

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Risk-Informing Post-Fire Shutdown
Circuit Analysis Inspection

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Wednesday, February 19, 2003

Work Order No.: NRC-788

Pages 1-225

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UNITED STATES OF AMERICA
 NUCLEAR REGULATORY COMMISSION
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 PUBLIC WORKSHOP ON RISK-INFORMING
 POST-FIRE SAFE-SHUTDOWN
 CIRCUIT ANALYSIS INSPECTION
 + + + + +
 ROCKVILLE, MARYLAND
 + + + + +
 WEDNESDAY,
 FEBRUARY 19, 2003
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The workshop was convened in the Auditorium of the Nuclear Regulatory Commission Headquarters, Two White Flint North, 11555 Rockville Pike, Rockville, Maryland, at 9:15 a.m., Francis "Chip" Cameron, Facilitator, presiding.

PRESENT:

FRANCIS CAMERON	Facilitator
FRED EMERSON	NEI
JOHN HANNON	NRR, NRC
DENNIS W. HENNEKE	Duke Power Company
ROBERT KALANTARI	EPM, Inc.
ELIZABETH KLEINSORG	Kleinsorg Group
BIJAN NAJAFI	SAIC, EPRI

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PRESENT: (CONT.)

STEVE NOWLEN Sandia National Laboratories

CHRISTOPHER PRAGMAN Exelon & BWROG

KEN SULLIVAN Brookhaven National Laboratory

MARK SALLEY NRR, NRC

ERIC WEISS NRR, NRC

KIANG ZEE, P.E. ERIN Engineering & Research

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

(9:22:03 a.m.)

1
2
3 MR. CAMERON: Thank you all for coming out
4 today. We know travel has been difficult. My name is
5 Chip Cameron, and I'm the Special Counsel or Public
6 Liaison here at the NRC, and it's my pleasure to serve
7 as facilitator for your meeting today. And the topic
8 of the meeting is Associated Circuits for Post-Fire
9 Safe-Shutdown of a facility, and as your facilitator,
10 I'm going to try to help you to have a productive
11 meeting and to achieve objectives that the NRC has for
12 the meeting today. And the Staff is going to go more
13 into objectives when they give their presentation, but
14 I think a simple statement on objectives that the NRC
15 would like to have out of this meeting today is to
16 identify the most risk-significant associated circuits
17 post-fire safe-shutdown. And the goal would be for
18 the NRC to use those risk-significant circuits as the
19 basis for its inspection program.

20 My job as the facilitator will be to help
21 you keep organized and focused, to make sure that
22 everyone has a chance to participate, to help you with
23 problem solving, keep us on schedule, and keep track
24 of your progress as we go along through the day.

25 In terms of the format for the meeting, we

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1 do have a round table up here with representatives of
2 the affected interests, people who are knowledgeable
3 about this issue from one perspective or the other.
4 And we not only want to hear from each of you on what
5 your perspectives are on this issue, but to get the
6 reaction of your colleagues around the table to those
7 perspectives, and to try to have a discussion on these
8 issues.

9 Although the focus of the meeting is on
10 the people at the table, we are going to go on to
11 those of you in the audience after each major agenda
12 item to hear any comments that you may wish to give
13 us, so you will have a chance to talk if you have
14 something to say.

15 In terms of ground rules, each of you has
16 what I call a name tent in front of you, and what I'm
17 going to do is ask you, if you want to talk, put that
18 up like that, and that way I'll be able to keep track
19 of who wants to speak, and you won't have to keep
20 waving at me or whatever. I may not take the name
21 tents in order they come up, because we want to try to
22 follow discussion threads as much as possible, but
23 that will also help us to get a clean transcript. We
24 have Heather here who is our stenographer, and there
25 will be a transcript of this meeting that will be

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1 available to people on the NRC website, or possibly
2 through a hard copy if that's what someone would like
3 to have. And because we are keeping a transcript, I
4 would just ask you to just one person at a time speak
5 so that Heather knows who's talking, and also so that
6 we could give our full attention to whomever has the
7 floor at the time.

8 There may be issues that come up that
9 don't fit squarely into the agenda item that we're
10 talking about, or perhaps don't even fit under the
11 focus of the meeting. I'm going to keep track of
12 those over here in what I call the parking lot, and we
13 either go back to them at an appropriate time for
14 discussion, or the NRC will have that list of issues
15 that they may need to consider outside of this meeting
16 in another forum.

17 What I'd like to do, I want to go over the
18 agenda with you and see if anybody has any question
19 about it, but first of all, I think it would be
20 appropriate for us to introduce ourselves around the
21 table. And if you could just give us your name, and
22 affiliation, and maybe a couple of sentences on what
23 your interest or concerns are on this particular
24 issue. I'm going to start with Eric Weiss.

25 MR. WEISS: I'm Eric Weiss. I'm the

1 Section Chief for Fire Protection in NRC's Office of
2 Nuclear Reactor Regulation, and my obvious interest is
3 congruent with the purpose of this meeting, which is
4 to identify the most risk-significant circuits and
5 associated circuits so that we can focus our
6 inspections in a way that is productive for the
7 public, predictable for the industry, and serves NRC's
8 underlying mission, so with that I'll turn it over to
9 the next guy, John Hannon

10 MR. HANNON: Good morning. I'm John
11 Hannon, Plant Systems Branch Chief, DSS at NRR, and
12 I'm responsible for the NRC's Fire Protection Program.

13 MR. SULLIVAN: Good morning. I'm Ken
14 Sullivan from Brookhaven National Laboratory. I've
15 been involved providing technical assistance to the
16 NRC for approximately 17 years in this area, both in
17 discussions and performing safety evaluations.

18 MR. KALANTARI: I'm Bob Kalantari with
19 EPM, Engineering Planning Management. I'm involved
20 with the safe-shutdown appendix on analysis for the
21 last 18 years. I'm hoping, I don't think we'll get
22 there today, but what to get today is a clear
23 definition of a number of issues that has been kind of
24 putting industry on hold to do a complete safe-
25 shutdown analysis. As a consultant, I work with a

1 number of clients, and I think I know the right
2 answer, but I can't tell them because it's not clear
3 yet. And the document that Ken wrote, I reviewed it,
4 and it clarifies a lot of issues. I hope we can put
5 this to bed.

6 MR. SALLEY: I'm Mark Salley. I'm a Fire
7 Protection Engineer with NRR.

8 MR. NAJAFI: Bijan Najafi. I'm with SAIC.
9 I've been responsible for EPRI's Fire Research Program
10 for the past 10 to 15 years. I've been involved in
11 most of the methods for fire-risk assessment,
12 development and also in the NEI-001. My interest is
13 pretty much to see what is the issues and roles
14 related to these post-fire safe-shutdown in a risk
15 assessment, because currently we're developing a
16 methodology or upgrading a methodology that needs to
17 reflect in part some of these issues that we discuss
18 today.

19 MR. CAMERON: Okay.

20 MR. ZEE: Kiang Zee with ERIN Engineering.
21 My background has been a lot in the fire risk
22 assessment area. My actual roots are in traditional
23 deterministic electrical design, electrical analyses,
24 so I kind of go back to Appendix R compliance. And
25 again, to sort of chime in a little bit with Bijan,

1 what I'd like to see is have this all come together,
2 if you will, in a consistent framework.

3 MS. KLEINSORG: I'm Liz Kleinsorg with
4 Kleinsorg, and I've been working with fire protection
5 since about 1978. I'm also helping NEI write
6 implementing guidance for 805.

7 MR. PRAGMAN: I'm Chris Pragman. I'm here
8 from Exelon and also representing the BWROG. I've
9 been doing fire safe-shutdown analysis for 12 years,
10 I am currently conducting analysis on plants for
11 Exelon, and one of the things I'd like to get out of
12 the meeting in some sense of stability that the
13 methods used for analyses are not changing constantly,
14 and some degree of comfort that when we go make
15 changes in a plant that whenever the NRC has to come
16 and inspect that the changes were acceptable.

17 MR. HENNEKE: I'm Dennis Henneke with Duke
18 Power, and I've been doing PRA for about 20 years.
19 I'm on the ANS Fire Writing Group for the Fire PRA
20 Standard, and worked on the NFPA 805, and NEI-001.
21 And I guess my main goal in life right now is to not
22 only respond to our three sites, fire issues and
23 circuit issues, but kind of bring -- hopefully bring
24 all these things together like 805 and circuit
25 analysis, and the Fire PRA so they're kind of all

1 heading in the same direction, and supporting each
2 other, so the Fire PRA and the methods we develop
3 really kind of support a regulatory approach and
4 finding the right answer for circuit analysis.

5 MR. NOWLEN: Hi. I'm Steve Nowlen from
6 Sandia National Laboratories. I guess I have many
7 hats here. I've been involved with the U.S. NRC
8 Research Program for about 20 years. I've been
9 leading the program for about 15, so I'm involved in
10 the requantification studies that we're doing in
11 coordination with EPRI, and Bijan, and SAIC. I'm also
12 involved with some contract work, either directly or
13 through research for NRR and various aspects of
14 circuit analysis. We're working on the SDP revision.
15 I'm also a member of the Writing Committee on the ANS
16 standard, so I've got a number of risk-type hats here
17 that make me very interested in what happens here
18 today.

19 MR. CAMERON: Okay. Thank you very much
20 all of you. I should note that Fred Emerson from NEI
21 will be joining us. He's running a little bit late,
22 and we have a couple of other participants who may
23 show up some time during the day.

24 In terms of the agenda, and in just a few
25 moments, we're going to go to John Hannon, who just

1 introduced himself, to give you a formal welcome from
2 the NRC, and talk a little bit more about objectives
3 for today's meeting.

4 After that we have two context pieces, so
5 to speak, so that everybody gets an understanding of
6 the background on these issues. I know that all of
7 you are experts on this, but we wanted to try to
8 clearly set some context so that everybody knows how
9 all these moving parts fit together. And our first
10 context piece is going to be done by Eric Weiss, and
11 then we'll go to all of you, including the audience
12 for any questions that you might have.

13 By that time, Fred Emerson should be here,
14 and Fred's going to tell us about the NEI Circuit
15 Failure Issues and some of their work, then go for
16 clarifying questions, and at that point take a break.
17 And then we're going to come back for our first
18 discussion period, which is called "Discussion of
19 Threshold Questions".

20 In other words, if the goal is to identify
21 four, five, fifteen, whatever the most risk-
22 significant associated circuits as the basis for the
23 NRC Inspection Program, what issues do you need to
24 agree upon first before you get into those specifics.
25 Two issues that stood out for us were one, what is the

1 definition of associated circuit. And secondly, when
2 we talk about risk-significant, what are we talking
3 about there? What are the components of that?

4 We'll then go to lunch and try to figure
5 out who's going to escort this group to lunch, since
6 we're not operating on our usual more flexible process
7 here, but we'll figure that out. When we come back,
8 we want to start to talk about potential candidates,
9 these are associated circuits candidates or ranking.
10 And we're going to have a slide, what I call a
11 taxonomy, that Eric and his staff have put together as
12 sort of an opening on that for you to think about.
13 And then we're going to try to categorize these
14 candidates into most significant, medium significance
15 - perhaps those can wait for incorporation into the
16 NRC Inspection Program. And Eric is going to talk a
17 little bit more about this. Or perhaps those that
18 need more research before we can establish that they
19 should be in the inspection program. And what are the
20 low significance items that then do not need
21 inspection program. And we're going to continue that
22 for the rest of the day, and then do a sum-up at the
23 end. And I would just encourage you to give us your
24 views, and one thing that as a layman that I've
25 noticed more so in this area, perhaps, than in a lot

1 of other areas, is we use a lot of acronyms and, of
2 course, we know what we use acronyms, because it's
3 efficient. And I don't want to discourage you from
4 doing that today, but I would ask that when we first
5 use an acronym, for example EGM, ROP, we could go on
6 and on, that we identify, and I'll remind you of this,
7 what that is, so that the transcript will reflect at
8 least in the beginning what that acronym stands for.

9 You've heard the agenda. Before we go to
10 John, are there any questions about the agenda? Is it
11 clear what we're trying to do? Okay. And we can do
12 agenda checks, obviously as we go along through the
13 day, to see what's going to be the most productive
14 around the table. And with that, I'm going to turn it
15 over to John Hannon.

16 MR. HANNON: Thank you, Chip. I'd like to
17 thank everyone for coming. There's a few people in
18 the audience I want to recognize. Susie Black, the
19 Deputy Division Director for DSSA is here with us,
20 will be here for at least the first part of the
21 meeting. We also have Joe Birmingham, Program Office,
22 who's helping us with this topic. A couple of people
23 from the Division, Roy Fuhrmeister is here from Region
24 One, and we have Charlie Payne on the phone with us
25 from Region Two. Charlie, can you hear us okay?

1 MR. PAYNE: I hear you fine.

2 MR. HANNON: Okay. I think just from the
3 brief introductions that we've heard, I would suggest
4 that we have critical mass talent in the room here,
5 and I appreciate the level of interest, and the number
6 of people that were able to get here under the adverse
7 weather conditions, but I do think we have the
8 necessary talent assembled here to reach a real good
9 conclusion at the end of the day.

10 Just to briefly recap, Chip's mentioned
11 the purpose. The NRC needs to resume inspections in
12 the area of associated circuits. We want to do it in
13 a risk-informed way consistent with the Reactor
14 Oversight Program. I am committed to withdraw the
15 Enforcement Guidance Memorandum which placed the
16 inspection of associated circuits on hold by the end
17 of this fiscal year, by October. I intend to have
18 that EGM withdrawn, enabling a resumption of
19 inspection activity.

20 I would remind everyone that this is not
21 about the final resolution of the issue. Some of you
22 have mentioned some agenda topics that would be
23 constructive toward reaching a final resolution.
24 That's not what we're here to discuss today, so if
25 those kinds of issues can be put in Chip's parking

1 lot, we'll attempt to do that so we can keep focused
2 on the resumption of inspection activities.

3 Now the goal of this workshop is to, as
4 you've heard, identify and rank risk-significant
5 circuit analysis areas to focus our inspection. I
6 intend for us to obtain alignment on the areas that
7 should be inspected for maximum safety benefit.
8 Notice I didn't say there has to be a certain number
9 of items, I just want it to be an alignment on what
10 needs to be inspected obtaining the maximum safety
11 benefit. So a successful outcome of this meeting
12 would be that we conclude today with a ranking of
13 circuit analysis items that are risk-significant for
14 inspection purposes.

15 We want to be able to focus our inspectors
16 on the risk-significant area, obtaining the maximum
17 safety benefit using our limited inspection resources.
18 I'd like constructive participation. It's important
19 that we stay focused on the outcome we're seeking.
20 Chip is here to facilitate and we have a transcriber
21 here to record the meeting to help us stay on target.

22 Important that licensees prepare for the
23 resumption of the inspection, so what we determine
24 today will be important for the licensees as they move
25 forward in this area. Are there any questions from me

1 before we resume or continue with the meeting? I'd be
2 happy to take any questions right now at the opening.
3 Okay. If not, then let me turn it over to Eric who's
4 going to open up with a technical dialogue.

5 MR. WEISS: Well, I want to welcome you to
6 the Facilitated Workshop on Associated Circuits. We
7 have with us today a broad range of technical experts,
8 engineers, scientists from the NRC, utilities, NEI,
9 National Laboratories, consulting firms and others.
10 What we want to accomplish today is to see if we can,
11 as reasonable engineers representing many viewpoints,
12 agree on the most risk-significant circuit
13 configurations so that we can remove the Enforcement
14 Guidance Memorandum, the EGM, that suspended
15 inspection in this area, and resume inspections.

16 What we identify as the most risk-
17 significant items will go in what I'll call Bin One.
18 In the second bin, we're going to identify those other
19 associated circuit configurations that are of medium
20 significance or need further research to decide on
21 whether they're appropriate for inspections. The
22 third bin, as I'll put it, will have those things of
23 low significance, where we'll have to decide how to
24 deal with them in regulatory space so that they are no
25 longer contentious.

1 Everyone should benefit from this
2 approach. The public will get the most efficient and
3 effective inspections. They'll get the most safety
4 per inspection hour. The industry will get inspection
5 predictability, which will make their processes more
6 efficient and effective. Their dollars will be wisely
7 spent and give the public the most safety, and they
8 won't be involved in contentious matters with NRC to
9 no apparent purpose. And NRC will be able to resume
10 inspections in this important area, and serve our
11 mission.

12 As a word of caution -- Dan, can I have
13 the first slide, please. As a work of caution, I want
14 to remind everyone that what we're doing today will in
15 no way change a plant's licensing basis. We're
16 talking about a risk-informed approach to resuming
17 inspections. Next slide please, Dan. The landscape
18 of associated circuits issue is complicated with plant
19 unique licensing bases, and the regulation that has
20 generated some unclear expectations. For this
21 conference, we've provided participants through the
22 web with access to the NEI-001, which is their
23 approach to handling the circuits analysis issue, and
24 a copy of the NRC's draft NUREG on the subject, which
25 represents our perspective on historical viewpoints,

1 definitions and so forth, so that we could all speak
2 the same language.

3 We're considering endorsing NEI-001 in a
4 regulatory guide, but the outcome of today's meeting
5 is directed at inspection guidance. Next slide
6 please, Dan. As most of you know, the Brown's Ferry
7 fire was the seminal event in nuclear power plant fire
8 protection. It illustrated the vulnerability of power
9 plants to severe consequences should a fire occur
10 affecting circuits for safe-shutdown. And there was
11 a SECY 80-438A, which was the Commission paper that
12 resulted in the famous Appendix R rule, that
13 explicitly requires addressing associated circuits.

14 Next, Dan. Here on the screen is the most
15 relevant portion of the rule. Anyone associated with
16 the subject is already familiar with the difficulties
17 that this regulation has sometimes caused in terms of
18 its expectations. I won't read the slide to you
19 though. The next slide please, Dan.

20 Here is a definition of associated
21 circuits for the purpose of nuclear power plant fire
22 protection. I know there are many people in the room
23 who are experts in electrical engineering, but I would
24 point out that this is not the same definition as used
25 by the institute of electrical and electronic

1 engineers that appears in their standards. This is
2 the definition that we use in nuclear power plant fire
3 protection.

4 Implicit in this definition is that
5 understanding that Appendix R requires the physical
6 protection of required circuits by one of three
7 methods that I'm sure you are all familiar with as
8 experts, three-hour barrier, one-hour barrier with
9 suppression detection, or 20 feet with no intervening
10 combustibles in suppression detection. Next slide
11 please, Dan.

12 Attempts were made to clarify the
13 associated circuits issues in the past. There was a
14 Generic Letter 81-12, and subsequently Generic Letter
15 86-10. Note on this diagram that appears in the
16 Generic Letter, that there is an illustration of one
17 of the three types of associated circuits. Next
18 slide, please.

19 Here are four examples. The first example
20 illustrates the importance of an associated circuit.
21 Certainly, those consequences are important. Note
22 that the three types of associated circuits are
23 indicated by the underlining in the remaining
24 examples. It is generally the last type that is the
25 most difficult to identify, and the most controversial

1 once identified. Next slide, Dan.

2 What we want to focus our inspections on
3 are the most risk-significant areas of the associated
4 circuits, and remove the Enforcement Guidance
5 Memorandum, the EGM, so we can resume inspections.
6 Undoubtedly, some things will remain controversial
7 with their risk-significance at issue, and those
8 things deserve further study. We will give the public
9 the best possible inspections if we focus on the most
10 risk-significant items. We, as regulators, do not
11 want to focus our inspections on the least risk-
12 significance items because it doesn't serve anyone's
13 purpose.

14 Licensees should expect predictability in
15 their inspections, and that's what we're trying to do,
16 not only in this workshop but in our subsequent
17 actions to resolve the associated circuits issue. We
18 plan to deliver that by following the existing Reactor
19 Oversight Process, the ROP, and focus on the most
20 risk-significant associated circuits. I look forward
21 to working with you in the balance of this workshop.
22 Thank you very much.

23 MR. CAMERON: Okay. Thank you, Eric. And
24 you can either stay there or come back down to field
25 any questions that the participants might have. And

1 particularly since Fred isn't here yet, and he's going
2 to be on next, I would just encourage you if you have
3 questions about Eric's presentation, comments that you
4 want to make about that, please feel free to do so.
5 And if you could just, you know, use your name card.
6 Does anybody have a question for Eric about what the
7 NRC's objectives are, or anything that he said about
8 the fire protection framework? Great. Let's got to
9 Bijan.

10 MR. NAJAFI: I guess this is bringing down
11 your objectives to the second tier a little bit more
12 tangible. I'm trying to look to see what kind of
13 answers this group is supposed to arrive at by the end
14 of the day. I mean, I guess we talked about what I
15 call 5,000 feet elevation. I want to bring it down a
16 little bit. Let's say ideally, are we looking for a,
17 first, generic set of type of issues and questions,
18 that it be grouped in significant and not so
19 significant groups? Are we looking for attributes
20 that defines those circuits or systems or components
21 into significant and not so significant, or what is it
22 that, let's say at the end of the day, we're looking
23 for? I mean, a list of components, a list of
24 attributes, a list of circuit types? Can you sort of
25 provide a little bit more specific --

1 MR. CAMERON: Well, that's a real good
2 comment, because it may guide how we march through
3 sequentially the various issues. What do we need to
4 get to the --

5 MR. WEISS: Well, I tell you, I have some
6 preconceived notions about how we might best approach
7 the subject, and when we get to this afternoon's
8 session, I'm going to throw up a slide that might be
9 an approach, but the field is wide open. If you have
10 a better idea than I do, or the person sitting next to
11 you, we welcome those ideas. If there's a way to
12 approach this subject that's going to be clearer,
13 easier to implement than what we've conceived of,
14 that's in large measure why we're meeting today, is to
15 see if we can't come up with the best possible ideas.
16 And like I say, I personally have something to kick
17 the discussion off with if no one else does, but I
18 think we should, given the level of expertise in this
19 room, be able to come up with, I don't know, five to
20 twenty kinds of associated circuits where we can all
21 agree that they're risk significant. And if we find
22 them in a nuclear power plant, we should do something
23 about them. We have processes to deal with that, the
24 Reactor Oversight Process.

25 I realize I'm -- the downside is I'm

1 giving you a non-answer in terms of I'm not laying
2 down a strict ground rule for what has to be done, but
3 on the other side of the coin, the positive side is
4 I'm indicating that we're receptive to new ideas and
5 new ways of thinking about things, and we want to
6 arrive at this answer collegially. We want to have
7 volume from the community of people who understand the
8 issue the best.

9 MR. CAMERON: And, Bijan, before you go
10 again, and I want to get -- this is an important
11 issue, because this is really sort of agenda setting.
12 I want to get feedback from others. The 11:00 session
13 was meant to try to identify, I think, some of the
14 attributes - maybe that's the wrong word, but to try
15 to establish that macro set of criteria attributes
16 that would be used to then focus in on the specific
17 associated circuits. And Eric does have a taxonomy on
18 that, but let's test this out and make sure that we're
19 all going in the right direction on this. Bijan, what
20 do you have to say after you heard Eric?

21 MR. NAJAFI: I guess in that case, I would
22 re-encourage for people that are on both end of the
23 inspection, the inspectors and the people who respond
24 to these inspectors, actively participate in this
25 discussion, because speaking for myself, I'm not sure

1 what kind of information would be helpful to an
2 inspector or somebody who can respond to that
3 inspector. What angle of that information could be
4 effective. I can talk to them a certain attribute
5 that they can tell me in the field is really not going
6 to make their life any easier, so we -- I think it's
7 very important to have participation from both the
8 inspectors and whoever responded to them from the --
9 I mean, the licensees or the plants to participate in
10 this, to make sure that those that we come up with is
11 useful and practical.

12 MR. CAMERON: Right. And, Bijan, you've
13 I think put your finger on a key element here. It's
14 that the idea of identifying these "risk-significant"
15 circuits is to resume the inspection program. How do
16 you give clear guidance to an inspector so that they
17 know what they're looking for, where to stop, and
18 that's why we need to have that type of input from all
19 of you.

20 Could we get some reaction to this, Chris?

21 MR. PRAGMAN: A few years ago we tried
22 asking ourselves this question, the BWR Owner's Group
23 effort to write their guidance document, and what we
24 found when we discussed it with different plants was
25 what may be a very risk-significant combination at

1 Plant X really had no risk-significant at all at Plant
2 Y, how the cables are routed, some underlying original
3 plant design that you are basically stuck with, the
4 plant was just laid out that way. So by the time we
5 were done, we thought we would be doing a disservice
6 to make a list of components and say are all BWRs
7 should look at this component. And instead we've
8 focused more on attributes: is there something that
9 could cause an immediate and unrecoverable condition,
10 no matter how good your safety-shutdown analysis is,
11 you can't bring the plant back. And that's where we
12 essentially had to leave it among ourselves because we
13 weren't really helping anyone by looking at specific
14 components. And if you all brainstorm about what is
15 important, there might be something out there that
16 Plant Z has that we haven't considered. So by
17 actually making a list we are limiting the fire
18 protection a plant has.

19 MR. CAMERON: Can we get some input from
20 Eric on Chris' point? And also, maybe for my benefit
21 more than anybody else's, is we've heard the term
22 "attributes" twice. Can we make sure that we're using
23 the term attributes in the same way? I'd like to
24 understand what you mean by attributes, and we need to
25 get a reaction from Eric, and apropos of making sure

1 we hear from NRC Staff in the Inspection Program, we
2 will go out and get a comment from you.

3 Eric, do you want to just start off with
4 a reaction to Chris, and then I'd like to firm up this
5 definition of attribute. Go ahead.

6 MR. WEISS: I agree with Chris. I think
7 we would be getting ourselves into trouble if we tried
8 to develop a list of components. To clarify the
9 attribute issue, I think maybe the best way to do
10 that, and it's a shame that Fred isn't here to do it
11 for us, would be to talk about some tests that were
12 conducted at Omega Point Laboratories under NEI and
13 EPRI auspices, where they examined a number of
14 attributes, if that's the right word, of some cables.
15 There are probably people better in this room to
16 describe what happened at Omega Point than I, but just
17 to throw out on the table for those people who aren't
18 familiar at all with what happened at Omega Point,
19 there were a series of tests conducted on control
20 cables largely, both multi-conductor and single
21 conductor cables, thermal set and thermal plastic
22 insulation in cable trays. They were configured in
23 different ways, and these attributes, if you will,
24 thermal plastic, thermal set, armored, not armored,
25 whether you got a ground or a hot short. These sorts

1 of things are what I would regard as candidates for
2 attributes for inspection.

3 I guess to reduce it to the absurd,
4 suppose we found an associated circuit that was in a
5 multi-conductor cable, and it only took one hot short
6 in that cable to achieve an unrecoverable situation
7 leading to immediate core damage or otherwise
8 preventing a plant from achieving safe-shutdown. I
9 think most people in the room would say well gee,
10 that's a circuit I'm -- if I find it in an inspection,
11 I think the licensee ought to have an answer for that
12 situation, so maybe there's some people in the room
13 that would like to jump in and volunteer the
14 attributes that were tested at Omega Point, and a
15 synopsis of what happened was.

16 MR. CAMERON: Before we go down too deep
17 in this, I want to hear from our NRC Regional Staff,
18 but from what you're saying, Eric, it sounds like
19 depending on how we define, if we all define attribute
20 the same way, that what we'd be looking for coming out
21 of this, is to focus on attributes, not specific
22 components but attributes. That would be the basis
23 for the inspection program?

24 MR. WEISS: Yes.

25 MR. CAMERON: Okay. We're going to come

1 back up to all of you at the table, but let's go for
2 NRC Regional Staff. And please tell us your name.

3 MR. FUHRMEISTER: I'm Roy Fuhrmeister from
4 Region One, and one of the first questions that comes
5 to my mind is how are we going to define risk-
6 significant? Are we going to define it as high
7 consequences if it's not mitigated? Are we going to
8 define it as achieving an unrecoverable condition, or
9 are we going to define it as the most likely to occur?
10 And that will change our target set when we go out and
11 do our inspection.

12 MR. CAMERON: Roy, let me make sure I
13 understand this. You're saying that depending, and we
14 have that definition of risk-significant on the agenda
15 for discussion, but what you're saying is that
16 depending on how we define risk-significant, and you
17 gave three possible ways to do that, that the
18 attributes that you look at will change?

19 MR. FUHRMEISTER: Yes.

20 MR. CAMERON: All right. Thank you.
21 Let's go to Dennis, and then we'll go to Steve, and
22 then back over to Bijan. Dennis.

23 MR. HENNEKE: Yeah. And I think the
24 testing and the actual panel elicitation associated
25 with NEI-001 came up with a number of the attributes

1 that we can look at. When we want to point to where
2 to look, the first thing you go to from a PRA
3 perspective would be Table 7-2 of the expert
4 elicitation in the EPRI Report, expert elicitation.

5 But what that says is that a plant that doesn't have
6 armored cable, for example, you may have a scenario
7 that may be risk-significant, and you go to plants
8 like our Duke Plants that have armored cable, and it
9 won't be. So you could change a single attribute and
10 go from risk-significant to non-risk-significant. But
11 more commonly even would be multiple attributes, and
12 that's kind of where we're trying to figure it out.

13 It might have even an armored cable
14 situation where it's over a large fire source or, you
15 know, multiple cable trays can be affected, so it
16 would be just the fire source itself can now be an
17 attribute; whereas, if that same scenario were over a
18 single electrical panel, say a termination can that
19 didn't have a high heat release rate, it would be very
20 hard to damage more than one cable tray. Then it's
21 not risk-significant, so the attributes are kind of a
22 hard thing to balance. You know, if we would have
23 known all of the attributes for risk-significant
24 scenarios, we would have already gone out and
25 identified them, and taken care of them, but that's

1 kind of the hard thing, to go look at all the
2 attributes in our plant and try to figure out where
3 our vulnerabilities are. It's kind of a hard thing to
4 do.

