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UNITED STATES NUCLEAR REGULATORY COMMISSION'S ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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593RD MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FRIDAY

APRIL 13, 2012

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B3, 11545 Rockville Pike, at 8:30 a.m., J. Sam
Armijo, Chairman, presiding.

COMMITTEE MEMBERS:

- J. SAM ARMIJO, Chairman
- JOHN We. STETKAR, Vice Chairman
- HAROLD B. RAY, Member-at-Large
- SAID ABDEL-KHALIK, Member
- SANJOY BANERJEE, Member
- CHARLES H. BROWN, JR. Member
- MICHAEL L. CORRADINI, Member
- DANA A. POWERS, Member

1 JOY REMPE, Member
2 MICHAEL T. RYAN, Member
3 STEPHEN P. SCHULTZ, Member
4 WILLIAM J. SHACK, Member
5 JOHN D. SIEBER, Member
6 GORDON R. SKILLMAN, Member

7

8 NRC STAFF PRESENT:

9 JOHN LAI, Designated Federal Official

10 ERIC E. BOWMAN, NRR/DPR

11 SUSAN E. COOPER, RES/DRA

12 RICHARD CORREIA, RESPONSIBILITY

13 KIM MORGAN BUTLER, NRR/DPR

14 SEAN PETERS, RES

15 MARK HENRY SALLEY, RES/DRA

16

17 ALSO PRESENT:

18 ERIN COLLINS, SAIC*

19 JEFF JULIUS, Scientech

20 KAYDEE KOHLHEPP, Scientech*

21 STUART LEWIS, EPRI

22

23 *Present via telephone

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A-G-E-N-D-A

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Staff Assessment of Responses to
NRC Bulletin 2011-01,
"Mitigating Strategies" 74

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

8:30 a.m.

CHAIR ARMIJO: Good morning. The meeting will now come to order. This is the second day of the 593rd meeting of the Advisory Committee on Reactor Safeguards. During today's meeting the committee will consider the following. First, Draft Final NUREG-1921, "Fire Human Reliability Analysis (HRA) Guidelines;" two, future ACRS activities and report on the Planning and Procedures Subcommittee; three, reconciliation of ACRS comments and recommendations; four, staff assessment of responses to NRC Bulletin 2011-01 Mitigating Strategies; and five, preparation of ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. John Lai is the Designated Federal Official for this portion of the meeting. We have received no written comments or requests for time to make oral statements from members of the public regarding today's sessions. There will be a phone bridge line. To preclude interruption of the meeting the phone will be placed in a listen-in mode during the presentations and committee discussion.

A transcript of portions of the meeting is

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1 being kept and it is requested that the speakers use
2 one of the microphones, identify themselves and speak
3 with sufficient clarity and volume so that they can be
4 readily heard.

5 At this point I'll turn it over to Mr.
6 John Stetkar which will lead us through the first
7 briefing.

8 MEMBER STETKAR: Thank you, Mr. Chairman.
9 What we're going to hear about this morning is the
10 NUREG that we've had a long history with. We've been
11 speaking to the staff and EPRI about this effort for
12 almost 3 years. We had our first meeting I think in
13 June of 2009. We've had a couple of subcommittee
14 meetings since then. It's a report that's developed,
15 a joint report by EPRI and the staff, and it's another
16 good example of the cooperation that the staff has
17 developed with EPRI in terms of a lot of these really
18 difficult issues in the area of human reliability
19 analysis and fire modeling. There are a number of
20 initiatives and I personally think it's working very,
21 very well. And this is another evidence of the
22 success of that cooperation.

23 The specific topic here are guidelines for
24 human reliability analysis with a particular focus on
25 fire modeling or fire analysis applications because

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1 those types of scenarios impose a few unique
2 constraints compared to some of your more traditional
3 internal event type human reliability analyses. So,
4 these guidelines were developed for that and I'm sure
5 the staff will -- and EPRI will walk us through that.

6 And without taking too much more time, I
7 don't know, Rich or Mark, do you want to say something
8 as introduction?

9 MR. CORREIA: Yes, thank you, just
10 briefly. Rich Correia, director of the Division of
11 Risk Analysis and Research. Thank you, Committee, for
12 your time today to listen to the presentation that we
13 will give you on fire HRA. It's been a 5-year effort
14 and we believe we've developed a comprehensible,
15 useful set of guidelines. And if we're successful
16 today we will be asking you for a letter.

17 MEMBER STETKAR: Thank you.

18 MR. SALLEY: Yes, and I'm Mark Salley,
19 branch chief for Fire Research in Rich's division.
20 Our speakers for today will be Susan Cooper from NRC
21 and Stuart Lewis from EPRI. They were the PMS and the
22 technical leads for this project so you should get a
23 good story on this. Can I have the first slide?

24 One administrative thing for the folks who
25 are on the phone line. The slides are in ADAMS and

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1 let me give you an ML number here real quick if you'd
2 like to have slides in front of you. It's
3 ML121010574. Again, that's ML121010574. Those are
4 the slides we'll be using.

5 Again, today's presentation, we're going
6 to give you a short history of This project. We're
7 going to talk about its objectives, some of the
8 challenges we faced. Having EPRI here as a partner we
9 get to see the industry perspective so we'll have some
10 good insights to the industry perspectives.

11 Also, with a program like this there was
12 a number of reviews and different tests that it went
13 through and trial applications. You'll hear in detail
14 some of that. And finally you'll hear some uses for
15 other HRA projects and the interface between them.
16 Again, as Rich said, the key here to This meeting is
17 we're going to ask for a letter.

18 And one last thing on that. It's kind of
19 interesting how the ACRS goes. Sometimes we'll be
20 here a lot and sometimes we won't see you for awhile.
21 We've got two big projects. This one is this Fire HRA
22 which you're going to see today. We've also got
23 another one we've just been through subcommittee, the
24 Fire Model Applications Guide, and we're currently
25 looking at June to come with that one which is also

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1 another big one we've worked with John Stetkar on. So
2 we need -- it's feast or famine. We either see you a
3 lot or we don't. Next slide, please.

4 This slide's a little busy but it really
5 kind of puts things in perspective. As Rich said,
6 this has been a 5-year voyage or journey, adventure,
7 I mean pick your word. When you look at research
8 programs like this they're quite interesting having
9 done a few of them when they get this involved. You
10 can look at this and say, you know, we've sang Auld
11 Lang Syne five times since the start of this project,
12 and wow, that's a long time to do this. But on the
13 other side when you hear some of the details of some
14 of the things this project had to do you want to look
15 at it and say it's pretty amazing you got it done that
16 fast. So, it all depends on how you're looking. You
17 know, it's the old adage, it's one thing to buy
18 sausage, it's another thing to see it being made and
19 this kind of puts that in perspective.

20 So, without too much ado I'd like to turn
21 this over to the technical folks, Susan and Stuart on
22 the next slide. And again, just keep your eye on a
23 few of these points. They'll explain in detail some
24 of this. This gives you a nice graphic of the history
25 of this project. Susan?

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1 MS. COOPER: Thanks, Mark. Okay, I also
2 would like to acknowledge Jeff Julius of Scientech who
3 is here today with us also helping Stuart Lewis here
4 to represent the industry side of this collaborative
5 effort. And I'm fairly certain that a couple of the
6 rest of our team are on the phone as well, probably
7 Erin Collins of SAIC and Kaydee Kohlhepp of Scientech.
8 And there are others that couldn't make it.

9 In any case, I want to just give you a
10 little bit more on the background of this particular
11 project. When we first started this project back in
12 March of 2007 the status of fire PRA was that about
13 half of the U.S. nuclear power plants were
14 transitioning to using NFPA-805 for fire protection.
15 And in order to make that transition they were using
16 another document that was a result of a joint effort,
17 and that's NUREG/CR-6850 or EPRI 1011989. And that
18 document provided detailed guidance on how to do fire
19 PRA to support the transition to NFPA-805.

20 With respect to HRA specifically NUREG/CR-
21 6850 provided basically two things, and that is they
22 provided some conservative or high, let's say high
23 value, the high values to assign to the human events
24 in the PRA that you identified to model. It also had
25 some discussion and identified some performance

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1 shaping factors that were considered relevant to the
2 fire context. And there were some new, quote unquote,
3 "new" performance shaping factors that we hadn't had
4 to address for internal events PRA. Things like,
5 things that you'd expect with fire like environmental
6 hazards, smoke, toxic gases, that sort of thing. So
7 that was principally what was in 6850 but the authors
8 of 6850 recognized when they published that document
9 that there still were needs in the HRA area.

10 And particular -- or to be very focused,
11 those were an approach to develop better, best
12 estimate HRA values, you know, things that were not
13 quite as conservative. And at the same time we had
14 the ASME ANS PRA standard being developed and that was
15 going to be something that industry needed to consider
16 when they were developing their PRAS. And so we
17 needed guidance that also met that standard.

18 So, the objectives of the joint effort
19 between EPRI and NRC to develop HRA guidance went hand
20 in hand with those recognized needs. So our principal
21 objectives in this effort had been to provide guidance
22 on how to do quantification, detailed HRA
23 quantification that can give you those error
24 probabilities that are not so high and not so
25 conservative.

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1 And while 6850 identified some of the
2 performance shaping factors that are important in the
3 fire context, it didn't really tell you how to address
4 those in HRA. How do you match up "I understand
5 there's smoke here" and "How do I reflect that in a
6 number?" So we needed to make certain that when we
7 provided our guidance we had that kind of match.

8 And we were also very cognizant of the PRA
9 standard requirements. And as Stuart's going to talk
10 in a little bit that was one of our challenges because
11 the standard was kind of evolving at the same time
12 that we were developing our guidance.

13 MEMBER BANERJEE: So let me ask you about
14 performance shaping factors, just to make this
15 concrete. If there's smoke here it affects your
16 performance and you have to take that into account?
17 Is that it?

18 MS. COOPER: It can. We have some
19 criteria about, you know, the proximity of the smoke
20 and so forth as to whether or not it affects you. It
21 also can then require or instigate people to want to
22 put on some kind of protective gear or breathing
23 apparatus. That can have an effect on their
24 performance. So there are a number of different ways
25 that those kinds of performance shaping factors can

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1 affect performance.

2 MEMBER BANERJEE: These are based on
3 empirical studies? You can get these factors?

4 MS. COOPER: The evaluation --

5 MEMBER BANERJEE: How do you get them?

6 MS. COOPER: -- of say, let's just stick
7 with smoke, how it affects human performance is
8 principally a qualitative assessment, especially with
9 respect to, for example, do you need to wear breathing
10 apparatus, except for when we talk about the
11 possibility of abandoning the control room. And then
12 we do actually even go back to 6850 and use some
13 numerical values about the density and so forth so far
14 as when we might consider that the operators would
15 leave the control room.

16 MEMBER BANERJEE: But there's a lot of
17 experience, right? I mean, when you get a Scott out
18 back, put it on, go out.

19 MS. COOPER: There is experience,
20 absolutely.

21 MEMBER BANERJEE: Yes, so don't you
22 correlate that?

23 MS. COOPER: Yes, mostly qualitatively,
24 but there still can be impacts. It can -- one that
25 can be most important is communication. So unless you

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1 have a built-in device in your breathing apparatus,
2 communication through the device can be garbled or
3 difficult. And so if it's important -- I mean, this
4 is another feature of the fire context is you have
5 many more actions that will be taking place outside
6 the control room.

7 And so as a result there's some need
8 usually for people, you know, in the control room,
9 operators in the control room to communicate with
10 people outside the control room. People outside
11 control room are wearing a breathing apparatus and
12 they need to communicate, you know, "I just did this,"
13 or "You do that." It's important. That can be more
14 difficult if they're wearing breathing apparatus.

15 MEMBER POWERS: I think the question he's
16 trying to ask is is there someplace I can go to that
17 says I have these data points and I have taken the
18 average, the mode, the 95th percentile of those data
19 points and come up with this number. Is there
20 someplace we can do that?

21 MR. LEWIS: No, I don't think we have that
22 kind of data.

23 MEMBER POWERS: Why not?

24 MR. LEWIS: It really is qualitative from
25 the perspective of --

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1 MEMBER POWERS: I mean, that's the
2 inherent difficulty. I mean, it's qualitative.
3 Somebody dreamed it up. I don't have his rationale
4 for dreaming it up, he just said well, it's difficult,
5 so I'll put this number in. I have no idea where the
6 number comes from.

7 MR. LEWIS: It tends to be less a matter
8 of putting in a different number than it is making a
9 judgment about whether or not the action is feasible
10 in the first place.

