerns, and tomorrow, as a matter of fact, I'm flying out
2 to Chicago, the Special Programs Branch, there is a regional
3 counterpart meeting with all the SRAs and the purpose there
4 is to find out what troubles are you still having, where do
5 you really want more guidance.
6 It's just kind of come up with a laundry list and
7 determine what still do we need to do.
8 MR. WEISS: This is very much a work in progress.
9 So we'll be looking forward to any insights or suggestions
10 that you have in this area.
11 But be assured, we're trying to work the problem
12 as best we can. This is a --
13 DR. POWERS: I would not look to the ACRS to give
14 you much insight on that, because it really is a management
15 issue and we stay away from those. I mean, Jack and I both,
16 I guess, have been in the roles of managers, but we're not
17 on the committee because of our expertise in management.
18 But we're happy to report back to you that we're seeing the
19 same thing you are.
20 MR. SIEBER: And that would probably be as far as
21 we would go.
22 DR. POWERS: That's probably as far as we would
23 go, because that's just really outside of our domain.
24 MR. WHITNEY: I'd like to talk about the
25 inspection results to date. We studied nine sets of results

1 and overall we found 19 issues and at two plants there were
2 no issues identified by the inspection team.
3 DR. POWERS: Which plants were they?
4 MR. WHITNEY: I purposely didn't put plant names
5 in here.
6 DR. POWERS: Ah, come on.
7 MR. WHITNEY: But if you wish to know, I can --
8 MR. SIEBER: You can tell us who the good one is.
9 DR. POWERS: Yes, you can tell us the good ones.
10 MR. WHITNEY: I can go back and find them out.
11 DR. POWERS: I'd like to know.
12 MR. WHITNEY: Recognizing that it's a sample
13 approach of selected areas of the plant, but they did --
14 DR. POWERS: And plants are always changing and it
15 can change tomorrow, but it would still be good to know.
16 MR. WHITNEY: Okay. Talking about the results of
17 interest, the IN-92-18 mechanistic versus functional damage
18 phenomenon was contested at one plant and that licensee had
19 not conducted analysis in accordance with the concepts put
20 forward in 92-18 as a result. That was an interesting
21 result.
22 Do I need to explain the mechanistic versus
23 functional for you?
24 DR. POWERS: No, it's 92-18.
25 MR. WHITNEY: Another finding was that a single

1 spurious actuation assumption was made in the front piece of
2 the analysis at one plant, but when the engineers came to
3 actually conduct the analysis, the licensee engineers did
4 not apply that assumption and, therefore, there were no
5 issues identified on that during the inspection.
6 I thought that was of interest.
7 There were various incomplete circuit analyses and
8 incomplete translations of safe shutdown analyses and
9 procedures, which is a common issue.
10 There was a case of alternative shutdown
11 capability not being independent of the fire area. The VCT
12 and RWST valves, control cables, plus charging pump power
13 cables were affected by a fire and because it was designated
14 to be alternative, there should have been an independent
15 method.
16 That was in three plant areas.
17 At the same plant, there was an alternative
18 shutdown capability that did not ensure primary coolant
19 integrity. There was a loss of reactor coolant pump seal
20 injection without temperature indication for the operator to
21 conduct a reactor coolant pump trip at the appropriate time,
22 and, of course, Generic Letter 86-10 talks about diagnostic
23 instrumentation. That was at three plant areas.
24 Now, I'll talk about the recent change in the fire
25 protection baseline inspection procedure scope, which we had

1 talked about earlier, as I pointed out. Direct associated
2 circuits inspection has been suspended until completion of
3 the voluntary industry circuit analysis initiative. We
4 believe that will be in this fiscal year, if everything goes
5 very smoothly.
6 General associated circuits, IN-92-18, and
7 multiple high impedance fault reviews will not be purposely
8 conducted by the inspection team, and that is reflected in
9 the procedure that I have provided you.
10 However, unavoidable or byproduct associated
11 circuits issues will temporarily be classified as unresolved
12 items. So if you run across one and you do flesh it out,
13 then you go ahead and document it for later adjudication,
14 when the criteria have been developed.
15 MR. SINGH: Let's go back to your slide 20.
16 MR. WHITNEY: Okay.
17 MR. SINGH: You mention in your first bullet,
18 there is incomplete circuit analysis and then you have
19 suspended indefinitely associated circuit analysis. How
20 long is it going to go on?
21 MR. WHITNEY: Let me draw a distinction here,
22 which I do draw in the other presentation. There's a
23 difference between safe shutdown circuit analysis and
24 associated circuits or interfering circuits analysis. We
25 are only having a hiatus in the associated circuits, and

1 then only selected portions of that, which I'm trying to
2 describe now.
3 We are not having a hiatus in safe shutdown
4 circuit analysis. Does that help?
5 DR. POWERS: That's an important point.
6 MR. WHITNEY: And I'll make that in my next
7 presentation, I believe.
8 MR. SIEBER: So all you're saying is that assuming
9 that there's problems in the associated circuits, you may
10 get spurious actuations, but not on your safe shutdown path.
11 MR. WHITNEY: Well, you can get spurious
12 actuations that interfere with your safe shutdown path.
13 MR. SIEBER: That's right.
14 MR. WHITNEY: It's the circuitry, the normal
15 integral circuitry of your safe shutdown equipment that we
16 inspect for. It's protection or it's independence.
17 MR. SIEBER: Right.
18 MR. WHITNEY: Without change. But circuits --
19 DR. POWERS: You can still get the interference
20 from the associated circuits.
21 MR. WHITNEY: That are non-safe shutdown
22 designated circuits that might interfere. Now, that has
23 been suspended.
24 MR. SIEBER: Which is the bulk of the work.
25 MR. WHITNEY: I don't know how you mean that.

1 It's a big area.

2 MR. SIEBER: More work.

3 MR. WHITNEY: But so is reviewing safe shutdown

4 circuits, it's also a big area.

5 MR. SIEBER: Have you found, in the licensees'

6 work in associated circuits of any type, problems

7 identifying where the cables actually are?

8 MR. WHITNEY: We always run up against -- well,

9 sometimes we have definitional problems, sometimes we have

10 running down the cables. Maybe Phil -- Phil Qualls has been

11 on a number of inspections. He's our headquarters fire

12 protection representative for inspection.

13 MR. QUALLS: Yes, we have. It's a very

14 plant-specific item. Some utilities, it's very easy, they

15 run a computer database and they can print out which cables

16 are in which cable tray and which functions or pieces of

17 equipment those cables actually deal with.

18 MR. SIEBER: Yes, based on pull tickets.

19 MR. QUALLS: Right. Well, other utilities didn't

20 have that level of documentation at the time of construction

21 or they didn't have computer databases to communicate with

22 each other. And in many cases, we can postulate, let's say,

23 a credible fire, when we're looking at an SDP process, and,

24 in effect, we know that in one side of a barrier or one side

25 of a failed barrier, there's maybe ten cable trays.

1 When you ask which functions or which cables might
2 be in those trays, it is a very time-consuming, laborious
3 process to make that determination, and it's very
4 resource-intensive.
5 MR. SIEBER: I would expect it would be very
6 difficult to do that by walk-down. I don't know how you
7 would do it.
8 MR. WHITNEY: They are not enabled in that way.
9 MR. SIEBER: So what do you do if the
10 documentation is not there?
11 MR. WHITNEY: Well, my personal approach to
12 something like that, I'll let Phil speak for himself, is if
13 the licensee doesn't understand their safe shutdown
14 capability, they're in violation of 50.48.
15 MR. QUALLS: Appendix R requires --
16 MR. WHITNEY: That's my simplistic answer.
17 MR. QUALLS: Appendix R requires separation of
18 redundant trains by three-hour barriers and many utilities
19 realize that all of train A for uncertain cable trays and
20 all of train B for uncertain cable trays, and they install,
21 let's say, a fire barrier between the trains, of course, a
22 very simple approach here.
23 Now you're faced with, like SDP determination,
24 which cables are actually in which cable trays or
25 determining risk for fire that might affect the additional

1 train. That level of analyses has never been performed at
2 many utilities and that level of data is not readily
3 available. It's usually reobtainable by going back to the
4 cable pull tickets and the original construction
5 documentation and that is usually available, but it's not
6 readily correlated and it's sometimes a manual -- a person
7 spending hours or many people spending many hours trying to
8 retrieve the specific information that's requested.
9 MR. SIEBER: Now, all this has been required since
10 the 1980s, hasn't it?
11 MR. QUALLS: No, not to that level of detail.
12 That's what I'm trying to say. The level of detail required
13 redundant trains separated by a three-hour barrier. If you
14 knew that all your train B cables were on one side of your
15 cable spreading room and all your train A cables were on the
16 other side, and you developed the 20-foot separation between
17 the cable trays by various mechanisms, that you didn't have
18 to know specifically which cables were in which tray and
19 which function that specific cable affected.
20 The printouts very often just identify the
21 shutdown cable numbers. They don't necessarily identify
22 which component.
23 MR. SIEBER: They belong to.
24 MR. QUALLS: Yes. And sometimes that's a very
25 laborious process and hasn't developed to the level of

1 detail we're requesting for inspections.

2 MR. SIEBER: Thank you.

3 MR. WHITNEY: Back to page 23, I'll repeat,

4 unavoidable or byproduct associated circuits are temporarily

5 being treated as unresolved items, but the inspector can

6 still review associated circuits calculations, plant

7 configuration assumptions, and the specific

8 non-controversial issue of fuse-breaker coordination, as

9 opposed to MHIF.

10 What's our rationale for this change? We've been

11 working with the BWR Owners Group and NEI and recently we've

12 gained new understanding of the wide variability in

13 licensing bases, some at variance with Generic Letter 86-10,

14 associated circuit analysis criteria, to our surprise.

15 Therefore, associated circuits issues are

16 unresolvable by the inspection team and we're trying to

17 develop the criteria to allow these issues to be resolved

18 through the voluntary industry initiative and our work with

19 them.

20 And that concludes my presentation on inspection;.

21 DR. POWERS: I guess the question that I have is

22 how do you respond to those that say by not looking at this,

23 you have degraded the adequate protection of public health

24 and safety?

25 MR. WEISS: If inspection resources were

1 unlimited, we could look at all of these issues and sort
2 through them on a plant by plant basis. It would impose a
3 huge burden, I think, on the industry, because undoubtedly
4 we would be pursuing some issues that ultimately, as a
5 result of the industry initiative, we may decide weren't
6 that risk-significant.
7 But that's not the state that we're in. There's
8 limited resources that the NRC has and it wants to employ
9 them efficiently; that is to say, we want to get the most
10 risk bang for the buck, and there are plenty of things to
11 look at.
12 Those people who are familiar with the NRC
13 inspection program know that it is not a comprehensive look
14 at the plant. It's a sampling look.
15 So rather than spend hours sorting through pull
16 tickets and arguing about how many multiple high impedance
17 faults are of concern, which would consume an inspection
18 team, with no -- for months, with no outcome in terms of
19 safety and a huge expense for both the licensee -- rather
20 than do that, we can usefully employ our resources and the
21 industry resources in ways that make big differences for
22 public health and safety.
23 DR. POWERS: My response to that is, yeah, what
24 you've done in this new strategy is you've increased the
25 number of inspection hours for plants that are good

1 performers that historically had less, and you've only done
2 it just because of the administrative feature of the current
3 inspection.
4 Why not take those excess hours that you're
5 applying to the plants that historically have been good
6 performers and put them on this track?
7 MR. WEISS: You're talking about the oversight
8 program a whole, not just --
9 DR. POWERS: Sure.
10 MR. WEISS: -- fire protection.
11 DR. POWERS: Sure. There are, what, a dozen
12 plants out there who have, as a result of the new oversight
13 process, seen their inspection hours go up, for no other
14 reason than because the new inspection procedure requires
15 the baseline inspection be so many hours. Not because of
16 any performance on their part.
17 MR. WEISS: That's a different issue. I think
18 that --
19 DR. POWERS: It's still an issue of resources
20 here. If it's resources that's the problem and I have a
21 choice between complying with a requirement that there be so
22 many hours of inspection and looking at something that could
23 potentially be a degradation of public health and safety, I
24 know which way I would go.
25 MR. SIEBER: Just taking that a step further, what

1 happens is when you have such detailed inspection
2 procedures, so that the inspectors, 95 percent of the
3 inspectors' time is devoted to going through all of those,
4 you lose the flexibility to respond to issues or move
5 resources to where the problems really are.
6 MR. WHITNEY: We have gone through some
7 discussions about that and that procedure, the baseline
8 procedure was not written to be conducted in toto every
9 three years. We recognize that we're going to have select
10 plant areas, we're going to have to select different
11 subjects, alternative, redundant, et cetera.
12 We've been in dialogue with the oversight group to
13 ensure that people are not inspection bound by this
14 procedure. It is comprehensive, but not intended to be
15 fully conducted at one three-year sitting.
16 The original FPFI program was envisioned on a five
17 to seven-year scale and my personal estimate is about every
18 three cycles, about every six years or so, you've probably
19 gone through the high risk locations of the plant and the
20 high risk situations and configurations you've found, but
21 certainly not in one inspection.
22 So although there's a lot in the procedure, I
23 don't think it's -- and we do not intend that it be
24 conducted all in one sitting and lock up the inspector.
25 MR. SIEBER: What's high risk in one plant may not

1 be so high risk in another.

2 MR. WHITNEY: That's why we do a bag man trip, an

3 information-gathering trip, and why we build an inspection

4 plan using the IPEEE information that's available. We try

5 and focus our inspection in those areas.

6 MR. SIEBER: Okay. But that's plant-specific for

7 each plant.

8 MR. WHITNEY: Right.

9 MR. SIEBER: Okay. Why don't we move on to

10 circuit failure analysis?

11 MR. WHITNEY: Which will get us right back to the

12 same subject.

13 MR. SIEBER: Yes, I noticed that.

14 MR. WHITNEY: Okay. Again, Leon Whitney, Plant

15 Systems Branch. I'd like to talk about NRR fire protection

16 circuit failure analysis issue resolution. Maybe it should

17 say NRR and industry.

18 Fire-induced circuit failure analysis, Appendix R

19 defines circuit faults as hot shorts, open circuits, and

20 shorts to ground. The new terminology from Sandia would

21 call those cable failures and the circuit faults would be

22 the phenomenon that result from it. I think that's a better

23 use of terminology.

24 But in any event, long-term inspection policy and

25 Generic Letter 86-10 associated circuits position is that

1 all possible sets of spurious actuations must be identified,
2 assessed, and mitigated, so as not to prevent safe shutdown.
3 Hot short conditions exist until isolated. How
4 are you going to deal with it, is basically the premise that
5 the inspection teams have taken and the under-text to
6 Generic Letter 86-10. It's embodied in the any and all
7 one-at-a-time approach of the original inspections and we
8 haven't varied from that.
9 We don't talk about multiple sets of actuations
10 going on, but this given -- let's take the River Bend all
11 SRVs going open. That's a set of spurious actuations. How
12 did your analysis deal with that? That's one question taken
13 in isolation from the next phenomenon that you find from
14 circuit faults.
15 Basic circuit analysis issues to be resolved
16 between NRC and industry, how many simultaneous circuit
17 faults should be assumed per fire which can cooperatively,
18 and I emphasize the word cooperatively, cause spurious
19 equipment actuations.
20 And the second question, how many simultaneous
21 spurious equipment actuations need to be assumed per fire
22 event.
23 This is what the circuit analysis resolution plan
24 was intended to work on as the starting questions back in
25 1997. In 1998, we held our workshops with public and

1 industry on circuit analysis and the voluntary industry
2 initiative caused the circuit analysis resolution plan to be
3 held in abeyance, and it's still in abeyance.
4 But this was where we were going in a
5 deterministic way and now, of course, we're trying the fire
6 testing risk-informed approach to resolving issues such as
7 this.
8 So basically, to talk about what we've talked
9 about before, there's a price to be paid for being
10 risk-informed. If this was a deterministic effort, I'd have
11 that generic letter on the street by now. But there's a
12 time price to pay for trying to be risk-informed.
13 In support of the voluntary industry initiative in
14 November of 1999, the BWR Owners Group submitted a
15 deterministic safe shutdown analysis methodology.
16 In April of 2000, the staff's extensive draft RAI
17 had a repetitive question; provide technical basis for your
18 positions. In a July 2000 meeting, our RAI clarification
19 meeting, the BWR Owners Group stated the following. The BWR
20 Owners Group saw no safety significant circuit analysis
21 issues outside of the current licensing bases.
22 Therefore, the BWR Owners Group document was a
23 collection of selected circuit analysis licensing bases.
24 There you go. Deterministic, extracted from licensing
25 bases.