5 MR. CAMERON: Dennis, are you sort of
6 affirming what Roy had said about, that you need to
7 wrestle with this definition of risk-significant,
8 where you can get into the attributes?

9 MR. HENNEKE: Actually, what we've been
10 trying to go with NEI-001 was to standardize what
11 risk-significant is, and with regard to the other SDP
12 processes, and that's core damage and large early
13 release, and so to have some other consequence that's
14 outside of that bounds, that may be different than
15 that, would be kind of counter-productive, and not
16 similar to the other types of inspections.

17 For example, we had in our last inspection
18 at our Oconee Plant, we had an issue where we had an
19 emergency feed-water, aux feed-water over-feed event,
20 and the scenario resulted in a loss of subcooling, and
21 so we were out of bounds of our design basis, but it
22 didn't lead to core damage. I mean, we had too much
23 cooling, and it wasn't an over-cooling event that
24 resulted in core damage.

25 Eventually when you shut the over-feed

1 down, subcooling would return. Those are the types of
2 things that it's a different consequence than what
3 we'd normally be looking at in PRA space. Those are
4 the types of consequences we think would be
5 counterproductive to be going after. We'd be more
6 interested in looking at core damage and release to
7 the public as a consequence.

8 MR. CAMERON: Okay. Thank you. I'm going
9 to ask Steve to try to maybe put this all in context.
10 Steve.

11 MR. NOWLEN: Oh, gosh. Okay. Well, I was
12 going to respond to Chris' comment. I think he's
13 exactly right, to try and develop a list of generic
14 components and systems is not going to be very
15 productive because it's going to be varied from plant
16 to plant, so I think you're exactly right there.
17 You've got to look at it in the context of the plant
18 that you're examining so it's right on target.

19 Roy mentioned -- I would rephrase in the
20 risk context a little bit what Roy said. We think
21 about, and maybe this will get to Chip's challenge
22 here. We think about risk usually as having three
23 pieces, the likelihood that you get a fire, the
24 likelihood that the fire causes damage, and then the
25 consequences of the damage that you see. So those are

1 sort of the three pieces of risk, and I think you have
2 to be a little -- don't get too hung up about how you
3 exactly slice which little item goes in which of those
4 pieces, but those are the three big pieces. I'm not
5 sure where this particular workshop wants to go in
6 terms of those three pieces. I mean, we've got a
7 pretty good handle on fire frequencies. There's lots
8 of stuff out there on that. Fire modeling, I think
9 there's a lot of other activities.

10 I can almost suggest that perhaps we're
11 focused on that third piece, the consequence piece
12 today. And with that, I throw in how the circuits
13 behave given damage, so I'm fairly broad on what I'm
14 defining there, so I think that's a good place for
15 this panel to focus.

16 Final point is, going back to our
17 requantification studies that we're doing for research
18 with EPRI, we had this same kind of a discussion the
19 other day, and we also were leading down this idea of
20 attributes. And we were even thinking about how you
21 might classify attributes. You'd have physical
22 attributes, and electrical attributes, and functional
23 attributes, and how important is this particular thing
24 to your plant, for example. So I think there's a
25 framework you can think about in terms of these

1 attributes and, you know, to go too far down that
2 path, we're a little ahead of the game. But I think
3 that's the correct way, and so the idea would be
4 again, as Dennis mentioned, a preponderance of
5 attributes that lead you to conclude that something is
6 more risk significant than something else.

7 That's probably a good enough answer for
8 right now. I don't know that we need an absolute
9 answer, is it ten to the minus four, is it ten to the
10 minus three, is it -- you know, it's not there but,
11 you know, I don't think we need an absolute answer.
12 I think a relative answer for today is probably good
13 enough.

14 MR. CAMERON: Steve, let me just go back
15 and clarify some things with you before we go to
16 Bijan. The three components of risk, I just wanted
17 you to repeat that for everybody. One was likelihood
18 of fire.

19 MR. NOWLEN: Yeah, the likelihood that
20 you'd get a fire. The second one is the likelihood
21 that the fire causes damage to some set of plant
22 equipment. And then the third piece is the
23 consequences of that damage state, how that impacts
24 your plant safety.

25 MR. CAMERON: Okay. And then you talked

1 about, good points about preponderance of attributes
2 and relative to this. Can you connect -- and you said
3 that the focus should be on those three elements. Can
4 you tie the focus on consequences into the identifying
5 the preponderance of attributes, just make that
6 connection for us.

7 MR. NOWLEN: Yeah. I guess I'll phrase it
8 in what it means you probably don't want to spend too
9 much time on, and I would say, you know, this panel
10 shouldn't spend too much time thinking about fire
11 frequency, because I think we've got that pretty well
12 handled. I'm not sure we should worry too much about
13 fire growth and damage, which is that second piece.
14 You know, again there's lots of things out there that
15 handle that.

16 I think the challenge for this group,
17 especially given the makeup here, is to think about
18 circuits, how they're going to respond to fires, and
19 what are the sorts of features or attributes, or
20 characteristics, however you want to say it, that lead
21 you to certain types of damage being more risk-
22 significant than others. I mean, certain categories
23 of events, certain types of circuits, certain
24 functional elements of the plant. It seems to me
25 that's where this group could be most productive.

1 If we get into the things about, you know,
2 worrying about suppression and detection, and timing
3 of all that, I think we're going to get bogged down in
4 a lot of stuff that isn't the best use of this group's
5 time.

6 MR. CAMERON: Okay. Thank you. That's
7 very useful, I think, for discussion. And let's test
8 this out with people around the table to see if they,
9 first of all, understand what you're saying. And
10 second of all, whether they agree with it.

11 Bijan, what do you think about Steve's
12 suggestion about what the focus should be?

13 MR. NAJAFI: Well, I guess I'd like to
14 sort of trace back a little bit. And I almost -- I
15 mean, the definition of the risk that you suggested,
16 I agree that basically there's three pieces of it.
17 And even today to make that decision of what
18 attributes should be in which category, we have to go
19 through this mind exercise of combining all three.
20 Even though we focus on the consequence third piece,
21 we have to have in mind that that accounts for the
22 other two, so that's part of the challenge. But I do
23 agree that, if I understand it correctly, the
24 objective today is to focus on the third piece which
25 is the consequence, and not to worry about the first

1 two.

2 I guess now I have a question for the
3 Staff, that the logical point or place for these three
4 to be linked together in an inspection process is SDP.
5 And since that revision is being done, how the results
6 of today's discussion is going to integrate into that
7 SDP revision.

8 MR. CAMERON: Could you do the acronym for
9 us?

10 MR. NAJAFI: Significance Determination
11 Process.

12 MR. CAMERON: Okay.

13 MR. NAJAFI: That there is a group of
14 people that is developing these revisions for these,
15 I guess in the next three months, I assume. And there
16 are meetings tomorrow for some test, and one of the
17 group involves safe-shutdown systems and component
18 surface circuits. And I would suggest that this is
19 basically in direct relevance to that kind of
20 revision, so there's got to be sort of the two link,
21 and sort of be consistent.

22 Coming back to -- I mean, we have -- I
23 notice that through this discussion we have dropped
24 from what I called 5,000 feet elevation, we're coming
25 down. I mean, another level below these consequences,

1 I think what you need to focus on is that there is a
2 series of attributes that account for the circuits,
3 what kind of circuits we consider important, whether
4 it's basically three phase circuits, grounded DC
5 circuits, or multiple high end feed-in faults, so
6 those try to define attributes, including the -- I
7 mean, the type of the cable, thermoset versus
8 thermoplastic, and a number of attributes that Eric
9 was mentioning in these testings about the intra-cable
10 versus inter-cable, and so on and so forth.

11 I would also recommend, depending on how
12 these are to be used, there are attributes associated
13 to the components and the function of those
14 components. Is it easier to tell an inspector that
15 don't worry about valves in two different systems, to
16 try to provide those attributes from a component
17 sense, versus to provide those attributes from circuit
18 sense. So there's two set at least to come one level
19 below those, is a component system set of attributes,
20 I believe, and there is a circuit set of attributes.
21 I'm not sure at this point which one is more useful to
22 an inspection process. In some cases, and I suspect
23 that depending on the conditions, one may be more
24 useful than the other, and at times maybe a
25 combination of the two may be useful.

1 MR. CAMERON: Okay. Let me try to sum
2 this up. First of all, it seems like you're agreeing
3 with what Steve was saying about the focus being on
4 consequences. I think we need to get to the rest of
5 you around the table and see what you think about
6 that.

7 You also raised an issue that perhaps we
8 can have a short answer for now, which what are the
9 implications of the SDP, and Steve may be able to give
10 us a little snapshot on that. But I did put that up
11 in the parking lot. You may want to spend more time
12 on that later.

13 And then, Bijan, you've fleshed out a
14 little bit more about this attribute issue, which
15 could be -- you could have attributes of the
16 component, as well as attributes of the circuit that
17 contribute to the consequence part of the equation.
18 That's what I heard. And, Steve, do you want to just
19 do the SDP implications for us before we go over to
20 Chris?

21 MR. NOWLEN: Yeah. I am involved in the
22 SDP, and I'm on the team that's been assigned the
23 circuits issue. The strawman recommendation was not
24 to attempt to put circuits in the SDP rewrite at this
25 time. There are some real challenges to doing that.

1 I don't want to go into those, but it's definitely a
2 challenge.

3 That decision is not final by any means.
4 There is a panel that's going to be discussing it.
5 Fred Emerson is a member of that panel, as well. And
6 there are those who would like to see the circuits
7 brought into the SDP, so that's a topic of current
8 discussion.

9 MR. CAMERON: Okay. Thanks. John.

10 MR. HANNON: If I could add to what Steve
11 -- what I would anticipate is that this -- the results
12 of this workshop would inform the SDP development.
13 What we come up with today may be instructive to the
14 group that is tasked with revising the SDP, to the
15 point where it may be less challenging for you to
16 include circuits in the SDP. We have to get this job
17 done first, and the results from this effort would
18 inform your work on the SDP.

19 MR. CAMERON: Okay. Great. I think that's
20 very clear. In other words, what comes out of here,
21 may be useful for the SDP effort in terms of how they
22 consider circuits. Let's go to Chris, and I want to
23 make sure I check in with the rest of you on what
24 we're developing here, and particularly with the NRC
25 Staff to see if we're heading in the right direction,

1 as far as what they want to get out of the workshop,
2 so we'll go around the table, and eventually we'll
3 welcome Fred who just came in, and bring him up to
4 speed on where we are. Chris.

5 MR. PRAGMAN: I just want to add a little
6 more fuel to the fire on the SDP response to Bijan.
7 We had a task team meeting. Dan Frumkin is leading
8 it, Ken Sullivan was also involved. We talked about
9 what is a safe-shutdown finding, how to put that into
10 the SDP process. And we quickly devolved into what
11 circuits we were interested in separating and are we
12 protecting them or not, so maybe Steve's team is
13 trying to skirt around the issue. We may have driven
14 right into the center of our task force. I think it's
15 going to end up the other way.

16 MR. CAMERON: Okay. Thanks for that add-
17 on on SDP. Let's go to Bob, and then we'll come over
18 to Dennis. Bob. And maybe push that mic over to you
19 a little bit so it's facing you. All right.

20 MR. KALANTARI: I guess what I'm hearing
21 is we're trying to come up with processes to help the
22 inspection team, the NRC to go out and do the
23 inspections in the near future. The problem I have
24 is, we are still far from identifying the requirements
25 to do deterministic Appendix R analysis, the

1 fundamental issue with regard to the shorts, hot
2 shorts, how many shorts, how many serious actuations.
3 Those have to be defined before we can identify what's
4 significant, what kind of failures we have to
5 postulate. Those are all input to the analysis.
6 Okay?

7 Without those, we cannot identify what's
8 significant. This document came up with a number of
9 examples. What happens when your HPSI pump starts
10 and, you know, in 60 or 90 seconds you fill up the
11 reactive, and you didn't even have RCIC or safe-
12 shutdown system component in this case. Now that
13 start of HPSI pump could be based on two hot shorts,
14 a cold short, a hot short, things that the industry is
15 still struggling with. And those have to be defined
16 and finalized before we can go there.

17 We are not there. We have written the NEI
18 document for revision with so many comments. We have
19 Ken's document. We have 805 Appendix D, and we still
20 haven't addressed that. Without that, I don't think
21 we're going to get there.

22 MR. CAMERON: Can I get a reaction from
23 Eric on that. Eric, can you try to place that into
24 the context that we've been talking about here?

25 MR. WEISS: Well, yeah. On the issue of

1 do we need to clean up the deterministic space? I
2 agree, we do. Can we use risk to focus inspections in
3 the most risk-significant areas while we're cleaning
4 that up? I think we can. I don't think we need to
5 decide whether it's end circuits or end factorial
6 circuits. What we need to decide is, is there an
7 unrecoverable situation that will be caused by a high
8 probability, high consequence event? And if the plant
9 has that, then we need to put that into our existing
10 regulatory processes and deal with it. That way the
11 public gets the most bang for their inspection buck,
12 and in the meantime while we're sorting out the SDP
13 and closing the many problems in the circuit analysis
14 arena that go beyond this, we'll be providing safety,
15 and we'll be providing predictability. And we'll be
16 providing efficient and effective inspection.

17 I think as plants move into the 805
18 environment, for those that choose to move that way,
19 they will be inherently adopting a risk-informed
20 performance-based approach, which means that an answer
21 that we come up with today should be exactly congruent
22 with their licensing basis. Those plants that have a
23 licensing basis that's in old deterministic world and
24 is somehow out of kilter with what we find today, we
25 do have an existing process to deal with that, and

1 that's the Reactor Oversight Process, so that's my
2 short take on it. I don't see that one precludes the
3 other. I don't see that proceeding in a risk-informed
4 way precludes us from approaching the deterministic
5 problems and vice versa.

6 MR. CAMERON: Okay. Thank you. And, Bob,
7 we may -- I'm going to put that up in the parking lot.
8 We may come back to that, and I'm going to ask Dennis
9 to give us his views. And then I'd like to try to
10 summarize this for Fred so he knows where we are,
11 because he's going to be going on next with some
12 context. Dennis.

13 MR. HENNEKE: Okay. Earlier Steve had
14 mentioned three categories of attributes that they
15 were thinking about, and that was the physical
16 attributes, electrical attributes, and the functional
17 attributes, and it kind of struck a chord that that's
18 exactly the type of thinking that we had put forward
19 in NEI-001. And in particular, the preliminary
20 screening.

21 Now the preliminary screening, it may be
22 a little bit too simplistic, it may miss some -- miss
23 everything that we really need to cover in order for
24 it to be effective, to screen out fully scenarios that
25 could lead to failure of function or core damage, but

1 from -- if you reverse that in looking at things that
2 are important, you could use the attributes we put in
3 it. There's a little matrix in there that has
4 frequency and consequence on the matrix. And if you
5 look at physical attributes, we had put in with regard
6 to frequency of the fire, in the long run you also
7 have to look at the damage. And basically, how big
8 can the fire get, and how much damage can it cause, so
9 physical attributes are generally the frequency of the
10 fire and the size.

11 The electrical attributes are basically
12 the spurious operation probability, which we look at
13 for the EPRI document for expert elicitation. And
14 then the functional attributes are does it fail to
15 function? Does it lead directly to core damage? And
16 so in ranking things, things with -- frequent fire
17 with a high spurious operation probability that does
18 fail to function is our highest category of concern.
19 If you start having a less frequent fire but it fails
20 to function and has a high spurious op, that would be
21 less important and so on, until you get down to the
22 very right and bottom of the matrix where it's a low
23 frequency fire, a low spurious operation probability,
24 and it doesn't fully fail to function. There's still
25 some function or operator action available to mitigate

1 core damage, those are of less concern.

2 That's kind of where we were looking at
3 it. If we could bring that into the picture with
4 regard to inspections to say look for these type of
5 attributes, maybe that would be helpful.

6 MR. CAMERON: Let me clarify this. We
7 were talking about focusing on consequences, and Steve
8 I believe noted these three types of attributes. And
9 Dennis talked about this in terms of frequency, odd
10 consequences. Can you comment on that for us?

11 MR. NOWLEN: Yeah. I had a little
12 different intent when I meant physical
13 characteristics. I was thinking of things that would
14 be say cable trays versus conduits and, you know, one
15 layer cables versus five layers of cables. You know,
16 those kinds of physical attributes that would indicate
17 a higher or lower likelihood of certain types of
18 faults.

19 In terms of the electrical, I was thinking
20 in the context of, for example, internal faults within
21 a multi-conductor cable versus cable-to-cable faults.
22 We know that's an important attribute. Going back to
23 even physical, I don't know whether you put this in
24 physical or electrical, but things like thermal
25 plastic versus thermoset. Those were the kind of

1 things that I was thinking in terms of the physical,
2 but I'm still in that third piece where I'm thinking
3 about the consequence side of this, you know, what
4 does this circuit do to me? So I hadn't really
5 included the thought of putting a fire frequency in as
6 a physical attribute on this particular one.

7 MR. CAMERON: Okay.

8 MR. NOWLEN: It's certainly part of the
9 risk equation but again, I'm trying to focus on that
10 third piece.

11 MR. CAMERON: All right. Thanks, Steve.
12 I'm going to try to sum this up for not only Fred
13 Emerson, but for all of you, and then if there's
14 comment from the audience, and then go to Fred for his
15 presentation, because I think we're making a nice
16 segue into that. But it seems that what people --
17 what I've heard is that we should focus on the
18 consequence in terms of this workshop, the most
19 productive thing that we could do is to focus on the
20 consequences of that three piece risk equation that
21 Steve gave us, to focus on what are the consequences
22 of the fire, and that in looking at the attribute of
23 circuits that we would look at the attributes that
24 would give us certain types, certain levels of
25 consequences. And Bijan clarified that you're not

1 only looking at the attributes of the circuits, but
2 you may be looking at the attributes of the component
3 system, as well.

4 Now somewhere in here we have this well,
5 there's physical attributes, functional attributes,
6 and I'm forgetting what the third one is. Electrical
7 attributes. As Dennis pointed out, you can look at
8 those attributes in terms of frequency, as well as
9 consequence, but what I heard around the table is
10 people think we should focus on consequences. Now I'm
11 not setting that out as some sort of a concrete
12 conclusion here. We can still go back and question
13 that, but that's sort of where we've been so far. And
14 before we go to Fred, and Fred, you can apply some of
15 this, relate some of what you're going to say to this.

16 Let me go on to the audience, and then let
17 me go to Ken for one final comment before going to
18 Fred. And please give us your name and affiliation,
19 if appropriate.

20 MR. TRUBATCH: Hello. My name is Sheldon
21 Trubatch and I represent the law office of the same
22 name. We are focusing on consequences, so I have to
23 ask myself the consequences of plots. I guess the
24 consequences of plots are the scenarios that we have
25 to consider. And it seems to me then that what we're

1 looking at, somehow bounding the scenarios that we
2 have to consider by looking at the attributes,
3 determining which of those scenarios is to be
4 considered to have sufficiently high risk consequence
5 or improbable to occur.

6 MR. CAMERON: Sheldon, you're taking us
7 back up to the frequency probability part of it.
8 Okay. Wade.

9 MR. LARSON: Wade Larson, EPM, I have been
10 involved in fire protection since 1977, starting with
11 Appendix A, Appendix R, have been associated with the
12 issue of interpretation of Appendix R since the
13 beginning. I think that Chris Pragram's his first
14 comments need to have some additional information.
15 Chris focused on unrecoverable events. The team
16 members that he interfaces with recognize that if you
17 take a plant passed a certain point, you don't know
18 where you're going to be, and you get into a somewhat
19 unrecoverable state. We see that when we run plant
20 time lines and we look for inflection points, and we
21 know we have to have certain operator actions occur
22 before certain other things occur. If you draw a time
23 line for operator actions, a time line for post fire
24 activities, we have a pretty good understanding of
25 what you have to accomplish by when. I think Chris'

1 points that his team know those issues. I think that
2 we have to have something simple where we look at what
3 those are, what is taking place there, what can get us
4 to those situations, and to disaggregate the events
5 leading up to that. I think that's hard for
6 inspectors to go out and do inspections. We have to
7 work up an inspection process that makes sense from an
8 operational point of view.

9 MR. CAMERON: Thanks, Wade. And on that
10 note, let me just check back in with Roy who had a
11 question for us earlier. Roy, you've heard this
12 discussion. Is it becoming clearer to you what's
13 going to happen here?

14 MR. FUHRMEISTER: The problem that I see
15 coming out of the gate is that if we're going to use
16 the classic revised Oversight Program definition of
17 risk-significant as a change in core damage frequency
18 or large early release, I'm going to have to run a
19 full significance determination on every one of these
20 things that comes up in order to determine should I
21 pursue it. And I don't want to go there, and you
22 don't want me going there, because that's not
23 efficient, so we're going to need some kind of a
24 screen coming out of this to tell us up front which
25 ones do we pursue, and which ones do we walk away

1 from, without having to go full-blown significance
2 determination to come up with the "risk-significance"
3 from the ROP standpoint.

4 MR. CAMERON: Okay. Thank you, and let's
5 get two final comments here, and then go to Fred's
6 presentation, and then we'll take a break. But I
7 guess I would like to get some reaction from Eric or
8 John, Mark to Roy's point about using the definition
9 of risk-significant that's used in the SDP process,
10 how using that is not going to get us to where we want
11 to be coming out of this meeting. Do you want to do
12 that for us, Eric, now?

13 MR. WEISS: Yeah, I'd like to give it a
14 shot. It seems to me that if we lifted the EGM, the
15 Enforcement Guidance Memorandum, and we said
16 inspectors, go find these associated circuits that are
17 risk-significant, because whatever, they have these
18 attributes, they lead to core damages, and it's
19 whatever, thermoplastic, thermoset, whatever, it's one
20 hot short, or two hot shorts. And we will be
21 introducing into the inspection process a great deal
22 of efficiency, because it has come to our attention in
23 the past that there have been controversies associated
24 with things that aren't risk-significant. And if we
25 can dispense with those, we're serving everybody's

1 purpose.

2 Now ultimately yes, I stipulate that the
3 SDP needs to be consistent with what we're doing. Do
4 you need to run a full SDP on each and every one of
5 these? Well, I think every inspector before he goes
6 out has a bagman trip and he establishes the plant's
7 licensing basis. And if it's clearly within the
8 licensing basis, and it's clearly something we've
9 identified as risk-significant, I don't think the
10 industry, the public, or the NRC will have any
11 disagreement that these things need to be addressed
12 and put in the corrective action program.

13 If it turns out that the licensing basis
14 is not clear, then we have to confront the existing
15 processes, the Reactor Oversight Process, the backfit
16 process, and we have to use those processes
17 appropriately, so I think that it is possible to
18 construct an EGM that will serve everyone's purpose,
19 that will get the public the safety that they need,
20 the licensees the predictability that they need, and
21 to get the NRC back in the business of inspecting
22 associated circuits. And hopefully, we won't trip
23 over the SDP process on the part of what we need to
24 do, which I don't expect will be the case in the
25 majority of instances.

1 MR. CAMERON: Okay. Are you finished,
2 Eric?

3 MR. WEISS: Yes, thank you.

4 MR. CAMERON: Let's have two final
5 comments, and then let's ask Fred if he's ready to
6 tell us a little bit about NEI-001. First, Ken,
7 comments and then we'll go to Bijan. Ken.

8 MR. SULLIVAN: I guess my comment is more
9 in line with a question. I guess from the inspector's
10 perspective, I think what he needs to have is clear
11 definition of what an unacceptable consequence is. Is
12 it sheerly core damage frequency, or is it an
13 inability to maintain performance criteria within
14 those specified regulations? So if we can come up
15 with what an unacceptable consequence is, I think it
16 would help inspectors tremendously.

17 MR. CAMERON: Okay. So I think what I'm
18 hearing is --

19 MR. SULLIVAN: There's certain performance
20 criteria specified in the regulation for safe-shutdown
21 systems, and an unacceptable consequence in one
22 inspector's mind be the inability to maintain those
23 parameters within those performance criteria. Another
24 inspector may think well, it's not going to lead to
25 core damage; therefore, it's not a high consequence.

1 So if we can define that a little clearer, I think it
2 will help inspectors a whole lot.

3 MR. CAMERON: Okay. So you're not -- I
4 mean, you're basically agreeing with the fact to focus
5 on --

6 MR. SULLIVAN: The focus should be on
7 consequence, but you need to define what a high
8 consequence is. Is it purely core damage frequency?

9 MR. CAMERON: And when you said "high", I
10 guess you're saying high would be your -- high, you
11 used unacceptable, but --

12 MR. SULLIVAN: Unrecoverable condition.

13 MR. CAMERON: Okay. All right. Okay.
14 Thank you, Ken. Bijan.

15 MR. NAJAFI: Well, I guess my question is
16 -- I mean, I'm listening to all of this. I'm going
17 back to my very first question, what is the end result
18 that we're trying to get out of this process? I mean,
19 what is the end of the day our desired outcome,
20 because I thought I was more clear, now I'm a little
21 bit more fuzzy again what the desired end result is.

22 First of all, with respect to what Ken
23 said, that changed my question a little bit now, is
24 that I thought the objective of this meeting is to
25 define risk-significant, so that risk is becoming our

1 figure of merit by stating that our objective is to
2 define what is more risk-significant, or prioritize
3 into groups based on risk, so risk is our measuring
4 stick.

5 But coming back to the three part, to the
6 risk that Steve was talking about and focus on the
7 consequence, to define the risk-significance you have
8 to have the whole picture. With one variable in the
9 equation you can't define risk. You have to have the
10 other three, so now we are faced with two possible end
11 outcomes, is to provide a set of attributes or tools
12 that somebody can take and with some tool, whether
13 it's NEI-001 or SDP process, to determine risk-
14 significance using the other two pieces on their own,
15 or we come up with a set of attributes for only the
16 consequence piece which we determine to be independent
17 of the other two. So we're saying forget about the
18 first piece and the second piece. These attributes,
19 like for thermoset or whatever, or our table, don't
20 worry about it if we can defend it, then we either
21 have to define an independent set of attributes for
22 consequence alone, or to provide a vehicle that those
23 attributes can be combined into a risk decision tool.

24 MR. CAMERON: Okay. Thank you, Bijan, and
25 I think we need to at some point try to get a

1 resolution to that issue. In other words, do we just
2 independently look at consequences as has been
3 suggested, and/or do we try to define attributes by
4 looking at all parts of the equation that were brought
5 up? Is that basically what you're saying?

6 MR. NAJAFI: No, what I'm saying is that
7 if we define the attributes as they will not be
8 independent of the other two pieces, we do not need to
9 talk about the two other pieces of the equation.

10 MR. CAMERON: Okay.

11 MR. NAJAFI: But we have -- we in turn, in
12 a way, expect the user to know enough to use whether
13 the SDP or any other one to convert the attributes
14 that we told them to a decision, what we told them
15 directly do not lead to a decision, because it's --
16 risk is not driven by consequence alone unless you
17 make it independent in some way of the two other
18 pieces of the equation.

19 MR. CAMERON: All right. Thank you.
20 Thank you, Bijan. Fred, are you ready to talk to us?
21 And I think you've sort of got a flavor for what we've
22 been talking about up to this point. Fred Emerson,
23 Nuclear Energy Institute.

24 MR. EMERSON: It sounds like you've had an
25 interesting discussion so far. Next slide, please.

1 These are the topics that I intended to cover. I'm
2 going to talk a little bit, this is more or less a
3 brief walk-through history, which hopefully we won't
4 have to relive much longer. Then I'd like to spend a
5 little bit of time talking about NEI-001 and what it
6 was intended to do, and what it was not intended to
7 do. And lastly, I'd like to address some specific
8 proposals for this workshop, as far as binning types
9 of things that the inspector should be looking at.

10 Before I get into that, I'd like to just
11 say up front, I think this workshop has a very useful
12 purpose, if the purpose is to define what the
13 inspector should be looking at, but I'd like to extend
14 that a little bit further. Part of the reason that
15 NEI-001 came into existence in the first place was
16 because there was a difference of interpretation of
17 the regulations between the licensees and the Staff,
18 which emerged over the last five or six years. And we
19 needed something -- we need to end up with something
20 where the inspectors and the licensees are on the same
21 page.

22 I've gotten numerous phone calls on this
23 and other issues where it was clear that that was not
24 the case. When the NRC inspectors come in with one
25 set of expectations, and the licensees have another

1 set of expectations, that's a formula for trouble.
2 And I don't want -- we've had enough discussion on
3 this topic in the deterministic and regulatory sense
4 for the last six years. And whatever we end up with,
5 we need to have clarity on both sides of the
6 regulatory fence so that everyone knows what the NRC
7 expects, and what they should be doing to address
8 those expectations. Okay. I'll stop philosophizing.

9 As I said, the basic issue was differences
10 in interpretation. I'm not even going to try to state
11 what all of those differences were, but that was the
12 reason why early on there was an exchange of
13 correspondence between the Staff and the industry
14 where we both drew lines in the sand. And about a
15 year later, we finally decided that it was time to try
16 to resolve this issue through another means, so the
17 NRC organized a workshop which I'm sure many of you
18 were at. And emerging from that workshop was a
19 mandate for the industry to develop a risk-informed
20 method for determining what the significance of
21 circuit failures was, so we could quit arguing over
22 whether it was or whether it wasn't in their licensing
23 basis, or whether you should be looking at one or two,
24 or six, or more. So emerging from that, we got a
25 mandate to go forward. And parallel with that, the

1 Boiling Water Reactor Owner's Group undertook a
2 mission for their members to develop a deterministic
3 method which they felt that if - Chris, you can raise
4 your hand if I misstate this - which they felt would
5 address things from a deterministic standpoint, that
6 it was a fair compilation of the regulations and
7 practices to address the regulations, and should
8 represent a way to address the issue and put it to
9 bed.