11 MEMBER POWERS: Well, I mean the question
12 is why is that acceptable? Why is that even vaguely
13 acceptable?

14 MS. COOPER: I think the place that we're
15 in with HRA is that the variety of contexts and fire's
16 a really good example. The variety of different
17 things that can be happening and what operators would
18 need to do and the conditions under which they need to
19 do them just doesn't lend itself to a statistical
20 mapping between, you know, experiments or anything
21 like that and a number.

22 MEMBER POWERS: How do you know that? Has
23 anybody ever tried?

24 MS. COOPER: Yes. We have. Actually, we
25 even have efforts right now in data collection. Sean

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1 Peters, my branch chief, is here if you need him to
2 speak to it. We have efforts right now that are
3 principally focused in the control room where you use
4 simulators. But when you talk about the ex control
5 room stuff it's a little bit different. Sean, do you
6 want to add something here?

7 MR. PETERS: Yes, we do have a variety of
8 data programs that we're implementing right now. But
9 as Susan indicated, the data programs in a control
10 room simulator are a little bit different than what
11 you can do, or what would be required in a fire
12 scenario. A fire scenario requires operator actions
13 outside of the control room and also indicates
14 spurious actuations and whatnot.

15 Getting, you know, getting a statistically
16 significant data sample for all the various human
17 actions that are required in a fire scenario would
18 incorporate, you know, millions and millions of
19 dollars. We're talking on the order of a Manhattan
20 type project to be able to encompass all the various
21 scenarios that could come out of a fire scenario and
22 getting a statistically significant number of data
23 points.

24 So what you have to do with an HRA is you
25 have to collect, you know, you collect data based on

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1 human factors research, human factors literature
2 that's out there and you try to encapsulate and
3 qualify that data into what you would do with a
4 qualitative analysis in HRA.

5 MEMBER POWERS: What you're saying is that
6 we should never try to build accident analysis models
7 because we could never melt down enough cores to
8 possibly get a meaningful database. That's not the
9 way we do it. We get data, we create a model and then
10 we look at all the interactions and presumably put in
11 correction factors when we find them. But you guys
12 are throwing up your hands and saying "I can't get all
13 the data, therefore I'll get none of the data."

14 MR. PETERS: We're not saying about
15 getting none of the data. We actually have programs
16 right now to get some of the data and we're trying to
17 at least put certain human scenarios in and collect
18 that data. Then we can bound all the other items, or
19 at least interpolate all the items based upon the
20 expert assessed difficulty of the various scenarios.

21 MEMBER SKILLMAN: I'm Dick Skillman. I'd
22 be curious in the effort that you've expended in the
23 last number of years how much time you've taken to
24 talk with real firefighting people who have donned the
25 turnout gear, faced the smoke, faced the lack of

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1 communication, the fear of confinement, the fear of
2 losing their gear and battling both a physical enemy
3 which is the fire and the emotional turmoil that these
4 men and women face.

5 It seems to me that there is a body of
6 evidence. Ships at sea have battled these fires, the
7 Navy's battled these in compartments. Municipalities
8 all over the country have fought deadly fires, not
9 just electrical fires or paper/wood fires, but
10 chemical fires. It seems that there's some real
11 information that may be very beneficial and not so far
12 away that provides the kind of information that Dr.
13 Powers is talking about.

14 MS. COOPER: So, first of all, let me make
15 one clarification. Within the context of fire PRA and
16 then HRA anything related to the fire brigade and
17 directly related to the suppression of the fire is not
18 modeled by HRA. That -- those efforts and their
19 success or failure are captured through data. And the
20 HRA analyst does not have a responsibility to that.
21 The only aspects of suppression that the nuclear power
22 plant operator does that we model has to do with
23 things done in the control room for, you know, maybe
24 backing up an automatic suppression system or
25 something like that. But anything related to the fire

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1 brigade's job of putting out the fire we do not model.

2 We do model the potential effect on the
3 control room crew because they may have just lost
4 someone to the fire brigade. We also model or
5 consider the fact that they'll probably be talking
6 with the fire brigade, there will be interaction
7 between the control room crew and the fire brigade.
8 But so far as the actual fire suppression and those
9 activities, we don't model that.

10 Now, I'm going to let Jeff and Stuart
11 speak to some of the rest of your questions, but I
12 will say that efforts that are still not yet
13 documented that were performed here at the NRC with
14 respect to fire events and human performance actually
15 contributed to this performance shaping factors in
16 6850. There was a group of researchers that included
17 NRC, Sandia National Laboratories and actually I was
18 part of that when I was not part of NRC. I was still
19 a contractor. And we looked at a lot of different
20 fire events.

21 And we had Dennis Bley who's one of your
22 members was on the team and he brought some of his
23 experience in from the Navy. We tried to get some
24 cooperation with the Navy. They were not willing to
25 share. We went out and talked to other firefighters.

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1 Dennis went to a conference in Boston of firefighters.
2 I mean, we did a lot of work to do some of that. That
3 was some time ago, but that was the basis in 6850 on
4 which we built. And although it's not done I'm still
5 working with Sandia to try to get some of that
6 background work that we did probably about 10 years
7 ago now published.

8 So there was a basis where we did some of
9 that but now I'm going to let Stuart and Jeff talk
10 because they're working with utilities right now.

11 MEMBER CORRADINI: Just, before you do,
12 can I just add to the -- just to address? Because I'm
13 kind of sympathetic to what Sanjoy and Dana are
14 asking. But you started off by saying -- maybe you
15 didn't say it exactly this way, but what I thought I
16 heard you say was something like it's pretty clear
17 what we're using now are conservative.

18 So at the very least what I'd be curious
19 about is what data or empirical evidence is clear that
20 what you're using now is conservative, and what you're
21 now going to evolve to at least gets closer to what
22 has been empirically observed. Because I think at
23 least that would give me some confidence you're going
24 in an appropriate direction.

25 But I think you said that to begin with

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1 and that one is the thing I remembered was -- so the
2 data must show you're already conservative on how
3 you're approaching this model.

4 MS. COOPER: So, if I could address that.
5 The conservative screening values that were provided
6 in 6850 are conservative as compared to the internal
7 events PRA values for human failure events because
8 many of those screening values are tied to those
9 numbers in some way. In some cases it's a multiplier
10 of the internal events number or something that's
11 higher than the internal events number. So that's the
12 area of conservatism and the criteria that are built
13 into 6850 -- realize we're not talking about our
14 document right now, though we borrowed some of this
15 just for the beginning. But the detailed
16 quantification is different.

17 But those conservative -- the criteria for
18 doing that, you know, if you're going to use a very
19 minor multiplier on your internal events number is
20 that there are no spurious effects going on in the
21 instruments. The fire damage to the cables is not
22 causing your safety-related equipment to have any
23 problems. For the most part the actions are just the
24 same as if it was internal events and there's a small
25 multiplier to add, you know, from the context of the

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1 fire. That's one set. That's the most -- that's the
2 best you can do there.

3 Everything else from there is much higher
4 and many of the -- at least two of the categories
5 which are new events that are coming from like using
6 the fire response procedures and things like
7 abandoning the control room, those get values of 1.0.
8 It doesn't get any more conservative than that. So,
9 that's where I'm coming from.

10 Now, what we've done is that we've tried
11 to back off from that very obvious conservatism by
12 providing some tools to look at the context in a
13 little bit more detail. So, you know, that's where
14 we're coming from.

15 All right, now back to the firefighting
16 experience. Take it away.

17 MR. JULIUS: I'm Jeff Julius of Scientech.
18 So when we started the project on the industry side we
19 went out and talked to utilities, both PWRs and BWRs
20 and both the in control room action, the fire
21 protection staff, as well as the operators that are
22 performing the local manual actions to talk about what
23 is your experience, what is your training. And a lot
24 of these guys have background in being ex-Navy
25 personnel and staff. So we did have an effort to go

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1 out and to get the insights that we could from those
2 people.

3 MS. COOPER: I guess one last thing that
4 I will add is that we -- early in the project Mark
5 Salley had arranged for some folks at NIST to look at,
6 again, what the, you know, look at the data. They did
7 their thing. I didn't quite understand it. But the
8 bottom line was to see if there was anything new or
9 different in how we should understand the effects of
10 fire on human performance. And the results were
11 pretty much the same as what was in 6850 so we decided
12 not to include that effort into what we're doing. It
13 didn't seem like it was an added effect. I sense that
14 Mark wants to add something.

15 MR. SALLEY: Yes. A final comment just to
16 try to address your concern, Dr. Powers' concern on
17 smoke. When you do these types of analysis it's which
18 tool do you go for in the toolbox. For example, the
19 next document that we're going to talk to you about in
20 a couple of months, the fire modeling, you know, smoke
21 is dynamic, okay? It's going to start small, we know
22 it's going to get bigger, the smoke's going to get
23 more optical challenging. It's going to get denser.
24 Questions if you're going to use the control room
25 purge system or not. These are the kind of things

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1 that the fire models give you, not the HRA piece.

2 So what I'm saying is if you want to use
3 these tools in concert that's how you'll do a full
4 analysis. And as a matter of fact, if you look at the
5 Fire Model Applications Guide there's a specific
6 example for control room abandonment where the fire
7 modelers go through it and they go through the smoke.

8 And again, the two criteria they'd use
9 there is the smoke density, can the operator see what
10 they're doing, in when do they need to go to breathing
11 apparatus, as well as any of the effects from the
12 heat, if the operators physically have to leave from
13 the heat. So that's something that happens in fire
14 modeling that would be an input if you will to a
15 complete HRA to make that decision.

16 MS. COOPER: Yes, that's a very good
17 point. Fire PRA is -- adds a layer of complexity to
18 all the other tasks including the HRA in the sense
19 that there are a number of inputs that are required
20 for the analysis that are done by other experts. And
21 the fire modeling is a good example. So we cannot
22 make our evaluations without input on, you know, where
23 there is smoke and what its intensity is until we get
24 that from someone else.

25 The same thing with the circuit analysis

1 and the fire progression. We don't know anything
2 specifically about what instruments and what equipment
3 has failed until somebody else has done their job to
4 a certain point and given that information to us. And
5 then in turn now we know what the job is for the
6 operators and then we have to evaluate all these
7 factors and see, you know, make an evaluation as to
8 the reliability or failure probability.

9 MEMBER STETKAR: Let me interject
10 something. I think this discussion has been really,
11 really good and I just want to kind of give a little
12 bit of my perspective.

13 This NUREG, this guidance is what I
14 consider, it's a snapshot in time of the evolving
15 understanding of how to model human response in
16 general. It's developed primarily to focus on fire
17 scenarios because quite honestly existing guidance at
18 the time that this effort was started 5-6 years ago or
19 more in its infancy didn't treat human response in the
20 context of severely challenging events like fires
21 because the PRA technology up till that time had
22 focused primarily on internal events. Internal events
23 don't generate smoke. They don't generate large
24 numbers of very strange indications. They don't
25 generate the challenges for people having to

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1 communicate with outside firefighters, with inside
2 firefighters, with people doing local actions in the
3 plant. The technology just had not faced those types
4 of challenges.

5 Now, as we're trying to model fires,
6 they've introduced those challenges and therefore
7 there was a need to kind of expand the state of
8 knowledge, the state of the practice, to address those
9 concerns. Is it perfect? No, it's a snapshot in
10 time.

11 There is -- I was going to give you a
12 chance to do some self-promotion, but there is in
13 progress a larger project to address human reliability
14 in what I'll call the more global sense in response to
15 a staff requirements memorandum. That project in
16 particular is very carefully looking at both what is
17 an appropriate set of performance shaping factors, how
18 can those performance shaping factors, both the
19 definition of the performance shaping factors and how
20 they're used, be tied back to fundamental
21 psychological principles. And how can they be tied in
22 terms of the scale of goodness or badness if you will
23 of particular performance shaping factors be tied back
24 to actuarial data which is part of the data collection
25 effort that was mentioned and other sorts of

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1 benchmarks.

2 So in my perspective this particular
3 effort is not trying to solve all of those problems.
4 It can't. That's part of the larger effort. This is
5 a very needed effort to address many of the very
6 challenging situations that power plant operators face
7 in the context of a fire that had never been addressed
8 before in the sense of overall human reliability
9 analysis.

10 It's not the endpoint in terms of, you
11 know, the global approach to human reliability
12 analysis which -- and I would hope that that global
13 approach. We have ongoing meetings on that project.
14 The goal of that global approach I believe will more
15 completely address some of the concerns that Sanjoy
16 and Dana and Mike have raised regarding sort of
17 benchmarking and definition of these performance
18 shaping factors, and using whatever data you have av
19 to try to pin down what those scales might be. And
20 with that I'll be quiet.