1 The staff accepts the BWR Owners Group document as
2 a first step and only a first step in the issue resolution
3 process. As you've been told yesterday, NEI has integrated
4 that document and is attempting to support it through fire
5 testing and other methods.
6 NEI --
7 MR. SIEBER: That's going to be a difficult
8 process with the testing, because fire testing is a very
9 complex phenomenon. You can do 100 tests and get 100
10 different kinds of failure.
11 MR. WHITNEY: I think that's a concern. We've had
12 three opportunities to comment. I think we're going to see
13 a final version and comment before the vendor is contracted
14 for. There aren't a large number of replications of given
15 tests and, to me, that's an issue.
16 Of course, there's not an infinite amount of money
17 out there, either.
18 DR. POWERS: We haven't seen this test procedure.
19 Is it designed following some sort of an experiment design
20 strategy?
21 MR. WHITNEY: Let me ask Ed Connell to come on up.
22 He's our prime commenter on the NEI fire testing and he
23 might be able to answer your question. How would we do this
24 without you, Ed?
25 DR. POWERS: He's proved to be a crucial dude.

1 MR. WHITNEY: New concept, crucial dude.

2 DR. POWERS: We have not seen this testing program
3 that Fred Emerson alluded to yesterday. The comment was
4 made here that there were few replicate tests, and I
5 wondered about the general strategy.

6 Does this follow some sort of a Plackett-Burnham
7 design strategy or something I would recognize as a designed
8 experimental matrix?

9 MR. CONNELL: Yes. There is some logic to the
10 testing. We made a lot of comments on it and NEI is going
11 back and relooking at it.

12 DR. POWERS: I guess what I'm asking is, is it a
13 factorial design.

14 MR. CONNELL: No.

15 DR. POWERS: How do they hope to interpret this
16 thing?

17 MR. CONNELL: It's not going to be a statistically
18 solid testing program. What it is, it's going to provide
19 input and NEI is going to impanel an expert elicitation and
20 try to use that to get some --

21 DR. POWERS: Why don't they get some experts in
22 experiment design to help them with their matrix at the
23 front end?

24 MR. CONNELL: Sandia commented on the test plan.

25 DR. POWERS: I will comment that I have not noted

1 Sandia to be an authority in the experiment design and --
2 MR. CONNELL: Steve Nowlen has done more circuit,
3 more cable fire tests and knows that more than anybody that
4 I'm currently aware of. So his comments were incorporated.
5 My experience was all Thermo-Lag testing programs. So we do
6 have people who have a lot of experience with the testing
7 effort.
8 So we did have a lot of comments. NEI was
9 responsive to those comments and they're going to go and
10 look at that.
11 I'll let Fred talk about it some.
12 MR. EMERSON: Since there are questions about why
13 we did this and why we didn't do that, I thought it might be
14 appropriate for me to respond instead of Ed.
15 DR. POWERS: I'd rather work on hearsay, it's more
16 fun.
17 MR. EMERSON: As to how the experiment is
18 designed, one of the starting points of that was the Sandia
19 report that Nathan talked about yesterday. They had gone
20 through and looked at a number of previous tests, some of
21 which were fairly applicable to the problem at hand and some
22 of which were not, and they established a set of parameters
23 where they evaluated the likely impact on the overall
24 resolution of the issue in terms of how these parameters
25 would affect the likelihood or probability of circuit

1 failures.
2 So we used that as a starting point for the design of our
3 test plan and our task force looked at those parameters,
4 especially the ones that were supposed to have either a
5 significant or a likely significant impact on the
6 probability of circuit actuation, which is what we're trying
7 to evaluate.
8 So we designed our test program to evaluate, to
9 vary the types of tests we know to evaluate those parameters
10 that were likely to be the most significant impacters.
11 While we don't have, as I said yesterday, hundreds
12 of tests which will give you a statistically significant
13 number in probability space, what we do have, we think we
14 have designed the tests so that we will get useful
15 information in determining how these parameters affect the
16 results.
17 It's true that we could rerun each test 100 times
18 and perhaps get different results, but having even one test
19 which carefully explores the parameters, I think, will go a
20 long way toward providing useful information.
21 DR. POWERS: I'm very used to situations in which
22 the amount of testing can be limited and the people that
23 worry about these things have over and over shown that when
24 you have a limited number of tests and you have high
25 variability in tests, that factorial design is the way to

1 go, and you get the most information for the fewest number
2 of tests.
3 And there are various strategies on how you do
4 replicates in a factorial design and things like that. I
5 guess I'm just curious why you didn't follow a factorial
6 design strategy.
7 MR. EMERSON: Well, I'll plead ignorance, unless
8 you tell me what factorial design means.
9 DR. POWERS: It's a statistically sound test
10 designed to minimize the number of tests that you have to
11 get to -- it depends on what your strategy is. If you think
12 all the things are linear, then it's basically a
13 two-factorial test design. If you need curvature and things
14 like that, then it's a two-to-the-nth-power plus a few sorts
15 of things.
16 Most experiment design strategies are basically
17 adjustments from the factorial design. Factorial design is
18 the statistically most efficient, but sometimes you can't
19 carry them out. Sometimes you've got more parameters. I
20 don't know how many Sandia defined, but once you get up
21 above five or six, the test numbers even there go way up.
22 So then people tend to go to Plackett-Burnham
23 designs that identify -- that sub-group the parameters into
24 those that -- it sounds like you have that -- that are very
25 significant and those that they have to make perturbations

1 on the thing to come up with efficient designs.

2 MR. HANNON: I think we've probably addressed some

3 of the issues that would need to be addressed in a factorial

4 design. I think it's probably worth our while to review

5 that carefully before we finalize our test plans.

6 DR. POWERS: I mean, the places to look are either

7 Davies' old industrial experimentation book, which is

8 ancient and takes a strong intestinal fortitude to plow

9 through, or the best sources are actually DuPont's

10 industrial design of experiments book, which at least is

11 easy to read.

12 MR. EMERSON: Okay.

13 MR. SIEBER: Thank you.

14 MR. WEISS: Are there organizations that you think

15 should be a part of this effort that are not?

16 DR. POWERS: I really can't say, without knowing

17 much more about the test program, but the statistical design

18 of tests, that's a variable discipline. I'm sure that there

19 -- I mean, the company that's really made this a religion,

20 and it is a religion to the practitioners, is DuPont. They

21 do this with, like I say, religious fervor, and teach

22 excellent courses on it, because it's a cost savings for

23 them.

24 They wanted efficient designs, because they're not

25 made of money. They've got a lot relative to the NRC, but

1 they're not made of money, so they wanted their test
2 programs to be very efficient.
3 The discipline has been around since the 1920s.
4 This Davies book that I mentioned is -- I mean, my copy is
5 falling apart, not only from over-use, but just decay of the
6 paper.
7 MR. WHITNEY: Well, we've succeeded in stealing
8 the thunder from my last slides, but I'll go ahead and go
9 through them anyway.
10 NEI continues development of a risk-informed safe
11 shutdown analysis methodology, NEI-00-01, which has
12 integrated -- it has integrated with the BWR Owners Group
13 document.
14 During recent BWR Owners Group circuit analysis
15 interactions, the staff learned of the wide variability of
16 circuit analysis licensing bases, some at variance with
17 86-10, associated circuits analysis criteria.
18 Therefore, in August 2000, NRR temporarily
19 suspended associated circuitry views; not safe shutdown
20 circuitry views -- from fire protection baseline
21 inspections. However, identified safety issues will still
22 be addressed.
23 NEI/EPRI fire testing is to be conducted to obtain
24 circuit failure characterization data. Testing is intended
25 to support the industry circuit analysis criteria of

1 NEI-00-01, which is the BWR Owners Group document criteria.
2 Electrical cable failure modes and circuit fault
3 characteristics will be determined as described yesterday.
4 NRR and Research commented in September 2000 on the fire
5 test protocols with respect to their validity and their
6 comprehensiveness and based on the December 2000 NEI/EPRI
7 fire test results, a complete version of NEI-00-01 will be
8 developed.
9 Expert solicitation panel is expected in January
10 and NEI methodology pilot trials are to be conducted at U.S.
11 reactor sites in January and February of 2001, and NEI-00-01
12 is to be submitted for staff review by the third quarter of
13 calendar year 2002, and we should have it in hand and we're
14 going to try and get it out this --
15 DR. POWERS: You said calendar year 2002.
16 MR. WHITNEY: 2001, I'm sorry. Third quarter of
17 calendar year 2001, we're going to start our review and
18 hopefully it will go simply, but, again, we can't predict
19 time, especially when you get involved in requests for
20 additional information.
21 MR. SIEBER: Thank you.
22 MR. WHITNEY: Thank you.
23 MR. SIEBER: Yes, sir?
24 MR. KALANTARI: Again, Bob Kalantari, from EPM.
25 As an electrical engineer, as a person who has inspected

1 several thousand cables in my lifetime, we try to understand
2 associated circuits versus safe shutdown circuits. Now, the
3 safe shutdown circuits I'm talking about are those that he
4 referred to as circuits for spurious operations.
5 That's the reason, in 805, Appendix B, we don't
6 call them associated circuits, we call -- or safe shutdown
7 circuits, we call them required circuits.
8 Every circuit that's required to support the
9 operation of the component, in my mind, is a safe shutdown
10 circuit.
11 But today, I'm hearing the associated circuit
12 portion has been suspended. I mean, can we have an example
13 -- let me help you, and this is not a trick question.
14 A PORV on a PWR, pressurizer PORV, which is not
15 required to operate, so the PORV itself is an
16 electro-mechanical device.
17 The cable connected to that PORV, you may call it
18 an associated circuit, in my mind, it is a very important
19 required circuit to not fail because if it fails, you put a
20 hole in your reactor coolant pressure boundary.
21 So are those the ones we are talking about when we
22 are saying associated circuits?
23 MR. WHITNEY: In the inspection procedure, there
24 is specific guidance to the inspector to use the definition
25 of associated circuits in Generic Letter 81-12, and I

1 believe that PORV would fall under associated circuits, by
2 my reading of it.
3 MR. KALANTARI: Okay. The second question is,
4 basic circuit analysis to be resolved with industry, you are
5 saying. Fundamental difference is how many simultaneous
6 circuits faults should be assumed and how many simultaneous
7 spurious equipment actuations need to be assumed.
8 I think to help the industry and the NRC, if we go
9 the approach that has been proposed in 805, the
10 performance-based approach, and not assume an
11 all-encompassing fire in an area that takes up all your
12 circuits, I think these two issues would go away.
13 As I said this morning in my presentation, we have
14 addressed that in every plant that we have done the
15 analysis, whether it was the Appendix R all-encompassing
16 fire or the more focused fire based on the area. You really
17 don't have to deal with too many of these.
18 So I don't think it's an issue that is going to be
19 insolvable. I think we can work together and make this go
20 away by simply focusing on the hazards and the effects of
21 the hazards on safe shutdown, rather than saying how many
22 and whatnot, because if you say two, I'm going to say three;
23 if you say one hot short, I'm going to say three.
24 A fire is going to melt those cables and every
25 time it's going to give you a different result. Let's do a

1 detailed analysis. Let's know where the problems are.
2 Okay? And in case that fire happens, at least you know
3 everything that could happen, and then address them.
4 MR. SIEBER: Any further questions, Dana? Why
5 don't we move on to SRV and low pressure system shutdown
6 activities.
7 MR. QUALLS: Good morning. I'm Phil Qualls, from
8 the Fire Protection Section. I'm here to discuss this
9 morning, briefly, the NRR activities on use of redundant or
10 use of the safety relief valves and the lower pressure
11 systems and shutdown activities related to a fire.
12 In September 1999, the BWR Owners Group submitted
13 a document --
14 MR. SINGH: Excuse me, Phil. You're not picking
15 up.
16 MR. QUALLS: Let's start over then. In September
17 1999, the BWR Owners Group submitted a document on the use
18 of safety relief valves and low pressure systems as a means
19 of redundant post-fire safe shutdown.
20 For some brief regulatory background, this system
21 was reviewed in the BWR design basis accident licensing
22 bases. During the review for BWR normal shutdown, it was
23 accepted as meeting GDC-34, since 1975.
24 It's been widely approved by the staff as a means
25 of alternative shutdown to meet the requirements of Section

1 3G3 of Appendix R.

2 The staff's regulatory and core thermal hydraulics

3 analyses support the use of safety relief valves and low

4 pressure system as a redundant safe shutdown method.

5 On April 25 --

6 DR. POWERS: When you say regulatory and the core

7 thermal hydraulic analyses, I guess I'm struggling with what

8 the basis of this conclusion that they reached was.

9 MR. WEISS: Let me address that. What that's

10 referring to is an internal memorandum from the Reactor

11 Systems Branch to the Plant Systems Branch in which they

12 looked at the thermal hydraulics of the core and they looked

13 at the licensing basis for plants and in the context of what

14 we had accepted in the past, they came to the conclusion

15 that it was safe from a thermal hydraulics point of view,

16 and it was consistent with regulatory positions that the

17 staff had accepted elsewhere.

18 DR. POWERS: When they say it was safe from a

19 thermal hydraulics view, I mean, it seems to me that the

20 issue really is whether you come down below the top of

21 active fuel for the clad to slip in height or not.

22 MR. WEISS: They looked at the fuel clad

23 integrity. We've got a call in to Dr. Tony Ulsis, who did

24 the thermal hydraulics analysis, and he should arrive

25 shortly and be able to provide amplifying detail on what

1 kind of analysis he did.

2 It was a computer code analysis. But his analysis

3 shows that we're a long way away from fuel damage and as a

4 matter of fact, in this fire that is sufficiently

5 challenging and large enough that it destroys all safety and

6 non-safety systems, the core remains not only intact, but

7 doesn't even -- and according to his analysis, doesn't even

8 reach its design limits. It's good to go for the next

9 cycle.

10 MR. SIEBER: You do have a deterministic

11 requirement that you not uncover the fuel, active fuel,

12 right?

13 MR. WEISS: That requirement is contained in 3L

14 and that is not applicable to the redundant shutdown path.

15 That's applicable to the alternative.

16 MR. SIEBER: Okay. Now, you also have a

17 bleed-and-feed for PWRs which follows the same line of

18 reasoning, right?

19 MR. WEISS: It's similar, for bleed-and-feed for a

20 PWR is somewhat different. Keep in mind that safety relief

21 valves, the ADS system, and the low pressure systems are all

22 safety grade and if you look at the context in which we've

23 used them, we have them as part of the licensing basis for

24 design basis accidents. We have it as part of the licensing

25 basis for normal shutdown to meet the GDC requirement for

1 34.

2 So forth and so on, all the things that are on the
3 slide, none of those apply to feed-and-bleed for PWRs. They
4 are not safety grade. They haven't been accepted as a
5 normal means of shutdown, so forth and so on.
6 Tony Ulsis just walked in, and so he can tell you about the
7 types of thermal hydraulic analysis that he did and what his
8 conclusions are.

9 MR. ULSIS: My name is Tony Ulsis. I'm in the
10 Reactor Systems Branch of the NRC. What I can offer is I
11 can go through all the details or I can get down to the
12 punch line.

13 DR. POWERS: Why don't we cut to the punch line
14 and we'll see if we need to go through the details.

15 MR. ULSIS: Essentially -- let me pull this over
16 here, so I can speak into the mic and get on the record.

17 Essentially, what I've done is we were asked to do
18 what I consider sort of like a reality check, this sort of
19 analysis. This is a kind of calculation. Actually, let me
20 hand out my handouts here, before I get ahead of myself.

21 So what I've done here is basically we took some
22 input models that we had prepared for a standard BWR-4 and
23 I've run two different cases. Basically, I wanted to try
24 and evaluate -- I wanted to look at just a few sensitivities
25 using what I would consider basically the EPG kind of a

1 scenario.

2 And, essentially, I want to just show you the
3 results. Basically, what I've got here is these are the --
4 this is the collapsed level and the indicated level from two
5 different cases; one, using the ANS 1979 version of the
6 decay heat standard, if I can find the darn plot now, and
7 one -- there we go -- and one using the decay heat model,
8 which would be more typical of what we'd use in like a LOCA
9 calculation, and we come up with a different answer.
10 Basically, the point on this plot is to show you, for this
11 case here, obviously, the level is going to drop off a lot
12 faster because we're boiling water off a lot faster, and
13 that was chosen to be the worst case heat-up and that's
14 what's going to give us this sort of a result for the peak
15 cladding temperature.

16 Let me see if I can get both of these on here.
17 For the -- what I will consider, for this type of scenario,
18 the -- we started to call this the worst case scenario
19 because of all the differences across the fleet. I would
20 call this a representative kind of a result.