10 Next slide, please. That document went
11 through its own set of regulatory discussions, and
12 eventually ended up being rolled into NEI-001. And in
13 April of 2000, we began working on it. We supplied
14 the first draft to the Staff. It was clear that we
15 needed to provide some data to go behind, to try to
16 lend some clarity to the things we were arguing over,
17 the phenomena, because we really didn't have a whole
18 lot of data to work with. So NEI conducted a series
19 of 18 tests at the Omega Point Laboratories in San
20 Antonio, where we -- and building up to these tests,
21 we worked with the staff very closely ensuring the
22 test plan had several rounds on comments, tried to
23 work in the NRC perspectives, and there were some very
24 valuable additions coming to that test plan from the
25 Staff.

1 We tried to cover as much a variety of
2 parameters as can be covered in a limited series of
3 tests, so we were trying to address the big
4 contributors that we thought would be to whether
5 spurious actuation occurred or not. So when we went
6 through that series of tests, we ended up with reams
7 of data which it took us a while to sort through, and
8 it eventually ended up being published in an EPRI
9 report.

10 After the tests, we provided a second
11 draft of the document to Staff. Next slide, please.
12 And on that second draft we got many, many, many
13 comments that our committee spent a good bit of time
14 sorting through and responding to. Many of the
15 comments were very good ones, and we incorporated them
16 in the document. There were others that we didn't
17 agree with.

18 There was a process building on the
19 testing which was called the expert panel, and this
20 was a group of regulatory independent and industry
21 people whose function in life was to, using the test
22 results and other data that existed, to create a set
23 of probabilities for circuit failures for open
24 circuits shorts to ground, and of primarily spurious
25 actuations. This team published, ended up. The

1 process was led by an expert, Bob Budnitz. There was
2 several other people in this room were represented on
3 that task force, and we eventually ended up with a
4 product that was published as an EPRI report, which
5 has been out for about eight months now.

6 In September, we conducted a series of
7 pilots. We finished the series of pilots, and
8 published an EPRI -- I'm sorry. This was a jointly
9 funded activity by the Owners Groups, and we conducted
10 a series of pilots of NEI-001, primarily the risk side
11 of the equation because the deterministic pieces were
12 generally reflected already in plant practices, and we
13 didn't see a need to repeat that type of history. So
14 we wanted to see how well this document served its
15 purpose of determining significance of fire induced
16 circuit failures. And I think the result that we
17 agreed with on the part of the industry folks, and
18 there were several NRC observers who participated in
19 portions of the pilots that the method turned out to
20 be, as we thought, fairly workable.

21 In October, we finished addressing the NRC
22 comments, and provided a lot of additional changes to
23 NEI-001 to reflect the circuit failure testing, to
24 reflect the pilots, to reflect the NRC comments, and
25 that's the current document as it exists today. In

1 December, we finally published the EPRI report, which
2 consists of a CD with 400 pages of text, and mountains
3 of data. Next slide, please.

4 Now I'd like to spend a little bit of time
5 talking about what NEI-001 is supposed to do, and you
6 may see a bit of repetition in the slides. I'll try
7 to skate through this fairly quickly. There are two
8 primary pieces of 001. One is Chapter Three, which is
9 a deterministic method which is built largely on what
10 the Boiling Water Reactor Owners Group did, and was
11 modified to take into account PWR issues, as well as
12 BWR.

13 The BWR method was considered to be pretty
14 much applicable to PWRs, as well, but we made a few
15 changes to make it universally applicable as far as we
16 could tell. This method provides, as I indicated
17 earlier, a comprehensive method for addressing safe-
18 shutdown analysis from a purely deterministic
19 standpoint.

20 The other primary piece is the risk-
21 significance method which is in Chapter Four, and was
22 intended to provide two separate screening methods,
23 one a simpler qualitative screening method which is
24 built on quantitative methods. And the second was a
25 more quantitative screening method using a risk

1 equation, which I don't have in the presentation, but
2 I've put up in public many times before.

3 What this is not intended to do is to
4 require any licensee to go out and do a wholesale re-
5 examination of his safe-shutdown analysis. The
6 principle being that every licensee has had a safe-
7 shutdown analysis reviewed and approved by the Staff.
8 Sometimes there are still questions remaining open
9 about it, but we're not trying to reinvent the
10 deterministic side of the wheel.

11 This is just basically a table of contents.
12 These are the topics that are covered in there, some
13 introductory matter, Chapters Three and Four of the
14 primary pieces, and then definitions and references.
15 There are several appendices which cover the topics
16 you see on the screen. Section B provides some of the
17 insights that our task force developed over several
18 years of effort, how to characterize deterministic
19 circuit failures. Some of that involved providing
20 justification for eliminating consider of multi-
21 conductor hot shorts using power cables or elimination
22 of Multiple High Impedance Faults from further
23 consideration. And I'll leave you to read those to
24 provide the justification for that. I'm not going to
25 go into here. Next slide, please.

1 We dealt with high/low pressure interfaces,
2 alternative dedicated shutdown requirements. We made
3 an effort to deal with manual actions and repairs
4 before it became the issue du jour, and provided some
5 supplemental selection guidance for any plant who
6 decides he wants to go out and see whether he's missed
7 anything in his previous analyses. Okay. That's it
8 for that table of contents.

9 This is, if you can believe it, a simplified
10 flow chart, which again I'm not going to try to walk
11 through. Basically, the left side of the flow chart
12 is the deterministic piece. The right side of the
13 flow chart is the risk-significance piece. If you
14 look at the bottom left-hand box, that says what the
15 licensee should do with the results of his analysis,
16 and I'll get to the -- what we say NEI should be doing
17 with the results in a minute.

18 Basically, you walk through a deterministic
19 pathway if you want to identify circuit failures.
20 Most every plant has done that. The risk-significance
21 method starts with a qualitative screen, as I
22 indicated. If things don't screen out, you do a risk-
23 significant, a more detailed quantitative risk-
24 significant screen, and you evaluate and you use those
25 screening techniques to come up with a measure of

1 safety-significance.

2 Now if you look at the wording right down
3 there next to NEI at the lower right, you'll see
4 safety margins/defense-in-depth satisfied. And I
5 can't emphasize this strongly enough, because we're
6 talking -- if we're discussing risk versus
7 consequences. Now we recognize that risk methods have
8 a certain amount of uncertainty associated with them,
9 so for every screening process we put in there, we put
10 in a step to determine using guidance very similar to
11 that in Reg Guide 1174, a last screen to determine
12 whether safety margins and defense-in-depth were
13 satisfied, and we put in a set of criteria that were
14 consistent with those from 1174. It's a last check to
15 make sure you have not produced a false negative. You
16 cannot screen anything out without going through that
17 last safety margins/defense-in-depth, and that was
18 part of the process that we tested in our pilots.
19 Next slide, please.

20 Some general guidelines for the use of NEI-
21 001. Its use is at the licensee's option. Nobody is
22 going to be forced to do anything with this document.
23 It's an opportunity, rather than a requirement. It's
24 not intended to expand the existing approved licensing
25 basis. Licensees have 20 years of history that

1 they've -- a lot of time and effort, and money that
2 went in to develop their existing licensing bases, and
3 what we have on the deterministic side is intended to
4 reflect those factors, not telling the licensee he has
5 to go out and do something brand new and revise his
6 licensing basis to encompass that.

7 It's intended for use on identified specific
8 issues. If there is an open URI that the licensee has
9 open from years past when we were still doing
10 inspections, or if he has identified an issue that he
11 is unclear on, that's the primary purpose of this
12 method, is to determine how significant is it.

13 At any time the licensee can say I don't
14 want to do this risk stuff any more, and I'll put this
15 into my corrective action program, or I can do even
16 more detailed risk significance screening. The
17 licensee is completely flexible on how he approaches
18 this.

19 The next two slides I'd like to emphasize.
20 This one talks -- this slide talks about issues within
21 the -- clearly within the licensing basis. The next
22 slide talks about issues that are not clearly within
23 the licensing basis. And the focus of these slides is
24 to say what does the licensee do with the results of
25 his risk-significant screen.

1 For issues that are clearly within the
2 licensing basis where licensee, staff, everyone agrees
3 that this was a licensing basis issue, you go through
4 the risk-significant screen. If you find it's risk-
5 significant, you address it through the Corrective
6 Action Program, and I would expect that if it's
7 significant, most licensees will conduct some kind of
8 a fix. If it's not risk-significant, they still need
9 to address it through the normal licensing process, so
10 they can either decide to fix it anyway, or they can
11 submit an exemption or deviation request. Obviously,
12 you have appropriate reporting requirements for this
13 type of discovery, as well. Next slide, please.

14 If it's not clearly within the licensing
15 basis, if it's one of these interpretation issues
16 we've been arguing about for five or six years, if
17 it's clearly outside the licensing basis, you do a
18 risk-significant screen. If you find that it's risk-
19 significant, if you go back and look at the previous
20 slide, you'll see that the wording is virtually
21 identical. You address it, if it's significant,
22 whether it's inside, outside, or nobody knows where it
23 is in the licensing basis. But here, if it's not
24 risk-significant, you don't have to do anything
25 further. You don't have to chase an insignificant

1 issue, and deal with it further. Next slide, please.

2 These are some general guidelines for the
3 use of the deterministic method. And honestly, I
4 don't know how many licensees are going to use it. It
5 presents a way to do analysis, but again, most
6 licensees have already done analysis to their's and
7 the NRC's satisfaction. Next slide, please.

8 Now the risk-significance method can be used
9 with any deterministic method, however you choose to
10 do a safe-shutdown analysis. It can be used to
11 address any identified single or multiple spurious
12 actuation issues, or other types of circuit failures,
13 and maybe even some things outside the circuit failure
14 area. You have to consider all fire areas where a
15 failure or combination of failures exists. You don't
16 just look at one fire area where the cables of
17 interest are. You have to consider the risk-
18 significance throughout the plant for any particular
19 failure, or combination of failures that you choose to
20 look at. And as I indicated before, before you screen
21 anything out, you have to go through this conservative
22 safety margins/defense-in-depth analysis to make sure
23 you aren't screening something out inappropriately.
24 Next slide, please.

25 We think it provides -- the risk-significant

1 method provides a robust method for resolving the
2 issues. I'd like to spend just a minute or so on the
3 pilots that we did. We conducted pilots at two
4 plants, one was a boiler, one was a pressurized water
5 reactor. We tested all of the risk-significance
6 methods that we have in there. We tested the safety
7 margins/defense-in-depth method. When we were testing
8 the early qualitative screening method, we set up a
9 rule in advance that even if we screened something
10 out, we were going to subject it to the full risk-
11 significance method to make sure that our initial feel
12 as to what was qualitatively acceptable or not was, in
13 fact, borne out by the numbers of a more detailed
14 analysis, and generally we found that they were.

15 As I say, we tested that safety
16 margin/defense-in-depth method to make sure we weren't
17 screening out things inappropriately. And the
18 conclusion we came to was that this seems to be a
19 pretty robust method. Several of the people, industry
20 people in here participated in it, and can speak
21 clearly to their views of that.

22 Resolution. Now we had a meeting on
23 February 4th where we addressed the Resolution more
24 carefully. What we're doing here today is one aspect
25 of Resolution, what should the inspectors be looking

1 for? But there are other aspects that we wanted to be
2 sure are not lost in the emphasis on developing new
3 inspection guidance. Those are, you know, what is the
4 NRC's expectation for licensee use of NEI-001? Does
5 the NRC have open issues that are going to create
6 remaining difficulties in the licensee's use of NEI-
7 001? How does the NEI-001 fit with the SDP and the
8 other risk-informed techniques that are being
9 developed to address fire protection issues?

10 There's a number of things that have to be
11 addressed, and since the purpose of this workshop was
12 not to do that, we want to be sure that those are
13 covered. We intend to revise NEI-001 yet again, to
14 address the final NRC comments, and the industry
15 comments, as well, expect to submit it in a couple of
16 months. We would like NRC recognition that the
17 deterministic methods do hold water from a regulatory
18 standpoint, and we would like the NRC to accept a
19 risk-significance method as an acceptable way for the
20 licensee to do that, whether as part of the SDP, or as
21 part of a separate process. Next slide, please.

22 As I indicated at the start of my talk, our
23 goal is clearly understood resolution methods. The
24 licensees and the staff need to know what the end
25 point is, how we're going to get there, and what

1 products we'll be using at the end of the road. We
2 have spent far too much time and effort arguing about
3 this, far too much time and effort addressing areas of
4 uncertainty, far too much time and effort addressing
5 inability to communicate effectively, and we need to
6 be sure, which I need to try to put those behind us to
7 the maximum extent.

8 So we're going to revise the document. We
9 need to have a clearly understood pathway for NEI-001
10 acceptance or whatever pathway we wend up choosing.
11 We need to prepare the inspection guidance, conduct
12 training. We need to address the existing URIs. I
13 don't know if you want to spend some time today
14 discussing that, but it is an inspection issue, and we
15 need to address risk-significance determination, how
16 that relates to this document that the industry
17 prepared.

18 Now I'm going to state the goals. Now the
19 last few slides, and I do have a few hand-outs,
20 certainly not enough for this crowd, but the next few
21 slides outline some specific proposals that we are
22 making for the three lists that I expect that we would
23 be developing here today, so we can perhaps, since I'm
24 already way behind schedule, defer those slides to the
25 point where we start talking about specifics. We can

1 do that, or I can introduce them, go through them
2 quickly, and at least give you a look at what we're
3 planning to talk about later today.

4 MR. CAMERON: Maybe it would be useful for
5 you to just quickly go through that so that people
6 have that in their minds.

7 MR. EMERSON: All right. I can do that.
8 Okay. The first two slides, or the next two slides
9 are areas where inspection should not be required.
10 I'm not even going to get into the risk versus
11 consequence discussion you've been having.

12 I should say that the conclusions that
13 you're going to see on these slides are based largely
14 on what we saw from the EPRI/NEI series of tests. If
15 you have not had a chance to look at the EPRI report
16 that was developed and put out in December, you'll see
17 a lot of what we're taking comes from that. It also
18 comes from the results of the expert panel, the other
19 EPRI report that I mentioned earlier. Frankly, it
20 also comes from standing there at Omega Point with --
21 smelling cable smoke for quit a few weeks, and
22 watching what happens when you burn cables, and try to
23 create spurious actuations. So I think the
24 conclusions we've come to have a reasonable amount of
25 support from the data that we saw during these tests.

1 Okay. This is a long, complicated sentence.
2 It basically says, "Multiple spurious actuations",
3 I'll talk about other types in a minute, "thermoset or
4 armored cable", recognizing the robustness of those
5 two types of cable, "involving a single component with
6 current limiting devices, such as control power
7 transformers." Now that's a lot of gobbledygook, but
8 there are at least four pieces of things in there that
9 say why these are low probability. Thermoset or
10 armored cable, single components, current limiting
11 devices, and multiple actuations. Next slide, please.

12 This is a long list of things for
13 considering of any spurious actuations. Again, this
14 is based primarily on the EPRI results. It considers
15 thermoset cable, armored cable, cable-to-cable,
16 spurious actuations versus intra-cable, the
17 temperature to which the cables are exposed during a
18 fire. That piece came from the expert panel results,
19 three phase hot shorts, DC motors, AOVs and PROVs that
20 return to the desired position with power removed. WE
21 think there's a reasonable technical basis for
22 excluding these. And we think we've introduced a
23 reasonable technical basis for eliminating multiple
24 high impedance faults from further considerations, and
25 open circuits as an initial failure mode.

1 Now what things should we be focusing on?
2 Based on the test results, if we have a multi-
3 conductor cable, and we have two components running in
4 a single cable where you have significant consequences
5 resulting from a fire affecting that cable, that might
6 be something you need to look at. Next slide, please.

7 You need to consider several different
8 criteria. Obviously, consequences is one of them, but
9 also you have to consider how likely it is that you're
10 going to get a fire that's going to cause damage in
11 the first place. You have to consider the likelihood
12 that you have mitigation from current limiting devices
13 once you do have fire causing damage to a cable. Next
14 slide, please.

15 These are areas that we think require
16 additional analysis. We're going to talk a lot later,
17 I'm assuming, about what additional steps may be
18 necessary to address scenarios in this category, but
19 I guess I would lean on the side of we have a lot of
20 tools, and I'm not sure how much additional testing.
21 If we're driving toward an early resolution of this
22 issue, I'm not sure how much additional testing is
23 going to tell us, especially if it's spread out over
24 a multi-year period. We've already had multi-years,
25 and we have some good data, and I don't think we have

1 to do a lot more in that area.

2 We have risk tools. We may not have risk
3 numbers for every possible scenario, but we have risk
4 tools that address the other elements than just the
5 spurious actuation or circuit failure probability.
6 That's it.

7 MR. CAMERON: Okay. Thank you very much,
8 Fred. I think that we need to see if people have any
9 questions for you. And I guess I would ask people to
10 hold questions on those last couple of slides that
11 address conclusions, and I think we also need to take
12 a break here soon, and come back and address some of
13 these threshold issues. And, Fred, one of the things
14 we've been discussing is whether the focus should be
15 on consequences or it should be a broader focus. And
16 I take it from at least what I think Chris and Dennis
17 said, and from what you said, that the NEI-001 took a
18 broader focus than just consequences and what
19 significant is. Is that correct?

20 MR. EMERSON: Yes. As I'm sure the members
21 of our task force indicated, Dennis and Chris being
22 two of them, we started with a look at what things are
23 we going to look at with this method, and we
24 determined fairly early that we ought to be looking at
25 high consequence events, but we can't really stop

1 there. There are things that have very high
2 consequences that are also very low risk, and I don't
3 think you can ignore the risk that Bijan was saying
4 earlier. I don't think you can ignore the front end
5 of the risk equation and just focus on the back end
6 without some consideration of how you got there,
7 because otherwise, we're going to have nothing in the
8 list, or have everything on the list of what
9 inspectors should be looking at, and nothing on the
10 list of what inspectors shouldn't be looking at.

11 MR. CAMERON: Okay. Thank you. And I think
12 that that's going to be perhaps the big focus before
13 we adjourn for lunch, is what to explore that a little
14 bit more fully. But let's go to Chris, and I guess,
15 Bijan, you wanted to add something. Chris.

16 MR. PRAGMAN: I just wanted to offer a
17 slightly different perspective. On one of Fred's
18 slides, he said that NEI-001 is not intended as a
19 wholesale re-evaluation of the safe-shutdown analysis.
20 I know why Fred put that there, because we're not
21 trying to compel plants to provide another analysis,
22 but I would like to emphasize for Eric that if I ever
23 find myself in a position where I need to re-evaluate
24 safe-shutdown analysis, my preference would be to use
25 the guidance in NEI-001 to do that. So having that

1 NRC seal of approval on it that guidance document
2 would certainly help me a lot to do that kind of a
3 change if I found myself in that situation.

4 MR. CAMERON: Okay. Thank you, Chris.
5 Bijan.

6 MR. NAJAFI: I wanted to add one other
7 perspective on this issue of consequence, whether
8 we're looking at the consequence or the risk. Even
9 the NEI-001, it's true that looks at the entire
10 picture, and determines the risk-significance or the
11 risk value of certain combination of circuit failures.
12 But as the first step requires that you select or
13 determine, or pick through a different process a set
14 that you determine have the potential for risk-
15 significance. And when you go through that first
16 step, which I believe the same way whether you use an
17 SDP, even though it's not within the current shape,
18 you're still faced with that kind of question. I
19 mean, you still have to in both of these approaches,
20 the screening approaches, what I call screening
21 approaches, one of your first step is to sort of put
22 your problem in a manageable set, and then decide
23 whether these combinations I looked at, they're risk
24 significant or not. Some may be risk, some may be
25 not, but the issue of -- I thought at least some of

1 the objectives of today, or the main objective, to
2 find ways or attributes so that we can select those
3 initial set, because obviously those set, the sky is
4 the limit. If you want to open it, that's just -- I
5 can say that theoretically that set is infinite, the
6 number is infinite.

7 I mean, we have gone through the exercise
8 through these projects, and it could be infinite, so
9 you have to -- and how you define that in some ways
10 you define it on a consequence mentality for the most
11 part, because you look at what can -- that's why our
12 sort of separation of the line of not looking to the
13 before, which is the other two factors in the
14 equation, looking to the after, what does it do after?
15 And what does it do after, which is the consequence,
16 so that's the distinction I wanted to make, that it's
17 not that we don't have to look at the total risk
18 equation, but we will be forced eventually to make our
19 initial decisions before risk-significance
20 determination on consequence. And that would be where
21 these attributes of what's important to the
22 consequence will come into the picture. I don't know
23 if that's confusing or not, but there --

24 MR. CAMERON: Okay. I think I hear what
25 you're saying, that we're here to select these

1 attributes fort the inspection guidance, and we've
2 been talking about focusing on the consequences. And
3 I think what you're -- and we've also -- we've heard
4 Fred say that there has to be some consideration of
5 other elements in the risk equation. But I think what
6 you're saying, Bijan, is that you can make some
7 initial decisions by solely focusing on consequences.
8 Is that correct?

9 MR. NAJAFI: I'm saying that you have -- in
10 order to go through your risk-significance
11 determination, you have to do an initial phase that
12 comes up with a batch of stuff that you look at, and
13 that you tend to do it on its consequences, and not do
14 that on the bigger picture of all in your head, or in
15 your looking at your PNID, looking at the fire all the
16 way from the beginning to the end. You can't just do
17 that through a qualitative exercise. All I'm saying
18 is a pre-step comes before all of these risk
19 determinations.

20 MR. CAMERON: Okay. Let me check in with
21 you because we are -- we started a little bit late.
22 We're running late. We're on this threshold question
23 of what we're going to focus on to try to get to what
24 Eric and John want to get to at the end of the day,
25 which are some specific attributes that the NRC can

1 use as a basis for reinitiating the inspection
2 program.

3 Do you want to take a break now, at least to
4 go to the rest rooms or perhaps to get coffee, and
5 come back and try to settle these threshold issues, if
6 we can. And then take our lunch from perhaps a
7 quarter to 12 to quarter to 1, and get into the
8 specifics? What's your pleasure? Eric, what would
9 you like to do here? Do you want to take a short
10 break now and then come back and have some more
11 discussion of these issues, and then go to take lunch?

12 MR. WEISS: Yeah, I vote for that.

13 MR. CAMERON: Yeah.

14 MR. WEISS: Could I have a sense of the
15 audience? Does everybody think that's a good idea?

16 MR. CAMERON: All right. And I know that we
17 have some comments here. We have some people in the
18 audience who want to say things. Let's take a break,
19 and because we're on the orange alert, I don't want to
20 take us up another level accidentally, but you need an
21 NRC staff person to escort you if you want to go up
22 and get coffee.

23 MR. WEISS: Joel is standing in the back of
24 the room. Raise your hand, Joel. He's an intern that
25 can escort you. I can escort you, Dan, John can

1 escort.

2 MR. CAMERON: If we can match up NRC people
3 with groups who want to go upstairs and get some
4 coffee, why don't you go up and do that. Use the rest
5 rooms, come back and we'll close out this part, and
6 then we'll go to lunch.

7 (Off the record 11:19:43 - 11:46:02 a.m.)

8 MR. CAMERON: Okay. WE'VE been having a
9 conceptual discussion here to try to set the framework
10 for developing some specifics this afternoon, and I
11 guess what I need your input on is to see if we can
12 try to agree on a perhaps imperfect, but to agree on
13 an approach that we're going to use this afternoon to
14 try to identify the risk-significant circuits that at
15 least might form the basis for an NRC Inspection
16 Program. And to sum up, I think that we're looking
17 to identify these attributes, these. Obviously, we
18 don't know what these are, but we're trying to
19 identify attributes that can be given to the
20 inspectors to guide the inspection program for
21 associated circuit.

22 In terms of selection criteria, you heard a
23 lot about focusing on consequences. Some people said
24 that you have to take frequency into account some way.
25 Some of you, this spectrum of where you focus, some of

1 you are perhaps on one part of the spectrum, others
2 are on the other part of it. And in terms of
3 consequences, we heard Ken Sullivan today use the term
4 "high", use the term "unacceptable", so even if you
5 are focusing on consequences, what types of -- how are
6 you going to determine what consequences are
7 unacceptable?

8 I think what we need to do, and it may be
9 that we can take this whole spectrum into account.
10 Fred Emerson's presentation showed that the NEI
11 document, although it looks at consequences, it also
12 looks at frequency. And I think what I'd like to do
13 in terms of our discussion this afternoon is see if we
14 can get some agreement on what our approach is going
15 to be, so that when we come back this afternoon we're
16 going to say let's identify those attributes where
17 there's an unacceptable consequence or whatever you
18 want to use there, or let's figure out how we're going
19 to factor in frequency in terms of risk-significance
20 so we can really get to some specific example, such as
21 the couple that Fred up at the end of his talk, and I
22 think Eric has some other suggestions there. So let's
23 see if we can do that, and then break for lunch. And
24 there may be other perspectives that are larger than
25 this exercise here that people want to offer.

1 What I'd like to do is to get all of this
2 conceptual discussion, see if we can get those points
3 out so that we can focus in this afternoon. Let's go
4 to Steve and then over to Fred. Steve.

5 MR. NOWLEN: Okay. Yeah, I just wanted to
6 be sure everyone is clear on what I was proposing when
7 I talked about the three terms and what the focus
8 would be. I am not arguing that fire frequency and
9 the likelihood of damage are not important. They are
10 clearly critical to the final answer of what's really
11 risk-significant, very important terms. My only point
12 was which piece of the pie do you want to try and work
13 today? You know, what's your objective for today? Do
14 you want to talk about how we deal with fire
15 frequency? I would argue no, that's not the purpose
16 today. It's a part of it. It's important. We have
17 to consider it, but not today, and the same with core
18 damage.

19 Now Bijan's point about dependency is an
20 important issue. You have to think about even on the
21 consequence side, you know, you have to have in the
22 back of your mind that these other two pieces exist,
23 and they may have an impact on what you do with that
24 third piece of the pie. Again, my only argument was
25 to try and focus this group on the one piece today for

1 today's objectives.

2 MR. CAMERON: Okay. And I'm going to treat
3 that as a proposal for discussion. In other words,
4 even though there are dependencies, is it profitable
5 for us to address the consequences today? Focus on
6 that piece, or are there other things that we should
7 focus on? Fred.

8 MR. EMERSON: When we were developing NEI-
9 001, as I think Chris may have mentioned earlier, we
10 were trying to get a handle on what things we should
11 focus NEI-001 on, and we began -- after some
12 discussion we began with the regulatory position that
13 seems to be embodied in the regulations and the
14 guidance. There is a differentiation, for instance,
15 when you consider high/low pressure interface as to
16 whether you look at three phase hot shorts or not, and
17 so there's a -- so for that type of scenario only,
18 there's a requirement that you look at three phase hot
19 shorts. And that seemed to be a regulatory boundary
20 between what was high consequence and what was not.

21 Something that would -- loss of high/low
22 pressure interface is something that would result in
23 things going south very quickly, with little
24 opportunity to mitigate it. And that was the general
25 type, and I emphasize general type of criteria, and we

1 tried to build into the things we should be applying
2 in NEI-001 too, so Ken earlier asked a very important
3 question. He said how do we measure consequences? Is
4 it core damage? Is it some sort of regulatory
5 consequence or -- Ken, maybe I'm paraphrasing you
6 wrong but to me it's not just core damage. It's how
7 rapidly you get there and what you can do about it,
8 because everything has a core damage frequency, every
9 scenario, if you throw enough failures at it, so core
10 damage frequency by itself is not -- or core damage by
11 itself I don't think is an appropriate consequence,
12 but how rapidly you get there seems to be something
13 you should consider when you're considering what types
14 of consequences you should be addressing.

15 MR. CAMERON: Okay.

16 MR. EMERSON: I guess in a very long-winded
17 way I'm saying maybe that's a starting point for
18 looking at what a consequence, appropriate high
19 consequence is.

20 MR. CAMERON: But do you, for purposes of
21 this afternoon, do you think it would be acceptable to
22 focus on that consequence part of the equation to
23 identify its attributes. And then we can figure out
24 what type of consequence we want to focus on, but do
25 you think that that would be where we should go this

1 afternoon? Because I think that that -- I just want
2 to make clear or understand that that's where we're
3 going to focus.

4 MR. EMERSON: I think we should start with
5 consequence, but we should not ignore how you get
6 there in terms of what the inspector can look for.
7 If you just consider high consequence events without
8 considering what it takes to get to the high
9 consequence, and you ignore the types of - I don't
10 know - precursors for lack of a better word that the
11 inspector is in a position to look at easily, I think
12 we've not done our job entirely.

13 MR. CAMERON: And when you say "precursors"
14 are you talking about this frequency part of the
15 equation or --

16 MR. EMERSON: Yes.

17 MR. CAMERON: All right.

18 MR. EMERSON: Not doing risk calculations.
19 I'm talking about things that the inspector can see
20 that would allow him to use some judgment as to
21 whether this is a high consequence event he should
22 focus on or not.

23 MR. CAMERON: All right. Let's continue in
24 this vein. Mark, we haven't heard from you.

25 MR. SALLEY: Yeah. I'm trying to be in a

1 receive mode and get as much as possible rather than
2 speak. You know, Chris alluded earlier that we can't
3 make this as simple as a table. And from the
4 regulator's standpoint, I wish we could. I wish we
5 could put a table down, put ten things on it and say
6 Roy, here's your ten things to look at. These are the
7 most risk-significant, you know, have at it. It's not
8 going to be that simple.

9 The point that Steve made, consequence, I
10 think that's where we need to focus. I'm in 100
11 percent agreement with him there. Fire frequency,
12 we've got databases, industry has databases, and we
13 can split hairs between the exponents on those at any
14 time.