21 MEMBER POWERS: Well, you know, for the
22 life of me I don't know how you assess a human
23 reliability analysis on this. If I come in and say my
24 performance shaping factor is 0.1 and you guys say 0.3
25 how in the world does that get resolved? It sounds to

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1 me it gets resolved simply by saying oh, you're not in
2 the in crowd, therefore your number is wrong.

3 MR. LEWIS: We may have given you a
4 misperception of what we're doing here. We didn't
5 create a correlation between the influence of this
6 factor and, for example, smoke density. It's more a
7 matter of making a determination as to whether the
8 conditions in the area where the action has to be
9 taken support taking the action or are prevented. So
10 that for example, as Mark alluded to, it doesn't take
11 a tremendous amount of smoke to get to the point where
12 you can't see what you're doing.

13 And we wouldn't give any credit to a human
14 action in an area where that condition existed. It's
15 not like we'd say well, you know, if you have this
16 much smoke you increase the probability by a factor of
17 2 and if you have more it's increased by a factor of
18 3.

19 We do make -- there are some situations
20 where we might make some adjustments to a basic
21 failure. If you're in a situation where the fire has
22 been extinguished but there's still some smoke in the
23 area it may be somewhat less reliable than other
24 cases.

25 And you're right, we could get into those

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1 kinds of discussions but what we're really trying to
2 do is get an understanding of whether or not that
3 action plays an important role in the core damage
4 frequency or other risk parameter, and then look at
5 whether or not something else needs to be done to
6 either reduce the uncertainty or to eliminate that
7 contribution. We're not really very often in a
8 situation where we would have to hang our hats on
9 small differences in human failure probabilities,
10 that's not the regime we typically work in. And we're
11 not in that kind of a correlation here.

12 MEMBER POWERS: You haven't -- I'm going
13 to change my question. Suppose that you say the
14 smoke is too dense here, you cannot see what you're
15 doing, ergo you cannot suppress this fire. And I come
16 in and say oh yes, I can do that, this smoke is just
17 fine. My guys can get in there, they're all operators
18 from Susquehanna, they're perfect supermen and you
19 would have absolutely no basis for criticizing me for
20 saying that.

21 MS. COOPER: Well, again, so it's not so
22 much -- well, as much as PRA tries to be realistic
23 there are still rules to the game shall we say, and
24 one of those is that we can't take credit for things
25 that some group of guys might be able to do but not

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1 everybody can do. So, when Stuart says if the smoke's
2 at a certain level where we don't think they can see
3 and we don't take credit for that, that's pretty much
4 the end of the game unless they want to talk about a
5 different path, a different location, some time later
6 in the event, that kind of thing.

7 Now, the other thing as Stuart said, and
8 I appreciate you correcting my mis-speaking.
9 Sometimes the fact that there may be enough smoke in
10 the area that they have to put on equipment, that
11 factors into the amount of time that they need to take
12 in order to do things, and time is something that
13 we're always keeping track of in HRA because you need
14 to be able to know what you're going to do, get the
15 equipment that you need to have, get to where you're
16 going, do it, report back. All of that has to be done
17 in some time to be useful to preventing some system
18 failure or plant function failure. So, the time it
19 takes to put on the equipment, the extra time it may
20 take you to just walk around wearing it or doing
21 things, all those things are what we take into
22 account.

23 And different people react differently.
24 We try to keep that into account too. So there's
25 never -- that's the other reason why it's difficult to

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1 say there's a number is because --

2 MEMBER BANERJEE: I thought that was the
3 way you were going to answer my question originally.

4 MS. COOPER: Okay.

5 MEMBER BANERJEE: I think -- so going back
6 to when I was a kid in a plant working we'd have to
7 put these Scott air packs on and find our way out and
8 take certain actions and they would time us.

9 MS. COOPER: Right.

10 MEMBER BANERJEE: How long it took us to
11 shut something down, do something else and get out of
12 the plant. So you have these numbers. They vary.

13 MS. COOPER: We do. As a matter of fact,
14 yes. We indicate that job performance measures and
15 other data that the plant may take can be an input
16 what our analysis. However, their starting point and
17 where we may start may be different. In other words,
18 they may start from, you know, right here, right now,
19 I've got my equipment on, I'm going.

20 We start earlier. We start back in the
21 control room when they decide they need to do this
22 action. They call somebody up on the phone. They go
23 and get their equipment. They go and put their gear
24 on and then they go. So we have a different starting
25 point. But you're right, there is information, data

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1 collection, timing information that can be used and we
2 discuss that in our report.

3 And then we try to factor in the gear.
4 There are other things we can't factor in, you know,
5 to that data collection like the actual presence of a
6 fire and how that affects things. Jeff, you wanted to
7 add something?

8 MR. JULIUS: That's right. That was one
9 of the major public comments in fact was that we had
10 not recognized the body of timing data that was out
11 there for the developing the time line. And so we've
12 addressed that in our revision here.

13 And the idea is that it's not these
14 individual performance shaping factors individually
15 influence, it's the collective set. So it's the
16 procedures, and the cues, and the training, and the
17 timing. And we look at those and be able to rank
18 those important, you know, whatever number we pick as
19 a ranked set. And then we can go back and have the
20 plants work on improving their procedures or training
21 for these important actions. So whether it's a 0.1 or
22 0.3 through this method we see the collective set of
23 these shaping factors and then -- so that the plants
24 have something to go back and to work on improvements,
25 or to reducing the uncertainty of those actions.

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1 MEMBER BANERJEE: Okay. So you're on the
2 path. All right.

3 MS. COOPER: We don't have -- separate
4 from the slide set that you have. We had some backup
5 slides but there isn't one there. But Jeff has the
6 actual report on his computer if you wanted to see one
7 of the --

8 MEMBER STETKAR: That's all right. In the
9 interest of time let's -- we've had quite a bit of
10 discussion in the subcommittee meetings regarding the
11 concept of time lines, and addressing uncertainties in
12 time lines. And there's uncertainty. Those time
13 lines account for cognitive responses, they account
14 for the actual implementation, whatever the action is
15 and how one assesses the uncertainties in those times.

16 In some cases the times are developed to
17 assess feasibility of the action. In other words, if
18 the time available is 15 minutes before something
19 undesired occurs and you do a reasonable analysis and
20 you say there's only 5 percent probability that you
21 can actually achieve what you desire within that 15
22 minutes you tend to basically fail the action. On the
23 other hand, if there's a large margin then you have to
24 still quantify the likelihood with uncertainty. So
25 timing, many of the concerns that have been raised in

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1 the context of this discussion do translate to timing.
2 Not all of them, but many of them do. That's what I
3 was kind of asking whether you had the -- if you don't
4 have the time line that's fine because it's important
5 to get through the rest of the presentation.

6 MS. COOPER: Yes, we do.

7 MEMBER BANERJEE: There is another time
8 line here.

9 MEMBER STETKAR: There is another time
10 line. We're still okay on that one.

11 (Laughter)

12 MS. COOPER: All right. I just want to
13 make two points before I move off of this slide. And
14 that is that, so what then eventually really kicked
15 off this effort then was that NRR came to the Office
16 of Research and asked to add a task to the user need
17 with the Fire Research Branch to say let's develop
18 these guidelines using existing methods. And
19 therefore it became a joint effort with industry and
20 the NRC and I'd like -- I think Mark already mentioned
21 but this is the third major joint effort on fire-
22 related research projects.

23 So, the next several slides I'm going to
24 pass over to Stuart to address. In particular he's
25 going to talk about challenges that the team addressed

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1 in our development, the industry perspective and some
2 things about review testing and trial applications.

3 MR. LEWIS: The first point here, in terms
4 of the kinds of things we had to tackle in developing
5 something advancing the state of the art in HRA for
6 fire I think is something John already alluded to, and
7 that is what had been done in human reliability
8 analysis up to this point primarily focused on
9 internal events, kind of nominal conditions in the
10 plant, without the sorts of stressors or influence
11 factors that a fire might produce. So trying to
12 really understand the context for a human action when
13 there's a fire in progress or when it's been
14 extinguished but perhaps has had some unique effects
15 on the plant was a major I think challenge that was
16 faced by this project early on.

17 I have to say, I wasn't part of this
18 project at the beginning until I joined in EPRI in
19 2009 so I've gotten to be part of the update effort,
20 but I didn't get to --

21 MEMBER STETKAR: This is your plausible
22 deniability.

23 MR. LEWIS: No, no --

24 (Laughter)

25 MR. LEWIS: My first, my introduction to

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1 the project was that I served as, I think the time
2 line that Mark went through pretty quickly. I served
3 on a peer review panel back in 2008 when the first
4 draft was put together. So I did have some
5 familiarity. And I'm not trying to deny or avoid
6 blame for anything that's in there. If we're talking
7 about specific things that's necessary.

8 (Laughter)

9 MR. LEWIS: But the fact is that we did
10 have a broad range of possible influences and many of
11 these were identified in NUREG/CR-6850 that hadn't
12 really been tackled in any depth when it came to human
13 reliability analysis. So that really was a big
14 challenge here.

15 Part of that challenge was to look at the
16 context to understand when human actions could be
17 feasible given that you had a fire in progress. So
18 for example, typically we would include that if you
19 had to take an action. I'm not talking about fighting
20 fire. As Susan said, we treat the firefighting aspect
21 empirically based on data collected from actual
22 nuclear power operating experience.

23 But if you have to go into an area where
24 there's been a fire and manipulate a valve, or a
25 circuit breaker, or take some other action we have to

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1 look at whether or not it's feasible actually to take
2 that action. If you have to don protective gear does
3 that make the time such that it's too late to take
4 that action for example, or are the conditions still
5 so adverse that you wouldn't expect that a human could
6 reliably perform the action in the first place. So we
7 would judge the action to be infeasible.

8 So we spent quite a bit of time developing
9 criteria for how to judge the feasibility of human
10 actions. The time line plays a big role in that
11 process. Because again, if you have insufficient time
12 to do what needs to be done by definition the action
13 is infeasible.

14 We also spent quite a bit of time
15 developing criteria or guidance on how to evaluate
16 whether the action was feasible in terms of walking
17 through the action in an actual plant context, or when
18 that's not possible at least doing a detailed talk-
19 through of the scenario with operators and other
20 relevant personnel to understand what would need to be
21 done, where the operators would have to go in terms of
22 how their transit paths might be affected, what
23 protective gear they might have to don, and that sort
24 of thing as part of assessing the feasibility.

25 For some actions plants have gone out and

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1 come as close as they can to simulating the realistic
2 conditions. That's difficult to do. Obviously they
3 don't start a fire in a room to see what level of
4 smoke is generated, but to the extent that it's
5 possible to simulate those conditions that has been
6 done for some of the more important human actions that
7 are considered in fire PRAS.

8 We've also developed guidance for how you
9 reflect the potential that a fire can cause spurious
10 signals or spurious actuations in the plant and how
11 that might affect the operators in the control room.
12 That can come into play in several ways. Among those
13 are the fact that the operators may be directed to
14 take an action that's contrary to what they should
15 actually be doing because you get a spurious signal
16 that says to, for example, block out a diesel
17 generator to prevent damage to the diesel when in fact
18 there may not be any actual problem, and by doing that
19 they've defeated the function of the diesel.

20 More generally, we expected in some fires
21 at least that could affect a lot of control cables you
22 may have a number of actuations occurring more or less
23 simultaneously. They may not have anything to do with
24 each other because they're not tied to anything that's
25 actually going on in the processes they monitor, but

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1 they could be distractions. The operators have to
2 filter through the alarms and indicators and figure
3 out what is really going on. So they have that
4 potential for distraction that we tried to address.
5 So that was another thing that we had to provide
6 guidance for in the context of the HRA.

7 The potential errors of commission, I'm
8 not sure how familiar you are with this concept. This
9 refers to taking intentional acts based on the
10 understanding the operators have in situations where
11 those acts are actually the wrong things to do. So,
12 it's not -- most of the things we look at in human
13 reliability analysis for a nuclear power plant are
14 failure to do something when it needs to be done.
15 This is a specific case, when the operators do
16 something they're not doing it by accident, they're
17 doing it intentionally but they have a
18 misunderstanding of the situation they're in. So
19 again, this ties back to the bullet before and that is
20 they might take these actions if they have spurious
21 signals telling them to take the action.