21 But this is basically what you see. This is the
22 peak cladding temperature of the hot channel in Kelvin.
23 This correlates to roughly 1,100 degrees Fahrenheit. And
24 this is the bottom line of what happens in this kind of
25 scenario, once you get up here, is you have essentially no

1 injection up to this point right here and this is where the
2 low pressure systems come on and you quench the fuel in the
3 event and this effectively opens and you're into a long-term
4 cooling, assuming the equipment is available that you needed
5 to operate the facility.
6 I can answer any questions, I can go through the
7 rest of the details, or we can --
8 DR. POWERS: If you can explain to me just a
9 little more about your level plot up there. Where do you
10 take the top of active fuel in this plot?
11 MR. ULSIS: Minus 164 is the top of active fuel.
12 Actually, this -- actually, this level here that it actually
13 levels out, that's the indicated level in the high range
14 instrument, which is going to go down scale in this sort of
15 event. So the operator is going to have to shift over to
16 the fuel zone -- they'd have to shift over to the fuel zone
17 instruments, which would actually give them more of this
18 kind of indication, the green and the blue.
19 So right here is where the SRVs were opened. This
20 corresponds to this big swell, then the level comes back
21 down. This case here, I didn't actually go through the SRV
22 depressurization. That's why you don't see the big swell
23 here. I just wanted to see the effects of the boil-off
24 times, primarily.
25 DR. POWERS: And where does level recover?

1 MR. ULSIS: The level recovers -- actually, I've
2 got that plot here. The level recovers -- this is the level
3 for the worst case scenario with the largest value of decay
4 heat, and this is effectively a level plot. So you see the
5 recovery out at roughly -- it starts to recover at about 38
6 minutes. Then the operators will start to the shutdown
7 cooling mode here.
8 DR. POWERS: What's the substantial dip at 40
9 minutes?
10 MR. ULSIS: I'm sorry?
11 DR. POWERS: You have a sharp dip at 40 minutes.
12 MR. ULSIS: Right out here?
13 DR. POWERS: Yes.
14 MR. ULSIS: Let me see what happens. What we
15 might be having there is -- what is probably happening there
16 is that as the level comes up, the level of steam
17 separators, you get a spill-over and it comes back down and
18 falls over again and then it comes back up again.
19 DR. POWERS: So we are uncovered for roughly 30
20 minutes, a little less, 25 minutes.
21 MR. ULSIS: Roughly, and you're not seeing any
22 significant heat-up here under these scenarios. It's really
23 by a number of factors. One, that the event starts, in this
24 case, roughly, ten minutes after shutdown, so the decay heat
25 level has already dropped off, in this case, a great deal.

1 Any other questions?

2 DR. POWERS: One of the things that people are

3 struggling with nowadays is what the acceptance criteria are

4 for fuel that goes to high burnup.

5 MR. ULSES: I knew you were going to ask that, Dr.

6 Powers, and --

7 DR. POWERS: I'm getting too predictable.

8 MR. ULSES: The answer to that question is, right

9 now, based on the criterion that we've established for the

10 existing burnup levels, we feel that what we have, based on

11 our current level of knowledge is acceptable. As we learn

12 more information with the ongoing experimental efforts that

13 I'm sure you're well aware of, you know, these and other

14 types of effects might have to be revisited in the future.

15 DR. POWERS: I'm going to put an asterisk by all

16 this and say stay tuned.

17 MR. ULSES: For the condition and the performance

18 of the cladding.

19 DR. POWERS: Quite frankly, the temperatures are

20 low enough that I really don't anticipate anything. The

21 only thing that I could imagine is hydride blistering might

22 be a problem.

23 You may not be happy with your fuel after this

24 event.

25 MR. ULSES: That's true, it may not be in very

1 good shape if you were in that sort of situation.

2 DR. POWERS: And it's all just because the swell

3 keeps the core substantially cooler.

4 MR. ULSES: Exactly, a lot of steam cooling, and

5 it's --

6 DR. POWERS: Thanks, Tony. That helps a lot.

7 MR. ULSES: Are there any other questions?

8 [No response.]

9 MR. SIEBER: Thank you very much. We can continue

10 on.

11 MR. QUALLS: On April 25th, the staff met with the

12 BWR Owners Group to provide technical, regulatory, risk, and

13 legal feedback.

14 Seven major subissues were addressed by the staff

15 during and subsequent to that meeting.

16 The first was the existence of plant-specific

17 licensing basis in which the staff has approved the SRV low

18 pressure system as a redundant means of post-fire safe

19 shutdown.

20 Five examples have been identified to date.

21 Another issue is whether an SRV low pressure

22 system hot shutdown procedure existed.

23 The BWR Owners Group provided a hot shutdown

24 procedure narrative based on EPG-4, which got incorporated

25 into EOPs.

1 DR. POWERS: This is the one that we discussed
2 yesterday?
3 MR. QUALLS: Yes.
4 MR. WEISS: Yes.
5 MR. QUALLS: That included likely depressurization
6 at the top of active fuel, and maintenance -- being able to
7 maintain hot shutdown capability from 200 to 212 degrees
8 Fahrenheit.
9 The nonapplicability of Appendix R, Section 30,
10 Performance Criteria, which was obviously at the top of
11 active fuel criteria:
12 The nonapplicability of single failure criteria,
13 this, like all -- you know, like virtually all systems I've
14 inspected, if you picked a single failure, you could
15 probably --
16 MR. SIEBER: Conk it.
17 MR. QUALLS: Conk it and make the system
18 ineffective.
19 The potential risk increase from removal or
20 abandonment of detection and suppression, there were certain
21 configurations which required detection and suppression when
22 you use it as redundant shutdown, and you may not be
23 required to maintain suppression systems.
24 DR. POWERS: What you indicate here is that it's
25 generally small as defined in Reg Guide 1.174. I guess I

1 didn't -- that analysis eluded me.

2 MR. WEISS: We have Steve Dinsmore with us from

3 the PRA Branch to address that. Let me preface his remarks

4 by saying that what we're doing here is essentially a

5 deterministic SE, but the staff chose to look at risk to get

6 a calibration, as it were, and to be frank, I think what --

7 if I were to characterize what Steve's about to tell you,

8 it's that we're in kind a gray area.

9 It doesn't help us a lot and it doesn't preclude

10 us from proceeding, but it is an interesting analysis.

11 DR. POWERS: Have we gotten the writeup on this?

12 MR. WEISS: I just received a memo on it last

13 week.

14 DR. POWERS: That's the thing that's been handed

15 to me. I can read about it, but I have not read about it.

16 MR. DINSMORE: Steve Dinsmore from the PRA Branch.

17 You got that memo recently --

18 First, let me go to real short, real quickly, what

19 the pluses and the minuses of the change in risk comes from.

20 If you look here, if you call SRV LPCS alternative, then in

21 this situation, you need automatic fire detection and

22 suppression in Area A.

23 And in Area C, you have to protect either the RCSI

24 or the HPSI lines. If you call SRV LPCS, if you call it

25 redundant, you don't need any protection in Area A, and in

1 Area C, you can protect any one of those --

2 So that's the change that happens. So, in Area A

3 you get a risk increase, because you can remove this

4 protection and suppression equipment, and it turns out,

5 since the SRV LPCS is slightly more reliable than the RCSI

6 or the HPSI, you call SRV LPCS

7 redundant, you can protect C.

8 So there's a little bit of a plus, a little bit of

9 a minus. The evaluations we did have indicated that the

10 risk increase in Area A is about a factor of ten, whereas

11 the risk decrease in Area C is about a factor of two. So

12 that's where you get the change.

13 We really were more interested in identifying

14 characteristics of fire areas where you could get a change.

15 And then once we had done that, we tried to estimate the

16 relative change in risk for these fire areas, and the last

17 one was to estimate a change in risk.

18 The reason is the uncertainty goes up as you go

19 down this list. It's pretty easy to identify the areas, and

20 to estimate the relative change, you have figure out the

21 failure frequencies of the systems and the stuff in those

22 rooms.

23 And with the last one, you have to do a -- include

24 the fire frequencies in fire areas and that kind of stuff.

25 Actually, this slide is the picture I gave us

1 that's better than this slide. It just tells you which
2 areas you've got to increase.
3 This one, as well, kind of gives you more
4 information on why you're getting the decrease and why
5 you're getting the increase.
6 I'll go through these carefully, if you want, but
7 I think the picture --
8 Then we come to the numbers. Essentially, this
9 whole analysis was done assuming that the thing that's
10 currently called alternative and that it will be changed to
11 redundant, and if it's changed to redundant, that they will
12 take everything out that they might have had in there.
13 And there's alternative, which I guess is a lot of
14 disagreement on, but that's an assumption that goes into
15 this analysis.
16 Essentially what you -- this is the condition of
17 core damage frequency, given a fire at the top.
18 It's about ten to the minus three when you get
19 this increase and if you -- let's see -- ten to the minus --
20 if it's called alternative on the top when it's a better
21 situation, because the ten to the minus three is smaller
22 than the ten to the minus two.
23 The areas of the decrease, the redundant one is
24 slightly smaller because of the difference in the
25 reliability.

1 If you add in that the probability of addition,
2 which is about ten to the minus three per area per year for
3 these types of rooms, and then you have the real kick of the
4 spatial effects. What is that fire? Where is the fire
5 going to start? What's nearby it?
6 This is why it becomes a very site-, plant-, and
7 room-specific, so this evaluation is just going to give you
8 an idea of what might happen.
9 So, these spatial effects, they go from about .5
10 to .05, depending on -- so I kind of took a nominal value of
11 .1.
12 DR. POWERS: And you came up with this nominal
13 value of .1 how?
14 MR. DINSMORE: Well, .25, well, actually I just
15 took it because ten percent seemed like a reasonable number.
16 I mean, it's as easy to defend as any of the others.
17 [Laughter.]
18 MR. DINSMORE: I just wanted to get some type of
19 idea about in the middle area, what type of changes you're
20 going to deal with.
21 And as it turns out, if you multiply all these
22 numbers together, the areas where you get an increase, you
23 get about plus one times ten to the minus six, and in the
24 areas where you get the decrease, you get about a minus one
25 -- to the minus six.

1 And the difference is, even though the areas with
2 the increase have a bigger factor of ten increase, the areas
3 where you get the decrease is only a factor of two.
4 But those areas have all shapes -- so if you get a
5 big fire in those areas, you have more of a problem.
6 So the absolute magnitudes kind of even out, which
7 is somewhat unfortunate, since we usually work with the
8 relative magnitudes. But we had to put the plus in there
9 because it's something that exists.
10 And I guess one of the biggest questions is the
11 relative number of fire areas with these characteristics are
12 in a plant.
13 I mean, they were talking about fire areas with
14 three or four stories and have all three systems in those
15 three or four stories, but I'm not sure if that type of fire
16 area if you would see it decrease. It's hard to imagine a
17 fire which would destroy all three.
18 We have some fire areas that are very small rooms.
19 We might have the two HPSI and RCSI. And in those areas,
20 you could see this actual increase in the --
21 Again, it's real site-specific. But I was charged
22 to do it, so --
23 Well, that was the CDF. We went ahead and looked
24 at LERF. We looked at 1.175, and 1.174, and unfortunately,
25 the scenario which is going on is the high pressure

1 injection and the failure to depressurize, which leads to
2 high pressure core damage events.
3 In the BWR, high pressure core damage events are
4 not very good. They usually go to LERF.
5 On the other hand, if you don't depressurize and
6 you don't do what -- well, if you don't get injection, and
7 you don't depressurize, you have about 30 minutes before the
8 onset of core damage.
9 Then you've got about another 30 or 45 minutes
10 before you can go through the vessel, so in this 30 or 45
11 minutes, there out there trying to recover injection, and I
12 believe in there, the emergency procedures, they're supposed
13 to try to depressurize before they get to core damage.
14 So there's a couple of things they could do which
15 would reduce the LERF below the CDF, which is good, because
16 it's a reasonably high LERF.
17 Actually, the conclusions are, again, this is
18 assuming that it's now alternative and it will be changed to
19 redundant. We believe that most fires will have a very
20 small change in risk.
21 So it's not going to make much difference in
22 almost all areas, and small change we define as below the
23 very small change in 1.174.
24 Some fire areas might have an intermediate in
25 those different ranges, but it's hard to rule out that there

1 could be some fire areas which have a fairly large increase
2 that might even be above the ten to the minus five and the
3 ten to the minus six boundaries which are not normally --
4 ten to the minus four.
5 And the total change is going to depend on how
6 many different types of these rooms you have at the plant,
7 and you're probably going to get one or two rooms that's
8 going to be driving your -- which is kind of what the IPEEE
9 shows, and those rooms are emergency switchgear rooms and
10 those types of rooms.
11 So I guess this is what we've -- it's a little bit
12 indeterminate. We can't really show that it's not a good
13 thing to do, and we can't show it's a good thing to do,
14 except that if there are any difficulties, it will be in a
15 small number of places.
16 DR. POWERS: What you're showing is that there is
17 something that you can't do generically.
18 MR. SIEBER: That's right.
19 MR. DINSMORE: Well, I'll agree with that.
20 MR. SIEBER: Any further questions?
21 [No response.]
22 MR. SIEBER: Okay, thank you. I guess we can
23 continue on.
24 DR. POWERS: We're trying to do a Generic Letter.
25 MR. SIEBER: It would appear that you would have

1 to do the analysis for each specific place where you -- each
2 plant.
3 MR. WEISS: If this condition existed, if this
4 worst case scenario existed, then I think that would be
5 incumbent upon us, but when we don't have any reason to
6 believe that that's really out there --
7 MR. QUALLS: Well, in addition, I think if a plant
8 were to make this change, it has its own existing design
9 control programs and stuff to evaluate certain items. There
10 is no requirement, to my knowledge, to evaluate risk change.
11 But they do have various design controls and
12 program controls in place, and they do have to consider it
13 for their licensing basis, whether it adversely affects safe
14 shutdown. It doesn't always involve risk.
15 MR. WHITNEY: Excuse me, Phil, we have some more
16 to add on that.
17 MR. QUALLS: Certainly.
18 MR. WHITNEY: My understanding, and Steven can
19 qualify this, is that the risk increase comes about where a
20 plant may have designated an area to be alternative. And
21 under 3G3, the alternative section that requires detection
22 and suppression in a fire affected area, okay, and then
23 that's the factor that's -- the removal or abandonment of
24 that suppression, when you redesignate it as redundant, is
25 the hypothetical reason for risk increase.

1 And to the extent that that is not applicable,
2 then there would be no problem in this area, and there are
3 discussions underway between us and the BWR Owners Group to
4 elucidate these plant configurations.
5 We're considering what to do, whether we need to
6 have information submitted or not, and how we would go about
7 doing that.
8 So that is under consideration.
9 MR. SIEBER: Okay, thank you.
10 MR. DINSMORE: The only thing I wanted to add --
11 and it got lost at the end -- the reason we did this was to
12 identify the types of rooms, so that we could narrow down
13 the focus of what we're going to have to look at.
14 MR. SIEBER: Okay, thank you.
15 MR. QUALLS: Additional issues that were
16 considered were the number of SRVs that would have to be
17 protected for the core thermal hydraulic safety during
18 depressurization.
19 That has to be based on a plant-specific analysis.
20 The vessel material concerns that were -- an additional
21 thing addressed were the vessel material concerns related to
22 cooldown rate in excess of 100 degrees.
23 There is thermal stresses, vessel fatigue
24 addressed by the number of stress cycles, assorted things
25 with that cooldown.