15 The second part that Steve talked about,
16 likelihood of damage, again NEI ran a real good test
17 program. We do have some good numbers to work with,
18 and I think that's doable, but the big question is
19 going to be the consequence. That's where we need to
20 focus. Now when we look at consequence, CDF and LERF,
21 those are noble causes, and that's the end game. And
22 that's where most of your PRA work is done. However,
23 Kenny brought a point up here earlier about, you know,
24 how the regulation is written in Appendix R, and the
25 end game there is hot shutdown. Now if you make hot

1 shutdown, obviously you've prevented core damage, at
2 least I hope so. So I think we need to define what
3 that consequence is going to be. And once again, that
4 takes it back to where Roy is at, because he's working
5 to that regulation when he does his analysis to
6 meeting Appendix R, which is hot shutdown, and cold
7 shutdown in 72 hours, so we need to define exactly
8 what that consequence is I think to focus in on it.

9 MR. CAMERON: Okay. Good. Thank you.
10 That's helpful. Let's go to Ken, and then we'll come
11 over to Kiang, and this side of the table. Ken.

12 MR. SULLIVAN: Yeah. When you talk about
13 consequences in a shutdown scenario, as Fred said,
14 there's a timing sequence to be accomplished. Systems
15 that are needed immediately to bring the reactor to
16 hot shutdown conditions, any impact on those systems
17 could have a high consequence, so I think you could
18 define it by function and timing. You know, actions
19 that have to be performed, let's say within the first
20 two hours of a fire event could be high consequence
21 events, so I think you could break it down by both
22 function in terms of hot shutdown versus cold
23 shutdown, and timing in this shutdown sequence. And my
24 personal opinion is I think inspectors should be
25 focusing on those systems and actions necessary to

1 achieve and maintain hot shutdown.

2 MR. CAMERON: Okay. We're going to get some
3 input from other people on that. Okay. You would use
4 this function.

5 MR. SULLIVAN: Well, that's a specific
6 function attribute. Then you've got other attributes
7 that are more circuit specific, like Steve was talking
8 about before, whether the cable is armored, whether
9 the cable is separated, whether it's a multiple, what
10 kind of cable tray its in, the cable fill of the tray.
11 Those are --

12 MR. CAMERON: But those would be --

13 MR. SULLIVAN: Those are down the road.

14 MR. CAMERON: Those would be over on --

15 MR. SULLIVAN: The first thing you focus on
16 is the function to be performed. In the hot shutdown
17 --

18 MR. CAMERON: Right.

19 MR. SULLIVAN: -- systems that are needed
20 immediately to bring the plant to a hot shutdown
21 condition, damage to those or fire induced impacts
22 that could impact the operability of those systems or
23 the shutdown capability could, in my view, have a high
24 consequence on the ability to achieve and maintain hot
25 safe shutdown conditions.

1 MR. CAMERON: Okay.

2 MR. SULLIVAN: Now if it's a cold shutdown
3 system, we may not focus on that so much.

4 MR. CAMERON: All right. Let's -- we're
5 going to the table and then to you in the audience.
6 Okay. Kiang, you see where we're going with this.
7 What do you have to say?

8 MR. ZEE: Well, in general I'll agree this
9 notion of starting with consequence with a framework
10 for timing and frequency probably is something to
11 visit, but talk about likelihood of damage I think I
12 just want to make it more clear. It seems almost as
13 if talking about likelihood of damage in the context
14 of only a single defined target or space area that
15 we're worried about. Often times we get these fire
16 circuit failures and if we start getting into the
17 multiple failures and try to get there, they may have
18 target area widely spaced in an area so I think in the
19 context of likelihood of damage, I think if spatially
20 separate, you have to revisit that at some point in
21 time when you start asking the question about
22 consequence. Where are these targets relative to the
23 circuit, so I think we want to try to stay away from
24 these other factors, but at some point in time we may
25 have to visit at least qualitatively actions about

1 those factors.

2 MR. CAMERON: Okay. And that seems to be
3 consistent with what Fred was saying.

4 MR. ZEE: Right. I don't think we can
5 completely not visit the other factors. I think at
6 some point in time we may find ourselves being dragged
7 to that. I think the trick is -- not make it
8 quantitative, to find some higher level qualitative
9 framework.

10 MR. CAMERON: Okay. Let's go to Chris, and
11 then Dennis, and then --

12 MR. PRAGMAN: I just want to build on what
13 Fred had said earlier about the high consequence of
14 areas that may occur. We haven't really fleshed out
15 yet, and hopefully the PRA folks can help with this.
16 Many times a failure can be mitigated with some
17 action, or failure may be acceptable because some
18 other complimentary system may be able to perform a
19 function that also leads to success. Maybe not
20 something that's in my Appendix R analysis, but
21 something that nevertheless may be available, so we
22 need some way to stir in those two aspects. I think
23 looking at complimentary redundant systems is already
24 in full power SDP worksheets, but I'm not really sure
25 how the SDP worksheets address recovery of systems.

1 MR. CAMERON: Okay. Thanks, Chris. Someone
2 may say something else on that. Dennis.

3 MR. HENNEKE: Okay. I guess to kind of
4 parrot a couple of other people. I agree that
5 consequence is the area of controversy. When the
6 inspectors get their guidance, they have to account
7 for frequency if they find -- frequency or damage, if
8 they find a circuit that's over a switch gear. Where
9 it's high frequency and high release rate, that would
10 be a different consideration than in a room with no
11 cabinets and just transient fires, and so that should
12 be part of the equation. But there is really not much
13 controversy, you know. Okay, in the second digit we
14 might argue about the frequency, but generally there's
15 not a lot of controversy in that area. And the
16 controversy lies in the consequence.

17 Ken mentioned hot shutdown as a consequence,
18 and I guess that's where we're going to disagree. The
19 other regulatory approaches, other SDP risk-informed
20 approaches have honed in on, and from Reg Guide 1174
21 and the other supporting Reg Guides, core damage and
22 large early release. Now large early release is a
23 surrogate for dose release to the public, and so to
24 protect the general health and safety of the public,
25 we would -- in the case of an accident, we'd like to

1 minimize the probability and frequency of a release
2 that could cause significant dose, and that's why we
3 measure LERF, and we measure core damage. And core
4 damage we have a higher criteria for that just in case
5 there is a failure of containment, which is one of our
6 levels of defense-in-depth.

7 So to use the design basis for Appendix R
8 and for safe shutdown for hot shutdown, if we can't
9 maintain or we can't get to hot shutdown as a criteria
10 for consequence would be the wrong approach in a risk-
11 informed environment. There are core damage sequences
12 and LERF sequences where hot shutdown is required, and
13 if that's part of the core damage sequence, then that
14 should be part of the equation for determining risk-
15 significance. But if does not lead -- if you can't
16 get the hot shutdown but it does not lead to a core
17 damage event, then it should not be part of our high
18 consequence consideration, so we have -- now if you
19 look at Fred's slides, he's saying if it's not -- if
20 you can't maintain hot shutdown, that doesn't mean our
21 licensing basis, it's still an issue. It still has to
22 go in our Corrective Action Program. We still have to
23 correct the issue to meet our licensing basis. It
24 should be not be posed as a risk-significant scenario
25 if it doesn't lead to core damage, or shows a very low

1 likelihood of core damage and large early release.

2 So we've heard high consequence. We got
3 that comment back on NEI-001 a number of times, but I
4 have yet to see a high consequence event that is a
5 potential impact to the general health and safety of
6 the public that does not fit the category of core
7 damage or large early release, so that's where I would
8 say we need to focus, still core damage and large
9 early release.

10 MR. CAMERON: Okay. Thanks, Dennis. And I
11 want to come back and focus specifically on that issue
12 after we go to Bijan, and then see if there's comments
13 out here. But I think that it seems like people are
14 agreeing that yeah, let's focus on consequences,
15 although I think at the end of the day we might want
16 to come back to a discussion of this frequency issue
17 in terms of what Fred called precursors, in terms of
18 what Steve said. We have to consider this
19 qualitatively, so I think we know where we're going
20 there, but there does seem to be this debate over how
21 you're -- even if you focus on consequences, what
22 consequences are you really concerned about that are
23 going to get you to the attributes that are going to
24 tell you the associated circuits. Bijan.

25 MR. NAJAFI: I may have said something

1 before that caused a bit of confusion, but when I say
2 you need to look at the consequence at the beginning,
3 I'm not saying that you can ignore or not use the
4 other two elements, whether the likelihood or the
5 propagation aspects of it. In either exercise, I
6 guess the question is that how do we want to present
7 this information to the inspectors? One option is to
8 provide them with a set of attributes that they can
9 directly -- consequence attributes they can directly
10 use for inspection. Don't inspect MHIV, MHIF period.
11 Or we want to provide them with a set of consequence
12 attributes, if that's the direction that we're headed,
13 that it needs to be put through some risk measure,
14 NEI-001 or SDP, to determine whether it needs to be
15 inspected or what needs to be done with it.

16 Depending on what route you take, either way
17 your first step to make the problem manageable, you
18 have to select what is the combination of circuit
19 faults, component lost, multiple, whether it's more
20 than two that you're going to examine. If you try to
21 pick those combinations, as I said before, by
22 definition infinite, if you can keep these other two
23 equations that are -- two pieces of equations that are
24 relevant in your mind and do it all in your head and
25 pick up the right circuit, all the power to you, but

1 it's not trivial. It's not trivial to walk in the
2 room and say -- and on top of it to say whether these
3 circuits are too far or too close. You don't know
4 that.

5 In most of these cases, there are those that
6 you don't know. You don't know where the circuits
7 are. I mean, it's just putting the cart before the
8 horse, so some of these issues -- if these are
9 components, and circuits and the fault modes that you
10 already know in your Appendix R, then you can use any
11 of these methods, analyze, determine their risk-
12 significance. It's an arguable approach, there are
13 tools there, but the question is those that you
14 maintain you do not know, so how do you determine the
15 risk-significance of a combination you do not know?
16 And to determine that, you have to sort of decide on
17 bounded attributes, and trust the answer you get
18 within the knowledge that you have, period. That
19 manageable set, whatever that is. Establish those
20 ground rules, make them a manageable set.

21 MR. CAMERON: And the bounding could be done
22 through --

23 MR. NAJAFI: The attributes, the consequence
24 and the attributes.

25 MR. CAMERON: The consequence.

1 MR. NAJAFI: Focus on the consequence. Pick
2 the attributes that its consensus appropriate, drove
3 those consequence and the attribute to pick the pairs,
4 and the combination, and the circuits that you think
5 you can look at, and then the risk determination can
6 come then.

7 MR. CAMERON: Okay. Let's see if there's
8 comments from the audience, and let's come back to the
9 table to focus on -- go back to this issue Ken said,
10 hot shutdown, Dennis said CDF/LER, and of course hot
11 shutdown could be part of that, but you should not
12 just focus on hot shutdown itself, is what I heard.
13 And Wade, do you have something?.

14 MR. LARSON: I had one comment on an
15 experience I shared with Mark Salley. We found a
16 situation where we wiped out the suppression system if
17 there is a fire, no suppression, I don't know where
18 you go with consequences after that. Is suppression
19 on your list? Do you check the suppression systems to
20 see if you've got a common mode failure that could
21 take out suppression systems?

22 MR. CAMERON: Okay. We'll come back up for
23 discussion of that example, when we come back up for
24 this question.

25 MR. FUHRMEISTER: I think Bijan made an

1 extremely important point. As an inspector, when I go
2 out to the site, I've got 200 hours total to do this
3 inspection. I cannot look at every circuit in the
4 plant. I have to pick and choose which ones I'm --
5 when I walk in the door, I do not have a core damage
6 frequency or a large early release fraction for every
7 component, so what I typically do, and what I'm hoping
8 to get guidance from here, is how to pick those
9 circuits, and we have to look at a manageable set, and
10 we have to pick our circuit to look at intelligently
11 s something that's going to have a meaning to the
12 ability of that plant to meet its licensing basis, for
13 one thing, and to protect the public health and safety
14 for the second thing. So what we've typically been
15 doing in Region One when we pick circuits, actually
16 when we were still doing that years ago, what we would
17 do is we would take the major flow paths and the
18 inventory management, and we would look for what
19 component can cause you to have a big problem? What
20 component could cause you to not be able to meet the
21 functional requirements to achieve and maintain safe
22 shutdown? Inventory management, feed activity
23 control, makeup and cooling, and that was how we
24 picked what components we were going to look at,
25 because we've got to have somewhere -- we need

1 guidance on how to pick the circuits to review because
2 we can't look at them all.

3 MR. CAMERON: Okay. Thank you, Roy. I
4 think that's very useful to focus the discussion.
5 Coming back up to the table, I don't see anybody else.
6 One other gentleman. Yes, sir. And please tell us
7 your name.

8 MR. OATES: I'm Ron Oates of Progress
9 Energy, retiree, involved with Appendix R since 1980,
10 currently Appendix R Solutions, Appendix R.com, or
11 whoever is paying my salary. This is a big elephant
12 I think we're all talking about here, and we're still
13 up in this theoretical kind of discussion.

14 I think, Fred, you mentioned high/low
15 interfaces. I think in the dialogue that the group
16 has, if the group is using a real example, you know,
17 some kind of high/low interface that you could all
18 kind of visualize, that might be a good way to walk
19 through the consequences and the other two properties
20 you talked about, because certainly the high/low
21 interfaces would be a high consequence situation. And
22 so by looking at that and having a dialogue around
23 high/low interfaces, for example, it would probably
24 carry you back to what conditions could put you in the
25 situation where you'd have a high/low interface. And

1 I would just offer thinking about using some sort of
2 example, and if you work through that, then maybe at
3 a later date, they can consider the associated
4 circuit, the multiple high impedance fault, some of
5 these others and walking through those kinds of
6 examples.

7 What we learn from the high/low interface
8 kind of dialogue or discussion would probably help set
9 some criteria that would help us look at some of the
10 less significant kinds of situations.

11 MR. CAMERON: Thank you. Let me go to Fred
12 on that. Fred, how does the -- you brought up the
13 high/low interface. How does that tie in with the hot
14 shutdown suggestion that Ken Sullivan made, or with
15 Dennis' CDF/LER criterion? Go ahead.

16 MR. EMERSON: Understand that I'm not a safe
17 shutdown expert, but I think what Dennis said, what
18 Ken said, and what several people have said about
19 high/low pressure interfaces are -- it's kind of like
20 different ways to get at the answer of what high
21 consequence event is. And I guess one thing that I
22 see as perhaps being a useful task after lunch would
23 be to list attributes such as we've started here, hot
24 shutdown, LERF, high/low pressure interface, other
25 things that sort of get at the issue of what is high

1 consequence and what isn't.

2 None of them define by themselves what is
3 high consequence and what isn't, but collectively it
4 gives the inspector a starting point on what he might
5 consider a consequence event. List those things, and
6 then make a separate list of the mitigating factors
7 that - I'll call them risk factors - that would help
8 you decide whether that was a high consequence event
9 you wanted to look at or not. And I think then we've
10 achieved the best of both worlds. You've given the
11 inspector a starting point based on consequence.
12 You've given him a way to decide which high
13 consequence events to look at, and which ones to not
14 look at.

15 MR. CAMERON: And to use specific examples.

16 MR. EMERSON: Yeah. Specific examples are
17 always good, because if you want to keep --

18 MR. CAMERON: There's a suggestion for an
19 approach to use after lunch. All right. Okay. We're
20 going to -- Eric has a matrix that he's going to put
21 up that may help us with this. Keeping in mind what
22 Fred just suggested, in other words, not to just look
23 at one particular way of defining high consequence,
24 and then there's the mitigating factors part of it,
25 but don't pick one specific way, but take a look at a

1 couple of different ways of defining high consequence.
2 What do people think of that proposal? In other
3 words, don't focus just on hot shutdown or high/low
4 pressure interface. Ken.

5 MR. SULLIVAN: I agree with what Fred said,
6 and I also understand completely what Roy said. I
7 believe our objective here is to give inspector
8 guidance, not to -- if you just tell inspectors to go
9 out and look for circuits that are going to cause core
10 damage, you know, it's an impossible task. They have
11 to have a specific set of criteria to go on. And what
12 I'm getting at from an inspector point of view,
13 systems that are going to get you in trouble right
14 away are those systems that are needed immediately
15 after shutdown, and that's where I'm coming from,
16 those in my view a high consequence system. They were
17 affected by fire.

18 Now in the SDP process, if it turns out that
19 inspectors looking at these potentially high
20 consequence events, and it turns out that other
21 systems not analyzed in the safe shutdown analysis
22 could be available for a fire in that specific area to
23 prevent core damage, well that's resolved through the
24 SDP process. But from an inspector point of view, he
25 needs to have or should have a specific list or focus,

1 not a list but a focus on the direction that he should
2 be going on, and one of those should be systems
3 required immediately after shutdown.

4 MR. CAMERON: Okay. Thank you. Bob.

5 MR. KALANTARI: During the break I talked to
6 some folks, hallway conversation, and a few people
7 commented we came in confused, and we're going to walk
8 out of here confused. And they understood what I said
9 this morning with regard to setting up the criteria
10 for figuring out what's failure, how do we get there,
11 how do we determine the consequence?

12 Fred just mentioned that he wants to know
13 how you get there, how do you determine the
14 consequence? Kiang Zee had a different idea that, you
15 know, you may have circuits, two different trays far
16 away from each other. Again, he's talking about
17 criteria before I decide what's failing, what's the
18 consequence of that failure?

19 Roy said he needs to know what circuits he
20 needs to go after. You put the circuits in the
21 parking lot, not outside there. That's what I was
22 saying this morning. Without the criteria, you can't
23 get there. Okay? We need to figure out what's our
24 criteria, what's the circuit selection criteria,
25 what's the failure criteria? Can we assume two table

1 trays in cable spreading room 20 feet apart with no
2 major hazards too often would not catch on fire
3 simultaneously within the first 20 minutes, first half
4 hour? These are the things we need to look at. Other
5 than that, we are not going to get there. To me,
6 that's important and everybody in different words are
7 saying the same thing.

8 MR. CAMERON: Well, let me ask you about
9 what you just said. You say we need the criteria.
10 Okay? And correct me if I'm wrong, but I thought that
11 what we were doing was trying to determine what the
12 criteria would be in terms of consequence frequency
13 for identifying those circuits. When you use the term
14 "criteria", what do you mean by it?

15 MR. KALANTARI: Criteria again I go back to
16 the fundamentals. In 1997 there was a big difference
17 between the way the plants were doing their analysis.
18 And an issue initiated, as Fred said, the Owners Group
19 BWR, NEI-001, and we are no Rev D. This is six years
20 plus later. In conjunction with that, a separate
21 activity was NFP 805, circuit selection and all that.
22 Then we have this document prepared recently by NRC
23 that talks about what circuits, how many hot shorts,
24 how many cold shorts, how many spurious actuations and
25 all that. None of this is finalized yet, so how do we

1 figure this out?

2 I want to do an analysis. It's going to be
3 very different. Every plant you go to, you're going
4 to get a different result. When that criteria is
5 different from plant to plant, it's going to be
6 different. One plant, the spurious actuation of pump
7 is going to be an issue because he's postulating two
8 spurious actuations, not simultaneously, one at a
9 time. Same thing with two hot shorts could cause
10 that.

11 Ken didn't mention this, but he had a good
12 idea. He says why don't we focus on low consequence
13 issues. Maybe those we can agree on. I mean, let's
14 say MFHI, I think most people agree that's, you know,
15 low probability of occurring multiple. You know,
16 limit that to two, to three, limit that to one and get
17 it over with. Right now I have clients that are
18 asking me should I do MHIF analysis? Well, right now
19 it's an 8610. It could be anywhere from 50 to
20 \$500,000 analysis. What does that buy you?

21 At the end I say if you have an MHIF, go
22 with the breakers, you know, close the ones you need.
23 Okay. A lot of effort for nothing and, you know,
24 maybe we should look at that. Define high/low
25 pressure. It varies from plant to plant. Some plants

1 have 18 high/low pressure valves, some plants have
2 two, has been accepted. These are the things we need
3 to agree on, set the criteria, then go further.

4 I don't think we're going to get there
5 without these fundamentals. We need to know how to
6 get there, what's the failure criteria. And to add to
7 that, then we add fire frequency, what's the
8 probability of fire in this area? Then we add the
9 consequence of the fire. Where is my hazard? My
10 hazard is in this corner. The most that hazard can do
11 is get the cable trays above, and the most the fire
12 can travel is 10 feet. The cable tray 50 feet away is
13 going to be unaffected for at least the first hour of
14 my fire. These are the things, but without the
15 criteria, I can't do this analysis.

16 MR. CAMERON: Someone help me out in terms
17 of trying to tie what we've been talking about here
18 with what Bob just said, and his reference to without
19 the criteria, we're not going to get anywhere. Now I
20 keep thinking that we're trying to work on the
21 criteria, and Bob's premise is that somehow we're not
22 working on the criteria, so could someone try to put
23 what Bob said into context of what we're discussing?
24 Dennis.

25 MR. HENNEKE: Yeah. I think Bob had -- is

1 kind of putting the cart before the horse. In a
2 similar way that I guess I put the cart before the
3 horse in talking about only CDF and LERF. And that is
4 agreeing that an inspector doesn't know where a
5 circuit is, they may be in the same cable tray, they
6 may be in ten A fire areas. They really don't know.
7 They can't walk in with those criteria ahead of time.
8 Those criteria, and similar to measuring CDF and LERF
9 are when you determine risk-significance, and that's
10 where we've really been focusing on in NEI-001. So
11 okay, that needs to be worked out, but not initially
12 for the inspectors when they walk in the door, that
13 they can only choose circuits that are within 10 feet
14 of each other or something of that sort, or within
15 three cable trays. That's all later on when we look
16 at fire modeling and risk significance, and maybe that
17 can be criteria in that regard.

18 When an inspector walks in the door and
19 wants to look at circuits, there are other things we
20 should be focusing on. Now Ken mentioned looking at
21 hot shutdown. I want to clarify that. The problem on
22 that, of course, is most hot shutdown systems, and
23 especially those early systems in the first two hours,
24 if they're hot they're going to lead to core damage
25 anyway. At some point in this, and that probably is

1 a good place for an inspector to look as an initial
2 point.

3 At some point there's going to be a system
4 that's needed for hot shutdown that won't affect core
5 damage. And the Oconee over-feed example, and in fact
6 over-feeds in most plants, PWRs, are an example where
7 we would over-feed, and if we have a turbine driven
8 pump you can't run the turbine driven pump because you
9 have no steam, or you might lose subcooling so you
10 can't get the hot shutdown because you can't cool down
11 because you lost subcooling.

12 At some point that has to be thrown out
13 because it doesn't lead to core damage. It's a no
14 never mind. It just means we've over-cooled, shut it
15 off. You wait a couple of hours. It'll heat back up
16 by itself, and then you can regain subcooling and
17 start cooling down. At some point that has to fit in.
18 It would be nice if we could put that up front, but
19 agreeing that an inspector can't say first question,
20 does this circuit affect core damage? Hot shutdown is
21 a good place to start, and not have to focus at least
22 on the cold shutdown circuits to look at circuit
23 analysis.

24 MR. CAMERON: Okay. Good. Let me, before
25 we go back up to Bob and Ken, this gentleman had

1 something in response to what Bob said.

2 MR. CICHON: My name is Ron Cichon. I work
3 for Framatome. I actually, I think the panel is
4 really saying the same thing. And as an engineer
5 trying to understand all this and put all this in
6 perspective, what I'm getting out of this is that the
7 first thing we should do is determine the attributes
8 of the circuits to be inspected. Then when that's
9 done, focus on the hot shutdown systems. That narrows
10 everything down for the inspectors. Then the
11 consequences of the failure of that particular
12 circuit, and from there you could take it down. Well,
13 can that be coded, can a manual action be done showing
14 that a time line analysis would mitigate that problem?
15 If it can't, then you are placing the plant in an
16 unrecoverable situation. That obviously is a much
17 more important issue, so I really think everyone is
18 saying the same thing, but I think we have to start
19 with the determining of the attributes of the
20 circuits.

21 MR. CAMERON: When you say "attributes of
22 the circuits", what do you mean?

23 MR. CICHON: Similar to what Bob was again
24 talking about, exactly, you know, what -- how many hot
25 shorts or whatever electrical considerations you want

1 to give to those circuits.

2 MR. CAMERON: Okay. Bijan.

3 MR. NAJAFI: Well, I guess when it turns
4 around the question changes, because initially I
5 wanted to address what Roy mentioned, which goes back
6 to what I was saying earlier on. The important is to
7 understand how the inspector, how best the inspector
8 can use the information.

9 For example, what you need because when you
10 set the examples of the systems, I noticed that you're
11 focusing on the consequences. You do not focus on the
12 risk, even though our task today is determine the
13 risk-significant circuit failure combinations. I
14 guess we will have to do that prior and provide you
15 with a set of attributes of the system. For example,
16 look at the injection valves, or multiple injection
17 valves to the makeup system, or do not look at the
18 instrument components that could potentially cause
19 drainage -- in a spurious operations cause drainage of
20 a tank, I mean things like that.

21 So I guess my first question is that, would
22 it be of any help to you to define certain attributes
23 to the circuits, as well as the systems and
24 components, what I separated this morning to the
25 component system versus circuits. How valuable the

1 issue of not looking at MHRF is to you, or how
2 valuable is don't look at circuits with armored cable,
3 or dedicated cables and dedicated conduits, I mean
4 things like that. Is that a value to an inspection?

5 MR. CAMERON: Roy.

6 MR. FUHRMEISTER: Yes. That would be
7 valuable because I go in and I pick components to
8 review. And then when I look at the circuit, if I
9 need more than two shorts to make a malfunction, how
10 likely is that? That's now -- is it risk-significant
11 in that even though it may have consequences, is it
12 very likely to happen? If I have an armored cable in
13 a tray, it's very unlikely, to my understanding, that
14 I'll have a hot short coming from another cable in
15 that same tray, so if I have one component control
16 circuit routed within an armored cable, that would be
17 a circuit that would not be likely to suffer hot
18 shorts, and that would not be a good use of my
19 inspection time. So those are the kind of things that
20 I need for circuit, as well as what the component
21 consequences are.

22 If I have a component, it doesn't matter
23 whether or not I get the hot shutdown, and there's no
24 consequence and it's not worth looking at, because
25 there will be no risk. When I walk on the site, the

1 only thing I really know is consequences of a
2 component not functioning. Will I lose my injection
3 path? Will I have a flow diversion? Will I lose my
4 inventory because we've now opened up a two inch hole
5 at the bottom of the vessel by spuriously opening a
6 valve? That's what I know when I walk on site, and I
7 use that to pick which component control circuits to
8 re.

9 MR. NAJAFI: For example, would it be of
10 value to you if I tell you you wouldn't have to worry
11 about multiple spurious operation of valves in
12 different systems?

13 MR. FUHRMEISTER: That would only be of
14 value if they can show that they haven't run all those
15 valves through one cable tray. If I've got 12 valves
16 all running through one cable tray, and I have a fire
17 under that cable tray, I have the possibility of 12
18 valves going south, so to say that, you know, multiple
19 spurious actuations is not an issue is very much
20 dependent upon the specifics of the cable routing for
21 a control circuit.

22 MR. NAJAFI: Yeah, because it goes back to
23 some of these situations is where you don't know the
24 circuits yet, so with that information, not knowing
25 where the circuits are, probably you won't use it as

1 a guide.

2 MR. CAMERON: Okay. I think we have to
3 release you for lunch soon, but let's go to Ken, and
4 back to Bob.

5 MR. SULLIVAN: I'd just like to point out
6 that I think buried in all this discussion, I think we
7 agreed on something. We agreed on the need to focus
8 or have inspectors focus on hot shutdown systems as a
9 guideline, if you will, from a risk perspective, focus
10 their circuit analysis issues on hot shutdown systems
11 required to achieve and maintain hot shutdown.

12 MR. CAMERON: Does anybody -- I mean, there
13 may be subtle nuances here, but is anybody in violent
14 disagreement around the table, first of all, about
15 what Ken said? Okay. And is that going to be -- is
16 that conclusion -- I mean, we've reached agreement on
17 this, but is that helpful for proceeding forward?

18 MR. SULLIVAN: Well, I think from both an
19 inspector's point of view and a licensee's point of
20 view, I think it is. You want to focus your efforts
21 on those that could potentially be risk-significant.
22 And getting there from an inspector's perspective is
23 those systems that are needed to achieve and maintain
24 hot shutdown.

25 MR. CAMERON: Okay. Fred, do you have

1 something to say on that?

2 MR. EMERSON: Yeah. I think that's a good
3 starting point, but it's not the only consequence we
4 should consider.

5 MR. SULLIVAN: Absolutely not. It's a
6 starting point.

7 MR. EMERSON: Right. It's a good starting
8 point, and maybe we can build on that after lunch.

9 MR. CAMERON: All right. Bob, did you have
10 anything else you wanted to say?

11 MR. KALANTARI: Yeah. I just want to go back
12 to Roy's request as one of the inspectors. When he
13 goes out there he says he has 200 hours to do this
14 inspection. Two hundred hours is not enough for him
15 to do any detailed analysis of circuits and
16 components, so when he walks in there he needs to be
17 able to ask that utility what is your component
18 selection criteria, what's your cable selection
19 criteria? Review that and do a sample checking on a
20 couple of components by looking at the drawings or
21 whatnot.

22 Again, I'm going back to the fundamentals.
23 If we don't set that criteria - okay - and, you know,
24 he can't hang his hat on some defined criteria, his
25 cable selection identifying the safe shutdown circuits

1 is going to be different. He's going to have a
2 different set of cables compared to what the utility
3 did, because his criteria could be different.

4 I mean, right now in the industry we have
5 plants that do not consider two valves in series as
6 required for safe shutdown, because by definition one
7 of them is going to survive. None of the cables are
8 required for safe shutdown again because no matter
9 where these cables are, one of those two valves is
10 going to survive because the regulation, or some
11 wording in some document said assume one spurious up
12 period, So two valves in series became not safe
13 shutdown components.