22 So in that context it's a little bit hard
23 to call them errors. They have a signal. They're
24 responding according to what their procedure tells
25 them to do, but in fact in the context of the accident

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1 sequence they're treated as errors of commission.

2 We typically don't look at those in detail
3 or we haven't in PRAS up to this point. I think this
4 is an area that the project that John mentioned to
5 respond to the other staff requirements memorandum
6 will be looking at in detail as we go forward. It's
7 certainly a hole in HRA today I believe, but it is
8 something we do tackle in a specific context in fire
9 HRA.

10 Distractions, again, you know, not only
11 the spurious signals, but if you have to -- if the
12 operators have to deal with what's being done to fight
13 the fire that can add time and distraction to what it
14 is they need to be doing to respond to the plant
15 conditions. And then we have the whole --

16 MEMBER ABDEL-KHALIK: I can understand
17 distractions and spurious signals that are caused by
18 the fires. How do you address distractions or
19 spurious signals that the operators are constantly
20 subjected to as a result of deficiencies in the fire
21 protection, fire detection system in a flame?

22 MS. COOPER: Deficiencies, not failures.

23 MEMBER ABDEL-KHALIK: Correct.

24 MS. COOPER: I'm not sure I know what you
25 mean by that. Could you --

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1 MEMBER ABDEL-KHALIK: I mean, have you
2 looked at the health of the fire protection system in
3 an older plant? Have you looked at the health of the
4 fire protection program in an older plant and seen how
5 many deficiencies there are and how many spurious
6 indications that come into the control room so that
7 they have to have fire watches, either hourly or
8 shiftly fire watches all the time?

9 MS. COOPER: I think Mark wants to say
10 something and I believe our industry folks want to say
11 something.

12 MR. SALLEY: Do you want to go first?

13 MS. COOPER: Why don't you guys go ahead.

14 MR. LEWIS: Jeff was pointing out that
15 with respect to the firefighting systems themselves,
16 again, that's treated within -- separate from the
17 context of the HRA in evaluating the reliability of
18 those systems.

19 Now, if there are failures within those
20 systems that could create additional demands for the
21 control room --

22 MEMBER ABDEL-KHALIK: That is -- that's my
23 --

24 MR. LEWIS: -- we haven't explicitly
25 addressed that. I don't think that is --

1 MEMBER ABDEL-KHALIK: If the operators are
2 constantly getting alarms which they know are spurious
3 because they're caused by deficiencies in the system,
4 are they conditioned in such a way that when a real
5 alarm comes in they just ignore it?

6 MS. COOPER: That is part of some of our
7 discussion about distractions. That, some of that
8 discussion is a result of interactions with the
9 subcommittee in the last few meetings. And that is
10 that we recognize whether it's fire protection systems
11 or other things on balance of plan, that even though
12 the operators are trained for a fire to focus on their
13 safe shutdown equipment and what would be needed for
14 safe shutdown, there could be things going on that
15 because of their prior operating experience, you know,
16 like I've been having trouble with that rad waste
17 system. It shouldn't matter to me right now but it's
18 been a bug in my, you know, a bug for me for the last
19 week and so I'm just going to take care of that
20 instead of what I should be.

21 And we talk about -- this is a little bit
22 beyond what we can do right now, but we have some
23 discussion about how you can handle it in uncertainty
24 space.

25 MEMBER ABDEL-KHALIK: But that is totally

1 different. You know, having, you know, history of
2 problems with a waste-handling system versus having a
3 history of problems with the fire detection system.

4 MR. SALLEY: And that's an age-old
5 question. And you know, it becomes the difference
6 between nuisance alarms and false alarms. I believe
7 the codes have dealt with it and the inspectors check
8 that. Back in my NRR days I can sympathize because I
9 know exactly what you're talking about.

10 But it's also interesting to see that
11 there's a similar but different change going today
12 with the technology. Something that I know NRR has
13 been dealing with and we have a separate research
14 program going on and that's the advent of the very
15 early warning detection systems, if you're familiar
16 with this. It's a new technology that samples the
17 air. Like I said, we have a research program going on
18 right now and what we're seeing with the PRAS and with
19 the 805 applications is the licensees are finding out
20 what really is sensitive in the plant. You know, what
21 are the real pinch points and where do I really need
22 to be sensitive for cabinet fires especially.

23 Harris, this is in part of the Harris SER
24 if you've looked at it, but they even install brand
25 new, state-of-the-art detection systems that work off

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1 air aspiration where they pick up the smallest points
2 of combustion. In essence, it's really fire
3 prevention because when the electronics start to break
4 down before they turn into a combustible type fire,
5 the operators are able to pick it up and go in there.

6 We have a program right now in Research
7 that's looking at this. And it's interesting because
8 a lot of the other technologies, the other sciences
9 have gone beyond us. For example, one of the people
10 I'm talking with a lot is NASA and NASA is using this,
11 Department of Energy is using it, some of their
12 facilities and we're out trying to get their
13 experience. Also in Canada, I understand the CANDU
14 reactors have used this in years past. So, there is
15 newer technology for that problem.

16 As to the nuisance alarms, wow, your
17 question really dances on safety culture. I mean, how
18 serious do the operators take the alarms? And that
19 can go for any alarm on the annunciator, not just the
20 fire alarm.

21 MR. LEWIS: Clearly we needed to develop
22 guidance related to uncertainties that can affect the
23 human reliability analysis. If you've been exposed to
24 other elements in PRA you know that uncertainty plays
25 an important role in everything that we do in PRA.

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1 We had some unique considerations, maybe
2 not so unique, but sometimes we forget that when we
3 draw a time line we have uncertainties in the
4 estimates of each of the elements of that time line,
5 and some of those are magnified a bit. Or at least
6 the consequences are magnified in terms of the fire
7 scenario where we may have less time margin because of
8 other things that are going on are distractions.

9 MEMBER STETKAR: And in some sense -- I
10 mean I have the time line in front of me. In some
11 sense it -- from Said's question it doesn't address it
12 completely, but in the context of this time line there
13 is a starting point when the real fire really starts.
14 And there is a delay time until the operators receive
15 -- essentially perceive the cues to start their
16 action. Now, their action might be to turn on a pump
17 or to go, you know, open a valve.

18 In some sense, some of the confusion or
19 distractions of inadequate or confusing fire alarms,
20 fire detection could factor into uncertainties in that
21 delay time. In other words, people being distracted
22 by saying where the heck is the fire before they
23 actually respond to the cues to maybe start the pump.
24 It's not a complete, you know, deterministic
25 evaluation of those actions, but I would argue it

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1 could be factored into that initial delay until they
2 get started doing the things they ought to get
3 started.

4 If it's enough of a distraction
5 unfortunately it pervades the entire time line which
6 is something that Susan mentioned. We've had some
7 fairly extensive discussions about this notion of
8 distractions and focusing on other things. And that's
9 about all I can say.

10 MEMBER SKILLMAN: John, what I heard, or
11 at least what I assumed originally was that this is an
12 extremely wide focus on human reliability analysis
13 relative to fire. And what I then heard based on
14 Susan's explanation is this is really focused on how
15 the control room behaves given a set of inputs. And
16 so from that perspective what we're talking about this
17 morning is that more limited discussion item. Am I
18 accurate in that or am I missing the point here
19 please?

20 MEMBER STETKAR: I wouldn't characterize
21 it personally, and I'll speak for the staff here. I
22 wouldn't characterize it as more limited because in
23 terms of nuclear power plant safety the response of
24 the control room operators and the operating crew to
25 mitigate the effects of a fire is what we're

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1 interested in. So it's not limited at all in that
2 sense. Plants get into trouble primarily because of
3 the combined effects from the fire damage and perhaps
4 personnel making errors. And those personnel are not
5 the firefighters, they're the people responsible for
6 operating the power plant. This is focused on the
7 operators of the power plant.

8 As Susan mentioned, the extinguishment of
9 the fire itself is factored into the global fire
10 analysis through empirical correlations of times for
11 fire suppression that are derived from actual data.
12 So it is a time factor, it's a probability of
13 suppression as a function of time, based on whether or
14 not you have to -- you know, local firefighting,
15 automatic, you know, those types of things. Those are
16 treated empirically. Those aren't treated in terms of
17 uncertainty, in terms of does the fire brigade
18 captain, you know, forget to put his hat on.

19 So yes, if you -- your understanding is
20 correct. This effort is focused on the operators of
21 the nuclear power plant response in the context of a
22 fire which eventually will be extinguished at some
23 time even if it has to burn itself out.

24 MEMBER SKILLMAN: That's helpful. Thank
25 you. Thank you.

1 MS. COOPER: But it can be and often is
2 outside the control room that the operators are
3 performing their actions. And that is an element that
4 there's not much of in an internal event. So that's
5 something that we've had. And that's actually
6 Stuart's last bullet. But there's a bullet in
7 between.

8 MR. LEWIS: So, what we've been talking
9 about up to this point is primarily the qualitative
10 aspects of what needs to be done to deal with the
11 human reliability for the fire scenarios.

12 We also had to look very carefully at what
13 was available to support quantifying the probabilities
14 of failure to take appropriate action. And in the
15 context of doing that, again, as Susan mentioned
16 earlier we had a screening approach from the -- from
17 NUREG/CR-6850 that was very general in context. And
18 we had existing detailed approaches to performing
19 human reliability analysis that we looked at adapting.

20 We concluded -- our team concluded
21 somewhere along the line that an approach in between
22 those two extremes, a fairly simplistic screening
23 approach and a more detailed analysis would be helpful
24 in terms of further screening actions that didn't
25 contribute significantly to the risk results so that

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1 it didn't -- they didn't necessarily warrant really
2 extensive resources being applied to evaluate them.

3 And a scoping approach was developed
4 that's unique to this effort. The scoping approach is
5 intended to be somewhat less bounding than the
6 screening approach but still be something that can be
7 applied in a fairly simple or straightforward manner
8 without -- again, you still have to do a fair amount
9 of work to understand the context for the action to
10 make sure that the action is feasible in the first
11 place and to understand some basic aspects of what
12 needs to be done, but it doesn't require the full
13 analysis that a detailed analysis would. So, this new
14 scoping approach was developed along the way.

15 And then we looked at two detailed
16 approaches for performing the analyses. One is
17 comprised of methods developed by EPRI over the years
18 and the other is the ATHENA approach that was
19 developed by the NRC. And essentially we give
20 analysts the choice. If they conclude they need to do
21 a more detailed analysis they can choose either of
22 those two paths. And there's some guidance on when
23 one path might be more appropriate.

24 For example, if you get into certain
25 cognitive actions that are particularly challenging

1 ATHENA may be able to handle those, some aspects in
2 ways that the EPRI approaches can't do. But for the
3 most part it's up to the analyst to decide which
4 approach to follow. And then the rest of the work in
5 the quantification arena had to do with how do you
6 adapt those approaches to take into account the fire
7 context along the way.

8 And then as Susan said, the last bullet
9 has to do with the fact that actions would have to be
10 taken outside the control room for the fire scenario
11 may have some unique implications. The operators may
12 not be able to take the path to a local area they
13 would under normal circumstances because the fire is
14 in an area that's in the way, or they may not be able
15 to have access to an important area to take the
16 action, or other aspects of taking action outside the
17 control room. Communication becomes a greater issue,
18 for example, so we had to address those implications
19 for actions outside the control room.

20 A few more of the things that we had to
21 face in this process, including the fact that we felt
22 a strong need to pilot the methods in the guidance.
23 This is something that has come up repeatedly in the
24 context of NUREG/CR-6850 which is a very broad
25 approach to performing fire risk assessment.

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1 And both on the industry side and the NRC
2 side I think it's been recognized that it would have
3 been very helpful to have actually gone all the way
4 through a PRA applying the guidance in NUREG/CR-6850
5 before people launched into production PRAS as part of
6 the NFPA-805 transition. A lot of the more subtle
7 gaps or challenges in 6850 weren't really recognized
8 until a lot of people were well under way in
9 performing their fire PRAS.

10 And so for the last few years we've all
11 been scrambling to try to fill those gaps and
12 compensate for some of the things that look fine going
13 into the process and you don't recognize the
14 importance of until you're actually trying to use the
15 guidance. So we felt it was important to do an
16 effective job of piloting this process to force out
17 any challenges or gaps that we didn't recognize when
18 we put the guidance together. And we'll talk a little
19 bit more in a minute about how that was done.