1 MR. SIEBER: When you try to figure out how many
2 SRVs you'll need, what kind of margin do you have in mind?
3 It would certainly be unfortunate if you calculated it right
4 on the money and your code wasn't as good as you'd like it
5 to be.
6 MR. WHITNEY: Leon Whitney. The industry in their
7 current submittal talks to plant-specific analysis, but does
8 not give us any data on that.
9 This submittal was received late in September, and
10 we have not had a chance to ask questions of industry on
11 that.
12 DR. POWERS: These things are always confusing to
13 me, because it's not obvious that having a large number of
14 protected SRVs is the safe strategy to go with with these
15 boilers.
16 MR. QUALLS: I'm not probably the -- you know,
17 we've got Tony who also says -- is an expert in the area,
18 but different BWRs have different size SRVs.
19 And if you have a limited number of SRVs, smaller
20 ones available, then you depressurize slower, such that it
21 takes a lot longer to reach the point where your low
22 pressure injection system would inject, and, due to decay
23 heat and other effects, your vessel level at that point
24 would be at some point lower than you would desire for
25 initiation, you know, for actual injection, and you may get

1 into thermal shock considerations and some of the others.
2 So, it's also important to have an adequate number
3 to depressurize rapidly enough to inject.
4 MR. SIEBER: The point of my comment wasn't so
5 much that you would calculate them and tell the operator to
6 use them. It's that you would protect them, and it does no
7 harm, other than spending money to protect the --
8 MR. QUALLS: Well, that's exactly right. We came
9 upon that --
10 MR. SIEBER: You can use whatever you need.
11 MR. QUALLS: Many years ago at a BWR-5, we came
12 upon that issue where they had three protected valves, and
13 it was based on the BWR NEDO document which was done for
14 BWR-4, the analysis was done for BWR-4.
15 The reactor is a slightly different design, and
16 when they reanalyzed, that protected some additional valves
17 to be able to depressurize in an adequate time.
18 That was for alternative shutdown, not for
19 redundant.
20 MR. WEISS: So they may protect a certain number
21 of valves under alternative shutdown, but generally
22 redundant shutdown means that they'd have half of them
23 protected, is generally what that means.
24 Dr. Powers made a really salient point yesterday
25 when this subject came up, which was that when we're using

1 an EOP here, and it's the same EOP we used for a spectrum of
2 events and accidents, including things like loss of
3 feedwater.
4 So, I would think a reasonable person would say
5 that if this EOP is an inappropriate place to be, the
6 implications are far broader than just fire. If this EOP is
7 no good for fire, then that means it's no good for a lot of
8 other things.
9 And I thought that was a key point, and I was
10 planning on making that today, but Dr. Powers made it
11 yesterday.
12 DR. POWERS: Yes, I'd say that when it's put in
13 human error terms, that if I train my operators to do this
14 for a lot of accidents, and here I've got another one which
15 in effect is doing the same thing to me.
16 I want it to do the same thing consistently for
17 anything that's involving a -- reactor vessel, no matter
18 what's causing it, because I don't want to have to rely on
19 identifying, oh, it's a fire in this area, for this reason,
20 and things like that.
21 I mean, it's got hard enough of a life.
22 MR. SIEBER: Well, you're almost philosophically
23 put into that kind of a position on -- based procedures,
24 because that's the action you would take, and I think the
25 knowledge that there is a fire and where it might be is

1 helpful in dealing with the associated circuit and spurious
2 actuation issues, because once you know where it is, you
3 know what cables are in there.
4 MR. WHITNEY: In fact, to add some perspective to
5 this, Appendix R is a design rule, and it is essentially
6 silent on the procedures. And there is no intent or ability
7 of us to change the procedures in a 3G3 shutdown in any way.
8 Plant procedures are not affected by Appendix R directly.
9 MR. SIEBER: Right, thank you.
10 MR. QUALLS: Just a concluding bullet that final
11 consideration of the issues -- upon final consideration, the
12 staff expects to issue an SER on the topical report during
13 October of 2000, which is this month.
14 DR. POWERS: It must be very close to done.
15 MR. SIEBER: Maybe this afternoon.
16 MR. QUALLS: I think it's completed in draft.
17 MR. KALANTARI: In the late 80s, I was involved
18 with the first Appendix R analysis for the boiling water
19 reactor. In that plan, we generically used a low pressure
20 system, no high pressure.
21 That plant -- with no open items, no issues
22 dealing with Appendix R inspection.
23 Later on, we did other Appendix R analysis for the
24 boiling water reactors, and it was up to the utility to use
25 high pressure systems.

1 Use of high pressure systems gives you more
2 flexibility. You always don't rely on just -- core spray
3 pump. You have high pressure means, but then you need to do
4 more analysis.
5 Okay, the first time I myself heard about the use
6 of high pressure, to be honest with you, was in 1991, and
7 again, redoing an Appendix R analysis for a plant, and the
8 question was asked, how about high pressure systems?
9 Well, we are not using them. Why not? And from
10 there on, it cascaded in the industry.
11 The comment I'm making with regard to redundant
12 versus alternative, if you look at GE's -- Nuclear Safety
13 Operational Analysis, they list HPSI and next to it is ADS
14 LCPS.
15 They don't say RCSI, they don't say any other --
16 HPSI by itself is no redundant. Redundant to HPSI is --
17 ADS.
18 RCSI was designed not as a safety-related system,
19 okay? It's there for reactor core isolation cooling. It
20 could be used as a low volume system, but as far as being
21 redundant, I do believe -- redundant to HPSI, so based on
22 that, I think suppression --
23 MR. QUALLS: Well, ADS, was an ECCS system; it
24 wasn't a normal -- ADS, as you term ADS where you have
25 several interlocks involved, involving reactor level and

1 such, pump running and some of the other interlocks, it was
2 actually an ECCS system using ADS.
3 The BWR Owners are the people that can address
4 that, but we're not -- and that's why we're trying to stay
5 away from use of the term, ADS, because we're not talking
6 about ECCS actuation. They're not using the interlocks.
7 MR. KALANTARI: Again, I'm using the term more
8 than -- low pressure, HPSI is your high pressure, division
9 power, and also offsite power, operators, if they try to use
10 HPSI, if not, they -- and that's if you don't have any other
11 means.
12 MR. QUALLS: If you don't have any other means,
13 sure. That's why it's been accepted as a normal shutdown
14 path under GDC-34, right?
15 MR. KALANTARI: Right, and the other thing is,
16 again, I'm just commenting because I think it's important
17 for the Committee to hear this, the operators in most cases
18 -- if you do an analysis -- and again, he's the expert on
19 the GE stuff, but I've seen the EOPs.
20 And you use HPSI for three, four, five hours, and
21 you look the EOPs, your suppression goes up and they tell
22 you -- so when they use it the first two, three hours, or
23 use it later on, you're going to end up blowing down and --
24 pressure.
25 MR. SIEBER: Tom?

1 MR. GORMAN: Tom Gorman with the BWR Owners Group.
2 I just wanted to make a couple of comments on the issue of
3 alternative versus redundant.
4 Our intent in offering the position to the NRC was
5 that we believe we had used a redundant safe shutdown system
6 when we were using our SRVs in a low pressure system, and we
7 believed it was acceptable and our request was simply to get
8 an endorsement of that.
9 There was no intent on our part to reclassify
10 shutdown methodologies, and really there is no intent on our
11 part to be removing any fire suppression or detection
12 systems from the power plant as a result of an acceptance of
13 that position.
14 The other comment relates to the number of SRVs in
15 the most recent response that just came in a little while
16 ago on that issue. Our position was that the minimum number
17 of SRVs ought to be either consistent with what the
18 emergency operating procedures require, or that can be
19 supplemented with a plant-unique Appendix R analysis.
20 That was the position on that, and then the third
21 comment is really a question for Tony. I was looking at the
22 water level slide, and I was wondering, was there an EDS
23 timer involved in the analysis?
24 MR. ULSES: No. I was just assuming manual
25 action.

1 MR. GORMAN: Okay, so you had manual action at a
2 given level of --
3 MR. ULSES: That's how it works out. The code
4 was, you know, in reality would be a manual action.
5 MR. GORMAN: Okay, so there was no automatic
6 initiation timers or anything?
7 MR. ULSES: No.
8 MR. GORMAN: Thank you.
9 DR. POWERS: So was his analysis roughly
10 consistent with what you expected?
11 MR. GORMAN: I thought the uncovery time was a
12 little bit longer than I would have expected, and again, I'm
13 not familiar with all of the assumptions.
14 DR. POWERS: You mean the time to uncovery or the
15 duration of uncovery.
16 MR. GORMAN: We've got a similar curve in our
17 submittal in the --
18 MR. ULSES: Actually, I did two different
19 analyses. I assumed that they had the actual minimum number
20 of ADS valves available, and then I ran it with half the ADS
21 valves, which would be for this plant, the minimum number.
22 And the curve I put up there was for the minimum number of
23 ADS.
24 So I think what you're talking about was where
25 they have the full complement of valves available, which for

1 this plant would be six, and the uncovery time would be much
2 less.
3 So what we're looking at is a sensitivity there.
4 DR. POWERS: But even with the longer uncovery
5 time, you still were up around an 800K times the clad
6 temperatures.
7 MR. ULSES: Right, and I'm sorry that that was
8 something that I forgot to mention before.
9 DR. POWERS: Inadvertently, you did a good thing.
10 MR. SIEBER: Thank you very much. What I would
11 like to do now --
12 MR. HANNON: John Hannon. I'd like to make a
13 clarification. I see the committee picked on the comparison
14 between the BWR SRP LPCS application for redundant shutdown
15 and the PWR being fully bleed and feed, which is of course
16 an option in 805, but I want you to recognize that the NRC
17 has approved the BWR application in design basis space.
18 We have not done that for the PWR bleed and feed.
19 We have approved that application of PWRs on a plant
20 specific, on a PRA basis at individual plants but not
21 universally for design basis applications.
22 MR. SIEBER: Thank you. I think that since it is
23 11:30 we have an opportunity now to hear from NEI, Mr. Fred
24 Emerson.
25 We will have lunch when we conclude. Thank you.

1 MR. EMERSON: Fred Emerson, NEI. The subject I
2 want to cover very briefly is our industry view of the
3 oversight inspection results in the fire protection area so
4 far.
5 This is very similar to discussions I have had
6 with the oversight --
7 [Pause.]
8 MR. EMERSON: This is very similar to a discussion
9 I have had with the oversight group. They have biweekly
10 meetings to discuss the status of issues with the oversight
11 inspections and the conclusions, not conclusions, they are
12 observations I am going to give you are a collection of
13 results from the oversight fire inspections that have been
14 conducted so far.
15 Prior to the implementation of the oversight
16 process on April 1st there were three pilot fire protection
17 oversight inspections conducted, one each in Regions 1, 2
18 and 4, and since April 1st when the oversight process
19 started there have been 11 -- at least that is the number
20 that I have -- that have been conducted.
21 There have been two in Region 1, three in Region
22 2, one in Region 3, although there is another one scheduled
23 for next week and five in Region 4.
24 I would like to just say a couple of words about
25 the inspection procedure and then have a separate set of

1 observations about the conduct and what is going on in the
2 field with respect to the inspections.
3 The moratorium that Leon discussed on the
4 inspection of associated circuit analysis issues we view as
5 a very positive step and we think it will alleviate some of
6 the pressure on the industry as we go forward in the
7 resolution of the issue, and I concur with the comments that
8 Eric made earlier as to the need for that.
9 The concern we have with the procedure is a very
10 heavy emphasis on safe shutdown as opposed to the other
11 elements of defense-in-depth, and my understanding is that
12 the reason for that is that the other elements of
13 defense-in-depth were covered pretty well during previous
14 inspections but safe shutdown was an area that hadn't been
15 inspected to the extent that the Staff would like.
16 The inspection procedure for the triennial
17 inspections does focus in that area. Now the residents are
18 supposed to take care of the inspections in the other areas,
19 as I understand it.
20 The problem with that was the level of resources
21 devoted to the safe shutdown triennial inspections and to
22 the resident inspections on a routine basis of the others,
23 there's quite a disparity in the amount of resources applied
24 to that and the concern that I have about the emphasis on
25 safe shutdown is at least, and this is my personal opinion,

1 it sends a message that safe shutdown is the most important
2 area of defense-in-depth to the licensee.
3 That I don't think is the kind of message that is
4 appropriate because the licensees have devoted a lot of
5 effort to developing fire protection programs, fire hazards
6 analyses. They have put a lot of emphasis on prevention of
7 fires as one of the keys to making sure that the fire
8 effects -- you don't have to deal with them in the first
9 place.
10 It would be our recommendation that the inspection
11 procedure focus, that there be more balance in what the
12 triennial inspections address.
13 DR. POWERS: If you integrate over the three
14 years, I mean it seems to me there is a balance then. In
15 fact, I might even argue that the balance is the wrong way
16 if I integrate over three years or, better yet, I agree with
17 Leon. You really ought to integrate over six years, six or
18 seven years is what you ought to do the integration over.
19 If I do that I mean I can't remember his exact
20 numbers but it's two or three weeks of work for the
21 triennial inspection plus a bag trip, right?
22 MR. EMERSON: Yes.
23 DR. POWERS: Versus, what is it? -- 200 hours
24 every year for the baseline inspection. Sounds like a
25 pretty good balance to me.

1 MR. EMERSON: 200 hours from the resident
2 inspections? Originally it was supposed to be what? -- one
3 hour a month, two hours a month devoted to that activity.
4 MR. SIEBER: The triennial was 200 hours.
5 MR. EMERSON: Yes, the triennial is 200 hours.
6 MR. WHITNEY: Let me explain. The residents have
7 two hours monthly and some number of hours annually for just
8 the fire brigade and so they don't have very many hours to
9 do their job in this regard.
10 The inspection team has 200 hours every three
11 years.
12 MR. EMERSON: And that basically suggests that we
13 think there is an imbalance there.
14 If you also look at the inspection procedure as to
15 how it is weighted between prevention and mitigation in the
16 procedure itself, it says it is 10 percent devoted to
17 prevention and 90 percent to mitigation and suppression, so
18 you could draw your own conclusions.
19 MR. WHITNEY: I do have a comment.
20 MR. EMERSON: Okay.
21 MR. WHITNEY: Some of us consider safe shutdown to
22 be a form of mitigation. The classical fire protection
23 mitigation is protection of suppression of various kinds but
24 in the nuclear defense-in-depth triad, we consider safe
25 shutdown to be a form of mitigation.

1 MR. EMERSON: Okay, I understand that. I just
2 think that prevention ought to get more attention in the
3 triennial inspections.
4 DR. POWERS: If I were designing the things,
5 wouldn't I say, gee, I will bet licensees spend a lot of
6 money and time, their own efforts, focused on prevention.
7 There's a lot of reasons to do certain things for
8 prevention, so I know the licensees are very responsible.
9 They probably do a good job there.
10 Let me go monitor the mitigation and suppression
11 activities because that is the area that might get
12 short-changed relative to prevention in their own thinking
13 and I want approximately equivalency overall on the thing,
14 so why wouldn't I do that? Seems kind of logical to me.
15 MR. EMERSON: Okay, I understand.
16 MR. QUALLS: Can I make a brief comment? This is
17 Phil Qualls.
18 This is just a brief historical comment and I am
19 sure Mr. Singh can verify my numbers here but I having been
20 an inspector in Region 5 and in 4 during -- since the early
21 '80s we in the mid-1980s through early '90s we had like a
22 one week inspection, the 6.4704 program, that was devoted
23 primarily to your basic preventions and suppression.
24 In general during that time every year we spent
25 roughly 40 hours onsite looking at these procedures.

1 In the early '90s that became biennial, I think --
2 it was done every two years at each site, same amount of
3 time, 40 hours.
4 What we were finding was that housekeeping
5 procedures, this type of items, generally didn't change a
6 lot. Your basic suppression systems that used to be
7 inspected annually -- plants don't make a lot of changes in
8 that stuff, but they were very heavily inspected in the old
9 annual inspection procedures.
10 Generally plants developed very good housekeeping
11 programs and stuff during that time such that certainly by
12 my inspections in the mid'90s we found very few housekeeping
13 deficiencies, as compared to what we were finding in the
14 mid-'80s.
15 Utilities got very good at these types of programs
16 and they haven't changed so our inspection hours got, as a
17 result of some of the FPFI experience, we devoted a lot more
18 of the time to safe shutdown that hadn't been inspected
19 during the routine program from the mid-'80s up through the
20 current time.
21 We had the original Appendix R inspections. The
22 original Appendix R inspections were essentially one week
23 onsite by a team leader, myself or Mr. Singh or someone
24 else, two contractors from Brookhaven, and maybe a person
25 from NRR, maybe another person from the Region. We would

1 arrive onsite Monday morning, go through at the time the old
2 GET training which took us a full day, might not actually
3 start inspecting until Tuesday morning timeframe, conclude
4 the inspection essentially Thursday night to prepare for a
5 Friday exit meeting and that is the total inspection effort
6 that had been devoted to safe shutdown.
7 It resulted in what we felt was an inadequate
8 inspection effort at that time and hadn't been looked at
9 again since the mid'80s and that is why the program is
10 arranged the way it is.
11 DR. POWERS: Well, in fairness I know what Fred is
12 saying about this overemphasis on the safe shutdown is
13 reflecting a pretty consistent story that came out of the
14 last fire protection forum.
15 I mean I can think that during the time I was
16 there and I wasn't there for the whole thing, I think every
17 speaker began with a statement to that effect, so you are
18 accurately reproducing a sense that is out with the
19 licensees and a concern over a mixed message.
20 MR. EMERSON: Yes, I understand completely your
21 point that as to why you are devoting more effort in that
22 respect now. I guess the only last point I would like to
23 make as we move forward in the oversight process -- you
24 would like your inspection programs to reflect the levels of
25 risk that are associated with each of the elements of

1 defense-in-depth.

2 DR. POWERS: That might be something to spend some

3 time on to see if our risk assessment technologies have

4 gotten sophisticated enough that they can make a

5 differentiation among these and say where do you really want

6 to spend your time and effort.

7 Fred, it is an interesting idea. I am not sure we

8 can do it right now.

9 MR. SINGH: Just for the record, Dana and Jack,

10 you probably remember when we were in Region 3 in June we

11 were told that Region 3 plants have not been inspected

12 triennially on Appendix R -- only one time --

13 DR. POWERS: Ever?

14 MR. SINGH: Ever. So there are plants out there

15 we don't even know what is going on and then you guys go

16 back and say industry, initiate them. I can't -- that is my

17 comment.