14 We need to define that because when he walks
15 in there, he's going to ask them where is this
16 component? Oh, it's not required because the criteria
17 is this. We haven't even settled on these. I think
18 it's important, so this is not putting the horse in
19 front of the cart but really -- cart in front of the
20 horse, but the other way.

21 MR. CAMERON: Okay. Thank you, Bob. Let's
22 have a final comment from Chris, and take some lunch.
23 And I'd just like to briefly caucus with the NRC Staff
24 before they go to lunch. All right. Chris.

25 MR. PRAGMAN: I think one caution trying to

1 meet Roy's needs is even if you had more time to do
2 the inspection or a larger team, or guidance to help
3 them focus on specific systems, you're still doing a
4 sampling, because he's really not given the
5 opportunity to do 100 percent review. And so if he
6 goes into a plant and picks a few components, it could
7 just be because of the roulette wheel, that those have
8 nothing in common, that doesn't raise his eyebrows,
9 and doesn't give him concern for that inspection.

10 He comes back a few years later, picks three
11 different ones, and all the cables are in the same
12 cable tray and that gives him great concern, so even
13 if we fill him with all kinds of guidance and
14 knowledge, we're still, I guess potentially a victim
15 to the fact that he has to do sampling just because of
16 the situation he's in with his inspection process.

17 MR. CAMERON: And that's a reality that's
18 always going to happen no matter what criteria are
19 given to Roy. All right. Why don't we take an hour.
20 It's about 20 to 1. Why don't we come back around 20
21 to 2, quarter to 2 at the latest. Fred.

22 MR. EMERSON: Do we need to be escorted to
23 the lunchrooms?

24 MR. CAMERON: Yeah. And I'm going to ask
25 NRC Staff who are here to escort people up there. And

1 there shouldn't be a line at this point. You can
2 leave everything here, not guaranteeing it'll be here
3 when you get back.

4 (Off the record 12:37:05 - 1:50:19 p.m.)

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1 A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

2 (1:50 P.M.)

3 MR. CAMERON: As you can see, the easy part
4 is coming now. Okay? But what I'm going to suggest
5 is using consequences as the criterion, guided by
6 consequences in terms of hot shutdown which may be the
7 first part of the sequence for CDF or LERF, but
8 certainly there's other ways to view consequences.
9 But we did agree at least with that for a starting
10 point, see if we can identify some attributes for
11 risk-significant associated circuits.

12 We also heard Fred Emerson talk about let's
13 talk about some risk mitigators and fold that into
14 that discussion. Also, keep in mind that though
15 everybody agreed that let's start with consequences,
16 that at some point there has to be some consideration
17 of frequency.

18 People have referred to a number of
19 situations of well, what can be taken off the table as
20 the inspector not have to look at? I think Fred had
21 a couple of examples of those. Very important point
22 translating these attributes into workable guidance
23 for the inspector. That may not happen today, it may
24 be something that Staff takes with them after the
25 attributes are determined.

1 Bob Kalantari was talking about the
2 deterministic issue before, and that's why I have a
3 little asterisk there, is that we're going to be
4 looking at attributes in terms of consequences, at
5 least starting with that. And there may be other ways
6 to look at attributes from other perspectives, but as
7 I understand what the Staff wants to do, it's to try
8 to look at these "risk-significant" circuits.

9 So with that, could we start off with at
10 least trying to get specific in terms of attributes,
11 in terms of consequences? I was going to ask Steve to
12 perhaps start us off on that one. And if you have
13 problems with this, we'll get into that, but that's
14 our methodology so far.

15 MR. NOWLEN: Okay. Well, again thinking
16 about consequences as having perhaps functional
17 electrical physical kinds of attributes, one
18 functional attribute as an example that you could
19 think about would be a diversion path. Your
20 functional attribute is opening up a diversion path,
21 and then I think you'd probably want to think about
22 how you would measure that, you know. Do you do it,
23 for example, in terms of the makeup capacity. You
24 know, if you do it just in terms of the relative size
25 of the diversion versus your capacity to overcome it,

1 you know, that might be a measure that you could use.
2 If it's a 10 percent diversion path, I'm not going to
3 worry about it. If it's over 50 percent diversion
4 path, maybe I'll worry about it. I don't know what
5 the thresholds are. That's the sort of thing I had in
6 mind.

7 MR. CAMERON: Okay. So opening up a
8 diversion path, how would that -- can we put a little
9 bit more gloss on that in terms of if we were going to
10 be identifying associated circuits in terms of opening
11 up a diversion path, how would you frame that? And,
12 Ken, do you want to comment on this too? And I don't
13 want to forget, we have a matrix that we'll put up in
14 a minute that Eric prepared to help perhaps guide us
15 through this, but go ahead, Steve or Ken.

16 MR. SULLIVAN: In terms of opening up a
17 diversion path?

18 MR. CAMERON: Yeah.

19 MR. SULLIVAN: Well, it's typically a
20 diversion path.

21 MR. CAMERON: Speak into that mic.

22 MR. SULLIVAN: Well, many times when you're
23 talking about diversion paths, you get into the issue
24 about a single spurious actuation or not, and that
25 depends on whether it's two normally closed valves in

1 series. For example, the inspector may look at it and
2 say well, if both of these valves open up, I could
3 have a significant impact on my shutdown capability
4 but, you know, the licensee may have taken a position
5 that he only assumes one of those valves would
6 spuriously operate in the event of fire, and didn't go
7 any further in terms of locating the cable. Okay?

8 So it's the type of issue where it may be
9 risk-significant or it may not be, depending on if the
10 plant evaluated for it and has identified mitigating
11 actions to take in case it did happen, or to prevent
12 it from occurring.

13 MR. CAMERON: You said -- can we get some
14 more discussion on this to make sure if we're going on
15 the right direction on this? Fred, what do you think
16 about this opening up a diversion path in terms of an
17 attribute? And I'm still not sure that's the right
18 way to frame it.

19 MR. EMERSON: Well, a diversion path is one
20 attribute. Another might be loss of cooling. That
21 might be another attribute that would impact hot
22 shutdown.

23 MR. SULLIVAN: The loss of cooling though,
24 I might add, that if you're talking about a valve
25 that's in a flow path or required shutdown system,

1 that's a required circuit. That's not an associated
2 circuit that we're talking about today. That's
3 required to be protected.

4 MR. CAMERON: Okay. So loss of coolant
5 would not be an attribute because it would be a
6 required circuit rather than an associated circuit?

7 MR. SULLIVAN: If it's a normally open valve
8 that could spuriously close as a result of fire damage
9 and it's in a required flow path, that's a required
10 circuit. That should be protected or separated.
11 That's a required circuit. That's not an associated
12 non-safety circuit.

13 MR. EMERSON: I guess I hadn't divided it by
14 associated circuits or not. I think I was looking at
15 consequences.

16 MR. CAMERON: Okay. I think that that's a
17 fair comment. And I think what the Staff is focusing
18 on though is what are the associated circuits that
19 need to get inspected. Any comments on diversion
20 path? Go ahead. And let's get you on --

21 MS. KLEINSORG: I don't actually think
22 that's true that we're only looking at associated
23 circuits. Aren't we looking at the circuit failure
24 issue in general? And so is a required circuit more
25 important than a flow diversion path?

1 MR. WEISS: Well, our -- excuse me, if I
2 could jump in. We have an Enforcement Guidance
3 Memorandum that suspends inspection on associated
4 circuits, not required circuits.

5 MS. KLEINSORG: Okay. So you handle them
6 differently then.

7 MR. WEISS: Well, right now if a license --
8 if an inspector goes out and finds a licensee has not
9 protected a required circuit, then that's -- we know
10 how to deal with that. What we don't know how to deal
11 with is the associated circuits issue, because there's
12 been so much controversy in that area.

13 MS. KLEINSORG: So the flow diversion path
14 is less important than the normal.

15 MR. SULLIVAN: It depends upon the
16 consequences.

17 MS. KLEINSORG: Okay.

18 MR. SULLIVAN: It could be more. It could
19 be just as important. You're right.

20 MR. NOWLEN: I don't think it's an issue of
21 importance. It's just the language of the particular
22 issue they're trying to deal with, this suspension of
23 associated circuits inspections. That's why we're --
24 not because they're less --

25 MS. KLEINSORG: Well, I mean it's -- the

1 analysis kind of gets done the same way usually. I
2 mean, I think that's Bob's point over and over again.
3 Your point, that the basics they get done. They get
4 treated kind of the same, you trace them the same, you
5 evaluate them similarly, but --

6 MR. SULLIVAN: Some plants do. You're
7 right.

8 MS. KLEINSORG: Yeah.

9 MR. CAMERON: Right. Can we sort of -- can
10 we take this -- can we use this example and take it to
11 what the inspection guidance would look like? Let's
12 take it and use it as an example so that we can test
13 this out. And, Eric, you want to put your framework
14 up. And I just want to make sure that this is getting
15 us off on the right foot here.

16 MR. WEISS: Up here is the way I first
17 started to think about the subject, and you'll notice
18 that I have a functional class I call Power Circuits,
19 Instrument Circuits. And over here my first sorting
20 criteria is the number of faults leading to core
21 damage or not recoverable condition. And by that I
22 mean immediately, immediately in the PRA, meaning if
23 I'm looking at a faulty, the next step is core damage.
24 The next step is not a branch to see whether it's
25 recoverable or not because of manual actions, or

1 because there's an alternate system that's available.
2 It goes right to core damage. Let me give you an
3 example.

4 I have a cable, multi-conductor cable. I get
5 two hot shorts in that single cable, and all SRVs go
6 open, or I have an Event B. I take the core inventory
7 and I put it in the parking lot. It's immediate core
8 damage, unrecoverable situation in either case.
9 That's what I'm talking about. These are very high
10 consequence events.

11 Now do I need one fault, or two or more
12 faults? It's seems likely that the control cable, to
13 me, seems like we did a lot of testing at Omega Point
14 and that causes things to happen. I don't need to
15 intervene and perhaps recover the situation, and
16 control cables have less insulation than power cables.
17 And in any case, we test the control cables and saw a
18 number of faults there that surprised a number of
19 people. When the Omega Point results were presented
20 to ACRS, several of the members said gee, that's
21 several orders of magnitude more frequent than I would
22 have expected. I never would have expected those
23 results, but that's what they said so okay. So I say
24 two, one, one. I don't have a hot short or a short to
25 ground, open tray is much more likely, I think

1 problematic. Multi-conductor cable is more
2 problematic than single conductors. Single conductors
3 have more insulation, they can be located on opposite
4 sides of the tray, where a multi-conductor cable it's
5 all in one tight bundle.

6 We know that current limiting devices, like
7 current control power transformer makes the spurious
8 actuation less likely, so this is the more likely
9 result. We know that armored cable tends to mitigate
10 against the effect. We know that having a shield on
11 it tends to mitigate to some extent. Having neither
12 of the above makes it really bad. And sometimes we
13 have grounded and ungrounded circuits. That seems to
14 be less significant, so if I were to pick out sequence
15 here, I would say something like two, one, two, two,
16 two, two. You see, I've just defined what in my mind
17 is something that has a very high consequence, and has
18 a probability of occurrence that's significant enough
19 based upon the Omega Point testing that it was
20 something that I would say going into this meeting is
21 probably what we ought to be telling inspectors to go
22 look for.

23 If they find this multi-conductor cable that
24 leads immediately to core damage, all SRVs go open, I
25 mean, I'm not making this up. They found this at some

1 plant, or an Event B, man, that's risk-significant, in
2 my opinion.

3 Now you saw some examples that Fred put up
4 earlier that are not risk-significant, but restate the
5 obvious. We're trying to put things in three bins.
6 I'm trying right now to find out these risk-
7 significant sequences, and I know I left a couple of
8 things off of here based upon this morning's
9 discussion I wish I had included, like the combustible
10 loading. Does that make a difference? A room with
11 nothing in it but the cables, is that more risk-
12 significant than one with cabinets? We could have a
13 column there. Maybe I should have included whether
14 there was suppression and detection in the room.

15 Well, I've got to wonder about suppression
16 and detection because if I have a multi-conductor
17 cable, by the time the detection goes off and the
18 suppression goes off, that hot short is probably
19 already there. I mean, it's in the same cable we're
20 talking about. Right? Well, I guess if the fire
21 started external to the cable, suppression and
22 detection would be a lot more significant. And I know
23 that internal fires are a lot less likely than
24 external fires.

25 Anyway, I'm not trying to tell you what the

1 right answer is. I'm trying to give you what Chip
2 calls a taxonomy, a way of thinking about it. Now I
3 could have lowered the bar right here, and here where
4 I say leading immediately to core damage. I mean,
5 this will repeat some of this morning's discussion.
6 We could say instead of leading immediately to core
7 damage, meaning the next step is core damage or not,
8 I could have lowered the bar and I could have said
9 prevents safe shutdown or takes safe shutdown outside
10 of its design parameters, or get it even lower. Those
11 are all bars that are lower. Here the bar is up real
12 high, real high, I'm going immediate ME, and I've got
13 a sequence, a taxonomy here that tells me I know from
14 my Omega Point testing it can happen. I've seen it
15 happen in 30 minutes, and unless there's some factor
16 that rules it out like there's no credible fire, why
17 shouldn't I tell my inspectors to go look for that
18 sort of thing? So at this point, I think I've reached
19 80/20 or whatever they call it. Well, I'll be quiet
20 for a minute and let other people hold forth on it.

21 MR. CAMERON Thank you, Eric. How does
22 opening up -- how does the diversion path fit into
23 your evaluation? How would this --

24 MR. WEISS: Well, let's say for the sake of
25 argument that part of the safe shutdown path is I have

1 an aux feedwater pump, and it's going into the steam
2 generator move heat, and there is a line off of the
3 aux feedwater line, that it's not a required circuit,
4 but this valve is large enough, for whatever reason
5 it's there, that if it opens enough, there's not
6 enough water going to the steam generator to cool the
7 plant, and I no longer have a safe shutdown path.

8 Now that's a flow diversion, but it may not
9 lead to core damage if there is another way of cooling
10 the plant. You know, boilers in particular have all
11 kinds of ways of getting heat out of plant, but I'm
12 talking about steam generators here, and they don't
13 have steam generators. But anyway, the point is that
14 there may be other systems available that are not
15 taken credit for in safe shutdown space, and that be
16 a viable means. I mean, PRA doesn't care about the
17 licensing basis. You can do a PRA on a plant that
18 doesn't have a licensing basis. You just look at the
19 sequences. You look at the configuration of the plant
20 and the sequences, and you may say well, I have this
21 diversion path, doesn't lead immediately to core
22 damage, doesn't trigger this criteria, that's not
23 something I'm asking my inspectors to go search for.
24 Does that answer the question?

25 MR. CAMERON: Yeah. Yeah, I think it does.

1 Let's get comment from others around the table both on
2 these ranking criteria, the diversion path, other so-
3 called attributes. Dennis.

4 MR. HENNEKE: Yes. Eric, what you've put up
5 here on your ranking criteria is in a similar way to
6 what Fred and the group tried to do with their's, and
7 that was to take what we know with regard to failure
8 rates on circuit failures, and determine what's more
9 likely or less likely and that type of stuff. And
10 that's already -- I mean, that's in Table 7-2 of the
11 expert elicitation. Actually, I meant to clarify
12 that. The EPRI data that came out after the expert
13 elicitation had two disagreements with that. I think
14 that's going in NEI-001, that conduit failures,
15 circuits and conduits are more likely to have spurious
16 operations, but cable-to-cable on thermoset cables was
17 less likely, what the expert elicitation came up with.
18 But generally, it agrees with that, and so when you
19 have armored cable there as a factor, that factor is
20 already in the numbers here.

21 Now what we were thinking about from a PRA
22 aspect was at some point, the spurious operation
23 probability, or even the general sequence probability,
24 excluding the first part, just on the consequence
25 side, if it gets below a certain level, it's a no

1 never mind at this point. It cannot be high risk.

2 The first starting point was similar to what
3 we had in the screening criteria, that a high failure
4 rate was .1 or above, so a single spurious operation
5 probability of a thermoset cable or thermoplastic
6 cable, a .3 or a .6, depending on whether it has CPT,
7 that's high probability event. That should be first
8 on the agenda. Even multiple spurious non-CPTs
9 circuits is .6 each, .36 for two, so you've got two
10 valves that don't have CPTs, they could go open with
11 greater than .1 probability. That's the type of thing
12 that we'd be considering high, and you have a whole
13 series of them that are kind of medium. And then
14 eventually if you get enough combinations or the right
15 type of failures, like armored cable that has CPT
16 protection and fusing, that's already below 10 to the
17 minus 2.

18 Those are the types of things we're saying,
19 and what Fred tried to put on the page, that are no
20 never minds at this point, that you should not do
21 that. So 80 percent what you have on your matrix up
22 there is in the numbers, and you can -- if you look at
23 it from an objective saying a criteria type of thing,
24 you can put a criteria out there and say if the
25 spurious operation probability is less than 10 to the

1 minus 2, just don't inspect that. If it's greater
2 than .1, those are the ones you want to concentrate
3 on. And the stuff in the middle depends on your fire
4 damage, your fire loading frequency, all that type of
5 stuff. And that's kind of what we found in the pilots
6 also.

7 MR. CAMERON: All right. You said that's
8 reflected in 001? Right. Let's go to Chris, and then
9 we'll go out. Chris.

10 MR. PRAGMAN: Eric, I just want to caution
11 you a little bit about like some of the examples you
12 used. I think if we're interested in core damage,
13 then the question we always need to be asking
14 ourselves is, is adequate core cooling being
15 maintained? And for an example, like 16 SRVs opening,
16 at some plants that may be acceptable. Adequate core
17 cooling may be maintained throughout that transient,
18 and as long as there's some way of putting water in
19 the vessel, they may never depart from adequate core
20 cooling.

21 MR. SULLIVAN: That's a valid point Chris,
22 depending on what is available. It may have the same
23 impact as if that BWR relying on its CRD pump.

24 MR. PRAGMAN: Right. So if you're relying
25 on some small steam --

1 MR. SULLIVAN: I mean in essence, it is how
2 we define a high/low pressure interface. Now I throw
3 that on the table, but my view of a high/low pressure
4 interface is a LOCA, any time loss exceeds make up
5 capability. Other people may have different opinions
6 about what constitutes a high/low pressure interface,
7 but typically that's it. The loss due to your SRVs
8 opening exceeds your makeup capability, i.e., as
9 defined in safe shutdown analysis. You've got a LOCA
10 that's unrecoverable, potentially.

11 MR. PRAGMAN: That's typically also the --

12 MR. SULLIVAN: That's not to say when you go
13 to the next step, you may go outside your analysis and
14 say oh, I've got this other pump available, you know.
15 But an inspector is not going to know that. He's
16 going to what's in your safe shutdown analysis.

17 MR. CAMERON: Let's hear from Wade.

18 MR. LARSON: You guys are taking this in a
19 number of different directions. Ken, you can start
20 putting enough energy into the torus, that you fail
21 the torus too. When you go look at these cable trays,
22 you started the example with one cable in a tray, but
23 no one looked at those cable trays and find out that
24 you've got six, to ten, to a hundred sensitive cables
25 in that particular tray, so you've got to start

1 looking segment by segment through the plant to see
2 just what you've got in terms of potential
3 vulnerability. I'm not quite sure how you're going to
4 process this information with the inspectors.

5 MR. CAMERON: Any comment on that? Steve.

6 MR. NOWLEN: Yeah. I was going to -- some
7 might perceive here it seems like we're kind of mixing
8 up two problems here. One problem is basically
9 defining the entry conditions for the inspector; that
10 is, what are you going to look for, and how are you
11 going to decide when you've got something that's worth
12 chasing? That sort of is the first problem. And then
13 the second problem is once you've identified that
14 issue, that item, how are you going to evaluate it?
15 And I think we're getting those all mixed up, so maybe
16 if we think a little bit and try and separate the
17 problem a little bit, how are we going to get into
18 this first? And then, you know, it again falls back
19 to some of the other things I've said, is that, you
20 know, how you evaluate it. It has to bring in fire
21 frequency, it has to bring in timing, it has to bring
22 in all these other -- you know, do you a mitigation
23 plan? Do you have manual actions you can take? All
24 that comes into how you would evaluate the problem,
25 not necessarily how he gets into deciding he's got

1 something he needs to evaluate. I don't know if that
2 makes sense. Maybe it can get us focused again.

3 MR. CAMERON: John, do you want to respond
4 to that?

5 MR. HANNON: Yeah. Let me refocus this
6 workshop on the first element you just described.
7 What we'll do after we define how we would get into
8 the inspection, we're going to prepare the guidance
9 for the inspector. That's a separate activity. It
10 doesn't need to be covered in this workshop.

11 MR. CAMERON: Okay. So we're going to focus
12 on telling the inspector what to look for. Now I
13 guess I'm still struggling with, in terms of a
14 diversion path. How does that translate -- what do
15 you tell the inspector? And I know that what you
16 eventually give to the inspector, the guidance that
17 you develop is going to have to be crafted in that,
18 but just as an example, see how this would be to Roy,
19 for example, or the other inspectors.

20 Can you take the diversion path as an
21 example of risk-significant because it's high
22 consequence, can you frame that in a way to -- here's
23 one of those John talked about. Let's have five
24 items, for example, come out of this workshop. How
25 would you frame the diversion path as one of those

1 items? Yeah, Roy.

2 MR. FUHRMEISTER: The way that I have
3 described the concern of a diversion path to other
4 inspectors is if that diversion path is big enough to
5 impact your system functional capability, then that's
6 a concern. If you've got a two inch diversion path
7 off a 12 inch main header, walk away. If it's a 10
8 inch diversion path off a 12 inch header, then yeah,
9 you better look close and see if it's been adequately
10 protected because that could seriously impact system
11 capability.

12 MR. CAMERON: Is that the type of thing,
13 John, Eric, that you're looking for in terms of what
14 is a risk significant associated circuit? I take it
15 that, you know, just to use your words, if big enough
16 to affect system capability, when you say take a look
17 at it, that means you better take a look at the
18 associated circuit with that. Is that -- I'm just
19 trying to figure out if we're on the same wavelength.

20 MR. WEISS: Yeah. Let me give you a little
21 feedback. Yeah, that's part of the answer, but part
22 of the problem we've had with associated circuits is
23 which ones do you look at? How many hot shorts do I
24 have to look at? If I have a cable tray and I have,
25 I don't know, a thousand conductors in that cable

1 tray, do I look at end factorial combinations? Do I
2 look at that many? Isn't that incredible? Is that
3 what I look at? Well, yeah, I want to know, Bill, if
4 there's something that has a high probability of
5 occurring, so what do those thousand conductors look
6 at?

7 Maybe if I look at one single multi-
8 conductor cable, it causes that diversion, and it's
9 only one or two hot shorts in that one -- to me,
10 that's risk-significant. Now I don't know that it's
11 either reasonable for the regulator or for the
12 licensee to be asked to look at end factorial
13 combinations where N is a very large number. And the
14 way we whittle that down is by looking at these other
15 attributes, some of which are on this chart, and some
16 of which aren't, like how credible is the fire is not
17 on this chart, but is it thermoset or is it
18 thermoplastic? We know that they have different
19 thresholds for damage, and if it's thermoset and the
20 fire doesn't create a hot gas layer that will get you
21 up to the failure criteria for the thermoset, then I
22 don't think I should be looking at that. I shouldn't
23 be asking my inspectors to go chase it, but I have to
24 fashion inspector guidance, so I can't ask the
25 inspector to do a PRA in his head. I can only ask him

1 to use his own good judgment and the guidance that I
2 provide, so I say go look for that, and go look for
3 multi-conductor cables because I know that's where
4 most of problem is in control circuits without current
5 limiting transformers. In particular pay attention to
6 thermoplastic, and stay away from armored, or things
7 that have a conduit around them dedicated for that
8 purpose.

9 Then I've got a reasonable set of inspection
10 criteria, at least I think it's reasonable. I can't
11 get it out in a few words, but I could probably make
12 up a matrix of attributes adding these functional
13 things like diversion or, you know, inability to
14 control reactivity, or whatever.

15 MR. CAMERON: Let's go to Roy, and then
16 we'll go to Fred, and Ken.

17 MR. FUHRMEISTER: But as an inspector, I
18 can't start out from the number of conductors in a
19 tray or the number of conductors in a cable. I have
20 to start with a component. That component will now
21 tell me the cables that are affiliated with that
22 component, and then from the cables that'll tell me
23 which trays it's in. So I need to start on it,
24 because I can't start with a cable because we don't
25 know what they are yet.

1 MR. WEISS: So what you do is you, as an
2 inspector you go out and you look at a few components
3 that you think have high consequences associated with
4 their failure. You know, it's the Event V sequence,
5 or some other sequence that leads immediately to core
6 damage or prevents you from reaching safe shutdown.
7 Then you go out and you look and say what's connected
8 to those components? Ah hah, all of those components
9 are in the same multi-conductor cable. That gives me
10 concern. And to make matters worse, there's no
11 current limiting transformer on them. Man, I've got
12 something.

13 But on the other side of the coin it may
14 turn out that oh, yeah, I've looked at these two
15 components, and this one is in this armored cable, and
16 that one is in that armored cable, and I'm just not
17 going to chase that.

18 MR. SULLIVAN: I'd like to, if I could,
19 clarify something about armored cable. If you have
20 multi-conductor cable in an armored cable, I don't
21 believe that mitigates the probability of getting
22 conductor-to-conductor faults within that multi-
23 conductor cable.

24 With regard to armored cable, what we're
25 talking about is the probability of getting a cable to

1 cable fault when both are in the -- does your data
2 show that?

3 MR. HENNEKE: Yeah. The expert elicitation
4 tables have them too, which is -- you know, everybody
5 has participated in that.

6 MR. SULLIVAN: So if I have a multi-
7 conductor cable in a conduit, I don't worry about
8 conductor-to-conductor faults within that cable?

9 MR. HENNEKE: No, not conduit. So if you
10 have an open cable thermoset or thermoplastic, it's a
11 fairly high probability, .3 is a typical MOV circuit.
12 Conduit is going to be slightly less than that,
13 depending on whether the actual panel, but it'll say
14 .1 to .05, and armored cable is going to be on the
15 order of .01 in the cable itself, not cable-to-cable,
16 so because the armor is -- surrounds the cable and
17 it's --

18 MR. SULLIVAN: So you get more force to
19 ground is what you're saying.

20 MR. HENNEKE: Yeah. Any cable like an A
21 conductor cable, the first thing that's going to
22 happen is that cable is going to short to ground, and
23 it's going to blow the circuit, so the armored cable
24 is 10 to the minus 2. What we're saying is it's 10 to
25 minus 2 for a cable of armor, and it is -- for cable-

1 to-cable it is physically impossible.

2 MR. SULLIVAN: Physically impossible.

3 MR. HENNEKE: You can't have that.

4 MR. CAMERON: Okay. That clarifies it. All
5 right. Fred.

6 MR. EMERSON: Bear with me. What I want to
7 put up here is somewhat similar to what we're doing in
8 a related process of coming up with USB , so bear with
9 me. I'll try to put down a concept which I think kind
10 of puts in one place what we've all been talking
11 about, so bear with me for a moment.

12 Okay. First we start off looking at
13 consequence. Okay. Start off with consideration of
14 consequence, and then the inspector would be asking a
15 series of questions when he walks into the plant. The
16 first question is, is it involved with associated
17 circuits? The second question is, does it have
18 consequences for hot shutdown? And there may be some
19 sub-tier questions which he may ask himself, like does
20 it affect flow diversion, does it create a flow
21 diversion path? Does it involve a loss of high/low
22 pressure interface?

23 These are all questions that he can ask to
24 allow him to hone in on scenarios that may have high
25 consequences. I'm going to separate that from how you

1 look at it after you've determined what the high
2 consequence scenarios might be. Let's see. There may
3 be several other questions you can ask yourself too,
4 which help you determine whether it's high consequence
5 or not. Okay. So based on asking himself this series
6 of questions, he comes up -- he's gone over. He's
7 gotten his PNIDs. He's gone -- well, see if -- I'm
8 curious about this one. It affects hot shutdown and
9 it may impact a high/low pressure interface so okay.
10 I have this scenario that I want to look at,
11 potentially high consequence.

12 Then you go and ask yourself another series
13 of questions, and this is what I meant by risk
14 mitigators. Then you look at whether those specific
15 scenarios can really happen or not from a realistic
16 standpoint. Can I have a credible fire? I'm just
17 going to list a few examples. I'm not going to try to
18 make this exhaustive. Is there a credible fire
19 associated with this? Does it involve armored cable,
20 or you might say the same thing for thermoset cable.
21 You know, does it involve circuit protection? And
22 there's probably a whole series of questions, some of
23 which I test on in the slides in my presentation which
24 you could ask yourself, but the whole point of this
25 was to first define what the possible scenarios are,

1 going through a series of questions. And then once
2 you pick the scenarios, you go through and you ask
3 yourself is this scenario really possible, using these
4 risk arguments.

5 We've been kind of talking about doing
6 something like that, but I wanted to try to put it
7 down as maybe part of a flow sheet or a series of
8 questions that the inspector could ask himself to
9 allow him to define high consequence scenarios, and
10 then determine whether they really are risk-
11 significant or not. And hopefully, would fairly
12 quickly allow him to hone in on the ones that he
13 really needed to go dig into further, and ask some
14 really low level questions. Are the cables in the
15 same -- are they neighboring cables in the same tray,
16 which would be really down the list.

17 So I guess the point is, you work your way
18 down from some very general questions on consequence,
19 very specific questions on can this scenario happen.
20 That's what I had in my mind for how the inspector
21 might approach it.

22 MR. CAMERON: Well, let me put some
23 questions out for the group. I think what I hear you
24 saying is you're suggesting that the inspection
25 guidance might be written in the form of questions

1 like this. Is that what you're proposing?