20 Another of the challenges, and I think
21 this was more of a challenge early on, but the fact
22 was that the requirements in the PRA standard, the
23 ASME ANS standard, were evolving along with the
24 guidance that this project put together. So it was a
25 little bit of a moving target, trying to put together

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1 guidance that would tell people how to do the things
2 that a standard tells you you need to do when the
3 things in the standard are changing is clearly a
4 challenge. But I think we have -- to getting pretty
5 close on that aspect.

6 Another thing I think that wasn't fully
7 recognized at the outset was the fact that in the fire
8 PRA itself there are a large number of different
9 tasks, some of which iterated different points. It's
10 by no means a linear process where you can define a
11 point at which you need to perform certain elements of
12 the HRA and then another point where you need to do
13 additional things. It's very much a process of trying
14 to screen continuously areas in the plant that could
15 contain important fires, focusing in more and more on
16 the areas that are important and developing more and
17 more detailed information about the fire scenarios.

18 And all that information is needed to
19 support the HRA so that you can't just define a simple
20 point when you perform the HRA. And trying to
21 characterize the ties between the HRA process and the
22 broader fire PRA process was a big challenge in this
23 whole process.

24 Another thing that has come up as the fire
25 PRAS get closer to completion is the fact that the

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1 procedures in place at the plant have been improved as
2 part of the transition process. And in many cases
3 it's necessary to evaluate the risk as the plant will
4 exist after these procedures are changed. And so you
5 have a situation where you're expected to evaluate
6 human reliability for a procedure that may not have
7 actually been implemented in the plant yet, so you
8 have to make some judgment about what that's going to
9 look like. The fire procedures I think are one of the
10 significant areas of improvement that plants going
11 through this transition process have realized, but
12 that's certainly not made the HRA process any easier
13 along the way.

14 And finally, a challenge that we did face
15 in terms of the schedule. Not so much a technical
16 challenge, but the -- as many of you are aware there
17 is a fairly extensive fire PRA course that's offered
18 jointly by EPRI and NRC twice a year. And starting in
19 2010 there was a new track added to cover the fire
20 HRA. And trying to develop a week's worth of training
21 materials and to conduct that training and improve the
22 materials has been a big focus of what's gone on the
23 last 2 years. So that's been one cause for how it
24 took us this long to get to where we are. It's just
25 a fact of life, but that's something that the team who

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1 was putting the report together had to deal with in
2 parallel.

3 MEMBER SKILLMAN: Has that training course
4 been well attended?

5 MR. LEWIS: Very well attended. I think
6 it's been on the order of 20 to 30 students, the HRA
7 part of the course, 20 to 30 students each of the four
8 times it's been offered. It was offered twice in 2010
9 and twice more in 2011. So there must be somewhere in
10 the neighborhood of 100 people who have gone through
11 that class.

12 MEMBER SKILLMAN: Are these primarily PRA
13 practitioners from the fleet?

14 MR. LEWIS: It's a mixture of PRA
15 practitioners, a fair number of NRC inspectors and
16 others who are going to be reviewing NFPA-805
17 submittals have attended. Other interested parties
18 have come. So it's -- one aspect of the way this
19 material has evolved is that many of the plants that
20 are performing their fire PRAS have already had to
21 deal with much of the HRA before they had the chance
22 to attend the training. So that's -- it's been
23 somewhat less beneficial from that standpoint
24 unfortunately. The timing wasn't ideal anywhere along
25 the line. But it has helped quite a bit with some

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1 plants' HRA or fire PRA efforts.

2 MR. SALLEY: The training is split pretty
3 much. It's interesting, we had a very good attendance
4 as far as not just the industry and the consultants
5 that we open it up to, because we treat it as a free
6 public meeting. But we also get our inspectors.

7 Our inspectors are actually starting to
8 use this for some of their qualification. Remember,
9 the fire PRA is bigger than 805 and the things that we
10 learn in here and the original roots of 6850 were for
11 the fire re-quantification which was for the SDP
12 process. So you know, that's a big part of it. The
13 training does continue to expand.

14 Another interesting fact is when you look
15 out there, where can you get this kind of training?
16 And every year that we do this we tend to get
17 somewhere between 10 and 13 different countries that
18 are sending their people, both their consultants and
19 their regulators, here. So this is kind of a cutting
20 edge program, this training.

21 We've also, like Stuart said, we expanded
22 it. It originally had three modules: fire PRA,
23 circuit analysis and basic fire dynamics. The fourth
24 track is this HRA that matches up with this NUREG.
25 We've also added a fifth track that we started last

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1 year which is the fire modeling and advanced fire
2 modeling. So the training is thriving.

3 We take turns with it. This year is the
4 NRC's turn. There will be two sessions of it up here
5 in the greater D.C. area and next year EPRI will have
6 it again.

7 MEMBER SKILLMAN: Thank you.

8 MEMBER SCHULTZ: Stuart, I understand the
9 importance of the fifth bullet with regard to the PRA
10 practitioners and the inspectors, and so forth. The
11 fourth bullet there, continuing improvements in fire
12 procedures in plants. Is this not the key focus of
13 why we're doing this in the first place is to develop
14 an understanding of where improvements can be made to
15 the fire procedures? Perhaps more importantly, where
16 it's not feasible to develop improvements to the
17 procedures.

18 MR. LEWIS: Absolutely. It is an
19 important focus, probably the most important focus of
20 this work. The reason it's here, listed here as a
21 challenge, it's just that when this process started we
22 had a set of existing procedures. We tried to write
23 guidance to address how you evaluate human reliability
24 in the context of those procedures. Many of those
25 procedures have been very fundamentally changed

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1 through the last few years and so our guidance has had
2 to adapt and accommodate those changes in the
3 procedures. So that's where the iteration comes back.

4 MEMBER SCHULTZ: I didn't mean you didn't
5 understand it as a good thing, but in terms of the
6 practice, the focus of the overall effort should be to
7 assure that the improvements aren't being made to the
8 procedures in those areas where they can have the most
9 impact, the most effect.

10 MS. COOPER: I would agree. Some of the
11 discussions we've had in the training sessions, we've
12 had some very interesting comparing of notes of
13 different procedure formats, what works best here.
14 Even we had some folks from the Spanish regulator show
15 us some procedures from some of their plants and how
16 they differently attack the problem.

17 So yes, it's good that this is coming up
18 and the HRA is playing a role here, it's just that,
19 you know, this is again sort of the delta against
20 internal events. For decades now we've been looking
21 at EOPs and only EOPs, and now we're looking at an
22 entirely different beast. And it's evolving and we're
23 providing the input. So, anyway. John's giving me
24 high signs that we need to --

25 MEMBER STETKAR: Yes, to have some hope of

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1 meeting this time line we do need to try to get
2 through the remainder of the presentation.

3 MR. LEWIS: I'll try to quickly give you
4 a little bit of perspective on what it was we were
5 trying to do.

6 MEMBER STETKAR: By the way, I told you
7 there would be interest.

8 MR. LEWIS: Yes -- in terms of our
9 participation in this project. Certainly the most
10 important thing that we had to deal with was that we
11 have -- we needed to provide clear and consistent
12 guidance on how to perform an HRA for fire PRAS so
13 that our users could do a good job of implementing
14 this aspect of the analysis, and that this wouldn't be
15 a tremendous obstacle to completing the fire PRA. We
16 also wanted to make sure that along the way we
17 provided adequate review and iteration on the guidance
18 as it evolved.

19 But I do want to make a couple of points
20 about what we view as important attributes of the
21 approach that exists now in NUREG-1921 or EPRI
22 1023001. First of all, it does -- as it's constituted
23 now it does have the capability to address a broad
24 range of fire response strategies because not every
25 plant uses exactly the same approach to responding to

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1 a fire, and provides detailed guidance for how to
2 evaluate and address those strategies. This guidance
3 coordinates I think much better than it did in the
4 early days with the way actual fire PRAS are
5 conducted. So it provides the right level of
6 information, when inputs are available and when the
7 outputs are needed for the fire PRAS. Although I
8 think we couldn't claim that the results have an
9 extremely high degree of accuracy, just as we can't
10 claim in any human reliability analysis. We do think
11 that the studies can produce useful insights into
12 where actions are important and what might be done to
13 improve procedures or other aspects of the scenarios
14 to reduce risk.

15 And we think that the guidance is
16 producing results that are consistent with the way
17 human reliability analysis is performed for internal
18 events, but taking into account the fire HRA -- fire
19 context.

20 I mentioned one of our challenges early on
21 was to ensure that we did a sufficient amount of
22 testing and piloting of this process. And the fact is
23 we didn't have a full set of guidance that then went
24 all the way through a PRA and then we made some tweaks
25 and published the report. We did have to do the

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1 piloting and testing along the way, but we did enough
2 of that that I'm confident that we've tested all the
3 aspects from this guidance sufficiently.

4 Starting with, you mentioned the peer
5 review that I participated in back in 2008 before I
6 was at EPRI. In 2008 there were also pilot
7 applications that focused primarily on this new
8 scoping method conducted at a PWR, Diablo Canyon and
9 a BWR, Nine Mile Point, to provide some feedback. And
10 the scoping approach was modified as a result of that
11 experience.

12 It was also piloted in 2009 by the PWR
13 Owners Group and they provided quite a bit of feedback
14 to help improve the guidance.

15 MEMBER SHACK: All the guidance or focused
16 on the scoping stuff?

17 MR. LEWIS: That was all the guidance at
18 that point. In December of 2009 a draft version of
19 NUREG-1921 was published for public comment and we
20 received comment from primarily four entities, both of
21 the owners groups, the PWR and BWR Owners Groups.
22 Exelon -- on a set of guidance, and then the EPRI --
23 we have a human reliability analysis users group that
24 supports our software development and other
25 activities. And they provided quite a few comments as

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1 well. And so much of the time, aside from developing
2 training materials, much of the time in the last 2
3 years or so has been spent making sure that we
4 properly account for those comments and make revisions
5 to the report that reflect what we learned from that.

6 We've also, perhaps at least as
7 importantly as any of these aspects, the guidance has
8 been in use over the last few years. Some of our team
9 members, including Jeff from Scientech and SAIC, are
10 actively involved in performing fire PRAS as part of
11 this transition to NFPA-805 and they've used this
12 guidance to support those PRAS. So even though it
13 wasn't published in final form they had a little bit
14 of an inside track on the guidance and were able to
15 provide feedback to allow us to further improve the
16 guidance.

17 And finally, Susan mentioned that we did
18 get quite a bit of comment and feedback from the
19 students who came to our training classes in order to
20 the experience. Those who had actually participated
21 in HUMAN RELIABILITY ANALYSES for fire PRA up to that
22 point had feedback that was helpful to the process.
23 And that, it continued through the two courses last
24 year. I was only at the ones in 2010 so I can't speak
25 directly to what happened last year, but I believe

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1 that was very useful.

2 And of course as John said at the outset,
3 we've had a number of interactions with the ACRS
4 subcommittee through the years and quite a bit of
5 useful feedback from John and others on that
6 subcommittee.

7 So again, we're pretty confident that
8 we've tested everything maybe not in the ideal format
9 but in at least as thoroughly as we need to to have
10 confidence in what we've got.

11 I'll quickly go through some of the things
12 that have changed. I may not hit all of these bullets
13 in the interest of time, but a lot of the work that we
14 did in response to the testing and the reviews that
15 were conducted affected the qualitative analysis. The
16 qualitative analysis captures all the important
17 aspects of the context for the action we're assessing,
18 the timing procedures and all the other things we look
19 at. And it's a really crucial first step in getting
20 -- setting the stage for all the rest of the work we
21 do in the human reliability analysis. And we did make
22 quite a bit of modification to that process as it was
23 originally formulated as a result of the feedback we
24 got.

25 Made some changes to the scoping approach.

1 I won't get into any details there. We did refine the
2 way we would reflect the timing considerations,
3 especially as it's applied in the scoping approach.
4 And some of the other guidance for things like walk-
5 throughs of the scenarios and how to perform an
6 adequate talk-through.

7 An important aspect of what we've
8 addressed in our revision was looking at the potential
9 for spurious actuations or spurious equipment
10 operations along the way. And then we made some
11 changes to the way we characterized some of the
12 pieces, the specific pieces, including treatment of
13 recovery, the dependency among human actions and the
14 uncertainty analysis. So all of this, all this review
15 and testing that we did really did make substantive
16 improvements to the guidelines as we went along. With
17 that I think we can turn it back over to Susan.