18 DR. POWERS: I mean we may have a transient period

19 year but I think we are talking about a longer term effort.

20 MR. SINGH: Yes.

21 MR. SIEBER: Any additional comments or questions

22 by anyone?

23 MR. EMERSON: I am not quite done yet.

24 MR. SIEBER: Oh, okay.

25 SPEAKER: He is sending you a message, Fred.

1 [Laughter.]

2 DR. POWERS: It is inadvertent, Fred.

3 MR. EMERSON: The next topic is what has actually
4 occurred during the inspections and I would like to
5 categorize the issue not so much as concerns about things
6 that are going on, but inconsistencies that appear from
7 region to region and how -- and actually from inspection to
8 inspection, and how these things are done.

9 Before I get into that I am sure a lot of this is
10 due to the learning curve that is involved. There's
11 probably a pretty steep learning curve by the regional
12 inspectors and changing the focus of inspections to a large
13 extent from what they used to do and then applying an SDP
14 process which is a new process, so I am sure there is a
15 steep learning curve that will smooth out and some of these
16 issues will be addressed just simply through experience.

17 Nonetheless, the four areas that I would like to
18 cover -- one is the treatment of licensing and design bases,
19 and again I emphasize that there are inconsistencies. It is
20 not a universal problem.

21 The issue basically is the acceptance of previous
22 NRC inspection reports and SERs to justify where the
23 licensees' licensing basis is when the inspectors are
24 reviewing it.

25 The experience across the board has been that in

1 some cases the NRC inspectors accept the SERs and previous
2 inspection reports. In some cases they have rejected them
3 outright and in some cases the licensee has had to work very
4 hard to convince the inspector that these apply and they
5 justify the situation or the current licensing basis the way
6 it is.
7 MR. WHITNEY: Fred, let me speak to that.
8 MR. EMERSON: Sure.
9 MR. WHITNEY: Leon Whitney, Plant Systems Branch.
10 By coincidence today we were discussing that
11 before we came over here and we are about to go look at the
12 definition of licensing basis that is in the license renewal
13 rule and Generic Letter -- I think it is 9118.
14 We are going to take a look at those and see if
15 those need to be advertised in the regions.
16 MR. EMERSON: Okay. The second issue has to do
17 with applying the SDP and if there was ever a target for
18 attention on the part of the industry -- first of all we
19 recognize that this is a very difficult thing to do and SDP
20 application has had issues associated with it in areas
21 beyond fire protection as the oversight process has been
22 implemented.
23 In the area of fire protection the two things that
24 I wanted to mention with respect to the SDP uses, in some
25 cases, not all but in some cases probably a minority of

1 incorrect assumptions have been used during the SDP which
2 forces the licensee to have to work even harder to justify
3 where his licensing basis currently is.
4 In some cases the use of the SDP has not been
5 transparent to the licensee, as it is supposed to be. He is
6 supposed to understand how the Staff goes through the
7 process for a finding and determine -- come to a conclusion
8 as to the seriousness or the color of the finding in the
9 oversight process.
10 In some cases the inspectors have worked very
11 closely with the licensees. In some cases it has been a
12 closed process with the licensees.
13 Because of the fact that this is a new process, we
14 would like to see more transparency on how the SDP is
15 applied and more input into are the assumptions that are
16 being used to judge the adequacy of the program applied
17 correctly.
18 DR. POWERS: In the Phase 3 part of the process
19 the licensee has a tremendous amount of input into Phase 3,
20 doesn't he?
21 MR. EMERSON: Well, Phase 3 is a pretty
22 significant effort on the part of the licensee and the
23 Staff. What I am saying is you could avoid getting to Phase
24 3 at all if you were, if the process for Phases 1 and 2 was
25 more transparent. You could avoid that extra expenditure of

1 resources.

2 The third area has to do with resource

3 requirements.

4 This is an issue that it's fun to complain about

5 but realistically it may be difficult to do anything to do

6 about.

7 The licensees, as they did with the functional and

8 fire protection functional inspections, have expended a lot

9 of effort in preparing for and conducting these inspections.

10 Again there's been inconsistencies in the experience.

11 One extreme is for instance one licensee had to

12 spend 2000 man-hours after the exit meeting helping to

13 resolve the issues. In another case a licensee and the

14 inspection team closed out the whole process at the time of

15 the exit meeting and there was no follow-up action required

16 so again inconsistencies in how this is done.

17 DR. POWERS: It seems to me there are a couple of

18 things here that come to mind.

19 When you were in the FPFI process we had lots of

20 reports from the licensees on the resource requirements.

21 They found it formidable, but when you asked about it a lot

22 of that was reconstituting the design basis, which the rule

23 seems to require that -- that should be there all the time.

24 I mean that should not be a special for an

25 inspection. At any time NRC should be able to show up and

1 say let me look at your licensing basis for fire protection
2 and it should be there and it was not and I think people
3 recognized it was not --
4 MR. WHITNEY: I would like to add to that. Leon
5 Whitney, Plant Systems Branch.
6 I think we have got to be careful. In some cases
7 this may be due to licensees not being able to portray or
8 not understanding their plant or their licensing basis and
9 the inspectors are trying to follow the analysis conducted
10 by licensees.
11 To the extent that the licensee has to create new
12 information its possible that that is a deficit in the
13 analysis, so just the fact that there is extra work doesn't
14 necessarily mean that somehow the process was misapplied by
15 inspectors. It may but there may be other reasons.
16 MR. QUALLS: This is Phil Qualls.
17 I have been on I think six or seven of the Region
18 4 and one of the Region 3 inspections -- I think the only
19 Region 3 inspection and the pilot in Region 2.
20 I know of at least two cases where the licensees
21 in my opinion had to extend significant resources
22 post-inspection to determine color of potential findings
23 identified by the team. That goes back to my earlier
24 discussion about you could conduct an Appendix R analyses
25 and separate fire barriers without having to identify

1 specific cables/components that might be on the opposite
2 side of that fire barrier so long as you separate the
3 trains.
4 The way we have to implement to perform an
5 advanced SDP for example, you build a credible fire -- let's
6 just take a very simple case, a fire barrier that is
7 degraded.
8 The licensee may even agree that it is degraded --
9 not one of the cases we are discussing here but even when
10 the licensee would agree that the fire barrier is degraded,
11 on the opposite side of that fire barrier would be cable
12 trays. In the analysis required for Appendix R you would
13 just have to determine that Train A is on one side of the
14 barrier, Train B on the other.
15 Now the barrier may separate large fire areas.
16 Now you have your fire on Train A side and the
17 question is to determine SDP color which systems could be
18 affected by a fire, a degraded barrier, on Train B side.
19 Well, now you have to know specific data as to
20 which cables are in which trays on the Train B side and what
21 functions would be affected by those cables and in some
22 cases that may not be a difficult analyses but in some cases
23 it is and it requires a lot of manual going through old
24 computer databases to determine that information and this
25 was never required to be determined to that level for the

1 original Appendix R and Appendix R analyses.

2 I have seen what I think is significant resources

3 in at least a couple of cases expended by licensees to

4 implement the SDP process.

5 MR. WHITNEY: Leon Whitney again. Phil brings up

6 a very important point.

7 We have had discussions and we may go talk to the

8 oversight group. Is there a possible way for a licensee

9 just to stipulate in some fashion, okay, there is a hole in

10 the barrier -- we can all see it -- now let's go on from

11 there and avoid all the expenditure of resources.

12 The initial answer we get informally from the

13 oversight group is no, we would have to flesh out the

14 significance of the finding, but if there were a way to

15 stipulate, yes, there is a hole in the barrier, it's ungood,

16 something over there is in the other train -- let's go from

17 here and solve the problem physically and in regulatory

18 space. I would stop all this extra analysis that is

19 required by the SDP.

20 MR. EMERSON: The last issue has to do with

21 communication. Some licensees have -- inspectees have been

22 experiencing difficulties in resolving issues through

23 communications with the Regional staff.

24 That is not an issue that NEI is going to get

25 involved in directly as far as facilitating that kind of

1 communication but again we are trying to represent a
2 cross-section of licensee perspectives and that is an issue
3 that is a very real one for the long-term resolution of
4 issues.
5 My last slide shows one recommendation, actually I
6 have two, which sort of gets to the point we were just
7 discussing.
8 We have asked the oversight group in the NRC to
9 conduct a workshop in the January timeframe to address fire
10 protection issues.
11 The reason for that is that fire protection was a
12 fairly late addition to the oversight process and there was
13 a great deal of effort made by the Staff to get procedures
14 done in time for that, to conduct training, and I'm sure
15 Leon spent a lot of hours he wishes he could have taken time
16 off for to get ready for that, but it was a fairly
17 last-minute addition.
18 The counsel that we got during a discussion with
19 the Staff on the inspection procedure in the SDP in February
20 prior to this was we will let the oversight process -- we
21 will actually go through it. We will see what happens. We
22 will use the actual inspections to flesh out and improve the
23 process.
24 Well, in order to carry that out now that we have
25 some experience under our belts, and we will have a little

1 bit more by the time January rolls around, we think it would
2 be a good idea to explore the issues not only with NRR but
3 with the regional staff as well, to address some of the
4 issues that we have seen coming out of this, some of the
5 inconsistencies.
6 The other point that I would like to make that
7 isn't on the slide has to do with the resource issue.
8 Now we in the industry think that one of the ways
9 you can address the resource issue by both the licensee and
10 the Staff and I know the Staff is devoting a tremendous
11 amount of resources to this program is to make better use of
12 licensee self-assessments.
13 Now there have been arguments that the licensees'
14 self-assessments have been spotty, not consistent, not of
15 universally high quality, and to that end we at NEI have
16 provided a guideline in doing fire protection
17 self-assessments to the industry about eight months ago.
18 Now obviously that is going to take awhile to take
19 hold and for licensees to get experience in that but the
20 self-assessment guide was designed to address the issues
21 that were coming out of at least the early round of the
22 FPFIs and help the licensees conduct both a comprehensive
23 and a thorough self-assessment without an excessive
24 expenditure of resources.
25 We think to the extent that the inspections

1 recognize and utilize what the licensees have done in the
2 self-assessment process we can reduce both the demands on
3 the inspector time and the licensee time in doing this, and
4 that is my last statement.
5 DR. POWERS: I think if the licensees have been
6 trained to use the SDP version that I have they are in big
7 trouble, because I have a hard time understanding, but I
8 understand they are getting another version of it and I
9 guess I would certainly think it would be useful to go
10 through that because it may have -- the older versions may
11 have missed the critical things, the whys and the wherefores
12 and how did we get to this in the SDP that really have an
13 impact on the philosophy of the thing.
14 That is certainly what I am missing, I think, so a
15 workshop on it might be a good way to get that.
16 MR. EMERSON: Yes.
17 MR. SIEBER: Any additional questions or comments?
18 MR. EMERSON: Thank you.
19 MR. SIEBER: If not, I would like to spend just a
20 couple of minutes between Dr. Powers and myself summarizing
21 any issues that any one of us believe deserve our additional
22 attention.
23 Dr. Powers?
24 DR. POWERS: You are supposed to telegraph these
25 things.

1 MR. SIEBER: It's in the agenda, sir.

2 [Laughter.]

3 DR. POWERS: Well, I mean if you are asking me

4 what kinds of things we need to be taking to the full

5 committee I think we will be taking the research program in

6 another guise to the full committee and I think we have got

7 the kind of background on the research program, the existing

8 programs that are going on now that we need.

9 I mean I don't think we need another presentation

10 on that. I think we have got written material that we can

11 show to the full committee.

12 What we are missing right now is what the

13 long-term strategy is for the agency with respect to its

14 fire risk assessment technologies.

15 I come away with two feelings on that.

16 One is all these things on the practicality of

17 implementations of inspection and monitoring could really

18 benefit from a much stronger risk assessment capability

19 routinely available to the NRR folks, to the inspection

20 folks, so that they could assess some of these issues that

21 come up in a risk context on a routine basis.

22 I would look to that to be a long-term goal. It

23 sounds consistent to build upon the ongoing work -- that

24 that would make it a long-term goal.

25 DR. POWERS: With respect to NFPA 805, I think we

1 see lots of challenges coming down to the agency to handle
2 that. A lot of them are man-material challenges, and we let
3 the guys who get the big bucks wrestle. The ACRS has a lot
4 to contribute there. I think some of the questions of
5 bundling and what not really deserve fuller discussion with
6 the ACRS, not so much in the connection with 805, but the
7 whole risk informed regulation. I mean, I've -- I went
8 along with 1.174's prescription against bundling because of
9 the argument that they want to go slow. Well, now we've
10 gone slow for a while. It's time to go back and revisit
11 that because I can consider prescriptions against bundling
12 doing the one thing that we hope that risk informed
13 regulation would do and that's unleash the creativity of the
14 industry to attack some of these safety issues in a highly
15 efficient and effective manner. And so I think it deserves
16 revisiting.
17 The whole 805 issue I think we just have to let
18 run its course, because the process is now getting voted on.
19 I see all kinds of challenges to the existing regulations
20 posed by 805. How the staff's going to sort this out, and
21 then SER for endorsement, I think we just have to let that
22 -- let go. I think it's really worthwhile to share with the
23 ACRS as a whole the results of this pilot, because I think
24 they've fleshed out a lot of the challenges that the
25 licensees will face in trying to apply 805 to their plant.

1 And they uncovered them. They came across very positive,
2 much more positive than I would have from the pilot. And so
3 I think it's worthwhile to share that with them rather than
4 just the subcommittee's view because I would tend to be more
5 negative than they were on that, so I thought that was
6 useful.
7 The challenges posed by this endorsement that's
8 sought by the BWR Owners Group on the SUV low pressure
9 injection system is a multi-faceted issue to bring to the
10 ACRS, because I see it as involving the details of fire
11 protection regulations on the one hand, but also you have
12 this accident analysis, and then you have this, what I call,
13 the human error component, the consistency of emergency
14 operating regulations that have to take into account. And
15 you want to look at this in a multi-disciplinary fashion. I
16 guess the upshot of everything I've seen -- I came in fairly
17 negative on the idea, and I'm coming away fairly positive on
18 the idea, so it's -- I mean, I've changed my view over the
19 course of the days on it, because I've seen these things.
20 Circuit analysis issues that we're facing, and
21 that still seems to be a major challenge, but it seems like
22 it's premature to bring that to the full committee, because
23 there's all these activities that have been going on in the
24 interim.
25 MR. SIEBER: Well, I think there's still some

1 basic issues that aren't firm yet.

2 DR. POWERS: That's right. That's right.

3 MR. SIEBER: And until you get past the basic

4 stuff and into the details, including the testing program

5 and see what results it gives, I think I'd agree with you

6 it's premature. And it's probably very optimistic to meet

7 the time schedule that you're talking about.

8 DR. POWERS: Well, again, that's a management

9 issue, and I'll let that proceed on its course. I guess I

10 would -- at some time, it would be fun to hear more about

11 the experimental program than we've heard now. I guess I --

12 we had a presentation earlier this morning where I think --

13 it overstated his own view, but he said, gee, there's big

14 challenge in using experimental data, because it's difficult

15 to replicate the experiment. And I think that's just a

16 truism of a fire experiments. They're difficult to

17 replicate. And that means you have a certain stochastic

18 character to this. I think what professor Apostolakis would

19 call a substantial aleatory component in the uncertainties

20 here. And I think that's just a truism.

21 It is, however, because of the impact of a small

22 amount of experimental data that we have a good

23 understanding of what we're getting out of this experiments

24 and what they're useful for and what they're not useful for.

25 I guess I agree with what -- that the only way

1 that we're going to make progress on the interpretation is
2 through some sort of expert judgement; but that there are --
3 the fire analysis tools seem to be getting more
4 sophisticated all the time.
5 MR. SIEBER: Because of the aleatory nature of the
6 data that we hear.
7 DR. POWERS: Well, I mean it's the -- right now,
8 we've got a substantial epistemic character, because we're
9 coming along and say well, we absorbed all these horrible
10 things at Browns Ferry--
11 MR. SIEBER: So let's assume they--
12 DR. POWERS: Let's assume everything's the worst,
13 and that's -- that served some function over time, but now
14 we've got -- we're looking for much more realistic analysis
15 on these things, because it can have a real impact on costs,
16 and I share the view that cost is a safety issue, because
17 dollars spent on one item means they're not dollars
18 available to spend on another item, and so you want to
19 optimize those resources as best you can.
20 Well, that kind of begs the issue of do we want to
21 look at this proposal from the BWR Owners Group that says,
22 okay, in the face of all this, here's what we say to go
23 ahead.
24 MR. SIEBER: I think that's a legitimate question
25 that we'll have to determine.