2 MR. EMERSON: It may not end up looking just
3 like this in the inspector's hands, but it's a way for
4 us to get started on honing in on how to look at
5 things, whether they're something the inspector should
6 look at or not.

7 MR. CAMERON: Let me go to Eric, and Mark,
8 and other experts around the table. What do you think
9 about this approach in terms of trying to work through
10 these to get you to where you want to be?

11 MR. WEISS: My first question would be how
12 does the regional inspector see this approach?
13 Usually when we issue inspection guidance it's not in
14 the form of questions or think about this area. It's
15 usually something a little more direct. Maybe Roy or
16 somebody else from our region would --

17 MR. CAMERON: And to clarify what Fred said,
18 is that he's suggesting this is a starting point.

19 MR. EMERSON: This is the starting point for
20 writing inspection guidance. It's a structured
21 approach to writing inspection guidance.

22 MR. CAMERON: And does this-- this may get
23 us to the types of things that Eric has in his matrix,
24 I suppose, these types of questions.

25 MR. WEISS: Right.

1 MR. CAMERON: Mark.

2 MR. SALLEY: It's a good idea. I mean, I
3 think it's workable, Fred. To work the problem back
4 from the consequences forward I think would be a much
5 more successful way. And I think that's what you're
6 doing here. And that would be a good approach. Now
7 let's get some examples up there, you know, besides
8 flow diversion to see how many areas we could work
9 backwards.

10 MR. CAMERON: Okay. Anybody else have a
11 comment? Bijan, and let's hear from Dennis and Chris.
12 Go on, Bijan.

13 MR. NAJAFI: I think this is very
14 consistent. I thought that so far what we've been
15 talking about since this morning, that I guess the
16 challenge is to try to carry these consequences to the
17 attributes. For example, when we talk about the flow
18 diversion, that Roy said if it is 10 inch in a 12 inch
19 header, then I go further. I carry it, look at it a
20 little bit more. I'll ask the question, what if in a
21 12 inch header you have four one and a half inch
22 diversion path? So I guess when I say attributes to
23 add, to continue is that what do I exclude, what do I
24 include? Which in his practice he chose to exclude or
25 put in a lower priority if it had four one and a half

1 inch diversion path. To say spurious operation of all
2 four MOVs in these four, but look at the ten instead
3 of the four two and a half, so I guess those kinds of
4 -- that's what I'm saying. I guess we're getting
5 finally to the same process, start with the
6 consequence to define the components that you need to
7 look at, and then do the risk element, go through your
8 step to determine whether it's risk-significant. But
9 I guess it comes back to the challenge being to define
10 each one of these consequence elements or criteria,
11 and then attributes associated with each one. How can
12 we eliminate some of the flow diversion path, but do
13 look at others? That's what the challenge, I guess,
14 is for us.

15 MR. CAMERON: Okay. And the question is how
16 detailed are we going to get on this, in this
17 particular discussion. Dennis, Chris, you want to say
18 anything about this particular approach? And then
19 let's see if we can go through it.

20 MR. PRAGMAN: I just want to suggest when
21 we're thinking about consequences that we stir into
22 the mix, that sometimes consequences are immediate,
23 and sometimes they can be delayed if a situation goes
24 unmitigated for an extended period of time. So flow
25 diversion may not propose an immediate concern, but

1 over a long period of time cumulatively it could have
2 a concern, and there may be a way we can mix that in
3 there to help push certain things up a ranking scale,
4 and certain things down a ranking scale.

5 MR. CAMERON: Okay. Dennis.

6 MR. HENNEKE: Yeah, I agree with Fred. This
7 will make it much simpler, and fairly straightforward.
8 Of course, depending on how you answer the first page
9 of his questions might depend on what questions you
10 ask the second time, because for example, if you have
11 a high/low pressure interface that happens to be an
12 interface in system LOCA outside containment, then you
13 may not care if it's armored cable because the
14 consequences are high, and it would take much more of
15 a risk reduction from these risk factors that we've
16 included in order to make it not risk-significant. So
17 I think depending on what consequence you're going
18 down the path, you'd have to ask different questions.
19 But generally, the questions would be the same, and
20 they're kind of additive. If you have armored cable
21 and it takes a long time to damage, and you can't have
22 a credible fire, and maybe a series of questions, then
23 it would be easier to throw it out if it wasn't a
24 high/low pressure interface; whereas, if it was a
25 high/low pressure interface then it would be much

1 harder to throw it out.

2 MR. CAMERON: Okay. Where do you want to
3 start on this? These are consequences, hot shutdown,
4 high/low pressure interface. Do you put anything
5 else?

6 MR. SULLIVAN: More PWR isolation, reactor
7 pressure vessel isolation, PWR. You guys can jump in
8 here.

9 MR. HENNEKE: Well, on high/low pressure
10 interface it's either a LOCA or an interfacing system
11 LOCA, and we would treat those differently. A PORV
12 opening may or may not be considered a high/low
13 pressure interface depending on the plant. That's a
14 LOCA. That's not as bad as an interface.

15 MR. SULLIVAN: It all depends on how you
16 define a high/low pressure interface. Station
17 blackout or -- station blackout.

18 MR. CAMERON: Let me just put some of these
19 down. Let me check in with you, Fred. Is this
20 consistent with what you think? Take a look at all of
21 these types of things as a starting point that could
22 lead to high consequences. Okay. Now one question.
23 Is it -- this is a different beast than these. I
24 mean, why did you have this here, "Identify associated
25 circuits"? Are all of these systems -- in other

1 words, is it something that's over here or what?

2 MR. EMERSON: Just because I thought this --
3 what I'd understood earlier was that the scope of what
4 we're writing is inspection guidance for associated
5 circuits.

6 MR. CAMERON: Well, that's right. I just
7 wondered why you listed that with these types of
8 consequences. I mean, you're looking at all these.
9 Right?

10 MR. EMERSON: Yeah.

11 MR. CAMERON: To see what associated
12 circuits you're going to deal with.

13 MR. EMERSON: Right.

14 MR. CAMERON: Okay.

15 MR. NOWLEN: But it's more in the way of an
16 overriding entry condition. It's not an associated
17 circuit. It doesn't go here.

18 MR. EMERSON: It's not a high consequence
19 thing, it's a way to focus your high consequence
20 considerations.

21 MR. CAMERON: All right. Any other --

22 MR. NOWLEN: How about sealed LOCAs?

23 MR. CAMERON: What is it?

24 MR. NOWLEN: Sealed LOCAs.

25 MR. SULLIVAN: Reactor coolant pump seals?

1 Varies from plant to plant. These guys could probably
2 help you out there more than I can.

3 MR. NOWLEN: So it's on the list. Thanks.

4 MS. KLEINSORG: How about aux feedwater? Is
5 that --

6 MR. CAMERON: Aux feedwater.

7 MR. SULLIVAN: Well, it's a hot shutdown
8 system, so it's -- any hot shutdown system I guess
9 would fall in that category.

10 MR. CAMERON: Yeah. See if you can go back
11 and try to organize these perhaps, but at least you're
12 coming up with some things that may have high
13 consequences, so at least that's a starting point.
14 Anything else? Excuse me.

15 MR. PELLIZZARI: You are expecting a bus to
16 be protected by electrically operated circuit breaker,
17 somehow the power cable and the control cables and
18 there is a fire, you lose the capability to trip the
19 breaker. Say a loss of 125 volt DC control panel for
20 the breakers, that would be one.

21 MR. CAMERON: Ken, I think that you're going
22 to probably for the stenographer maybe just give us
23 those things a little bit slower.

24 MR. PELLIZZARI: Okay.

25 MR. CAMERON: Okay. How would we describe

1 that now?

2 MR. PELLIZZARI: You are tripping the
3 control power for the electrically operated circuit
4 breaker so your high voltage breakers require -- you
5 have a fire that causes a 4 Kv power cable to fail as
6 well as the control power for the breaker that's
7 supposed to isolate --

8 MR. CAMERON: So loss of breaker --

9 MR. PELLIZZARI: Breaker control power.

10 MR. CAMERON: Loss of breaker. Anything
11 else. Yes, Bob.

12 MR. KALANTARI: I don't know if you want to
13 list ADS actuation spuriously for boilers, ADS.

14 MR. CAMERON: So ADS.

15 MR. KALANTARI: Right. Okay. Automatic
16 Depressurization System.

17 MR. CAMERON: Okay. Automatic
18 Depressurization.

19 MR. KALANTARI: How about diesel generator
20 started without service water, DG start without
21 service water.

22 MR. CAMERON: DG start.

23 MR. KALANTARI: DG start. Diesel generator
24 starts without service water.

25 MR. CAMERON: Without service water.

1 MR. KALANTARI: How about any pumps that
2 that start without suction opening?

3 MR. HENNEKE: These aren't consequences,
4 these are just scenarios. I mean, I could come up
5 with hundreds of thousands of scenarios. I mean, it's
6 not necessarily leading to a loss of hot shutdown
7 capability.

8 MR. KALANTARI: If you start that pump with
9 that suction, you destroy that pump, you drain your
10 water, you have no safe shutdown capability.

11 MR. HENNEKE: But there has to be a number
12 of other failures that lead to that.

13 MR. KALANTARI: One pump, you close the main
14 flow, you close the suction, you start -- that pump
15 destroys itself. You drain your CST.

16 MR. CAMERON: Okay. Let's get all this.
17 Bob, can you -- let me just get that up there. There
18 may be a disagreement. We may be going from high
19 consequence into listing all the different types of
20 things that go could wrong. And I think you're going
21 to have to try to sort this out but, Bob, what was the
22 last one?

23 MR. KALANTARI: The last two I had was any
24 pump suction closed with pump start signal, closed
25 pump, suction closed or not opening. And then similar

1 to that would be pump start with main flow valve not
2 opening, or main flow closing actually if it's open.
3 Then the pump gets that head, the reactor is at high
4 pressure. You are trying to pump against a thousand
5 pounds. Takes no more than 30, I don't know, 120
6 seconds. That pump is going to cavitate, destroy
7 itself, put a big hole in the system.

8 MR. CAMERON: Fred, what do you think about
9 Dennis' comment on some of these examples?

10 MR. EMERSON: I agree with him.

11 MR. CAMERON: Okay. So the trick is to try
12 to differentiate between hot shutdown, high/low
13 pressure interface, aux feedwater. How would you
14 distinguish between say these first three that we're
15 talking about, and say these last three? Chris.

16 MR. PRAGMAN: The last three are specific
17 examples that may or may not be true for a specific
18 plant. They're ways of certainly of losing a
19 particular function, not necessarily the only ways.
20 I think they're bounded by the examples we have in the
21 first page that are more general, that just say the
22 function can be lost.

23 MR. CAMERON: Okay. So in other words,
24 these -- what Bob has given us are all examples of
25 ways that these capabilities would be lost. Okay. So

1 that they could be included under those as specifics.
2 Okay. Yeah. Go ahead, Steve.

3 MR. NOWLEN: Yeah. I was going to suggest
4 that as another one, you might just put in a general
5 loss of inventory that would -- you know, that's one
6 mechanism that you could lose inventory coolant, so
7 it's sort of a higher level.

8 MR. CAMERON: We have to get -- Wade, I've
9 got to ask you. We've got to get all this on the
10 transcript. Okay? So let me know if you want to say
11 something.

12 MR. LARSON: I think from Rich Fuhrmeister's
13 point of view, he has to get some very specific things
14 down, examples that would be good for inspectors, so
15 the more specific we get in these examples, rather
16 than going back to the generalities, the better off it
17 will be for the inspectors. So I think we're speaking
18 to the issue of the day.

19 MR. CAMERON: Okay. Good. Let's see who we
20 have. Go ahead, Ken.

21 MR. SULLIVAN: I think that all of the cases
22 that you studied and, you know, they're right. You
23 can go on for hours to talking about specific
24 scenarios. But in general, all of those scenarios
25 fall under hot shutdown with regard to those that

1 could have a direct and immediate impact on your
2 shutdown capability. Certainly, if your pump gets a
3 start signal at the time when the suction valve goes
4 closed, you're going to lose that pump. But if it's
5 a high shutdown pump or system, then certainly
6 something -- it's an example of how a hot shutdown
7 system could be impacted, so these are examples, not
8 specifically -- you know, you can't define them all
9 right here and now, that may be significant at every
10 plant. But I think they all fall under bullet number
11 two there of hot shutdown.

12 MR. CAMERON: Okay. Let's go back to hot
13 shutdown. What else do you need to do with hot
14 shutdown? Now Fred put these credible fire, armored
15 cable, circuit protection. I mean, where are we going
16 to go if you wanted to look at hot shutdown, where are
17 we going to go next with Fred's suggested analysis?
18 Ken.

19 MR. SULLIVAN: Well, the first step you do
20 is you identify the vulnerability, which is what we
21 did first. WE identified a potential vulnerability as
22 far as an inspector is concerned. You have a case
23 where this flow diversion valve could open. You know,
24 you're looking at a PNID. You don't know what the
25 potential of that is occurring right now. It's a

1 potential vulnerability. That's all it is.

2 From there you then go and you look at where
3 those cables are located, are they in the same fire
4 area, are they in the same cable tray, what's their
5 spatial separation? And you consider those factors
6 for what's the impact a fire could have on damaging
7 those cables of concern, so the first step in the
8 process is identifying the vulnerability. The second
9 step is identifying the potential impacts of fire
10 damage to cause that vulnerability, or to have an
11 impact on safe shutdown.

12 MR. CAMERON: Okay. Safe shutdown on top.
13 Right?

14 MR. SULLIVAN: Right.

15 MR. CAMERON: One thing that interferes with
16 safe shutdown is flow diversion?

17 MR. SULLIVAN: Uh-huh.

18 MR. CAMERON: Then you have to look at where
19 the potential vulnerability is.

20 MR. SULLIVAN: Right. Is there a potential
21 vulnerability? From the PNIDs you'll identify the
22 flow diversion path. Okay? If you see two valves
23 located in series, and you then find through cable
24 routing that the cables are in the same fire area,
25 there is a potential vulnerability there. Now you

1 don't know whether just because they're in the same
2 fire area, that doesn't mean they're both going to be
3 affected by a single fire. You know, maybe, maybe
4 not, depending on the spatial separation and certain
5 other attributes. Then the inspector would go and
6 look, and see what kind of protection is provided, if
7 spatial separation is provided for those cables.

8 MR. CAMERON: Let me ask you. Is it useful
9 to keep talking about this particular example to see
10 what we could get down there, that may be a good
11 example? Dennis, what did you want to say about this?

12 MR. HENNEKE: Well, I think we kind of
13 jumped ahead here, that in fact in the McGuire pilot
14 for NEI-001 what we want to do is identify as much as
15 we can before we traced anything. We want to know if
16 the cables are in the area, or travel in the same
17 area, but you don't have to go through a cable trace.
18 In fact, during inspections I think that would be even
19 more important when they're limited by time that they
20 want to identify the vulnerability, and certainly look
21 at attributes that they can quantify prior to cable
22 tracing. So Fred listed some things here like armored
23 cable, circuit protection, that type of stuff. And
24 another example of it is the time available. We all
25 know PORV cables, for example, are vulnerable. You

1 can spuriously operate a PORV, but PROVs and AOVs
2 actually in many cases will actually go back to their
3 failsafe position, and the testing showed that the
4 average time for a spurious operation was about two
5 minutes, so it spuriously operated, two minutes later
6 it would go back closed. Now an MOV won't go back
7 closed. It's going to fail wherever you sent it, but
8 a PORV or an AOV may go back closed. So if you can
9 last say 10 minutes, or 20 minutes with a PORV open,
10 and you're pretty certain it's going to go back
11 closed, that would be one of the factors you want to
12 include, and even identify that before you trace a
13 single cable.

14 MR. SULLIVAN: You're absolutely right. My
15 only problem with that is, you know -- you're
16 absolutely right. Your test data did show that, but
17 does that test data bound all configurations found in
18 every plant? I'm not real comfortable with that when
19 you start saying the PROV is going to go closed in two
20 minutes. That occurred during a test. It may not
21 occur for all plants.

22 MR. HENNEKE: Well, in fact the test didn't
23 look at PORV cables. They just looked at --

24 MR. CAMERON: Let's go to Eric.

25 MR. WEISS: Yeah. I just want to say that

1 I understand the points that were made, and they're
2 certainly valid. But to keep us on focus, we don't
3 have to have the total answer here. We're not looking
4 -- we're looking for a smarter way to do associated
5 circuit inspection, so if we can agree on a few things
6 that are risk-significant, we've accomplished what we
7 want. We don't need to solve, you know, whether the
8 spurious operation is bounded by a certain description
9 in all cases. That's too much for us to try and do.

10 MR. CAMERON: Is this going on the right
11 track for you, Eric and John, or --

12 MR. WEISS: Well, I think we are laying out
13 an approach which is to sort of work backwards from
14 what we originally conceived, to start with a
15 consequence and go to the attributes that are attached
16 to that consequence. I think we -- I had hoped that
17 we could all agree on a few of the attributes that are
18 well-documented, which was what I was attempting to do
19 with my chart. I mean, it's documented in the expert
20 panel. It's documented in large measure in NEI-001.
21 I think we all agree that there's different damage
22 thresholds for different types of cables. And if I go
23 and I find a flow diversion, and I see that it's in
24 non-armored cable, and there's no current, that's
25 something I expect my people to go look for. Am I

1 getting a yes out of the audience? General consensus?

2 MR. CAMERON: Anybody disagree with that?
3 Anybody think that that's not useful? Bijan.

4 MR. NAJAFI: Yes. I think I totally agree
5 with that, and also Dennis, that I think you do not
6 want to go to those fourth and the fifth item. I
7 mean, that's where you go wanting to get to this risk
8 question that Fred has up there. I thought our
9 objective was to go through the first three, and then
10 under potentially vulnerable, list an attribute that
11 allows us to determine which are the candidates,
12 attributes that somebody can just go pick up that
13 inch valve as opposed to the four or the two and a
14 half inch valve, so that's where you stop, I think.
15 I mean, we don't need to go to the third and fourth,
16 and the fifth.

17 MR. CAMERON When you're talking fourth and
18 fifth, what should I take --

19 MR. NAJAFI: The location of the cable and
20 separation of the -- I mean spatial separation,
21 because those are basically -- to me it comes when you
22 really want to determine the risk, and what is the
23 value or effect of it, but to do that first, you have
24 to pick that MOV that he's talking about. That's the
25 tough part. He's got to pick that MOV among another

1 500 MOVs. That's the first step, pick those MOVs
2 among 500 other ones.

3 MR. CAMERON: And when you say "MOV" you
4 mean?

5 MR. NAJAFI: Motor Operated Valves. There's
6 a thousand pieces of equipment, he's got to pick five
7 or ten, or fifty, or whatever.

8 MR. CAMERON: All right.

9 MR. SULLIVAN: If I may, maybe I could
10 clarify a little bit. Picking the MOV or two MOVs out
11 of the 500 MOVs, that's identifying the potential
12 vulnerability. The inspector is going to look at the
13 PNIDs, and he's going to go through a flow diagram,
14 and he'll come across perhaps a flow diversion path.
15 Well, there's his two MOVs or a single MOV. That's
16 how he picks the one, the potential vulnerability. At
17 that stage in the game that's all it is, is a
18 potential vulnerability. If both of these valves open
19 up, I can have a significant impact on my hot shutdown
20 system. Okay? That's all he knows right now.

21 What he's got to find out really for that,
22 what's the potential for a single fire to cause those
23 valves to spuriously actuate or mal-operate for a
24 better word? From that, he's got know where the
25 cables are routed, where are the control cables for

1 those valves routed? And once he has that
2 information, he can see the spatial separation for
3 those cables, and see whether or not a single fire
4 could affect both of those cables or that valve.

5 MR. CAMERON: So you're saying that these
6 things that should be -- you're just agreeing with
7 what Bijan was saying?

8 MR. SULLIVAN: Well, your vulnerability,
9 you're identifying your vulnerability as your valve,
10 the potential for that valve to spuriously open.
11 Okay? And what's going to cause that to happen. The
12 fire damage to what is going to cause that to happen?
13 Fire damage to the control cable for that valve would
14 cause it to happen. Where are those cables located?

15 MR. CAMERON: Steve.

16 MR. NOWLEN: Yeah, I go back to what I said
17 before. Again, we're mixing up this problem of the
18 entry condition versus how we're going to analyze it
19 once we've decided it needs to be analyzed. And I
20 think when you get into things like spatial
21 separation, detection suppression available, all of
22 those things are how he's going to analyze it once
23 he's decided he needs to do that. But Roy's first
24 problem is, is he looks at the PNID and he sees two
25 valves in series that create a diversion path or

1 spuriously opened. How does he decide whether he
2 should even chase those two cables at all? Very high
3 level. First, the entry --

4 MR. SULLIVAN: I thought we've already
5 established that as --

6 MR. NOWLEN: No, I don't think we have. We
7 haven't got a single attribute up there that tells him
8 yes or no, do I chase that diversion path.

9 MR. NAJAFI: This goes even beyond
10 mechanical pieces of equipment, how many instruments,
11 how many combination of the instruments? So that's --
12 I mean, it's not as trivial that he's going to look at
13 a PNID and say one diversion path, I'm going to take
14 it. And the problem is more complicated than that.
15 I mean, there's -- to really look at the PNID, one
16 line diagrams, at time procedures, to pick a
17 manageable set of whatever you can look at, which the
18 next step then yes, location of the -- that's when you
19 -- if you need to, you start going into cable tracing
20 and the rest.

21 MR. CAMERON: Okay. There seems to be some
22 agreement on that. Fred.

23 MR. EMERSON: I'm going to agree also. When
24 I started that list of risk items, those were things
25 that the inspector could evaluate qualitatively to

1 help him judge how important that scenario was. I
2 mean, Roy, you can go into a room and pretty well
3 determine whether you think it's a high risk room or
4 not, even based on the combustibles that are there,
5 and the ignition sources. I mean, that's a judgment
6 you make every day. It's pretty easy to tell what
7 kind of cable it has, you know, and most safe shutdown
8 engineers can tell you what kind of circuit protection
9 they have. And I'm just offering those as a few
10 examples of things that the inspector can
11 qualitatively use to sort out what things he's going
12 to look at in more detail, and what things he's not.
13 The question of where the cables are routed in that
14 zone requires a lot more analysis, and that's not what
15 I had in mind as an initial sort of whether something
16 should be looked at or not.

17 MR. CAMERON: Okay. Ken, did you have
18 anything to say on that?

19 MR. SULLIVAN: Well, with regard to
20 selecting fire areas, the way the inspection procedure
21 reads currently, we only focus on risk-significant
22 fire areas to begin with, as determined by the IPEEE
23 or other processes, so the inspection focuses on risk-
24 significant fire areas, i.e., they typically have
25 ignition sources in there, or high combustible

1 loadings already, so that phase is already done. But
2 with regard to determining potential vulnerabilities
3 to what could impact hot shutdown, with regard to flow
4 diversion, I thought we already had established that.
5 If it could have a direct and immediate impact on your
6 shutdown system or capability, it would be one you'd
7 pick. If it could not, forget about it.

8 MR. CAMERON: Let's go to Roy, and then to
9 Wade, and see if we can figure out where we are.

10 MR. FUHRMEISTER: Now as an inspector, once
11 we have identified that a component is vulnerable, our
12 next step is we go get a control circuit schematic for
13 that component, pump valve, whatever it is. And then
14 we look at the control circuit schematic to determine
15 are there potential circuit faults that could cause
16 mal-operation? An example would be where you have the
17 power supply cable going up to the control room in the
18 same multi-conductor cable as the conductor that runs
19 out to the motor control center to engage the
20 contactor coil, so our next step, once we have
21 identified the vulnerable component, we look at the
22 control circuit. And that's where the inspector is
23 going to need the next piece of guidance, how many
24 faults. If it takes two shorts and three grounds to
25 make the mal-operation, I don't want to go there.

1 That's too hard. I'm not sure it's even credible, but
2 that's where we need actually the next piece of
3 guidance, it's how many control circuit faults do we
4 have to consider for mal-operation? And then once we
5 determine is it really something we have to pursue,
6 then we get into the cable location, the separation,
7 the credible fire, which is all in our significance
8 determination process, where I, as the inspector, have
9 to develop a credible fire scenario to cause the
10 damage to make it happen. I have to be able to start
11 a fire. I have to be able to make it big enough, and
12 that all gets included in the significance
13 determination which is being worked in another forum
14 outside of this room.

15 MR. CAMERON: I'm going to clean this up and
16 put something up for your consideration after we take
17 a break, and see if it's coherent. Wade.

18 MR. LARSON: I think you ought to just
19 follow that thread and see where it goes.

20 MR. CAMERON: Yes. I think that's a good
21 idea. That's a good idea. Any comments on what Roy
22 just said. Go ahead, Fred.

23 MR. EMERSON: I don't.

24 MR. CAMERON: All right. Bijan.

25 MR. NAJAFI: You asked, I mean, one comment.

1 That's why I'm getting exactly the same kind of
2 example you're talking about, how many control
3 circuits do I stop at, whether three or four. This is
4 the kind of attributes I'm talking about. It applies
5 to the mechanical pieces of equipment as much as it
6 applies to the circuits. I mean, how many of these
7 valves in series do I stop at? Two is enough. Is
8 three enough, or four or five? Those are the kind of
9 attributes that that's what I was looking for. And
10 when I said that even separate the attributes in terms
11 of the mechanical pieces of components and system, and
12 electrical attributes, do I stop at two valves, or
13 three valves, or four valves, or four diversion paths,
14 or how many of these, or even diversion path of one
15 system with a diversion path of a secondary system
16 that may be related in terms of its function for
17 makeup, so where do I stop? And the same thing
18 applies to the circuit, do I stop at armored? Do I
19 stop at cable-to-cable? Do I stop at those? So if
20 those attributes can be made at some generic level,
21 then that's going to be helpful.

22 MR. CAMERON: Okay. Dennis.

23 MR. HENNEKE: I guess we had a similar
24 experience in the NEI-001 pilots, and that we went and
25 we identified the vulnerability. We looked at the

1 circuits, and then we tried to do as much as we could
2 with those circuits prior to having to do any sort of
3 cable tracing at all, because cable tracing is a lot
4 of effort. And it's also where you would have to
5 interface with the utility and say trace me these
6 cables, and then a couple of days later they come back
7 with the information. And the cable tie-up and that
8 type of stuff is pretty important. How many failures,
9 and we did that in the NEI-001, and we tried to put
10 that in in the screening process.

11 Now in that process we mixed in the fire
12 frequency and all that, which we probably wouldn't
13 want to do at that point, but there's a lot of things
14 you can identify which are generally the type of
15 failure, the type of cable you're going to be in, and
16 how many failures it would take. But I know from our
17 experience, you can, just by knowing the cable, you
18 can tell where it's going from. It's going from the
19 control room to the MCC, and it will go through the
20 cable spreader room and the penetration room or
21 something like that, so you can already know where
22 it's going, and then start identifying characteristics
23 of what it's doing, what cable type it is, and that
24 type of thing. And that's exactly what we found in
25 the pilot.

1 MR. CAMERON: Eric.

2 MR. WEISS: My reaction to the discussion
3 that Bijan started about how many of these do we take
4 into account? Should we take into account three hot
5 shorts and two ground? My reaction to that is that
6 goes to Steve's point, which is two questions. What
7 should we tell inspectors to look for? And second,
8 how should we analyze what they find?

9 And as a manager, I want to turn inspections
10 on in a reasonable way, so I don't think I have to cut
11 it too fine. I don't have to say go look for four.
12 If I say one or two, isn't that good enough? Isn't
13 that going to capture most of the risk? If I have one
14 hot short or two hot shorts in a multi-conductor cable
15 that lead to four valves opening, diverting all the
16 AFW flow so it's not available, isn't that good
17 enough?

18 I mean, down the road I would like to have
19 answers to all of these questions, but I've got time
20 to deal with things that are of lower safety
21 significance and less probability, and I can ask
22 Office of Research to give me smarter, better answers
23 so that I don't do something that's going to put a
24 huge burden on the inspectors, big burden on the
25 licensees for an uncertain regulatory effect. If I

1 just confine myself to one or two hot shorts, is there
2 anybody in the room that would disagree with that? Is
3 that being too coarse of a sieve for initial
4 inspection guidance in an area where we suspended
5 inspection because of the controversy?

6 MR. CAMERON: Bijan, too coarse?

7 MR. NAJAFI: NO, I don't think, especially
8 if you go down to two, especially for what the scope
9 of this is, which is primarily mechanical and control.
10 And we really haven't looked much at the
11 instrumentation and its impact on others, but limited
12 to those, I think that's a reasonable first sift, the
13 two. I think it is.

14 MR. CAMERON: Okay. John.

15 MR. HANNON: Just let me put on thing in
16 perspective, because what we're talking about is
17 resuming our inspection for associated circuits in
18 October of this year. Remember that the Reactor
19 Oversight Program is evaluated annually. What will
20 happen is once we've gotten about a year's worth of
21 experience in going after associated circuits with
22 this limited approach, we're going to feed that back
23 into the program office for evaluation, and we may
24 want to expand our look in out years, or we may decide
25 that what we're looking at is adequate for our

1 purposes. But it will be evaluated on an annual
2 basis, once we begin it again, for mid-course
3 corrections, if we find that we need to cut back on
4 the level of activity we have started, or if we want
5 to expand it, we'll be able to do that. So we're
6 starting in October. We're going to be doing limited
7 look inspection based on the criteria that we're
8 coming up with today, but it'll change over time.

9 MR. CAMERON: All right.

10 MR. LARSON: Just so I understand what you
11 guys are talking about, if you go to a room with a lot
12 of cable, a lot of cable trays and you have a fire
13 that involves that room, two hot shorts though a small
14 room, one cable tray, two hot shorts, how does compare
15 with cables spreading on to something else.