18 MS. COOPER: Thank you, Stuart. That
19 leads into the next and last topic, and that is to say
20 that we believe that the guidance that we provided for
21 fire HRA also provides a useful guidance that can be
22 used for other projects moving forward. In
23 particular, at the NRC we mentioned the new HRA
24 development from the SRM M061020. And then also the
25 Office of Research is beginning on a project to do

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1 site-wide level 3 PRA. So both of those projects in
2 particular we believe will be benefitted by this work.

3 In addition to some of the examples that
4 I'm going to give you, there has -- one of the other
5 benefits is that team members for the fire HRA
6 guidelines overlap many of the other projects at the
7 NRC, both the two that I mentioned here and then ones
8 in the past like some of the international and U.S.
9 benchmarking efforts where we've been looking at the
10 strengths and weaknesses of HRA methods.

11 You know, a lot of the focus that we have
12 in the NUREG-1921 on qualitative analysis is a direct
13 result from some of the insights from those early
14 international benchmarking efforts that was then
15 reinforced in the U.S. benchmarking efforts.

16 So, I'm just going to give you some
17 examples of some of the things that we think that will
18 be very important to other HRA efforts, development
19 efforts or application efforts. The first thing is
20 that we have in 1921 comprehensive guidance for all
21 steps in the HRA process. That doesn't sound like
22 much, but for the most part when someone's come up
23 with something new they're focusing on the
24 quantification aspect of it only. And so we've talked
25 a lot about the qualitative analysis, but another

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1 aspect that's very important is the identification and
2 definition of human failure events to put in the model
3 to begin with. And for internal events we can get
4 pretty lazy in a sense because there have been so many
5 of them done you can more or less say well, it's going
6 to look something like this. I don't have to dream up
7 something new.

8 For fire, in the fire context we couldn't
9 do that. We had to look at a different set of
10 procedures that had different actions that hadn't been
11 modeled before. We had to look at actions that were
12 outside the control room. So there was a significant
13 effort that has to be made on identifying and defining
14 human failure events to put in the PRA model. And
15 we've got guidance on that written down.

16 We mentioned several times that we've
17 written these guidelines to match the standard. Of
18 course, this -- you know, we're looking specifically
19 at the fire PRA standard, but in order to satisfy the
20 fire PRA standard you have to also satisfy the
21 internal events standard. So, you know, we find that
22 to be a useful thing to be able to know how to write
23 some guidance that would meet those kinds of
24 requirements.

25 Stuart has mentioned a few different times

1 that in the context of a fire PRA there are lots of
2 different tasks going on with different experts who
3 are feeding information, providing inputs, generating
4 input at different times in the project. And we've
5 tried to address some of this information flow and
6 some of the problems associated with it in our
7 document.

8 Now, we had to write the HRA process as a
9 serial set of steps, but we discuss how those steps
10 can be iterated and how you might have to wait to do
11 certain things and so forth. So, we've tried to
12 address that, that aspect of how you really do a PRA
13 in our documentation.

14 Stuart mentioned something about this new
15 scoping approach that we've developed. This provides
16 an example of how you can develop a simple HRA
17 approach that is very traceable, and where the number
18 comes from, and what kinds of judgments you made in
19 order to get at that number.

20 Another aspect that we've talked about
21 some is the notion of feasibility. And we have an
22 extensive discussion in our qualitative analysis
23 section on feasibility assessments. What are the
24 criteria, how do you assess feasibility and how do you
25 transition then from feasibility into making

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1 reliability assessments.

2 Again, this is very important when you're
3 talking about new actions, but for the most part when
4 you're talking about internal events, PRA, things
5 happening in the control room, using the
6 OPPORTUNITIES, we have decades of experience that show
7 that those things ought to be -- you ought to be able
8 to do them unless something really strange is going
9 on. We now have a brand new set of actions for which
10 we have no -- we may not have any prior experience or
11 limited experience in showing that they can actually
12 be performed. So we've -- we've got specific guidance
13 on how to make those kinds of assessments.

14 MEMBER STETKAR: And I think that's
15 important. We're, again, short on time, but to
16 address some of the concerns that were raised earlier.
17 If you ask Hero Ralph, "Can you do this?" Hero Ralph
18 always says, "Well, yes, I can and it'll only take me
19 10 minutes to do it." Guidance for an evaluator of
20 Ralph that specifically enforces a discipline to ask
21 questions about timing, about stress, about
22 distractions is really important because in many cases
23 Hero Ralph if you ask him can always do something
24 perfectly in the amount of time that's required. So
25 that I think is very important, as Susan mentioned,

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1 this guidance for an objective evaluation of just the
2 feasibility, can it be done within the available time,
3 is important.

4 MEMBER SKILLMAN: Let me pile on because
5 in that particular instance is to me the -- a very
6 critical piece of this. So, Hero Ralph will say I can
7 do it and a normal fire is out in, what, 22 minutes?
8 They're fairly short. But you send Hero Ralph out.
9 The fire's extinguished. He comes back and he said,
10 "Boy, that's the best 20 minutes effort I ever put
11 in," and they say "You've been out there for 3 hours
12 and 26 minutes."

13 MEMBER STETKAR: Yes, that's right.

14 MEMBER SKILLMAN: Because I know in these
15 circumstances one's mind loses track of the time line
16 and you're so committed to task that the world can
17 change around you.

18 MS. COOPER: Right.

19 MEMBER SKILLMAN: That is an awkward issue
20 but it gets back to this performance shaping that Dr.
21 Banerjee asked about and Dr. Powers asked about. But
22 this to me is the heart of this whole thing, how we
23 can somehow capture those types of issues and
24 communicate them in a quantifiable way so that the
25 industry and the agency really win this one. Because

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1 this to me is one of the most important things we're
2 talking about. Thank you.

3 MS. COOPER: Yes, thank you. Yes, it is
4 important. And as John said, having that discipline,
5 having it written down, you know, having some
6 discussion about the pitfalls is very important.

7 I'm remembering something I think that
8 Jeff and others at Sciencetech ran into. There was some
9 kind of valve that you had to access by climbing a
10 ladder and it was a big thing and so-and-so said, you
11 know, Charlie said he could do it and it turns out
12 that even Charlie couldn't do it. But you know, who
13 knew until you actually went and walked it down and
14 checked it for real. I'm sorry.

15 (Laughter)

16 MEMBER STETKAR: We know Charlie well
17 enough. He could have done it.

18 MS. COOPER: All right. So, and that
19 feeds into the notion, you know, the ex control room
20 actions, not everything's going to be in the control
21 room when we're looking at something outside of the
22 internal events PRA context. And then there can be
23 some environmental effects, you know, outside the
24 control room that you wouldn't have to worry about.

25 And we think that this is a useful

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1 framework for looking forward to things like seismic
2 PRA where again we might be sending people out to do
3 things outside the control room. Accessibility may be
4 an issue, so on and so forth. So we think we,
5 especially with the notion of feasibility and looking
6 at things outside the control room, that we have, you
7 know, we have a stepping-off point for going into the
8 future.

9 We mentioned some about the notion of
10 spurious cues and distractions. Typically in the
11 internal events PRA process we make assumptions that
12 the instrumentation is good and reliable and it's
13 there. There have been a few studies where we've
14 looked a little bit beyond that, but that's been the
15 predominant thing and certainly that's what the PRA
16 standard says.

17 So, here in the fire context we've had a
18 chance to move out of that comfortable place and start
19 looking at things, situations where the instruments
20 can be giving you wrong information and can be
21 distracting or leading you onto a bad path.

22 With respect to timing we've had a lot of
23 discussion about that. We also have a lot of
24 discussion in the report about certain aspects of time
25 that you need to be concerned about, how to develop

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1 timing information. Worrying about uncertainties in
2 timing. You know, some of the more recent
3 interactions we've had with the subcommittee suggested
4 that we provide guidance on don't just develop or look
5 for point estimates. Try to get an idea about the
6 range of times, those sorts of things. So we have
7 quite a bit of different developed that can help any
8 HRA I believe in that area.

9 We've talked some about the notion that
10 this is -- we've developed guidance on how to do HRA
11 for procedures other than EOPs and that's been our
12 comfortable space for decades and decades. There are
13 differences in the procedures, fire response
14 procedures, throughout the industry but we've tried to
15 capture some of the aspects and some of the things
16 that people need to be cognizant of when they're
17 making their evaluation.

18 And we -- it's, as Mark mentioned we're
19 going to be doing the training again this year, hosted
20 here in the D.C. area. We have training materials now
21 for all of the HRA process steps. We do have some
22 focus on fire of course, but there are other aspects,
23 again, with identification, definition, qualitative
24 analysis that we've developed materials on.

25 MEMBER STETKAR: Susan, you mentioned

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1 something in passing that I think is important, just
2 worth noting. And that is consistency with the ASME
3 PRA -- ASME ANS PRA standards. And this guidance if
4 I'm not mistaken has been developed with a focus of
5 trying to meet capability category 2, sort of those
6 standards. Is that correct? That's sort of the
7 general focus.

8 We don't have time -- for those of you,
9 the committee members who aren't familiar with these,
10 there are different capability categories in terms of,
11 if you will, scope and level of detail of the
12 analyses. It's important to understand, capability
13 category 2 is kind of -- it's more than a middle
14 level. It's a really good level of detail, but it's
15 not full scope if you will PRA.

16 It's important because in many cases, in
17 particular the treatment of spurious actuations within
18 the context of that capability category are
19 assumptions built in. And this, this guidance in
20 particular, the way it's formulated right now are
21 consistent with those assumptions. Capability
22 category 3 which is beyond the scope essentially of
23 this effort expands those assumptions in terms of
24 things that need to be considered. I think that's
25 worthwhile just mentioning.

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1 I wanted to get it on the record for this
2 meeting. It's stated pretty well in the document
3 itself, but it's important for the committee's
4 understanding to know that this isn't trying to solve
5 all of the problems or a capability category 3 or even
6 beyond type analysis.

7 MS. COOPER: That's absolutely correct and
8 we actually even identify some areas up front where we
9 think, you know, if there was interest or concerns
10 that we could go further. That's actually one area
11 where the standard changed while we were making our --
12 developing our guidance. We did at one point in time
13 have the beginnings of some guidance on how to treat
14 lots of spurious indications that might, you know,
15 combine to cause a wrong decision. But we shifted
16 when the standard did.

17 Okay, we made it. So, in conclusion we
18 believe that the project objectives have been
19 satisfied. We have comprehensive and useful guidance
20 for fire HRA and we have, some of the authors at least
21 have used it and find it to be so. And we have
22 feedback from others.

23 We've refined our approach as a result of
24 testing, public comments, applications, even feedback
25 from training. And we think that elements of these

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1 guidelines are also valuable to future and current HRA
2 research and development.

3 And to reiterate from what Mark said, the
4 team would like a letter, requests a letter. And that
5 concludes our presentation unless Mark or Rich or any
6 of my colleagues here want to say anything.

7 MR. SALLEY: We're ready to publish this
8 and the last step of course is to check with you.
9 This is a new, innovative way of doing it which is the
10 whole purpose of coming here. And we're ready to
11 publish this and move on with the next project.

12 MEMBER STETKAR: Any other comments,
13 questions from the members? If not, thank you very
14 much. You've covered an awful lot of material. You
15 made it. I wasn't worried. I had 4 minutes in the
16 bank from yesterday.

17 (Laughter)

18 MEMBER STETKAR: And with that, Mr.
19 Chairman, back to you 36 seconds late.

20 CHAIR ARMIJO: Okay. Thank you, John.
21 Let's take a break for 15 minutes and reconvene at
22 10:15.

23 (Whereupon, the foregoing matter went off
24 the record at 10:00 a.m. and went back on the record
25 at 12:59 p.m.)

1 CHAIR ARMIJO: Okay, we're reconvening and
2 we're now on the subject of mitigating strategies and
3 Said will lead us through that presentation.

4 MEMBER ABDEL-KHALIK: Thank you, Mr.
5 Chairman. Bulletin 2011-01 requiring licensees to
6 verify compliance with 10 CFR 50.54(hh)(2) was issued
7 by the NRC on May 11th, 2011.

8 The ACRS was briefed on the subject during
9 our 584th meeting in June of last year. We did not
10 write a letter on the subject. However, we requested
11 that the staff brief us after the responses provided
12 by the licensees are collected and analyzed. And the
13 staff is now ready to provide that briefing and I call
14 on Ms. Kim Morgan Butler of the NRC staff to begin the
15 presentation.

16 MS. MORGAN BUTLER: Thank you. Good
17 afternoon, my name is Kim Morgan Butler. I am the
18 acting branch chief of the Generic Communications
19 Branch within the Division of Policy and Rulemaking in
20 the Office of Nuclear Reactor Regulation.