1 DR. POWERS: Yeah, I think the answer is do we
2 have a point, has the staff gotten to the point that they
3 want to make a judgement on this BWR Owners Group? I mean,
4 I think we really depended upon having both, the proposal
5 and the staff's analysis--
6 MR. SIEBER: Right.
7 DR. POWERS: of that.
8 MR. SIEBER: And probably between the point that
9 staff finishes the analysis and prior to the ultimate
10 decision of this group, we'll get an, you know, an update on
11 exactly where they stand and what the issues are.
12 DR. POWERS: I don't think the ACRS would have any
13 view on the hiatus of associated circuit analysis. I mean,
14 I think that's a, again, a management judgement, and it's --
15 I think it's properly cast. They've got enough things on
16 their plate right now that they -- they're not really -- I
17 mean, even if they hadn't made the hiatus, they probably
18 wouldn't have gotten to it anyway. So--
19 MR. SIEBER: Well, I agree it's a management
20 issue, and it's a resource issue. And potentially it's a
21 secondary effect that complicates the life of an operator
22 trying to recover and mitigate the effects of a fire in a
23 fire area, but nonetheless I would not like to see that
24 process as resolving all that stop. You know, sooner or
25 later we got to deal with it, and it's been out there for a

1 long time, one way or another. And so I guess my concern
2 doesn't rise to where I think that you're harboring the SOKI
3 issue out there by not acting on it. On the other hand, I
4 think it's a good idea that NEI and the NRC work together to
5 try to bring this to resolution on a resource reasonable
6 schedule.
7 DR. POWERS: But the formal issue to bring up is
8 the significance determination process. You know, we've
9 held that off and held that off and held that off. It
10 sounds like we're getting a revised plan on this, and I
11 think we ought to share that with the entire committee. I
12 look forward to seeing it, because I've had big reservations
13 about the existing SDP simply because I didn't understand
14 where -- why we've gotten what we had, and apparently this
15 revision we'll be able to better understand that.
16 MR. SIEBER: Yeah, I guess one of the issues there
17 is 805 does not require baseline fire PRA. And to do
18 significance determination, you sort of have to know where
19 you start from in order to determine whether you have
20 changed the relative risk of whatever violation happened to
21 occur. And I think that that's a pretty big endeavor for a
22 utility to do. It's a new analysis. It's going to take a
23 fair amount of time. It's relatively detailed. And so one
24 sometimes wonders whether the traditional significance
25 determination is fully appropriate to classify violations or

1 deviations from classic deterministic rules. You may want
2 to see if there is not a simple way to do that that is not
3 so resource intensive. And you can probably tell I still
4 have some deterministic blood flowing.
5 DR. POWERS: You're my friends here. George left
6 us so there's no pure Bayesian here.
7 MR. SIEBER: I liked the days when you say do
8 this, and you say, yes, sir. They really worked out well.
9 Maybe I can add just a little bit to Dr. Powers'
10 remarks. I too am interested in the testing NEI is going to
11 do, because I'm curious as to what you're going to find.
12 And, you know, I'm not a fire expert in any sense of the
13 word, even though I've seen some fires. I've read about
14 them. And I've seen some testing. And so I asked myself,
15 you know, you've got grounds which seem to happen a lot, and
16 as long as you aren't grounding the whole world to the same
17 bus car maybe that's not as serious as some of the things.
18 On the other hand, I have seen, not in power plants, but hot
19 shorts, but I've never seen one in a three-phase power
20 circuit. And it would seem to me that there ought to be
21 some analytical way since we call the hot short thing an
22 engineered failure or an engineered fault, in slide 24, that
23 you could maybe say that it is improbable or unlikely that
24 you would get a three-phase hot short.
25 MR. WHITNEY: Leon Whitney, Plant Systems Branch.

1 We do have a proscription against a three-phase hot short,
2 except for high-low pressure interfaces.
3 MR. SIEBER: Right.
4 MR. WHITNEY: And we don't postulate it except for
5 those.
6 MR. SIEBER: Okay. But I'd still be curious as to
7 what the probability of that occurring really is. In single
8 phase and DC circuit, particularly controlled circuits, hot
9 shorts is realistic.
10 The additional area that I'm curious about is the
11 -- and talk about an engineered fault is the multiple high
12 impedance failures. You know, that's -- you almost have to
13 sit down and figure out exactly how you're going to do that
14 if you were doing it on a bread board in order to fool the
15 breaker coordination and get to the main power supply
16 breakers, so I'm curious as to what the outcome and the fast
17 resolution of that issue really is.
18 On the other hand, I think breaker coordination is
19 an essential element whether you have a fire or not in the
20 operation of power plants and protection of the distribution
21 circuit and the reliability of power supply to this
22 essential equipment, so regardless of what the outcome is,
23 breaker coordination ought to be scrutinized very carefully.
24 I also generally agree with the staff's -- the
25 slides that you put up that tell us what the additional

1 concerns that you're attempting to resolve, and I think that
2 you may be able to come to agreement or resolution on most
3 of those, and to the extent that you cannot, then I guess
4 it's up to the staff to decide exactly what position it's
5 going to take. But I think that this process is, and this
6 is my first fire protection subcommittee meeting, and I read
7 an awful lot of stuff to prepare for this, and I'm surprised
8 and feel reasonably comfortable that progress is being made.
9 I think that the NFPA 805 is a pretty good document. NEI
10 0001 is a pretty good document, minus some of the areas of
11 concerns. And overall, I think the industry and the staff
12 is taking the right approach to try to meet -- reach a
13 mutually acceptable and technically adequate resolution to
14 all these problems. Fire protection sometimes is a field
15 that is -- doesn't get the full attention that it deserves.
16 And so I think that anything that we can do to make it more
17 understandable, less complex and limit the risk, because I
18 think the risk is right in there with all the other risks in
19 the plant, and so we ought to be paying a similar amount of
20 attention to it.
21 DR. POWERS: That's one of the issues that never
22 ceases to amaze me. You know you would have thought that
23 with a pretty good fire requirement embodied in 50.48 and
24 Appendix R, I think it's not -- I mean, when you've gotten
25 805 that's all these experts getting together, and it's not

1 wildly different. You would have thought that that
2 eliminated the risk or truncated it substantially. And we
3 get these rumors from the IPEEE that we're seeing a
4 comparable level of risk, and I said, gee, you know, it just
5 doesn't seem likely to me. And I'm wondering if it isn't
6 just a consequence of the tools that were available to do
7 the IPEEE had a high level of conservatism because they
8 haven't been developed as well as the tools for risk under
9 normal operation. I mean, COMPBURN is what, correct me if
10 I'm wrong, 22 years old now?
11 DR. SIU: Yes, 22 years old roughly.
12 DR. POWERS: You know, I continue to wonder if
13 that result that we're seeing comparability between the risk
14 of fire and the risk of normal operations might not be
15 driven by conservatisms in the risk analysis.
16 MR. SIEBER: They might be, but not my feeling
17 based on, for example, if you're in the shipping industry
18 where there is some machinery involved or the Navy where you
19 have more than one kind of machinery and sometimes nuclear
20 reactors, fire is a big consideration, and the people that
21 go onboard ships do an awful lot of training on fire, and do
22 an awful lot of detection suppression--all the fire
23 protection elements that there are--and still fires occur.
24 Fires occur in industrial processes and occasionally another
25 place where fire protection is taken as an article of faith

1 and practiced with enthusiasm is in the petroleum refining
2 industry. And every once and a while, you end up with a fire
3 there, too. So I'm not surprised that fires turn out to be
4 somewhat of a risk because they're complex phenomenon.
5 There's a tremendous variety of ways that they can start.
6 Plants have combustible materials, and sometimes fires are
7 difficult to fight because of the configuration of the room,
8 configuration of the equipment, the temperatures you get and
9 smoke inhalation and a variety of factors, so I'm not
10 surprised that the risk is visible, and all I hope for is
11 that we continue to pay attention to fire risk and having
12 good fire programs.
13 With that--
14 MR. SINGH: Okay, before we adjourn. For the full
15 committee, my notes tell me we have to have a 805, and the
16 pilot results of the 805 code and owner's group SRP issue.
17 The circuit analysis and finally the SDP process. Is that
18 what you--
19 MR. SIEBER: The circuit analysis is premature.
20 DR. POWERS: Yes, I think the SDP process is
21 premature. I mean, I think we're awaiting this--
22 MR. SINGH: So you don't want SDP process.
23 DR. POWERS: No, I just don't think they have
24 anything to tell us until they've got this new drafting
25 ready.

1 MR. WHITNEY: Excuse me, I'm confused. My notes
2 say on the SRV LPS was -- oh, excuse me -- the SDP was to go
3 in front of the full committee.
4 MR. SINGH: Yes, that's what I'm talking about.
5 MR. WHITNEY: Right.
6 DR. POWERS: Well, I think only after they produce
7 this -- the new --
8 MR. WHITNEY: New version.
9 DR. POWERS: New version of the document.
10 Because, I mean, I think that what's crucial is to have an
11 understanding of where they get all this stuff.
12 MR. WHITNEY: And circuit analysis is premature.
13 DR. POWERS: Well, I think you have to wait until
14 the staff has a response to BWR Owners Group's position.
15 MR. GORMAN: You mean NEI, NEI's -- BWR Owners
16 Group.
17 DR. POWERS: Right.
18 MR. SINGH: Okay, so--
19 MR. SIEBER: On the other hand the subcommittee,
20 since there's only two of us, and maybe you aren't
21 interested, but I'd like -- I'm really interested in the
22 testing.
23 MR. SINGH: Okay, I want to make sure so I can
24 have the right people. NRC staff will do the 805 and the
25 user for SRV's right? And then NEI and Owners Group will

1 also come to the full committee for the 805 and the user for
2 SRVs.
3 MR. WHITNEY: The other thing that was on the list
4 was research. You wanted to hear research.
5 MR. SINGH: No, no.
6 DR. POWERS: I don't think we need that.
7 MR. SINGH: No, we don't need that, no. No
8 research.
9 DR. POWERS: I think the subcommittee got enough
10 that it can communicate the ongoing programs, and we're
11 going to have a separate subcommittee to discuss the future
12 programs.
13 MR. SINGH: Did you have a comment?
14 UNIDENTIFIED SPEAKER: Yeah, about the pilot since
15 that's a -- ongoing work which is -- I would want EPRI to be
16 present when the pilot is presented to the full committee
17 because I think that would be -- new, continue the work
18 going on from here until then in some of these -- that's my
19 suggestion.
20 When you're managing that activity, I think it's
21 appropriate for them to be involved in the--
22 MR. SINGH: I was -- we'll mention that; that you
23 will come. You have to come up there. He can't hear you.
24 MR. SIEBER: Yes, we may be at a point, since
25 we're just talking about administrative things, that we

1 don't need further transcripts.

2 DR. POWERS: If we're going to invite

3 participation we need to keep it on.

4 MR. SIEBER: Okay.

5 MR. NIJAFI: This is Bijan Nijafi. I'm sitting in

6 for EPRI. I just wanted to mention that we said yesterday

7 this pilot program for 805 is an ongoing work, and actually

8 right now it's sort of in the peak of it, which there may be

9 developments during the next month or so. So EPRI will be

10 -- I mean, planning to come and participate in that

11 discussion. So if there's anything new that has been

12 learned, we'll likely share it with the ACRS.

13 DR. POWERS: That would be great. I mean, I see

14 kind of two things coming that the ACRS itself needs to know

15 about. One are the results that you've gotten trying to

16 pilot it, because there were a lot stuff there. I mean, it

17 was more than I could have digested.

18 And the second one is that they have to understand

19 that they're not getting a prescription for how you do a

20 risk assessment out of 805, because they -- the ACRS as a

21 whole thinks the--

22 MR. NIJAFI: Yeah, because the next -- I mean,

23 until this comes to a conclusion, it's mostly the time

24 period that we'll go through the digestion of what we have

25 collected. So some of the questions that was like by George

1 yesterday. I mean, we've thought about all of these -- I
2 mean, that picture up front. I mean, I think that's a --
3 something that we weren't quite ready to share or offer an
4 opinion, but a month from now, and I'm not sure exactly when
5 it is at this point. But, I mean, that -- we may be better
6 -- have more or better information or --
7 MR. SINGH: Okay. For the record the full
8 committee is scheduled for November the 3rd, 8:30 a.m. to
9 10:30 a.m.
10 MR. SIEBER: Okay.
11 MR. SINGH: The third, which is Friday.
12 MR. SIEBER: Anything else?
13 MR. SINGH: That's about it.
14 MR. SIEBER: Well, I think we've had two good days
15 of meeting, and I would like to thank the staff, NEI, DPM,
16 licensees who are here, EPRI, Sandia, and the NFPA for their
17 input to us, and it's well appreciated. And so at this
18 point, I would like to adjourn the meeting.
19 [Whereupon, the meeting was adjourned at 12:26
20 p.m.]
21
22
23
24
25

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

NAME OF PROCEEDING: ACRS MEETING - FIRE PROTECTION

PLACE OF PROCEEDING: ROCKVILLE, MD

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Mark Mahoney

Mark Mahoney
Official Reporter
Ann Riley & Associates, Ltd.

NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants

Edward A. Connell
Office of Nuclear Reactor Regulation
301-415-2838

Advisory Committee on Reactor Safeguards
Subcommittee on Fire Protection
October 2000

NFPA 805

Background

- Purpose - Comprehensive FP Std to Protect Safety of the Public, Environment and Plant Personnel, as Well as Limit the Potential for Economic Loss During All Phases of Plant Ops
- June 1998 - Commission Approved Staff Proposal (SECY 98-058) to Work w/ Industry to Develop a PB/RI Consensus Std for NPPs
- Previously Briefed ACRS FP Subcommittee Jan 1999

NFPA 805

Update Since Jan 1999 Mtg

- Second Draft Issued for Public Comment
- Limited Scope Pilot of Draft Standard
- Rulemaking Plan (SECY 00-0009) Approved by the Commission
- TC Affirmative Ballot for NFPA Membership Vote

NFPA 805

Overview

- Combination Deterministic, PB, RI Fire Prot Std for Existing LWRs
- Deterministic Requirements for Admin Controls, Fire Brigade, FP System Design, Fire Barrier Testing and Water Supply
- Perf Criteria Can Be Satisfied w/ Deterministic or PB/RI Approach
- PB/RI Approach Can Be Qualitative or Quantitative
- Guidance on Performing Nuclear Safety Analysis, Use of Fire Models, and Fire PRA
- Risk Assessment Only Required for Changes
- Monitoring of FP Program Required

NFPA 805

Changes From Appendix R

- Performance Criteria for NS Allows Use of ADS/LPS for BWRs and Feed & Bleed for PWRs as Only SD Method
- PB/RI Allows "Recovery" of SSCs vs. Free of Fire Damage
- 72 Hour CSD Requirement Eliminated
- Alt/Dedicated SD Requirements Eliminated
- 8 Hour Emergency Lighting Requirement Eliminated
- RCP Lube Oil Collection System Eliminated
- Specific Criteria for Rad Release Added

NFPA 805

Outstanding Technical Issues

- NS Performance Criteria
- Circuit Analysis Methodology Conflicts w/ BWROG/NEI Approach
- Recovery of SSD Capability
- FP Capability Following SSE
- SFP Circuits Not Required to be Identified
- "Bundling" of Changes for Risk Impact
- "Grandfathering" of Existing Plant Configurations

NFPA 805

Implementation Issues

- Partial Adoption by Licensees
- Reactive Adoption by Licensees
- NEI Implementing Guidance
- Oversight by Regions
- Change Control
- NRR Oversight of Licensee Implementation

NFPA 805

Path Forward

- Nov 2000 - NFPA Membership Vote on Std
- Dec 2000 - Commission Update
- Mar 2001 - Std Published for Use*
- Apr 2001 - Public Meeting on Rulemaking*
- Oct 2001 - Publish Proposed Rule*
- Sep 2002 - Publish Final Rule*

*Tentative

NRR REDUNDANT SRV/LPS SHUTDOWN ACTIVITIES

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE ON FIRE PROTECTION
OCTOBER 2000

REDUNDANT USE OF SRV/LPS

- IN SEPTEMBER, 1999, BWROG SUBMITTED A DOCUMENT ON THE USE OF SAFETY RELIEF VALVES AND LOW PRESSURE SYSTEMS (SRV/LPS) AS A MEANS OF REDUNDANT POST-FIRE SAFE SHUTDOWN

- REGULATORY BACKGROUND

  - SRV/LPS IN BWR DESIGN BASIS ACCIDENT LICENSING BASIS

- SRV/LPS IN BWR NORMAL S/D GDC 34 SINGLE FAILURE LIC. BASIS SINCE 1975

- SRV/LPS WIDELY APPROVED BY THE STAFF AS A MEANS OF ALTERNATIVE SHUTDOWN (WITH DETECTION AND SUPPRESSION IN THE FIRE AFFECTED AREA IAW APPENDIX R SECTION III.G.3)

- THE STAFF'S REGULATORY AND CORE THERMO-HYDRAULIC ANALYSES SUPPORT USE OF SRV/LPS AS A REDUNDANT SAFE SHUTDOWN METHOD

- ON 4/25/00 THE STAFF MET WITH THE BWROG TO PROVIDE TECHNICAL, REGULATORY, RISK AND LEGAL FEEDBACK

- SEVEN MAJOR SUB-ISSUES WERE ADDRESED BY THE STAFF DURING AND SUBSEQUENT TO THAT MEETING:

  - THE EXISTENCE OF PLANT SPECIFIC LIC. BASES IN WHICH THE STAFF HAS APPROVED SRV/LPS AS A <u>REDUNDANT</u> MEANS OF POST-FIRE SAFE SHUTDOWN (5 EXAMPLES IDENTIFIED TO DATE)

- WHETHER AN SRV/LPS "HOT SHUTDOWN" PROCEDURE EXISTED. THE BWROG PROVIDED A HOT SHUTDOWN PROCEDURE NARRATIVE BASED ON EPG 4
  - INCLUDED LIKELY DEPRESSURIZATION AT TOP OF ACTIVE FUEL
  - HOT S/D MAINTENANCE CAPABILITY FROM 200 TO 212 DEGREES F
- NON-APPLICABILITY OF APPENDIX R SECTION III.L PERFORMANCE CRITERIA

- NON-APPLICABILITY OF SINGLE FAILURE CRITERIA

- POTENTIAL RISK INCREASE FROM REMOVAL OR ABANDONMENT OF DETECTION AND SUPPRESSION GENERALLY SMALL AS DEFINED IN RG 1.174 (FIRE AREA OUTLIERS MAY EXIST AT AT SOME PLANTS)

- NUMBER OF PROTECTED SRVS FOR CORE THERMO-HYDRAULIC SAFETY DURING DE-PRESSURIZATION (BASED ON PLANT SPECIFIC ANALYSES), AND

- VESSEL MATERIAL CONCERNS RELATED TO COOLDOWN RATE >100 DEGREES F/HR (DEPRESSURIZATION COUNTERACTS THERMAL STRESSES, AND VESSEL FATIGUE ADDRESSED BY LIMITING THE NUMBER OF STRESS CYCLES)

- UPON FINAL CONSIDERATION OF THE ISSUES, THE STAFF EXPECTS TO ISSUE AN SER ON THE BWROG SRV/LPS TOPICAL DURING OCTOBER, 2000.