16 MR. CAMERON: Anybody have an answer for
17 Wade on that one? Steve, or go ahead, Ken.

18 MR. SULLIVAN: I believe Eric was referring
19 to with regard to the flow diversion, if it takes two
20 hot shorts to cause that flow diversion, you may need
21 to consider it. I don't think he's limiting it to two
22 hot shorts per fire event. Correct me if I'm wrong,
23 Eric.

24 MR. WEISS: Well, yeah, I suppose if you had
25 a fire in a cable spreading room, cable spreading

1 rooms have thousands of cables in them going to all
2 kinds of systems. I think it would be -- it might be
3 unreasonable to assume that you're only going to look
4 at --

5 MR. CAMERON: Okay. Let's go to Chris, and
6 then over to Fred.

7 MR. PRAGMAN: Just to respond to Wade's
8 question, in my experience what I'm used to seeing is
9 that a plant will identify all the hot shorts that
10 could possibly happen. And it's the truncation of are
11 we looking at one, are we looking at two or multiples?
12 That happens when the plant has to decide what am I
13 going to do to mitigate them? So if there's an
14 individual hot short that could lead you to an
15 unacceptable place, I would expect you'll find the
16 plants have mitigated those individual cases. It's
17 when you start looking at combinations where I think
18 you're going to find the plant hasn't necessarily
19 contemplated two things happening in combination, that
20 together produce the unacceptable result. And the
21 reason I put my sign up originally was your original
22 proposal of maybe looking at ones or twos, I think is
23 reasonable, when you consider that for each additional
24 spurious actuation, you are dropping down some level
25 in the likelihood of that next one happening, because

1 each one either has a dependent or independent
2 probability of happening, so the probability of one is
3 greater than two, and the probability of three is less
4 than two, so it's going to keep decreasing. So even
5 though you could probably dream up a scenario where
6 ten things happen and lead you to core damage, the
7 probability of that happening I would expect would be
8 very low.

9 MR. CAMERON: Fred.

10 MR. EMERSON: No.

11 MR. CAMERON: Bijan.

12 MR. NAJAFI: I want to add also something,
13 another reason that I think the one and two is not
14 only the right, also the more practical thing to do,
15 because as these permutation you start increasing, if
16 our objective is to find the unknown out there, the
17 likelihood that you can find it becomes drastically
18 smaller and smaller. You can think about three, and
19 four, and five. By the time you're looking for the
20 five combination, the likelihood you get lucky is 10
21 to the minus 6 or something and you find it, because
22 the permutation just exponentially goes up, so it
23 becomes a point of diminishing return.

24 I mean, at some point it's not really
25 practical. You can't find all of them, so that's I

1 think the other reason that ones and twos are pretty
2 much stretching the practical limit. By the time
3 you're at three, you're pretty -- I mean, you can't
4 find what you -- yeah, I mean it's limited by the
5 resources and analysis that you can put in. And you
6 can't find all of that. And the other thing I
7 remember, the second point that is related to what
8 weight, if I -- I understood this process the way to
9 work is not necessarily by going through fire area by
10 fire area, it's rather you're looking for the
11 vulnerabilities, and you start with the PNID, so
12 you're not saying necessarily for this exercise, not
13 what you do for Appendix R outside of this exercise.
14 You're not looking at cable shredding room, control
15 room, switch gear room in that way. You start by
16 looking at a system level on a functional level
17 searching for combination permutation, where they're
18 in the cable shredding room, or control room or
19 anywhere for that matter. And if you limited it to
20 when you get into the cable shredding room, if you
21 have identified five, or ten, or fifteen combinations
22 of the two that based on other attributes which we're
23 still making the point, we need others, because even
24 combination of the two could be a few hundred. So we
25 need still other attributes to limit the combination

1 of the two. Then you don't worry whether it's the
2 cable spreading room or somewhere else at that point
3 for identification, so you're looking at it from a
4 functional/system/component.

5 MR. CAMERON: I think maybe it might be a
6 good time to get some coffee, or maybe even something
7 stronger, although I don't think they serve it up
8 there. But why don't we take a short break, and see
9 if we can do a summary of where we are, and how to go
10 forward with the discussion. And be back at 3:30,
11 gives you fifteen plus.

12 (Off the record 3:12:57 - 3:35:15 p.m.)

13 MR. CAMERON: People have assured me that
14 we've made progress and have agreed on a number of
15 things, so I'm not going to argue with that since you
16 all know more about this than I do. We're going to
17 ask Fred Emerson in about a minute to put the slides
18 up that he had up earlier about associated circuits
19 that they thought were of high significance, they
20 being the NEI Task Force. But I just want to sort of
21 summarize where I think we've been, and see if people
22 agree or wanted to add anything to that.

23 First of all, it seems we've agreed that the
24 focus should be on consequences, and that the entry
25 conditions for inspection, two entry conditions. One,

1 consequences falling from things that can affect hot
2 shutdown and consequences flowing from things that
3 could affect the high/low pressure situation. And
4 then we get to well, if you find that, what's the
5 realistic damage that you have to take a look at?
6 This is the two or less circuits, and if those are
7 found, then you get into things like the cable
8 separation credible fire. Does that make sense in
9 terms of a hierarchy? And, Roy, do you want to
10 restate that more coherently for us, since you're on
11 the line?

12 MR. FUHRMEISTER: Okay. What I have heard
13 as an inspector is that you folks have come to an
14 agreement that what I'm going to look at for my
15 associated circuits reviews is vulnerabilities which
16 can affect the ability to achieve the hot shutdown
17 function of a system, or a vulnerability that can open
18 a high/low pressure interface causing an unrecoverable
19 inter-system LOCA. That's what I've heard, and I
20 congratulate you on that. It took six years to get
21 here.

22 The next thing that we need as an inspector
23 is what is the credible damage to impose on cables and
24 in the control circuit based upon the cable
25 construction and installation. Is it in conduit, is

1 it armored? Is it a multi-conductor, or is it a
2 single twisted pair? And that's, I think, where we
3 need to go for guidance for the inspector.

4 Now we've identified which circuits to look
5 at, now we need to tell the inspector what does he
6 consider for damage in that circuit realistically,
7 based upon what everybody has learned from the NEI
8 test?

9 MR. CAMERON: Anybody want to add anything
10 to that? All right. We're going to go to Fred for
11 some specific examples, and see if we can connect
12 these two pieces of the conversation. First, Ken, do
13 you want to add something?

14 MR. SULLIVAN: Well, I have to say that
15 these would probably fall under, and let me know if
16 I'm wrong, vulnerabilities that can impact hot
17 shutdown, but along with those would be instrument
18 circuit per misses and control circuit interlock.
19 That would fall under the hot shutdown system.

20 MR. CAMERON: Okay. We know there's a lot
21 of sub-categories under hot shutdown, including flow
22 diversion and some of the other things that Bob and
23 others have mentioned.

24 MR. SULLIVAN: Automation actuation and
25 those kinds of things.

1 MR. CAMERON: All right. Fred, do you want
2 to give us some examples, and you have the lavalier.
3 Right? All right.

4 MR. EMERSON: Okay. I told Eric and I told
5 the NRC folks that I'd put up my slides which said
6 where inspection was required. In return, a small
7 price to pay is I would be allowed a few seconds to
8 put up slides where inspection is not required first.
9 That would be not doing the licensees a service if I
10 didn't do that, so I'll go just put those up, just
11 remind you that they're there, remind the NRC that
12 they're there, and then I'll fulfill Eric's wish.
13 They are in the handouts. Thank you.

14 Okay. I get paid for playing on words, so
15 I call this slide "Areas of Inspection Interest",
16 rather than high consequence scenarios. That's the
17 first one. There's a lot of sub-clauses in that.
18 Single multi-conductor cable containing circuits for
19 components whose simultaneous failure has significant
20 consequences. That means there's two components in
21 that one cable, that if they both fail from a fire,
22 there's significant consequences associated with that.
23 That was my first such slide. That's not a specific
24 example. I have some more specifics in the next
25 slide, so when you want -- is there anything anyone

1 wants to say about that one?

2 MR. CAMERON: Okay. Good idea. Yeah,
3 Chris.

4 MR. PRAGMAN: I apologize for putting you on
5 the spot, but would you be able to break down at least
6 a little bit for us why the words that are there are
7 there? Anything that we learned from the test that,
8 you know, led us to word it the way you did?

9 MR. EMERSON: Yes. What we found out, that
10 failures within a single multi-conductor cable, the
11 likelihood for conductor-to-conductor hot shorts and
12 having multiple conductor-to-conductor hot shorts was
13 considered pretty high, but the likelihood of getting
14 hot shorts between conductors in different cables was
15 much, much lower. We're getting spurious actuations
16 from those hot shorts, so that's why I limited it to
17 a single multi-conductor cable. That would seem to be
18 an area of higher risk, and higher consequence that an
19 inspector could profitably focus on.

20 Now the second part of that is do you have
21 more than one component in there? In a lot of cases,
22 I'm not a circuit expert, in a lot of cases you have
23 only one component with a multi-conductor cable.
24 Probably not going to happen very often where you have
25 two components whose simultaneous failure will cause

1 significant consequences, so that's why I'm saying
2 this is one area that if you have something like this,
3 it's worth focusing on.

4 MR. CAMERON: Go ahead, Steve.

5 MR. NOWLEN: Yeah, in a sense he's offering
6 a caveat on just look at two at a time. If they're
7 all in one cable, you may need to look at more than
8 two. I think that's what this says in the context of
9 what we were saying.

10 MR. FUHRMEISTER: Yeah. If it's all in one
11 cable anything in that cable is fair game, because you
12 cannot get too fine in your distinction as to what has
13 a hot short and what doesn't.

14 MR. CAMERON: Okay. Let's go to this
15 gentleman out here. And I want to check in with Roy,
16 see if he has anything to say about it. And following
17 on with what Steve said, is there anything -- is this
18 consistent with where we've been in terms of focusing
19 on consequences and some of these other things we've
20 been talking about? Yes. Could you tell us your
21 name? Oh, you don't. Okay. All right. Do you have
22 anything you want to say about it? It's good. All
23 right. Fred, is there anything in terms of what we've
24 been talking about, consequences, vulnerabilities,
25 credible damage? Is this all pretty consistent with

1 that sort of methodology, so to speak, that we've been
2 developing?

3 MR. EMERSON: I think so, because if you
4 start from the end of that long stem, you're starting
5 with consequences, and then you start talking about
6 the number of circuits. And then you start talking
7 about where those circuits are, so if you start at the
8 bottom and work your way back to the top, you're
9 starting with very general discussion of consequences,
10 and you're working your way back up to the kinds of
11 risk factors that we were talking about earlier.

12 MR. CAMERON: Okay. Great. Eric or John,
13 Mark, any questions, any comments?

14 MR. SULLIVAN: Well, with regard to multi-
15 conductor cables, we know that it's much more likely
16 to have conductor-to-conductor failures within that
17 cable than it is to have a cable-to-cable type
18 failure. That we can agree on.

19 Suppose I had a situation where I had two
20 multi-conductor cables in a cable tray, and each of
21 those multi-conductor cables controlled one component.
22 And a conductor-to-conductor within each of those
23 multi-conductor cables could cause each of those
24 components to spuriously actuate, as an inspector
25 should I be concerned with that?

1 MR. CAMERON: Fred.

2 MR. EMERSON: I guess in terms of what we
3 saw, to answer Ken's question in terms of the test
4 data, we did not see in the EPRI test any cases for
5 thermoset and armored cable where that occurred. I'm
6 not saying it could never happen. I'm just telling
7 you what the test data showed.

8 MR. NOWLEN: I feel compelled to respond to
9 that one. There were four circuits available, so you
10 didn't see two given four, but in a real case you may
11 have many more of them, so I don't think the NEI tests
12 give a lot of evidence to eliminate possibilities of
13 two concurring.

14 MR. SULLIVAN: In general then, I should be
15 as an inspector, if the component is controlled by
16 multi-conductor cable, and has multi -- I'm more
17 concerned with -- the basic point is I'm more
18 concerned with conductor-to-conductor within a multi-
19 conductor than I am cable-to-cable. I think that can
20 be --

21 MR. SULLIVAN: Yes. In fact, I would offer
22 that should be up here. Are we willing

23 MR. CAMERON:

24 MR. NOWLEN: That part should be up there.

25 MR. SULLIVAN: Yeah, for now. You know,

1 again this is not the end-all be-all answer, but for
2 now would we not be comfortable saying let's focus on
3 what we called intra-cable shorts, shorts within a
4 single cable, and not worry about inter-cable, the
5 shorts between cables? I would offer that up as
6 another criteria for here for in, and not in for now.

7 MR. NOWLEN: Exactly right. I think
8 conductor -to-conductor within a multi-conductor are
9 much more likely, even without doing testing.

10 MR. CAMERON: Okay. Let's -- I think we
11 have a comment on that. Yes, sir. Give us your name,
12 please.

13 MR. WYANT: I'm Frank Wyant, Sandia. I
14 wanted to respond to Steve. I agree with the inter-
15 cable issue not being significant for thermoset, in
16 terms of thermoplastic test data supported the idea
17 that external cable-to-cable interactions could occur.

18 MR. NOWLEN: Thermoplastic is more likely.
19 Again, I would still ask the question, would we be
20 comfortable for the purposes of getting back in the
21 business, starting with our focus on intra-cable, and
22 thinking about inter-cable for the future? I don't --
23 maybe thermoplastic you're not comfortable.

24 MR. EMERSON: I would support what Steve
25 said. It seems much harder to rule out interactions

1 intra-cable than it is cable-to-cable.

2 MR. NOWLEN: And again, the idea here is to
3 get back into business, focus on what's most important
4 first. It seems to me that's a pretty good kind of --
5 one thing that indicates more important than not. But
6 again, thermoplastic is a good point. The
7 probabilities for thermoplastic on inter-cable
8 interactions were much higher. It was a somewhat
9 artificial configuration that sort of helped that
10 along, but it is higher for thermoplastic.

11 MR. SULLIVAN: So we can't rule out
12 thermoplastic right now is the point.

13 MR. NOWLEN: Again, if you're comfortable --

14 MR. SULLIVAN: If it's thermoplastic you may
15 be concerned. Inspectors should follow that.

16 MR. NOWLEN: Well, again I think the
17 question that the group has to answer is where's your
18 threshold of comfort with getting back into business
19 now? Is your threshold high enough to allow you to
20 even say for now we're not going to worry about cable-
21 to-cable, even on thermoplastic? If the threshold is
22 not that high, then we've put thermoplastic back in
23 the mix for cable-to-cable. So again, it's a question
24 of how high is your threshold now versus things we can
25 think about in the future.

1 MR. CAMERON: When you use the term "inter-
2 cable", that's synonymous with cable-to-cable?

3 MR. NOWLEN: Yes.

4 MR. CAMERON: All right. So the suggestion
5 here is at least for thermoset, the focus should be on
6 intra-cable rather than inter, i.e., cable-to-cable.

7 MR. NOWLEN: Yes.

8 MR. CAMERON: And thermoplastic may be
9 something that needs to be looked at in more detail.

10 MR. NOWLEN: Yes.

11 MR. CAMERON: Okay. Good.

12 MR. SULLIVAN: I don't know. I think there
13 might be enough evidence in the testing to show that
14 thermoplastics do fail with some level of certainty
15 cable-to-cable.

16 MR. EMERSON: They fail at a lower
17 temperature. It's not inherently more prone to
18 failure. The same fire will cause a failure sooner in
19 thermoplastic cable than it will in thermoset.

20 MR. NOWLEN: Yes. But there is also
21 evidence that given failure, the thermoplastics were
22 more likely to have inter-cable interactions
23 sufficient to cause a spurious actuation. I don't
24 remember the exact numbers of how much higher it was.
25 It's still lower than the likelihood of intra-cable

1 hot shorts and spurious actuation, so it's still
2 lower. It's not quite as far down the scale as it is
3 in the case of thermoset material.

4 MR. CAMERON: Let's go to Bijan, then Mark,
5 and then Eric, and Dennis also has had his card up for
6 a while. Let's go to Bijan, then we'll go over to
7 Dennis and Mark. Bijan.

8 MR. NAJAFI: I hear when we talk, mostly we
9 talk about thermoset versus thermoplastic; whereas, I
10 thought tray versus conduit showed a bigger
11 difference. At least that's what's in the expert
12 panel report, that the difference -- the numbers drop
13 inter-cable significantly when you go from tray to
14 conduit. But when you have both thermoset and
15 thermoplastic in tray, I don't see much, at least in
16 the expert panel report, I don't see a lot of
17 difference between those two numbers.

18 MR. NOWLEN: A lot of questions there, but
19 with the conduit, there was conflicting information.
20 Some of the results indicated that conduits were a
21 substantial factor, but when we got the full EPRI
22 report with all the data analysis which came out after
23 the expert panel, it didn't really support that
24 conclusion, so the conduits may not be that different
25 from trays.

1 The thermoset and thermoplastic with inter-
2 cable shorting, again the EPRI data, and once the full
3 analysis was done, there was a pretty clear difference
4 between those two cases. I'm not sure that it's
5 reflected by the expert panel, because again the
6 expert panel didn't have the full report.

7 MR. WEISS: Let me jump in. This is a
8 classic case of bin two. You're listening to some of
9 the nation's leading experts, two people from the same
10 national lab, another national lab, people that were
11 present during the testing, that were on the expert
12 panel some of these people. This is a bin two item.
13 If you can't achieve consensus on this, this is
14 definitely a bin two.

15 MR. CAMERON: And bin two is need further
16 research. Right?

17 MR. WEISS: Need further consideration,
18 perhaps research.

19 MR. CAMERON: So we've got one bin two item.
20 All right.

21 MR. NOWLEN: We've also got a significant
22 concession here.

23 MR. CAMERON: Great. Thank you, Steve.
24 Dennis.

25 MR. HENNEKE: All right. Two points. On

1 the cable-to-cable for thermoplastic, most of the
2 cables that you're going to be looking at are going to
3 have failure modes that are inside the cable itself,
4 so you don't really care whether you have a slightly
5 increased probability, because if it doesn't fail with
6 itself, it will fail with the adjacent cable, so
7 cable-to-cable for 95 percent of the cables is really
8 a no never mind anyway. So dropping it from that
9 standpoint would be not a big deal, so I guess I would
10 reinforce that just inside the cable, or intra-cable
11 is probably the way to go, whether it's thermoplastic
12 or thermoset.

13 MR. CAMERON: Okay.

14 MR. NOWLEN: The other thing is, on Fred's
15 point here is, the reason this is up here is that the
16 expert panel and the data showed that failures a
17 relatively independent if the cables, if the circuits
18 are not in the same cable. So if you have two valves
19 and they're in the same tray, or they're in adjacent
20 trays or whatever, you can treat those as independent,
21 and you just multiply probabilities to get the overall
22 probability of failure. And we would have liked to
23 have done a thousand tests to prove the independence,
24 but --

25 MR. EMERSON: No, we wouldn't.

1 MR. HENNEKE: But we felt fairly confident
2 that cables fail in a kind of a random way, and you're
3 either going to ground, you know, short to ground, or
4 you're going to sort of see the equipment. And
5 depending on the makeup, the spurious operation
6 probably varied based on the cable type. But when the
7 circuits were in the same cable, the independence goes
8 away and there's dependence. So if one occurs, the
9 second one occurring in that cable is very likely, and
10 you can't ignore that, so that's the characteristic
11 that Fred was trying to put up here.

12 MR. EMERSON: I think we're all in agreement
13 on that point.

14 MR. CAMERON: Okay. Bijan, did you have
15 anything else to say before we go on to the next
16 example? Did you have your -- okay. Great. Wade.

17 MR. LARSON: I guess I'm confused on this
18 one point. When we used to do any and all one at a
19 time, now we're doing any -- when we get to this
20 situation are we doing two simultaneous failures?

21 MR. EMERSON: That means you can't rule out
22 more than one. It means you might just as well have
23 two or three, as one within a single multi-conductor
24 cable.

25 MR. CAMERON: Did he answer your question?

1 All right. Fred, do you want to go to another
2 example?

3 MR. EMERSON: Again, this I think fits into
4 the criteria that we were -- kind of the method that
5 we were talking about earlier. You start with a
6 consideration of consequences. If the spurious -- and
7 again remember, the difference between this and the
8 last slide, is the last slide we were talking about
9 multiples. This one we're talking about singles, so
10 how do you -- what sorts of singles would you focus
11 on?

12 Well, obviously we're going to start with
13 ones that have high consequence based on our earlier
14 discussion. But then the next two factors that I've
15 listed below there would seem to be, based on the data
16 that we saw on the testing, ways that you could
17 determine that these were high or low risk-
18 significance, as well as high or low consequence. If
19 you were not able to -- if it had high consequences,
20 and if you could not demonstrate, and you could argue
21 over the specific kilowatt levels and the specific
22 number of minutes, but generally if you couldn't
23 demonstrate that the fire was low intensity for a
24 fairly short period of time, then you might have to
25 consider it. And if you didn't have the circuit

1 protected by some sort of current limiting device, so
2 our contention would be if you have high consequences
3 plus these other two factors, you cannot rule out
4 single spurious actuations. The converse of that is
5 if you can demonstrate that the fire is of very short
6 duration, or of low intensity, and does have circuit
7 protection, you might be able to rule it out.

8 MR. CAMERON: How do people feel about
9 bringing in the probabilities on this one? And, Wade,
10 I know you have a question or comment. We'll get to
11 you. Steve, comment?

12 MR. NOWLEN: Well, we're -- a couple of
13 comments. We're crossing the line a little bit,
14 because as an entry condition you're not necessarily
15 going to know what your fire threats are. Again,
16 you're working from a PNID, so --

17 MR. EMERSON: I understand. That's why we
18 start with consequences.

19 MR. NOWLEN: Right. You're crossing the
20 line. And the other one is on the second one, I don't
21 agree with that criteria, 450 kilowatt fire is a big
22 fire, and I think you have to consider that under some
23 circumstances you can easily have damage in less than
24 15 minutes.

25 MR. EMERSON: Just going by the data.

1 MR. NOWLEN: Well, we could --

2 MR. EMERSON: We shouldn't be arguing over
3 interpretation.

4 MR. NOWLEN: But for the record, I object to
5 that second bullet, so we can talk about it.

6 MR. CAMERON: In the sense that it may not
7 -- 450 kilowatts isn't necessarily insignificant. Is
8 that your objection?

9 MR. NOWLEN: Yes. I would prefer to see
10 this expressed in a time temperature sort of
11 relationship. If I have a fire that doesn't expose me
12 at above my damage threshold, then I'm okay. But if
13 I've got a 450 kilowatt fire and I'm in the flame
14 zone, you know, your damage time is seconds, so again,
15 I think it -- you know, bringing in the concept that
16 certain fires aren't going to lead you to damage is
17 fine. It's a part of the risk equation.

18 MR. EMERSON: We could argue over the
19 threshold.

20 MR. NOWLEN: Yes.

21 MR. EMERSON: That's probably not what we
22 need to be doing here.

23 MR. NOWLEN: Agreed.

24 MR. CAMERON: Let's go to Mark.

25 MR. SALLEY: Yeah, just to second what Steve

1 is saying. The criteria of 450 kilowatts or 15
2 minutes, that doesn't add up in fire science. Okay?
3 Just to give you an example, if you take that small
4 enclosure there, put the 450 kilowatts in there versus
5 the sole room with a cable tray at the ceiling, a big
6 different event, so you can't use that as a criteria.

7 MR. EMERSON: Okay. The point of that is
8 you need -- the data showed that you need a fire, a
9 substantial fire for a substantial period of time,
10 whether it's 15 minutes, or 10 minutes, or 20 minutes,
11 or whatever. There is a threshold that you could
12 possibly -- probably almost everyone would agree on,
13 but maybe that obviously isn't it.

14 MR. CAMERON: Okay. Chris.

15 MR. PRAGMAN: All right. Correct me if I'm
16 wrong, but another way to express that might be a time
17 at a particular temperature.

18 MR. EMERSON: Yeah. I think that's what
19 Mark just said.

20 MR. SALLEY: Yeah. Just to go on, time at
21 a temperature, or with radiation heat transfer, you
22 look at an incident flux, and either one of those
23 values we could buy into, but this is just --

24 MR. CAMERON: Okay. There's disagreement
25 perhaps on what the exact conditions should be, but --

1 MR. EMERSON: But it sounds like there's
2 agreement on the concept.

3 MR. CAMERON: Right.

4 MR. EMERSON: The time plays a role in it.

5 MR. CAMERON: Yeah. Go ahead. Steve.

6 MR. NOWLEN: Yeah. I wanted to ask about
7 the last bullet, because I remember the CPT was
8 considered a factor of like two.

9 MR. EMERSON: Well, what we saw with the
10 data was that the CPT gave you much more likely to get
11 a short to ground rather than a hot short, so we felt
12 that that --

13 MR. NOWLEN: I thought the data said that
14 hot short probability wasn't actually changed, but you
15 couldn't get enough energy across a lot of the faults
16 to energize the device, and so that reduced -- I think
17 the expert panel said it gave it a factor or two,
18 without CPT versus with CPT.

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

20 MR. NOWLEN: A factor of two isn't a lot in
21 risk space.

22 MR. EMERSON: The net result was that the
23 short to ground was more likely to be the initial
24 failure when you had adequate current limiting devices
25 in the circuit, if you had a failure at all.

1 MR. SULLIVAN: Do you think the size and the
2 rating of the CPT might affect you?

3 MR. EMERSON: Sure.

4 MR. SULLIVAN: Just having a CPT may not --

5 MR. EMERSON: Yeah, these are very broad
6 criteria. And again, I don't know that we need to go
7 there and argue specifically over voltage and current
8 thresholds, but again, consider it in terms of the
9 concept.

10 MR. NOWLEN: Yeah. I guess the other thing
11 is to think these are things that you would put in the
12 bin. It doesn't say the converse, you would take out
13 of the bin.

14 MR. EMERSON: Well, notice I said all of the
15 above. If you had -- if you fail to meet any of those
16 criteria, then I would drop it out of the bin. But
17 again, we can argue over the criteria.

18 MR. CAMERON: Some might -- if you just
19 focused on consequences, obviously if it didn't meet
20 the second or third bullet, for those people who focus
21 only consequences, it would not drop out of the bin of
22 area of inspection interest. Right?

23 MR. EMERSON: Yeah. The reason I put those
24 two qualifiers in as second and third bullets were
25 those seemed to be the most obvious cases of something

1 that made a big difference in the overall risk of
2 whether you had a spurious actuation or not. Remember
3 we're talking about spurious actuation, not hot short.

4 MR. CAMERON: Let's go to -- Wade had a --
5 are you okay? Bijan.

6 MR. NAJAFI: One thing I want to point out,
7 that remember we already set some other criterias
8 before this between thermoset and thermoplastic, and
9 trays and conduits, so if this CPT -- I'm sorry,
10 inter-cable and intra-cable, if we're looking at the
11 two wires as an intra-cable already the CPT, the
12 effect is not going to make it negligible because it
13 was high to begin with. But if it's inter-cable,
14 unless we ruled it out already, that number was low to
15 begin with to have CPT, or is going to make it even
16 lower than it was, so I guess to me if we had made
17 that decision between intra-cable and inter-cable then
18 we don't need this, because the effect on the intra-
19 cable basically doesn't support it. It makes it from
20 .3 to .6, or from .6 to .3, from a too high to a high,
21 and from inter-cable was already low and we discarded
22 it anyway.

23 MR. EMERSON: There might be any number of
24 other plant specific risk factors that could be
25 applied here. These seem to be some of the more

1 obvious ones.

2 MR. CAMERON: Before we go on, I always like
3 to check in with our inspector. Roy, any comment on
4 this one?

5 MR. FUHRMEISTER: Actually, I do have a
6 comment. The second criterion, if you just changed
7 that to the cable -- if you can impose the damage
8 threshold on the cable, either radio flux or
9 temperature, that's a lot easier for me as an
10 inspector to determine.

11 MR. CAMERON: Great. Thank you, Roy. Staff
12 we got that one, that comment? All right. Now are
13 there more areas of inspection interest?

14 MR. EMERSON: No.

15 MR. CAMERON: So there's a lot of areas of
16 non-inspection interest.

17 MR. EMERSON: WE figure Roy can come up with
18 a lot of areas of interest on his own, and he probably
19 doesn't need a whole lot of help.

20 MR. NOWLEN: Fred, could you go back to the
21 previous slide, your last areas where inspection is
22 not required? Now you've got multiple high impedance
23 --

24 MR. EMERSON: Oh, you want to see not
25 required.

1 MR. NOWLEN: Yeah. Well, I think this is
2 one where consensus is developing, and I'm just
3 wondering whether it's true or not. It's got two
4 items on it, multiple high impedance faults and open
5 circuits as an initial fire induced failure mode.

6 MR. EMERSON: All right. That's the first
7 one.

8 MR. NOWLEN: No, the third one.

9 MR. EMERSON: Oh, the third one.

10 MR. CAMERON: And I think we can go through
11 these systematically too.

12 MR. NOWLEN: Well, this is one -- my sense
13 is that there is a consensus on both of these items.
14 Can we get that expressed now and take these two off
15 the table?

16 MR. CAMERON: Do you need to say anything
17 about them to describe them so that people understand,
18 or is this very clear to everyone? Is anybody -- I
19 guess does anybody disagree that these should be taken
20 off the table?

21 MR. NAJAFI: I just wanted to second that,
22 and I agree that these could be taken off the table.

23 MR. CAMERON: All right. Thank you. Ken.

24 MR. SULLIVAN: I would agree that these
25 could be taken off the table, with the exception of

1 multiple high impedance faults. If the failure could
2 have a significant consequence, loss of power supply
3 could have significant consequence on your shutdown
4 capability. By that I mean if it's powering equipment
5 that's needed immediately for hot shutdown, you may
6 need to consider that.