21 I'm here on behalf of DPR management to
22 introduce Mr. Eric Bowman. He's going to give us the
23 details and the updates on Bulletin 2011-01. He's
24 going to first start with the purpose and explain some
25 of the requests that we've made, the responses to

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1 those requests and then give us an overall view of the
2 effectiveness of this bulletin.

3 And without further ado I'll pass it on to
4 Eric.

5 MR. BOWMAN: Thanks, Kim. Good afternoon.
6 As Kim said I'm Eric Bowman. I'm the staff lead in
7 the Office of Nuclear Reactor Regulations for the
8 mitigating strategies required first under B.5.b of
9 the ICM order of 2002 and then codified as 10 CFR
10 50.54(hh)(2). I'm also the staff lead for the
11 mitigating strategies order that was issued on March
12 12th, the order A 12-049. That is not going to be the
13 subject of this presentation, however.

14 Bulletin 2011-01 was issued, as Said said,
15 in May of 2011. The reason we issued it was to once
16 again achieve a comprehensive verification of
17 compliance by all licensees with the mitigating
18 strategies requirements that were then in force. We
19 did that through asking a certain -- two questions
20 that were due within 30 days. We had further
21 information that we were gathering to determine if we
22 needed to make any changes to the requirements.

23 The 30-day request that I mentioned were
24 these two questions essentially. Is the equipment
25 there and available and capable of performing its

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1 functions. And are the strategies as proceduralized
2 and as the staff were trained capable of being
3 accomplished.

4 MEMBER SKILLMAN: Eric, a brief question.
5 Each of those questions is answerable with a yes or a
6 no. Was that purposeful in the development of those
7 questions?

8 MR. BOWMAN: Yes.

9 MEMBER SKILLMAN: Thank you.

10 MR. BOWMAN: And in fact, in general all
11 the responses we got were a little bit wordier than
12 yes or no, but ultimately they just verified that they
13 were indeed in compliance. We got all yes answers to
14 those set of questions.

15 CHAIR ARMIJO: Sorry, could you go back to
16 that last slide? I didn't finish reading it and I
17 wanted to check something. Did you ask specifically
18 whether there were any deficiencies that they found?

19 MR. BOWMAN: We did not in this question,
20 in this set of questions. The follow-on questions we
21 did ask for reporting of any deficiencies they found.

22 CHAIR ARMIJO: Okay.

23 MR. BOWMAN: We did have one or two
24 licensees that reported that they had a deficiency
25 that was corrected at the time that they made the

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1 report that compliance was verified.

2 CHAIR ARMIJO: Okay. Thank you.

3 MR. BOWMAN: Onto the 60-day request which
4 was the gathering of information for -- to assess
5 whether or not we needed to make any further changes
6 to the requirements. There were five questions that
7 we asked in this section of the bulletin. These are
8 the first three that concentrate on the equipment
9 itself, the maintenance, inventory control and testing
10 of the equipment. I'll give you a minute to read
11 these questions. In the bulletin itself there are
12 examples that were provided to further beef up or
13 specify the information we were looking for.

14 MEMBER SKILLMAN: Curiosity question.
15 Your slide 4 indicates all licensees verified
16 compliance. May we interpret that to mean even those
17 plants that are 95003 or in Manual 0350?

18 MR. BOWMAN: They all verified compliance
19 With that regulation, yes.

20 MEMBER SKILLMAN: One hundred and four
21 plants?

22 MR. BOWMAN: Yes.

23 MEMBER SKILLMAN: Thank you.

24 MEMBER ABDEL-KHALIK: So, how do you
25 reconcile that with the results of the inspections

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1 that were done immediately after Fukushima and found
2 nearly 2,000 violations?

3 MR. BOWMAN: I don't believe they were
4 characterized as being violations per se.

5 MEMBER ABDEL-KHALIK: Non-compliances.

6 MR. BOWMAN: There were different levels
7 of compliance. This was -- as, any time is a -- it's
8 a snapshot in time of the level of compliance. On the
9 date that they signed it and sent in that letter they
10 were in compliance.

11 And there are admittedly some areas, and
12 that's why we asked these questions, to see how the
13 maintenance of the compliance with the regulation is
14 being accomplished on a going-forward basis.

15 The other two questions we asked dealt
16 with configuration control for the plant, ensuring
17 that the mitigating strategies themselves get updated
18 if there are changes in the configuration of the
19 plant. And also that the training and so forth are
20 carried forward for the staff to ensure that everybody
21 is capable of performing the strategies. And finally,
22 the last question we asked dealt with the offsite
23 support that was necessary for compliance. The
24 question on the offset support was prompted in part by
25 anecdotal reporting of lapsed memoranda of agreement,

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1 and so forth.

2 MEMBER STETKAR: Eric, that number 4. You
3 said something that I didn't interpret when I read the
4 words. You said training. Is that the intent?
5 Because until now this has been very hardware-centric
6 and if the operators don't know how to use the
7 hardware.

8 MR. BOWMAN: Exactly. The first three
9 were intentionally hardware-centric. It also included
10 in the first three the maintenance of the hardware, so
11 that's a little bit of --

12 MEMBER STETKAR: But that's still --

13 MR. BOWMAN: Number 4 dealt with the
14 capability of performing the -- and it got into
15 training, as I mentioned, by the examples that we
16 provided to the types of information we were looking
17 for.

18 MEMBER STETKAR: This is the source of my
19 question. And this does not have anything to do with
20 a U.S. plant but I'll give you an example.

21 An unnamed plant in a foreign country
22 several years ago that I was working with had in place
23 a fire truck and connections to hook up that fire
24 truck for an alternate water supply. None of the
25 operators at the nuclear power plant knew how to run

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1 the pump on the -- they knew how to drive a fire truck
2 obviously, but none of them had been trained on
3 actually how to operate the pump. And if, I guess a
4 fire truck, you know, it sounds like it might be easy
5 to operate but apparently it's not. When we asked
6 them they said no, we have to call the local fire
7 department to get somebody to come and operate our
8 truck for us.

9 And that's the sense of what I mean by
10 real training. The truck was there, it had gasoline
11 in it, it had the connections, it's just nobody knew
12 how to use it. And they actually hadn't thought about
13 it.

14 So that's the sense of what I was asking.
15 Was the purpose of that number 4 to follow up at that
16 level of implementation? In other words, do the
17 people really know how to use the equipment, despite
18 the fact that it's there?

19 MR. BOWMAN: The purpose of question
20 number 4 was indeed to address that need. The
21 training for the programs that were set up were done
22 using the systematic approach to training. And
23 outside of the scope of this briefing of course but
24 the recent emergency preparedness rulemaking also
25 makes the 50.54(hh)(2) guidance and strategies part of

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1 the evaluated drills and exercises that are conducted
2 periodically. So that we actually see them go and try
3 and start the fire pump for those plants that use fire
4 pumps. Other plants have different types of pumps.

5 MEMBER STETKAR: But I mean, that's the
6 whole notion of --

7 MR. BOWMAN: That is.

8 MEMBER ABDEL-KHALIK: Question 4 is really
9 a configuration management.

10 MEMBER STETKAR: Well, that's why I asked.
11 But Eric, when he described it mentioned the word
12 "training" which is what triggered my question to him.

13 MR. BOWMAN: The bulletin itself, I'll
14 read you the examples that we included in there. It's
15 guidance management is more where we see the training
16 as being included. And we included as a subpart of
17 that examples of the types of information to include
18 when providing the responses to question 4 were (a)
19 measures taken to evaluate any plant configuration
20 changes for their effect on the feasibility of the
21 mitigating strategies, (b) measures taken to validate
22 the procedures or guidelines developed to support the
23 strategies can be executed. These measures could
24 include drills, exercises or walk-throughs of the
25 procedures by personnel that would be expected to

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1 accomplish the strategies, (c) measures taken to
2 ensure the procedures remain up-to-date and consistent
3 with the current configuration of the plant, and (d)
4 a description of the training program implemented in
5 support of the mitigating strategies and of the manner
6 in which you evaluated --

7 MEMBER STETKAR: Okay, so that's -- that
8 captures it.

9 MR. BOWMAN: So, that's what we were going
10 for. And when we do onsite inspections of the
11 mitigating strategies requirements for this particular
12 set of requirements they're accomplished on a
13 triennial basis under the fire protection inspection
14 program. And we do walk-throughs of the various
15 procedures with the plant personnel. And they do
16 demonstrate that they can, for the strategies that are
17 selected since that's just a sampling type of
18 inspection, they can indeed accomplish the strategies.

19 MEMBER STETKAR: But thanks. Those
20 examples clearly, clearly show that that covers the
21 area that I was questioning. Thanks.

22 MEMBER SCHULTZ: Eric, is there a similar
23 broadening of definition with regard to item number 5?
24 You mentioned letters of agreement, a memo of
25 understanding.

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1 MR. BOWMAN: There is.

2 MEMBER SCHULTZ: -- want to see those but
3 presumably from what you've said here for item 4, item
4 5, there may be opportunity for, or there should be
5 opportunity for the demonstration of the availability
6 and the communications and drills and exercises or
7 something like that.

8 MR. BOWMAN: For item 5 what we asked is
9 clarifying information for what would be the
10 information we were looking for in that brief
11 description. A listing of the offsite organizations
12 they rely on, measures taken to ensure continuity of
13 the memoranda of agreement or understanding, or other
14 applicable contractual arrangements, including a
15 listing of periods of lapsed contractual arrangements.
16 And finally, there was also a listing of any training
17 or site familiarization provided to the offsite
18 responders.

19 I've got a copy of the bulletin with me.
20 I didn't bring multiple copies. I can leave it With
21 you there.

22 MEMBER SCHULTZ: That's fine. I
23 appreciate the additional information.

24 MEMBER BROWN: I had a question on
25 question 4. The -- somehow something arrived in my

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1 inbox in preparation for this which was called a
2 Summary Report. And under question 4 it listed
3 summary of training and other types of information
4 like these standard industry practices for stuff. But
5 a bunch of asterisks were noted that for maintenance
6 43 of the 65 sites did not address training. In other
7 words, there was no response.

8 So I'm just following up on your thought
9 about what's done relative to training. Forty-seven
10 of the sites out of sixty-five don't provide anything
11 at all to general employees. And there was I guess,
12 I don't know who made the assessment, I guess it was
13 Mega-Tech, the services company provided the basis.
14 Well gee, they don't do that because most of these
15 people would be under direction of somebody else.
16 Therefore, they don't know, they don't have to know
17 anything else. It's kind of a broad conclusion.

18 I was kind of surprised that after all of
19 these there was almost -- I couldn't find any
20 deficiencies anywhere.

21 MR. BOWMAN: In large part the guidance
22 that we have and the regulatory requirement itself,
23 the guidance is not that specific as to who needs to
24 get trained, how often they need to get trained, and
25 so forth. So it's very difficult to come up with a

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1 specific deficiency in the training area because the
2 B.5.b effort that led to this regulation was a
3 performance-based effort. The sole requirement that
4 we really have is that they develop and implement the
5 guidance and strategies to maintain or restore core
6 coolant containment and spent fuel pooling.

7 MEMBER BROWN: Doesn't that call into
8 question somewhat the whole strategy of using a
9 performance-based requirement which it doesn't set any
10 requirements and just leaves it up to anybody to do
11 what they want to do?

12 MR. BOWMAN: It makes the inspection of it
13 less of a "go and be sure they check the box
14 everywhere." And it makes it more helpful for us that
15 the EQUIPMENT rulemaking included that in the drills
16 and exercises that are evaluated. And that's also why
17 on the reactor oversight process inspections of the
18 programs we go out in the field and we randomly select
19 on a risk-informed basis strategy and have the
20 operators actually walk through the strategy to
21 demonstrate that they can do it.

22 MEMBER BROWN: Normally I would expect for
23 a performance-based requirement that you have a ladder
24 or some type of acceptance criteria that would,
25 regardless of the methods they used, they have an

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1 endpoint, end result that would -- and there was no
2 mention of that in any of this. That's -- I was just
3 trying to get a handle on the comments and the way the
4 thing read.

5 I mean, I kind of drew a conclusion from
6 all this, maybe I'm wrong, is that they went out and
7 they answered your bulletin and they came back and
8 said Everything's okay.

9 MR. BOWMAN: I'll get into a little bit
10 more specifically about what we were looking at there.
11 And just give me a couple of slides.