NRR FIRE PROTECTION INSPECTION ACTIVITIES

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SUBCOMMITTEE ON FIRE PROTECTION
OCTOBER 2000

BASELINE FIRE PROTECTION INSPECTION PROGRAM

- COMMENCED APRIL 2000 IAW SECY 99-140 (FPFI FINAL REPORT) AFTER 3 PILOTS
- FIRE RISK COMPARABLE TO TOTAL RISK FROM INTERNAL EVENTS
- BASELINE INSPECTION TECHNIQUES DERIVED FROM FPFI PROGRAM

FIRE PROTECTION SIGNFICANCE DETERMINATION PROCESS

- BASED ON FP DEFENSE-IN-DEPTH
- FIRE SCENARIO MUST BE DEVELOPED (NO MORE "WALL TO WALL" FIRE ASSUMPTIONS)
- RISK SIGNIFICANCE OF FP FEATURE DEGRADATIONS ASSESSED
- DELTA CDF COMPUTED

BASELINE PROCEDURE CONTENT

- MONTHLY/ANNUAL RESIDENT INSPECTION
  - COMBUSTIBLES AND IGNITION SOURCES
  - DETECTION AND SUPPRESSION
  - MANUAL FIRE FIGHTING
  - PASSIVE FP FEATURES/FIRE BARRIERS
  - FIRE BRIGADE CAPABILITY AND PERFORMANCE
  - COMPENSATORY MEASURE ADEQUACY
  - RCP OIL COLLECTION

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM INSPECTION OF POST-FIRE SAFE SHUTDOWN CAPABILITY
  - ELECTRICAL, RX/MECHANICAL SYSTEMS, AND FP INSPECTORS
  - 2-3 DAY INFORMATION GATHERING VISIT
  - 1-2 WEEKS OF ONSITE INSPECTION WITHIN DESIGN AND LICENSING BASES

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM LINES OF INQUIRY:
  - FIRE AREA BOUNDARY DESIGN
  - SS/D SYSTEMS SELECTION ADEQUACY
  - HOT S/D SYSTEMS SEPARATION
  - SS/D CIRCUIT PROTECTION ANALYSIS
  - ALTERNATIVE SHUTDOWN

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM LINES OF INQUIRY (CONTINUED):
  - COMMUNICATIONS
  - EMERGENCY LIGHTING
  - FIRE PROTECTION SYSTEMS, EQUIPMENT AND FEATURES
  - FIRE SUPPRESSION DAMAGE ASSESSMENT

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM LINES OF INQUIRY (CONTINUED):

- OPERATOR RECOVERY ACTIONS
  - SMOKE REMOVAL
  - DEWATERING
  - CONTROLLED RE-ENERGIZATION
  - RETURN TO SERVICE

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM LINES OF INQUIRY (CONTINUED):
  - ASSOCIATED CIRCUITS OF CONCERN (INTERFERING CIRCUITS AS OPPOSED TO INTEGRAL SS/D CIRCUITS) [NOTE: CIRCUIT ANALYSIS ENFORCEMENT SUSPENDED INDEFINITELY BY EGM 98-002 REV 2 OF 2/2/00 AWAITING INDUSTRY RESOLUTION EFFORTS]

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM ASSOCIATED CIRCUITS LINES OF INQUIRY (CONTINUED):
  - COMMON POWER SUPPLY CONCERN (MULTIPLE HIGH IMPEDANCE FAULTS AND FUSE/BREAKER COORDINATION)
  - COMMON ENCLOSURE CONCERN (ELECTRICAL FAULT PROTECTION FROM NON-ESSENTIAL CIRCUITS)

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM ASSOCIATED CIRCUITS LINES OF INQUIRY (CONTINUED):
  - SPURIOUS SIGNAL CONCERN
    - HOT SHORTS
    - SHORTS TO GROUND
    - OPEN CIRCUITS

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM LINES OF INQUIRY (CONTINUED):
  - SS/D SYSTEM SELECTION ADEQUACY
  - INDEPENDENCE OF REMOTE S/D PANEL FROM THE MAIN CONTROL ROOM
  - S/D CAPABILITY WITH AND W/O OFFSITE POWER
  - EFFECT OF FIRE-INDUCED CIRCUIT FAULTS ON TRANSFER OF CONTROL

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM LINES OF INQUIRY (CONTINUED):
  - OPER. TRNG (OBSERVE ASD SIMULATOR)
  - SHUTDOWN STAFFING (ONSITE STAFF EXCLUSIVE OF FIRE BRIGADE)
  - PERIODIC OPERATIONAL TESTS OF ALTERNATIVE TRANSFER CAPABILITY
  - PROCEDURES

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM LINES OF INQUIRY (CONTINUED):
  - TIMELINE (THERMO-HYDRAULIC ANALYSIS)
  - COMMUNICATION PLANS
  - HUMAN FACTORS
    - NUMBER OF MANUAL ACTIONS
    - FEASABILITY
    - HABITABILITY
    - ACCESS ROUTES INDEPENDENCE

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM LINES OF INQUIRY (CONTINUED):

- PERIODIC OPERATIONAL TESTS OF REMOTE SHUTDOWN PANEL INSTRUMENTATION AND CONTROL FEATURES

- PORTABLE AND FIXED COMMUNICATIONS:
  - OPERABLE/AVAILABLE/RELIABLE
  - CLEAR WITH FULL COVERAGE

BASELINE PROCEDURE CONTENT (CONTINUED)

- TRIENNIAL TEAM LINES OF INQUIRY (CONTINUED):
  - COLD SHUTDOWN REPAIRS
    - DAMAGE SPECIFIC REPAIR PROCEDURES
    - DEDICATED ONSITE REPAIR EQUIPMENT AND MATERIALS
    - REPAIRS FEASIBLE WITHIN APPLICABLE TIME REQUIREMENTS

TRIENNIAL INSPECTION TRAINING

- ONE WEEK BNL/NRR CONDUCTED REGIONAL INSPECTOR TRAINING CLASSES CONDUCTED IN MARCH AND JUNE, 2000

- ONE DAY REGIONAL INSPECTOR REFRESHER TRAINING CONDUCTED IN EACH REGION SEPTEMBER, 2000

TRIENNIAL INSPECTION RESULTS

- NINE TRIENNIAL INSPECTION RESULTS SETS STUDIED
  - OVERALL RESULTS: 19 ISSUES, NO ISSUES AT TWO PLANTS

TRIENNIAL INSPECTION RESULTS OF INTEREST

- IN 92-18 "MECHANISTIC" (VERSUS FUNCTIONAL) DAMAGE PHENOMENON CONTESTED, AND NO LICENSEE ANALYSIS CONDUCTED

- "SINGLE SPURIOUS ACTUATION" ASSUMPTION MADE, BUT APPARENTLY NOT ACTUALLY APPLIED IN THE LICENSEE ANALYSIS (THEREFORE NO ISSUES DURING INSPECTION)

TRIENNIAL INSPECTION RESULTS OF INTEREST (CONTINUED)

- VARIOUS INCOMPLETE CIRCUIT ANALYSES, AND INCOMPLETE TRANSLATIONS OF SAFE SHUTDOWN ANALYSIS INTO PROCEDURES

- ALT. S/D CAPABILITY NOT INDEPENDENT OF FIRE AREA (VCT AND RWST VALVE CONTROL CABLES PLUS CHARGING PUMP POWER CABLES) - THREE PLANT AREAS

TRIENNIAL INSPECTION RESULTS OF INTEREST (CONTINUED)

- ALT. S/D CAPABILITY DID NOT ENSURE PRIMARY COOLANT INTEGRITY (LOSS OF RCP SEAL INJECTION W/O TEMPERATURE INDICATION FOR OPERATOR RCP TRIP) - THREE PLANT AREAS

RECENT CHANGE IN FP BASELINE INSPECTION SCOPE

- DIRECT ASSOCIATED CIRCUITS INSPECTION SUSPENDED UNTIL COMPLETION OF VOLUNTARY INDUSTRY CIRCUIT ANALYSIS INITIATIVE (FY 2001)
  - GENERAL ASSOCIATED CIRCUITS, IN 92 - 18, AND MHIF REVIEWS NOT TO BE CONDUCTED

RECENT CHANGE IN FP BASELINE INSPECTION SCOPE (CONTINUED)

- UNAVOIDABLE ("BYPRODUCT) ASSOC. CKTS ISSUES TEMPORARILY URIs

- INSPECTOR CAN STILL REVIEW:

  - ASSOCIATED CIRCUITS CALCULATIONS
  - PLANT CONFIGURATION ASSUMPTIONS
  - FUSE/BREAKER COORDINATION (NON-CONTROVERSIAL ISSUE)

RECENT CHANGE IN FP BASELINE INSPECTION SCOPE (CONTINUED)

- CHANGE RATIONALE:
  - RECENT UNDERSTANDING OF WIDE VARIABILITY IN LICENSING BASES, SOME AT VARIANCE WITH GL 86-10 ASSOCIATED CIRCUIT ANALYSIS CRITERIA
  - THEREFORE, ASSOC. CKTS ISSUES UNRESOLVABLE BY INSPECTION TEAM

NRR FP CIRCUIT FAILURE ANALYSIS ISSUE RESOLUTION

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OCTOBER 2000

FIRE-INDUCED CIRCUIT FAILURE ANALYSIS

- APP. R DEFINES CKT FAULTS AS HOT SHORTS, OPEN CKTS, SHORTS TO GROUND

- LONG-TERM INSPECTION POLICY AND GL 86-10 ASSOCIATED CIRCUITS POSITION IS THAT ALL POSSIBLE SETS OF SPURIOUS ACTUATIONS MUST BE IDENTIFIED, ASSESSED, AND MITIGATED SO AS NOT TO PREVENT SAFE SHUTDOWN ("HOT SHORT CONDITIONS EXIST UNTIL ISOLATED")

- BASIC CKT ANALYSIS ISSUES TO BE RESOLVED BETWEEN NRR AND INDUSTRY:

  - HOW MANY SIMULTANEOUS CIRCUIT FAULTS SHOULD BE ASSUMED PER FIRE WHICH CAN COOPERATIVELY CAUSE SPURIOUS EQUIPMENT ACTUATIONS?

AND

  - HOW MANY SIMULTANEOUS SPURIOUS EQUIPMENT ACTUATIONS NEED TO BE ASSUMED PER FIRE EVENT?

- IN SUPPORT OF A VOLUNTARY INDUSTRY INITIATIVE, IN NOVEMBER OF 1999 THE BWROG SUBMITTED A DETERMINISTIC SAFE SHUTDOWN ANALYSIS METHODOLOGY

- IN APRIL, 2000 THE STAFF'S EXTENSIVE "DRAFT" RAI HAD A REPETITIVE QUESTION: "PROVIDE TECHNICAL BASES FOR YOUR POSITIONS"

- IN A JULY, 2000, RAI CLARIFICATION MEETING, THE BWROG STATED:

- THE BWROG SAW NO SAFETY SIGNIFICANT CIRCUIT ANALYSIS ISSUES OUTSIDE OF THE CURRENT LICENSING BASES

- THEREFORE, THE BWROG DOCUMENT WAS A COLLECTION OF SELECTED CIRCUIT ANALYSIS LICENSING BASES.

- THE STAFF ACCEPTS THE BWROG DOCUMENT AS A "FIRST STEP" IN THE ISSUE RESOLUTION PROCESS.

- NEI CONTINUES DEVELOPMENT OF A RISK-INFORMED SAFE SHUTDOWN ANALYSIS METHODOLOGY NEI 00-01 (WHICH IT HAS INTEGRATED WITH THE BWROG DOCUMENT)

- DURING RECENT BWROG CIRCUIT ANALYSIS INTERACTIONS THE STAFF LEARNED OF:

  - A WIDE VARIABILITY IN CIRCUIT ANALYSIS LICENSING BASES, SOME AT VARIANCE WITH GL 86-10 ASSOCIATED CIRCUITS ANALYSIS CRITERIA

- THEREFORE, IN AUGUST 2000, NRR TEMPORARILY SUSPENDED ASSOCIATED CIRCUIT REVIEWS FROM FP BASELINE INSPECTIONS (IDENTIFIED SAFETY ISSUES WILL STILL BE ADDRESSED)

- NEI/EPRI FIRE TESTING TO BE CONDUCTED TO OBTAIN "CIRCUIT FAILURE CHARACTERIZATION" DATA

  - TESTING INTENDED TO SUPPORT INDUSTRY CIRCUIT ANALYSIS CRITERIA OF NEI 00-01

- ELECTRICAL CABLE FAILURE MODES, AND CIRCUIT FAULT CHARACTERISTICS WILL BE DETERMINED

- NRR AND RES COMMENTED SEPTEMBER, 2000, ON THE FIRE TEST PROTOCOLS W.R.T. VALIDITY AND COMPREHENSIVENESS

- BASED ON THE DECEMBER, 2000, NEI/EPRI FIRE TEST RESULTS, A COMPLETE VERSION OF NEI 00-01 WILL BE DEVELOPED (EXPERT SOLICITATION PANEL JANUARY, 2000)

- NEI 00-01 METHODOLOGY PILOT TRIALS TO BE CONDUCTED AT U.S. REACTOR SITES IN JANUARY/FEBRUARY 2001.