7 MR. NOWLEN: Well, let me rephrase it then.
8 In the short term goal of getting back in the
9 inspection business, with this not being the final
10 answer for all time, can we temporarily take it off
11 the table?

12 MR. EMERSON: WE could put it in bin two.

13 MR. NOWLEN: Put it in bin two, exactly.

14 MR. CAMERON: Anybody want to -- I don't
15 know if Liz and Kiang want to say anything about this.
16 Do you want to -- no.

17 MR. CAMERON: All right. It seems that a
18 number of people think this can just be taken off the
19 table all together, or at most, some people think that
20 the MHIF should be in bin two for further research,
21 some type of action in the future. Okay. Now it
22 seems that there's agreement on that. And, Roy, I
23 love this. I can just keep picking on you after each
24 one of these things. Do you have any concerns about
25 that? All right. No is the answer from our

1 inspection staff. How about other -- I mean Eric has
2 said -- do you want to go through the rest of these
3 areas where inspection is not required?

4 MR. WEISS: If you've got time.

5 MR. CAMERON: Sure. Let's do it.

6 MR. WEISS: When are we quitting?

7 MR. CAMERON: I think that our goal is to
8 aim for 4:45, unless someone wants to -- has a big
9 urge to stay longer. But if we do have business to
10 conduct we'll stay longer, but the goal is 4:45.

11 MR. EMERSON: Now I can either put up that
12 general slide with a lot of clauses in it, or I can
13 put up this slide which has a lot of specific
14 examples. Which one would you rather dig into?

15 MR. CAMERON: Is the first one, the previous
16 one the -- it covers all of those specific?

17 MR. EMERSON: This one is multiples.

18 MR. CAMERON: Okay.

19 MR. EMERSON: This one is singles. Which
20 one do you want to talk about first?

21 MR. CAMERON: All right. Singles.

22 MR. NOWLEN: I think we already talked about
23 the first one. You want to recap that?

24 MR. CAMERON: Okay. There's some debate
25 about the temperature used, the time needs to be

1 factored in, the amount of space.

2 MR. SALLEY: If we gave you that in say a
3 temperature around the cable, or an incident heat
4 flux, wouldn't that be good, and duration?

5 MR. CAMERON: Anybody have an answer for
6 Mark on that? He's suggesting reframing that in a
7 different way.

8 MR. EMERSON: I think it needs to be
9 reframed in a way that the inspector can answer
10 easily. He may not have access to heat flux. I don't
11 know. Roy, you have to decide what kind of
12 information you need to rule on that kind of a
13 threshold.

14 MR. LARSON: The utility is going to have to
15 provide it in order to make that inspector --

16 MR. NOWLEN: The inspector needs --

17 MR. SALLEY: One of the other projects that
18 we have is some fire dynamics that we work with the
19 inspectors, which we're going to make publicly
20 available here in about two months for the industry to
21 comment on, so that's a very easy way to do a
22 calculation for hot gas layer and incident heat flux,
23 so that would work in with this.

24 MR. CAMERON: Okay. So that is an area of
25 probably bin two, further research, to be evaluated in

1 light of what you guys are going to come up with. All
2 right. Armored cable with fuses.

3 MR. EMERSON: I'd defer to a Double E to
4 explain exactly why that's on there, but that was a
5 conclusion from the testing.

6 MR. CAMERON: Any comment on that? Go
7 ahead, Dennis.

8 MR. HENNEKE: Since I'm the armored guy,
9 actually in the previous slide there was a multiple of
10 thermoset and armored, and I don't think you guys
11 would agree with the multiple thermoset because that's
12 what you're asking the inspectors to look at. But the
13 multiple armored would kind of encompass, a single
14 armor would fuse. I mean, our criteria again was 10
15 to the minus 2 here for throwing it off the table, so
16 -- and multiple, or armored with fuses was a .0075, so
17 it's 7.5 ten to the minus three, and multiple armored
18 was a minimum of about 10 to the minus 3 so I think,
19 you know, from an armored cable standpoint we'd be
20 happy just to get multiple armored, and that's
21 justified by the data.

22 MR. CAMERON: Okay. Any other comments?
23 John.

24 MR. HANNON: Dennis, just for clarification,
25 the numbers that you just cited, the threshold for

1 taking it off the table, what was that in terms of?

2 MR. HENNEKE: Just the probability of
3 spurious operation. And, you know, there's no
4 criteria, but when you throw it into the fire model,
5 and Steve and I had talked about that before. And the
6 probability of it -- you know, frequency of a damaging
7 fire, and manual suppression, and severity factors and
8 all that, that at that point, spurious operations
9 becomes a no never mind. And it also is much more
10 reliable than your alternate shutdown, or your safe
11 shutdown, because your safe shutdown is already at 10
12 to minus 1, 10 to minus 2 system, so at that point it
13 becomes unimportant.

14 MR. CAMERON: Let's go to Steve.

15 MR. NOWLEN: I'd suggest that this might be
16 another bin two item, that for now we should be able
17 to take it off the table. Multiples were -- involving
18 multiple armored cable. I think, you know, that the
19 amount of test data that we got on armored cables was
20 fairly limited. There were just two tests with eight
21 circuits basically, so it's still a little fuzzy, but
22 I think for now I'd be comfortable putting this in bin
23 two, the way Dennis has phrased it.

24 MR. CAMERON: Bijan.

25 MR. NAJAFI: If I remember correctly, the

1 cable-to-cable went into bin two, as well, or went
2 into bin three?

3 MR. CAMERON: Cable-to-cable for thermoset
4 is in bin three, I think, but cable-to-cable for
5 thermoplastic is in bin two.

6 MR. NAJAFI: If the cable-to-cable for
7 thermoset is in bin three, why armored cable to
8 armored cable is in bin two?

9 MR. NOWLEN: No, that's not --

10 MR. NAJAFI: It's intra-cable for an armored
11 cable.

12 MR. EMERSON: It's a single spurious.

13 MR. NAJAFI: Single.

14 MR. NOWLEN: Well, we were talking about
15 multiples. Do we have to consider a thousand series
16 that are in separate cables opening, and I would argue
17 that if it's an armored cable in both cases, then for
18 now we're probably okay putting that in bin two for
19 future evaluation.

20 MR. NAJAFI: Separate components?

21 MR. NOWLEN: Two separate components. Yes,
22 we had put twosies on the table.

23 MR. CAMERON: Okay. Fire temperatures for
24 various types of cable.

25 MR. EMERSON: That came straight out of the

1 expert panel, the fragility curves where they
2 postulated almost zero chance of cable failures below
3 those temperatures.

4 MR. CAMERON: Mark.

5 MR. SALLEY: Yeah, just looking at the first
6 one, you've got the energy in kilowatts, and this
7 fourth one you have temperature and degrees
8 Fahrenheit. Once again, I think we can marry those
9 two together, make it much simpler, keep the units in
10 this temperature for this.

11 MR. EMERSON: Well, the reason I
12 differentiated them was because again, the fourth
13 bullet is stated very explicitly on one graph in the
14 experts panel report. There's really no question
15 about it. The other one -- the first one of the
16 threshold involves time as well as temperature, and
17 one thing that was very obvious to me in watching the
18 testing was the time, especially with thermoset cable,
19 plays a significant role in the likelihood that you'd
20 get a spurious actuation, because you'll likely have
21 enough time to mitigate or to take care of the fire
22 before it gets to the point where you'd get a spurious
23 actuation, so the two really are separate.

24 MR. SALLEY: Well, they're separate, but the
25 thing -- in your fourth bullet, you're below the

1 activation temperature for the types of cables for
2 them to have damage. Once again though for the, you
3 know, servicing Roy here, as the customer that has to
4 do the analysis, if I can give him everything in
5 temperature it would be easier for him to work it out,
6 rather than flipping back and forth, so I think we can
7 combine the two. I mean, the fourth bullet is an
8 entry statement. If you can't get a fire that's
9 hotter than 680 degrees Fahrenheit in the ceiling,
10 then you're wasting everybody's time. And we do that
11 today in SDP space, so that's nothing new for us.

12 MR. CAMERON: Okay. Dennis, did you have a
13 comment on this? Okay. Wade, and then we'll go to
14 Kiang. Wade.

15 MR. LARSON: What's the role that the fire
16 brigade is assumed to play in this kind of a slide
17 when you've got times and temperatures?

18 MR. EMERSON: Well, that was the reason why
19 we wanted to bring the time factor in, was to give the
20 -- because if the time frame is long enough, that the
21 fire brigade or automatic suppression can reliably put
22 out the fire, there appears to be enough time for that
23 to happen, so that's why I wanted to make sure the
24 time factor was explicitly included in a reasonable
25 way.

1 MR. CAMERON: Okay. Let's go to Kiang.

2 MR. ZEE: Actually, I have a question. I
3 apologize, but back on the third bullet. For
4 thermoplastic in conduit -- discussing that?

5 MR. EMERSON: I don't know that we got to
6 that level of detail. We talked about thermoplastic.

7 MR. ZEE: I know we talked about
8 thermoplastic cable-to-cable and conductor-to-
9 conductor --

10 THE COURT REPORTER: Please use the
11 microphone.

12 MR. ZEE: I'll try talking louder. But I
13 guess when you get back to the third bullet, this
14 whole notion of cable-to-cable hot shorts on armored,
15 so forth, it would seem like -- well, conduits ought
16 to be considered. If it's effectively the same
17 function as the armoring on the cable for cable-to-
18 cable.

19 MR. NOWLEN: Yeah. Let me take a shot at
20 that. I would agree if the cables are not co-located
21 in the conduit. You've got two cables within a single
22 conduit.

23 MR. ZEE: Oh, agreed. This is presuming the
24 source, the power sources are on the other side of the
25 metallic boundary.

1 MR. NOWLEN: Oh, absolutely. Then I don't
2 think anyone -- again, it's physically impossible to
3 do that without going through ground.

4 MR. ZEE: Right. That's all I was saying.

5 MR. CAMERON: Okay. So that's clear?

6 MR. NOWLEN: Yeah. I think the point, if I
7 can paraphrase it, is that cable-to-cable involving
8 cables where one is inside of a conduit, and the
9 second cable is not co-located in that same conduit
10 are bin three, physically impossible without going
11 through ground.

12 MR. CAMERON: Okay. Thank you. Let's keep
13 moving on this, because you have another slide, don't
14 you?

15 MR. EMERSON: Yes.

16 MR. CAMERON: Okay. How about the three
17 phase hot shorts? Any problems with that being in bin
18 three?

19 MR. EMERSON: Except for high/low pressure
20 interface.

21 MR. CAMERON: Except for high/low. WE have
22 a comment from Kiang on that.

23 MR. ZEE: Well, I guess I'm kind of
24 struggling with this, I guess with three phase needing
25 all the phases to come together in the right sequence

1 in the absence of touching ground or any of the other
2 phases. I'm struggling a little bit even for high/low
3 pressure.

4 MR. EMERSON: And that was our reason for
5 putting it on there. There's no point-- physically
6 what has to happen, there is no difference between
7 high/low pressure interfaces and others.

8 MR. ZEE: Right. I mean in general for the
9 high/low pressure interface, I almost by definition
10 have redundant valves that are already close. I'm
11 already forcing one of them to go open by some other
12 means.

13 MR. EMERSON: The difference is
14 consequences.

15 MR. ZEE: Right.

16 MR. EMERSON: So if consequences has a high
17 value in deciding what the inspector is going to look
18 at, it would be difficult to throw that out. If what
19 you're considering is the actual risk that this will
20 happen, there's no difference between that and any
21 other three phase hot short.

22 MR. ZEE: I guess what I'm getting at is the
23 three phase hot short takes out one of my boundary
24 valves. I mean, are we making the statement -- I
25 guess, Ken, you're saying we should keep them in for

1 high/low pressure interface.

2 MR. SULLIVAN: The reason that guidance is
3 out there is because the consequences are
4 unacceptable. That's why the guidance was developed.

5 MR. NOWLEN: Yeah. This is a case where you
6 run into conflict between really adverse consequences
7 versus potentially a very low likelihood event. I can
8 say that from the requalification study perspective,
9 we are not considering these. WE have not included
10 them. We generally think they're low risk, but again,
11 the consequences that, you know, the consequence piece
12 is big.

13 MR. SULLIVAN: It's one of those areas
14 that's very low risk potential probability, and a very
15 high consequence.

16 MR. CAMERON: Okay. So here's one of those
17 examples.

18 MR. SULLIVAN: So in lieu of protecting the
19 cables, what the Commission has determined is that
20 these consequences are unacceptable. And if you're
21 not going to protect them, you have to show that these
22 types of faults, given their very low probability,
23 will not impact safety, cause them to occur.

24 MR. CAMERON: Eric, why don't you go ahead,
25 and then we'll go to the rest.

1 MR. WEISS: Well, I understand what Ken is
2 saying. My perspective on this though is that we're
3 not here to really revisit licensing basis. We're
4 here to sort of see as engineers, as experts, do we
5 think this is bin one, bin two, or bin three? And I
6 sort of heard like an argument that it's bin two, bin
7 three, and an argument that it's bin one. And I wish
8 I'd get a sense of the audience. I have a sense from
9 over there that it's a bin three.

10 MR. CAMERON: Let's go to Bijan and Chris,
11 and see if we could get that sense.

12 MR. NAJAFI: When you started, I thought you
13 answered my question. That's why I turned my card,
14 but at the end, I think you -- if you're looking at it
15 from a risk-significance spectrum, definitely my
16 opinion is bin three, because it's true that the
17 consequence is high, but the frequency is demonstrated
18 being so low that I believe the combination will
19 justify the bin three.

20 However, my question was that how does it
21 fit into the current practice of the Appendix R? I'm
22 not an Appendix R person, but I thought that is within
23 the bounds of analysis that most Appendix Rs have
24 looked at, high/low pressure interface for three phase
25 hot short. Maybe not, but --

1 MR. WEISS: WE're not going to the licensing
2 basis issue.

3 MR. NAJAFI: Then I agree it's three.

4 MR. CAMERON: I've got to pull this out now.
5 Okay. Thank you, Bijan, and John, and Dan.

6 MR. NAJAFI: I guess my point was, to answer
7 your question, I believe it's bin three.

8 MR. CAMERON: Right. Chris.

9 MR. PRAGMAN: Bin three. Several years ago
10 the NRC actually asked the BWR Owners Group is there
11 any additional light we can shed on the specific
12 question of whether three phase should be in or out of
13 the regulatory context based on new insights we have
14 today on risk that we didn't have back when 610 added
15 this guidance, and so that's made its way into the
16 NEI-001 appendix. And we think that's -- what we
17 tried to do in there is provide some probabilistic
18 information that may suggest that this particular
19 bullet could be excluded even for high/low pressure
20 interfaces, and hope some day maybe that when NEI-001
21 gets through the life cycle it's on, then Staff will
22 accept that for licensing basis situations. But I
23 think the data is there now to say that the risk, just
24 from a purely risk-based decision it belongs in bin
25 three.

1 MR. CAMERON: Eric, does that give you a
2 better sense?

3 MR. WEISS: Yeah. I'm glad that I asked the
4 question. I got a better sense of the audience.

5 MR. CAMERON: Right. How about DC motor?

6 MR. EMERSON: I'm going to have a hard time
7 explaining the electrical data and electrical
8 engineering terms so I'm going to defer to someone.

9 MR. PRAGMAN: I'll take it, Fred. This was
10 similar to the previous bullet. The Staff asked us
11 several years ago as the Owners Group, would you
12 handle a 250 volt DC motor any differently than you
13 would handle a three phase AC motor operated valve?
14 And when you actually look at the way they're wired,
15 it takes even more hot shorts of the proper polarity
16 to make a 250 volt DC MOV change state, than it does
17 to make a three phase AC MOV change state. So any
18 justification that you may accept for the AC three
19 phase MOV would surely apply to the DC MOV as well,
20 since it takes even more hot shorts to make the thing
21 move.

22 MR. WEISS: Why is that? I'm curious.
23 There's three conductors going to the three phase AC
24 motor. There's two conductors going to --

25 MR. PRAGMAN: No. It's a 250 volt motor.

1 It's reversing motors so you have a shunt and a field,
2 so you actually need five separate conductors to be
3 energized for the valve to move.

4 MR. CAMERON: Kiang, do you have something
5 that you wanted to add on that?

6 MR. ZEE: Yeah. I'm just going to chime in
7 and agree. I mean, you could probably conceive a way
8 where if you put the right polarity on four to five
9 conductors, you can get the valve to do something if
10 you are missing some of the field strength. And for
11 the regular DC motors, you still have the shunt field
12 that's going to come back, where at least a regular DC
13 motor you're back to three. For valves you have five
14 conductors, but like I said, you might be able to
15 conceive a way if you get the right polarity for the
16 conductor, and it has to be in the right sequence.
17 Otherwise, it doesn't work.

18 MR. CAMERON: Okay. Let's go to Sandia.

19 MR. WYANT: AC motors versus DC motor
20 situation is kind of tricky. Granted going to the
21 motor itself you do have a number of conductors, but
22 it's an integral part of the control system, so you
23 may only need, depending on the whole system setup,
24 you may only need one single smart polarity short,
25 positive to positive, negative to negative at the

1 right spot in the control circuitry. So that
2 probability we feel is sufficiently high enough to
3 include it as a regular component of investigation for
4 the requantification study.

5 MR. EMERSON: And I wasn't trying to suggest
6 that this is specifically the cables from the motor
7 control center out to the valve operator that make it
8 move, and maybe we could add some more words to that
9 bullet to make that part clear. That's what the NEI-
10 001 appendix specifically is talking about.

11 MR. CAMERON: So you just need to be more
12 precise on what you meant by that, and it seems like
13 there's an agreement that that's in bin three. How
14 about the last --

15 MR. NOWLEN: I don't think there was
16 agreement that it's in bin three.

17 MR. CAMERON: Okay.

18 MR. NOWLEN: I'd want to see the
19 clarification.

20 MR. CAMERON: Right.

21 MR. NOWLEN: It may -- with that caveat --

22 MR. CAMERON: Okay. Last bullet on AOVs and
23 PORVs.

24 MR. EMERSON: One of the things that we saw
25 during the test was that typically, not always but

1 typically the -- the duration of a spurious actuation
2 was one of the things that we took data on during the
3 tests, and typically those were on the order of a
4 minute or so. Sometimes they were much, much less,
5 just a very few cases they were more than that. For
6 AOVs and PORVs once you remove the power, once the
7 valve will return to the safe position once the power
8 is removed. If the duration of the spurious actuation
9 is short, and then it shorts and the power is removed,
10 then it will go back to its desired position, so we
11 figured that -- we felt that given the shortness of
12 the duration, we could take these -- we could put
13 these in bin three. That's not true for MOVs which
14 stay in the undesired state once they're activated.

15 MR. CAMERON: We have one comment out here.

16 MR. PELLIZZARI: Is that statement inclusive
17 of high/low pressure interface valves?

18 MR. PRAGMAN: It says PORV so yes, it is.

19 MR. EMERSON: Well, it depends on whether
20 you consider a PORV a high/low pressure interface.

21 MR. PELLIZZARI: There's plants where if a
22 PORV stays open for a minute, they're approaching
23 unrecoverable condition. Does your study include the
24 application of suppressants and its effects?

25 MR. EMERSON: I'm sorry. Your microphone --

1 MR. PELLIZZARI: Does your study consider
2 the application of suppressants with respect to
3 duration or sustaining hot shorts keeping the valve
4 energized?

5 MR. EMERSON: No. The -- just took into
6 account how long a spurious actuation lasted
7 independent of any suppression.

8 MR. CAMERON: Steve.

9 MR. NOWLEN: Yeah. What happened in the
10 tests were all of the faults that were observed
11 eventually cleared when conductors shorted to ground
12 and blew out the control. Eventually, yeah. And I
13 think the longest that was observed in those tests was
14 13 minutes.

15 MR. EMERSON: I think it was 8, but there
16 were some that were a few seconds, and I think there
17 was one that was as long as 8 minutes, most of them
18 were on the order of a minute or so.

19 MR. NOWLEN: Well, my recall was there were
20 at least a couple that were more than 10 minutes, but
21 regardless, all of them eventually did clear, so the
22 question is timing. And that would be my comment
23 here, is that there ought to be some consideration of
24 timing available. You know, I believe the averages
25 were about 2 minutes, so for your plant, I mean maybe

1 we need to be out at the 95 percent confidence limit,
2 which brings us out to that 8, 10 minute time. And if
3 you can show that that's adequate, that doesn't get
4 you to the situation. And perhaps it's off the table,
5 so I think the idea is appropriate, but there should
6 be a timing factor, some verification of the time.

7 MR. CAMERON: Okay. Let's hear one more
8 comment here, and I think Roy has a comment on this.

9 MR. FUHRMEISTER: This last bullet where the
10 power operated relief valve is going to be very much
11 plant dependent. WE have a facility in Region One
12 that recently reported that if the first indication of
13 fire damage is the power operated relief valve going
14 open, they're going to have a steam bubble in the
15 vessel within two minutes, so if it clears in 8 to 10
16 minutes, it's not going to make it.

17 MR. EMERSON: Understand.

18 MR. CAMERON: Okay. Thank you, Roy.
19 Dennis.

20 MR. HENNEKE: Yeah. I mean, we're looking
21 at it from a risk-based, having a steam bubble is not
22 core damage, and that's kind of what we were trying to
23 differentiate. WE're going to lose subcooling -
24 there's no question - from a PORV being open just a
25 short amount of time, but it takes quite a bit of time

1 and the thermohydraulics for our plant showed 20 to 30
2 minutes that it would actually cause core damage. And
3 that's all dependent on the time on ejection and so
4 on, but it would take a substantial amount of time.
5 And once it went reclosed, you would still have
6 subcooling issues, but you would not have core damage,
7 and that's kind of the point. So if you identified
8 it, and it went down SDP space, and we showed it going
9 back closed, then it would show low risk. I don't
10 want to waste the time looking at low risk issues just
11 because you lose your subcooling.

12 MR. CAMERON: Okay. We need to do a couple
13 of things here. One is we'll hear Bijan on this
14 issue. There's another area of low interest, and I
15 think we need to try to sum up. I want to give both
16 Eric and Bijan for some final words. And, Bijan, on
17 this issue.

18 MR. NAJAFI: I just wanted to point out that
19 if a time is added to that, and a time frame of 8 to
20 10 minutes is something that can be lived with, then
21 it's appropriate to use. Otherwise, the numbers were
22 not the same - correct me if I'm wrong - for thermoset
23 and thermoplastic, that there were a smaller number.
24 But this -- I guess part of this question is, was it
25 dependent -- was it a different number at the time for

1 thermoset and thermoplastic, because I thought that --

2 MR. NOWLEN: Yeah. Actually, I've got the
3 table. The average for thermoset was 1.7 minutes.
4 The average for thermoplastic was 2.8. Thermoplastic
5 tended to be a little longer. The maximum for
6 thermoset was 11.3. The maximum for thermoplastic was
7 10.1 minutes.

8 MR. NAJAFI: See, that's what I'm saying,
9 that if we can live with the 10 minutes, then it
10 doesn't matter whether it was thermoset or
11 thermoplastic. If you can't live with 10 minutes,
12 then you may want to distinguish between the two at
13 lower times.

14 MR. CAMERON: Okay. It seems like some
15 clarifications, I guess, need to be made on that,
16 taking into account Roy's comment. Do you have one
17 more general one on --

18 MR. EMERSON: Well, I had this one last one.
19 Areas where inspection is not required for multiples.
20 Shouldn't have to consider for thermoset or armored
21 cable if you -- if each one has a single device within
22 the multi-conductor cable, and you have CPTs.

23 MR. CAMERON: Any comments on that one?
24 Yeah, Bob.

25 MR. KALANTARI: I guess it's not clear to

1 me, we are saying multiple spurious, then we reference
2 single component, so I'm really confused with this
3 one.

4 MR. EMERSON: Okay. What that means is
5 unless the -- if you have -- if you're considering --
6 let me go back just a second.

7 MR. ZEE: Fred, let me offer up an example.
8 I think what this is not intended to address is your
9 classical control cable, MCC control room where one
10 could postulate a conductor-to-conductor short between
11 two conductors causes spurious actuation. I think what
12 Fred is getting at is because circuit wire
13 configuration require two conduction to come
14 together, and then another short, conductor-to-conduct
15 short within that same table bundle, spurious
16 actuation.

17 MR. EMERSON: Yeah. If you limit it to a
18 single component within the cable, then you need
19 cable-to-cable interactions to get multiples.

20 MR. KALANTARI: So it's multiple cable
21 failures causing a single spurious actuation.

22 MR. EMERSON: Cable-to-cable interactions
23 causing multiple --

24 MR. KALANTARI: So that multiple spurious
25 actuation is -- I think that spurious actuation --

1 MR. EMERSON: I think it could be better
2 worded.

3 MR. CAMERON: Okay. Thank you, Bob, for
4 pointing that out. Are there -- I guess we're getting
5 pretty close to the time. I want to make sure that
6 Eric and John, anything that they have to say about
7 this. We -- I haven't kept track of what has been
8 placed in bin three, bin two, and bin one, but we do
9 have a record on the transcript. Eric, John, anything
10 that you want to say before we adjourn? And we'll ask
11 if anybody else has any burning issue. Thank you,
12 Fred.

13 MR. WEISS: Well, I definitely want to thank
14 everyone for coming. This more than met my
15 expectations. This is going to be of great assistance
16 to us in trying to develop inspector guidance, and
17 take a problem that has been with us for a very long
18 time and move forward. Admittedly, we set a rather
19 defined and narrow goal for this meeting, but I think
20 we've achieved it, and it was a very important goal.

21 The other thing I wanted to say is that
22 we're going to put all of the slides and the
23 transcript, once we get it, on our website. I'd
24 encourage everybody to go to the NRC's website and
25 look for fire protection. We have a fire protection

1 website with lots of good information on it. Tonya
2 Mensa keeps it up for us, and as soon as we get all of
3 this stuff put together, we'll have it on the website
4 for your reference. And I just can't say how grateful
5 I am, and I think the public, the industry and the
6 NRC, we're all very well served by this meeting.
7 Thank you.

8 MR. HANNON: I'd just like to second Eric's
9 comments, and also thank Roy Fuhrmeister for bearing
10 with us. WE put you on the spot to represent the
11 region inspection staff, Roy, and I think you did a
12 great job. Thank you very much.

13 MR. CAMERON: Great, Any other comments,
14 perspectives before we close? Yeah, Fred.

15 MR. EMERSON: I think this was a good first
16 interaction. I would hope it isn't the last one
17 before the inspection guidance appears.

18 MR. HANNON: Yes, I plan to start an
19 initiative next week to put together a draft
20 inspection guide, and I would hope to make that
21 available for NEI and stakeholders to see probably
22 within the next couple of months.

23 MR. EMERSON: Thank you.

24 MR. CAMERON: Great. Well, thank all of you
25 for coming in. Some of you had quite a bit of

1 aggravation. Bob, go ahead.

2 MR. KALANTARI: I came to this workshop
3 expecting that there would be discussions about the
4 newly developed document, a draft by this NRC Guidance
5 Document and NEI-001 Draft D document, at least
6 discuss the major differences, and come to a
7 conclusion and understanding of where we're going.
8 1997, 2003, and six years later, believe it or not, we
9 are involved with doing the Unit I Appendix R analysis
10 as we speak. And this is eight years later. They are
11 asking us how to do this, or people sitting here is
12 wondering how we should address certain things that
13 has been the subject in the industry.

14 I did not get that from this meeting. I'm
15 glad that NRC got what they were looking for, but
16 there was no discussion on this document. A lot of
17 effort went into this document, same thing with NEI.
18 There are some fundamental differences, and I'd like
19 to know when these would be addressed, so we can tell
20 our clients, or we know what to do, because when Roy
21 shows up, I want to match his expectation, and I don't
22 think that's clear yet.

23 MR. CAMERON: A simple answer perhaps on
24 relationship between the NUREG and NEI-001, when they
25 might be finalized? I know that Fred pointed out that

1 there was a lot of uses that they saw for 001, and
2 that Guidance to the Inspection which was the focus of
3 this meeting is only one of them. Eric, I don't know
4 if you want to talk to future interactions on these
5 documents so that Bob can tell his clients what's
6 going on?

7 MR. WEISS: Well, I wish I had an answer for
8 him that would say that we're going to come to quick
9 closure on these items. AS I mentioned in my speech -
10 I'm sorry Fred wasn't here to hear me - but we're
11 considering endorsing NEI-001 in a regulatory guide.
12 Regulatory guides take a while to get out, generally
13 about a year to draft, and a year to final. And we
14 haven't started yet, and that process would involve us
15 probably taking exception to certain things that we
16 didn't agree with. But before we can even begin that
17 process, we have to have a final document to endorse.
18 I can't start a Reg Guide to endorse a document that
19 is in Draft D and is not final, but we have every
20 intention of bringing these issues to closure. It's
21 just that we have to take it one step at a time.

22 MR. CAMERON: So the first thing we need is
23 a final NEI document. And, Fred, I don't know if you
24 have any time frame on that.

25 MR. EMERSON: Yeah. I had a slide up earlier

1 that said we were looking at a couple of months to get
2 a final out.

3 MR. CAMERON: All right.

4 MR. HANNON: Just let me comment on our
5 NUREG. It's our intent for that NUREG document to be
6 a historical record of past practice, identify the
7 definitions that we had been using in the past. And
8 it stands by itself, stands alone as a snapshot of
9 where we were when it was written. Now we expect to
10 move on from there with NEI-001, so in the future when
11 we're in the position to endorse the NEI document in
12 a Reg Guide that will establish our future practice.

13 MR. CAMERON: Okay. Thank you, John. I
14 guess with that we're adjourned. Thank all of you.
15 Have a safe trip home.

16 (Off the record 4:44:53 p.m.)

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