- NEI 00-01 TO BE SUBMITTED FOR STAFF REVIEW BY THIRD QUARTER CY 2001

Fire Protection Oversight Inspections

Fred Emerson, NEI

ACRS Fire Protection Subcommittee
October 17, 2000

Fire Protection Oversight Inspections

- Prior to April 1, 2000
  - 3 pilot inspections in Regions I, II, IV
- Since April 1, 11 triennial inspections conducted
  - Region I - 2
  - Region II - 3
  - Region III - 1
  - Region IV - 5

FP Oversight Inspection Procedure

- Recent moratorium on direct inspection of associated circuit analysis issues a positive step to facilitate issue resolution
- Heavy emphasis on mitigation/safe shutdown a concern
  - Prevention and suppression at least equally important

Inspection Issues

- Inconsistencies in
  - Treatment of licensing / design basis
  - SDP application
  - Resource requirements
  - Communication

Recommendation

- NRC conduct workshop by January to address
  - Procedure issues
  - SDP content and application
  - Resource requirements and lessons learned from conduct of inspections

Evaluation of ADS/LPCS as a Means of Achieving Safe Shutdown

Tony P. Ulses
Reactor Systems Branch
October 18, 2000

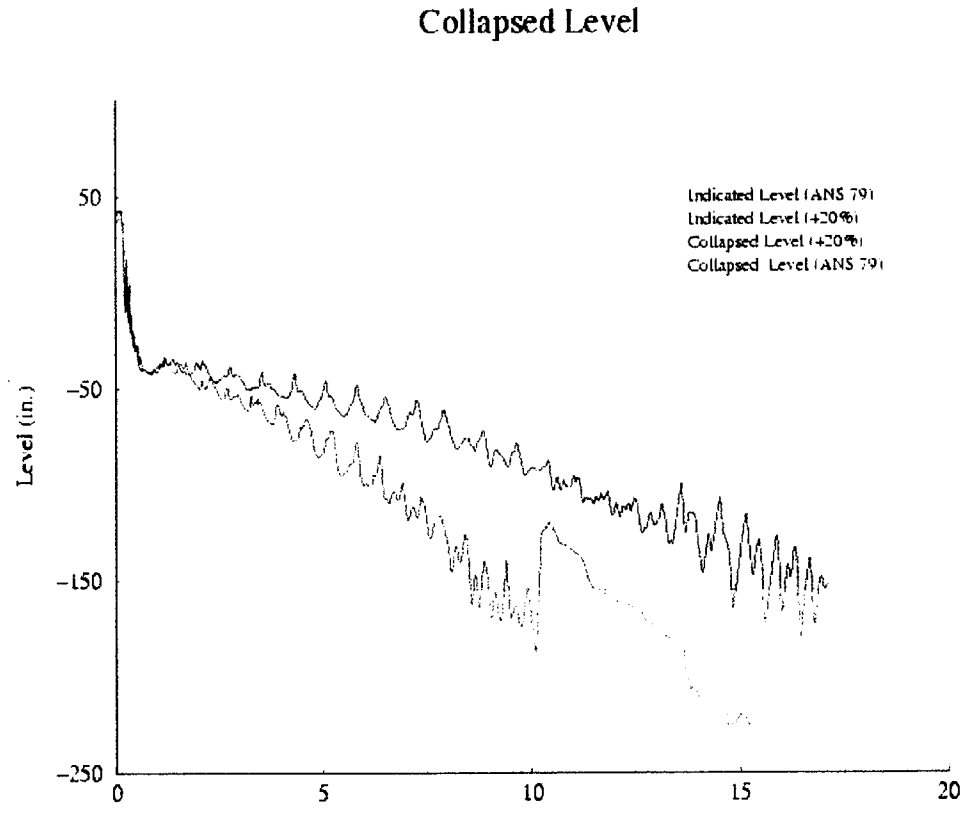
Definition of Problem

- Simulation of Representative Results Using ADS/LPCS to achieve Safe Shutdown
  - Is there indication of fuel damage
  - How much time do operators have to respond

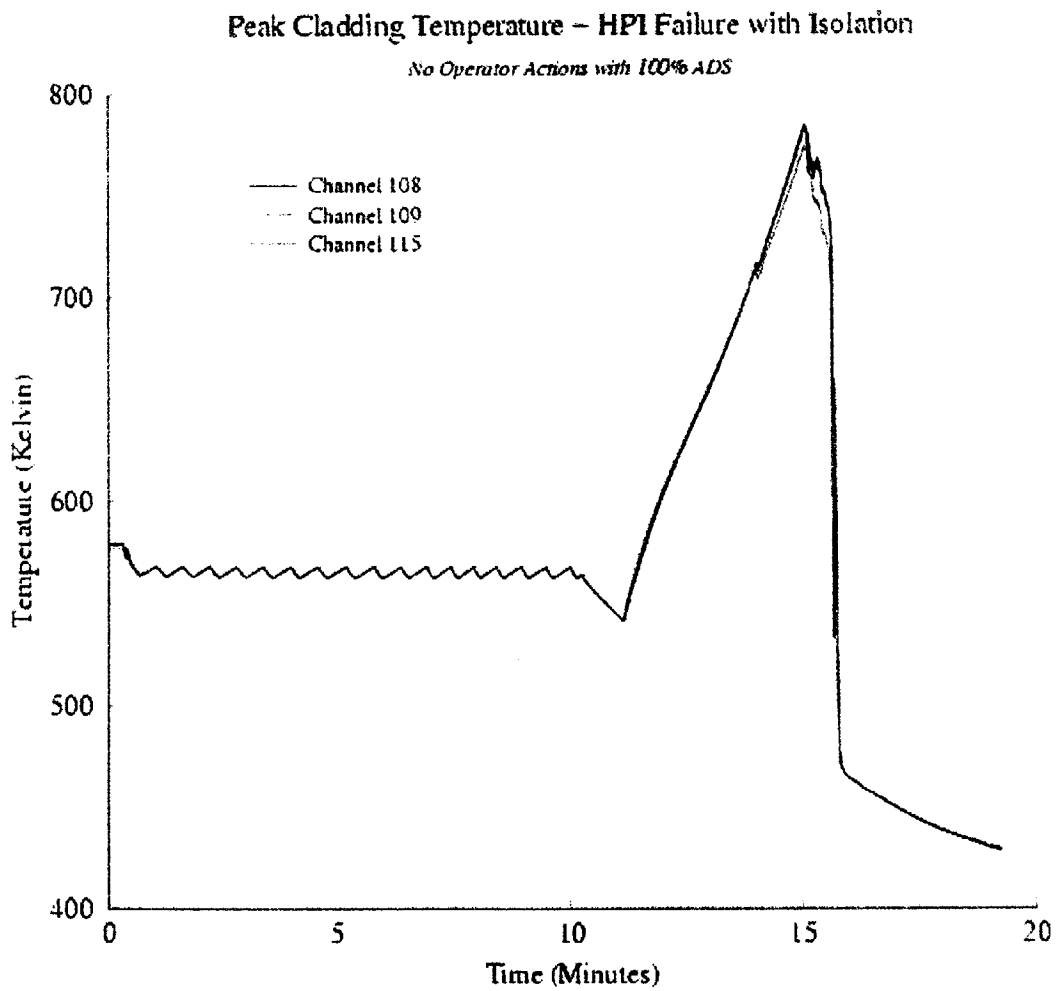
Analysis Assumptions

- Only ADS and LPCS available (and necessary support systems, i.e. AC)
- Operators take no anticipatory action
- LPCS automatically starts and functions as designed
- BWR/4 251 id. Reactor
- 8x8 fuel at EOC
- Evaluated 100% and 50% ADS

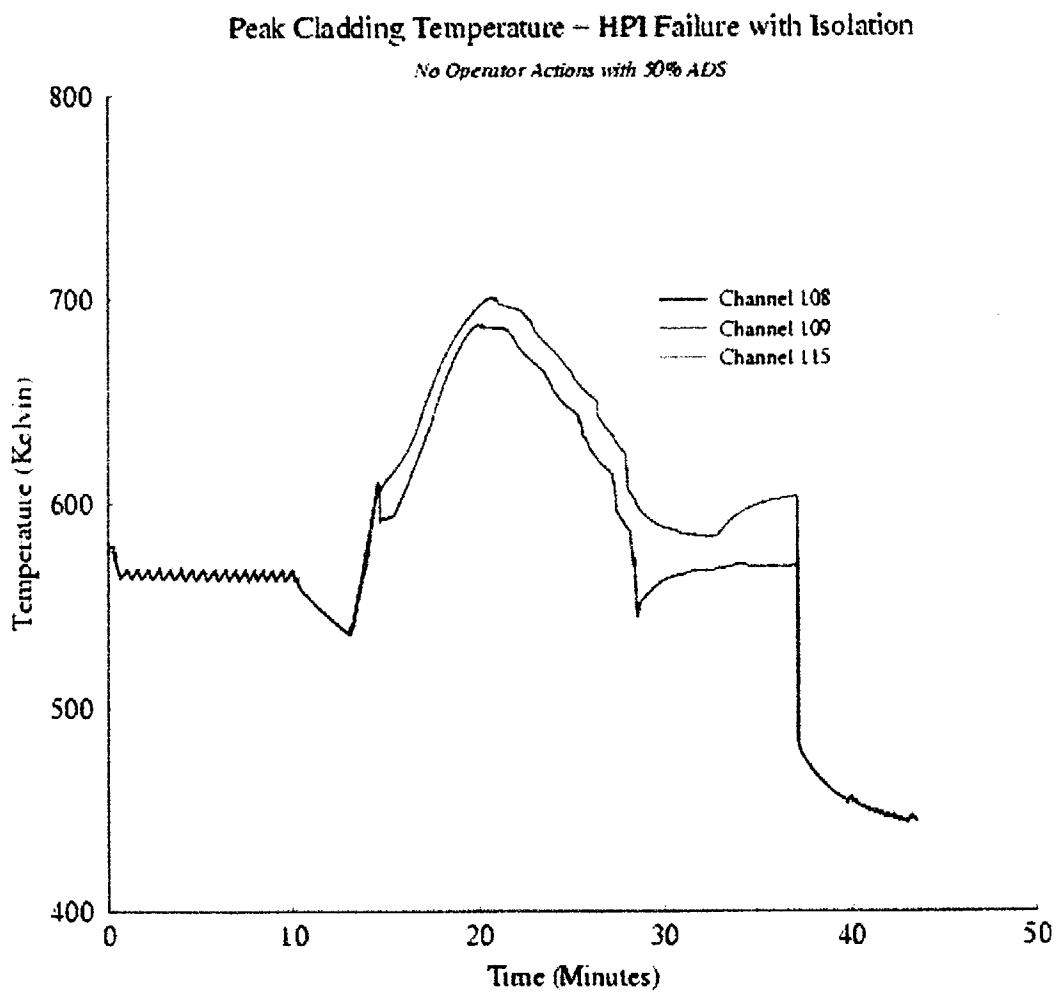
Collapsed Level



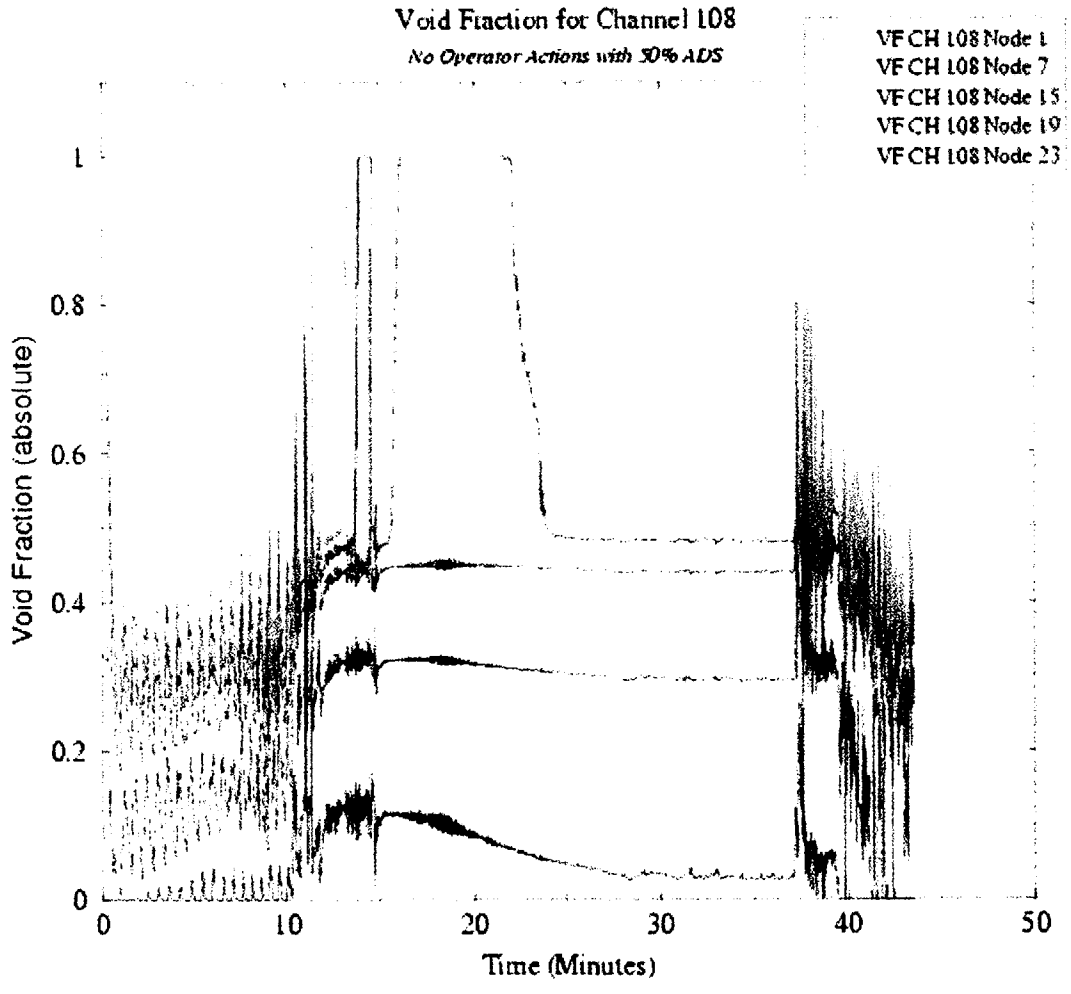
Peak Cladding Temperature Full ADS



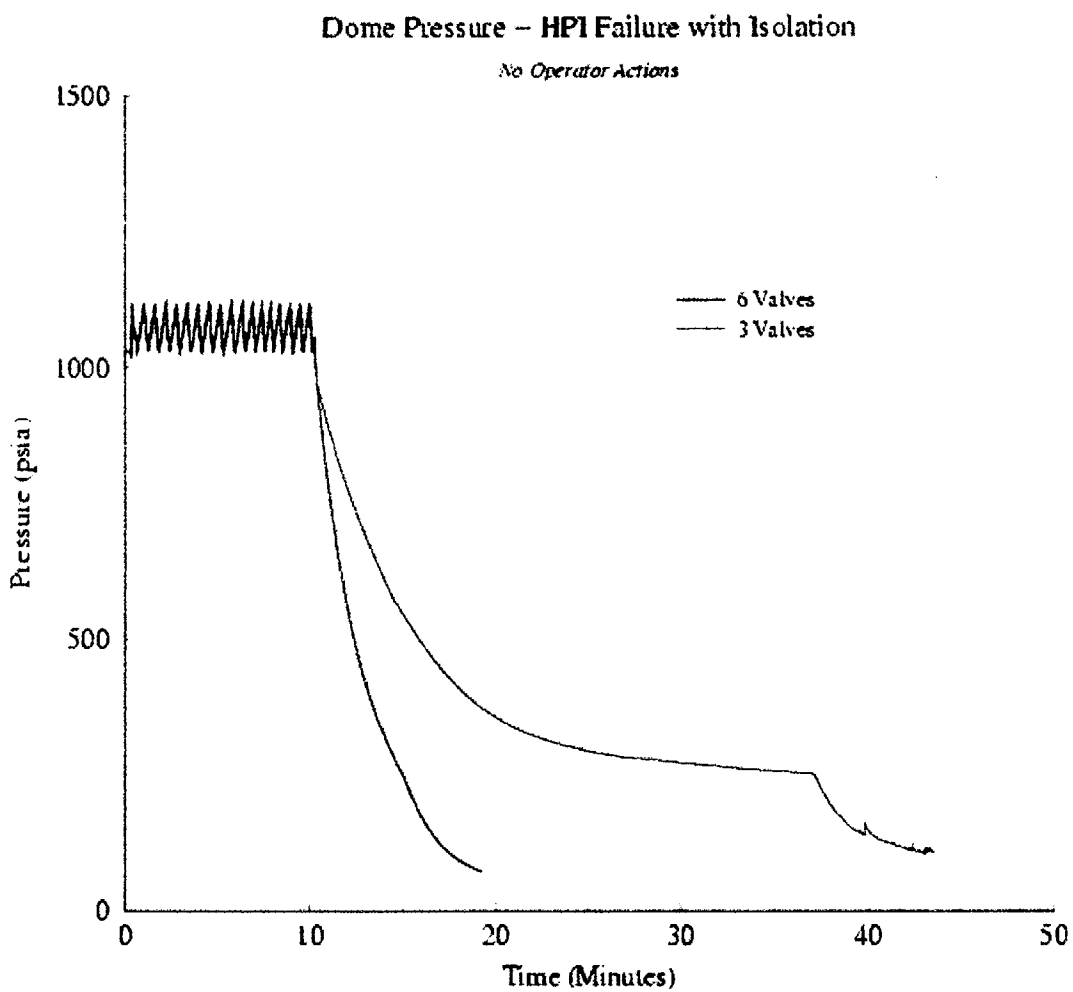
Peak Cladding Temperature 50% ADS



Hot Channel Void Fraction 50% ADS



Dome Pressure



Discussion of Results

- No indication of fuel damage
- Response time on the order of minutes