12 MEMBER BROWN: No, that's fine. I was
13 just trying to give you -- after reading the summary
14 report of what Mega-Tech reported back it seemed to be
15 -- go inspect, make sure everything's okay and they
16 come back and said it is. And Mega-Tech said yes,
17 they told us it was okay and therefore it's okay. And
18 it just seemed like the bulletin didn't have a whole
19 lot of -- they're good questions, but there were no
20 metrics associated with them. I've really ever seen
21 when you can't go to a place and inspect things and
22 find out that they don't --

23 MR. BOWMAN: I don't want to get too far
24 ahead.

25 MEMBER BROWN: I'll wait.

1 MR. BOWMAN: The wording that was chosen,
2 the guidance that was issued and endorsed is
3 susceptible to interpretation in varying degrees.
4 What we accomplished here was we got the licensees to
5 document what they are doing.

6 MEMBER BROWN: Okay, thank you.

7 MR. BOWMAN: In the process of reviewing
8 the responses we got to the bulletin we bounced the
9 listings of the equipment and the offsite responders
10 and so forth against the information that the
11 licensees had supplied during the submittal process
12 for the B.5.b licensing effort to ensure that they
13 covered all the equipment that was reportedly relied
14 on to meet the requirements originally.

15 We did notice some deltas between the
16 earlier submittals and what was reported in the
17 bulletin responses, and we wound up with 53 RAIs out
18 of 65 sites for various small things. Some of them as
19 minor as an offsite responder organization that was
20 cited with a different name because they changed their
21 name. But we went back and verified that they
22 continued to use those offsite responders or they've
23 updated it. And that all the equipment that they
24 cited they would rely on was actually covered under
25 the maintenance program, et cetera.

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1 MEMBER REMPE: Would you, I mean, you
2 indicated something is a minor RAI. What was the
3 major grouping of something that's maybe perhaps more
4 important?

5 MR. BOWMAN: If we could have
6 characterized something as being a deficiency that
7 would have made one or more of the mitigating
8 strategies unavailable then that would have been
9 something that would have been more than minor.

10 MEMBER REMPE: And did you find -- is that
11 any of the --

12 MR. BOWMAN: No.

13 MEMBER REMPE: What's more significant in
14 the 53 RAIs that you identified?

15 MR. BOWMAN: As I mentioned there were
16 differences between the listing of the offsite
17 responders and the offsite responders that they had
18 told us before. Omissions of certain pieces of
19 equipment that had been listed before. Some of the
20 pieces of equipment that were listed did not list
21 maintenance things that were accomplished for them.
22 Things of that nature.

23 And we -- part of the effectiveness of the
24 bulletin is that where they had not documented a
25 formal maintenance program for things like inspections

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1 of spray nozzles, that if they were fire hose spray
2 nozzles under the fire protection program would have
3 specified maintenance requirements under the National
4 Fire Protection Agency standards. Some sites didn't
5 have those for these particular fire hose nozzles
6 because they weren't under that program and they have
7 since entered them in their correction action programs
8 and are implementing maintenance of the same nature.

9 MEMBER REMPE: Thank you.

10 MR. BOWMAN: You're welcome. Okay. As I
11 mentioned, a lot of the motivating factors for the
12 group of questions that we asked in the 60-day
13 responses were due to the limited amount of detail in
14 the guidance that's out there for compliance with
15 B.5.b and 50.54(hh)(2). That guidance takes the form
16 of a Safeguards document that was issued in February
17 of 2005 as well as the endorsed industry guidance of
18 NEI 06-12 Revision 2.

19 The requirements, or what we endorsed as
20 being an acceptable means of meeting the requirements
21 for maintenance, testing and control of the equipment
22 referred to the use of standard industry practices for
23 acquisition and maintenance of the equipment, and gave
24 no better definition of just what standard industry
25 practice is.

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1 I had forwarded the document that you got
2 on your desk. The summary report was the analysis
3 that we had done by our contractor, Mega-Tech
4 Services, to try and discern just what "standard
5 industry practices" could be interpreted to mean. It
6 also goes into the questions 4 and 5.

7 For the offsite support, on a one-time
8 basis during the phase 1 effort for the B.5.b
9 development process we verified and evaluated the
10 adequacy of the memoranda of understanding and
11 agreement with the offsite responders and so forth.
12 This was a look at how the licensees are maintaining
13 that type of support on a going-forward basis.

14 MEMBER SKILLMAN: Eric, typically how many
15 offsite responders are there per site?

16 MR. BOWMAN: It varied. Some of the
17 licensees rely on things like statutory requirements
18 for their state or local area as opposed to listing
19 individual memoranda of agreement. Typically we saw
20 local law enforcement agencies, firefighting
21 organizations, hospitals, things of that nature.

22 MEMBER SKILLMAN: EMTs, hospital, that
23 kind of stuff?

24 MR. BOWMAN: Yes, exactly. But the
25 numbers of them of course vary from site to site

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1 because some sites are a lot further away from other
2 offsite responding organizations.

3 MEMBER SKILLMAN: Are there any -- let me
4 ask the question differently. What is the strangest
5 memorandum of understanding that you came across from
6 the licensees?

7 MR. BOWMAN: Strange in what way?

8 MEMBER SKILLMAN: I can understand
9 firefighting, law enforcement, EMTs, ambulance
10 service. Did you find any that required a helicopter?
11 Any that required a tank or an armed vehicle?

12 MR. BOWMAN: No tanks or armored vehicles.
13 There were listings of agreements with local airports
14 for things like firefighting foam. I don't really
15 consider those to be strange based on the context that
16 we're in here.

17 There wasn't anything that was really all
18 that strange in the context of a response to a
19 bulletin. There is of course a hesitancy to list
20 things that you don't want to be held to maintaining
21 in the future. So, essentially the responses we got
22 were restricted to things that were requirements and
23 things that made sense.

24 MEMBER SKILLMAN: Thank you.

25 MR. BOWMAN: The evaluation of the

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1 responses to the first three questions on the
2 maintenance and control of the equipment resulted in
3 the synthesis of a listing of what might be considered
4 to be standard industry practices. The contractor
5 looked at frequencies of performance of the various
6 maintenance items and so forth, taking into account
7 things like if hypothetically the industry were indeed
8 developing standards what would the resulting standard
9 look like.

10 The more solid thing that we can look to
11 as a result is what were the various licensees and
12 sites taking into consideration in developing their
13 maintenance programs and that was essentially the
14 manufacturer's or vendor's recommendations for the
15 equipment, differences in the uses of the equipment
16 from their intended purpose to the purpose they would
17 be put into use for in the mitigating strategies and
18 also industry standards such as the National
19 Firefighting Protection Association standards for fire
20 protection.

21 Because it's a sister art to the
22 mitigating strategies many of the pieces of equipment
23 that were procured, like fire hoses and nozzles, fire
24 engines and fire pumper trucks were purchased by the
25 licensees in order to meet the requirement for a

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1 portable pumping source. So there's a set of
2 standards that are out there that are not directly
3 applicable but are useful in reference to understand
4 the types of things that are done for This kind of
5 equipment.

6 Those are the sorts of things that
7 licensees looked at in developing their maintenance
8 programs and that is more what we see as being the
9 standard industry practice in that regard.

10 The responses for question 4 pretty much
11 followed along the same boilerplate language as to
12 what was looked at for maintaining configuration
13 control. That is the evaluation of configuration
14 changes in the plant's procedure validation, the
15 design change process and use of the systematic
16 approach to training.

17 And the question 5 results, we did have a
18 number of sites that cited prior lapses in memoranda
19 of agreement. They had all been corrected of course
20 by the time we got the response as well as documenting
21 the methodology they're using on a going-forward basis
22 to ensure that their memoranda or whatever contractual
23 arrangements they have going forward remain current.

24 And to a certain extent our desire is --
25 with the bulletin was to document and ensure that on

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1 a recurring basis the licensees are capable of
2 implementing the mitigating strategies and calling on
3 the offsite support. We weren't looking with this
4 bulletin to identify deficiencies per se as non-
5 compliances and enforce those.

6 Finally, the effectiveness of putting the
7 bulletin out. As I said, we had no instances of non-
8 compliance that would warrant enforcement. We were --
9 we have a lot of lessons learned on the value of using
10 phrases that are undefined such as "standard industry
11 practices" or "maintenance."

12 We are in the process right now of
13 developing the Interim Staff Guidance and the industry
14 guidance for the mitigating strategies order. And
15 we're taking this into account in what's going to be
16 documented as the programs going forward for the
17 strategies under that order.

18 One of the purposes of the bulletin had
19 been to assess whether or not the inspection program
20 needs to be modified or enhanced. After looking at
21 the results of the bulletin and the temporary
22 instruction inspection that preceded it we feel that
23 the ROP realignment process is adequate to handle any
24 changes to the inspection program.

25 MEMBER ABDEL-KHALIK: You're referring to

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1 the triennial fire inspection?

2 MR. BOWMAN: That's where it resides now.
3 And as I mentioned, further regulatory actions are
4 ongoing. Rather than taking the NTTF recommendation
5 to order reasonable protection of the equipment for
6 other beyond design basis external events, we've got
7 an entirely different set of mitigating strategies
8 being developed that we're developing guidance for.

9 And that ends my presentation subject to
10 your questions.

11 MEMBER ABDEL-KHALIK: Thank you. Are
12 there any questions for Eric?

13 MEMBER BROWN: Can I ask just one?

14 MEMBER ABDEL-KHALIK: Please.

15 MEMBER BROWN: I don't want -- I'm just
16 segueing a little bit from the other question. The
17 comment was made that the compliance -- I understand
18 you weren't looking for deficiencies or to issue non-
19 compliance stuff like that, but who did the -- the way
20 I read this, and the way I read the summary that you
21 gave me was that the vendors -- excuse me, the
22 licensees did the inspection. They wrote the
23 response. It wasn't like you had region people
24 sitting down with them and going through these various
25 areas to ensure that they were in compliance. Is that

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1 correct?

2 MR. BOWMAN: The sequence of events as it
3 happened, after Fukushima all of the licensees went
4 out on a voluntary initiative to re-verify their
5 compliance. There was an INPO Level 1 IER that asked
6 for certain information. There was our bulletin that
7 asked for certain information. And there were -- say
8 again?

9 MEMBER BROWN: Who looked over their
10 shoulder to say that they were -- were there
11 inspectors that made sure they were --

12 MR. BOWMAN: Resident inspectors were
13 going along and in parallel with this effort they were
14 -- there were two temporary instruction inspections,
15 TI 2515/183 and 184 that dealt with this action,
16 management guidelines. The TI 183 had the resident
17 inspectors going over the subject matter that was
18 covered by this bulletin.

19 MEMBER BROWN: Okay, thank you.

20 MEMBER ABDEL-KHALIK: Are there any other
21 questions for Eric? Well, thank you very much. We
22 appreciate it.

23 MR. BOWMAN: Thank you.

24 MEMBER ABDEL-KHALIK: Thanks. Back to
25 you, Mr. Chairman.

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1 CHAIR ARMIJO: Okay. Thank you, Said.
2 Let's take 15 minutes, come back at quarter of 2 and
3 we'll start on letter-writing. We've got an awful lot
4 of stuff to do. We're adjourned.

5 (Whereupon, the foregoing matter went off
6 the record at 1:31 p.m.)

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Advisory Committee on Reactor Safeguards

Bulletin 2011-01, “Mitigating Strategies”

Eric E. Bowman, Sr. Project Manager, NRR/DPR

April 13, 2012

Purpose

1. To achieve comprehensive verification of compliance with 10 CFR 50.54(hh)(2)
2. To gather information on licensee programs in order to determine if:
 - a. Additional assessment is needed
 - b. The current inspection program should be enhanced, or
 - c. Further regulatory action is warranted.

30-Day Request

1. Is the equipment necessary to execute the mitigating strategies, as described in your submittals to the NRC, available and capable of performing its intended function?
2. Are the guidance and strategies implemented capable of being executed considering the current configuration of your facility and current staffing and skill levels of the staff?

Responses

- All licensees verified compliance.

60-Day Request, Questions 1 - 3

1. Describe in detail the maintenance of equipment procured to support the strategies and guidance required by 10 CFR 50.54(hh)(2) in order to ensure that it is functional when needed.
2. Describe in detail the testing of equipment procured to support the strategies and guidance required by 10 CFR 50.54(hh)(2) in order to ensure that it will function when needed.
3. Describe in detail the controls for assuring that the equipment is available when needed.

60-Day Request, Questions 4 and 5

4. Describe in detail how configuration and guidance management is assured so that strategies remain feasible.
5. Describe in detail how you assure availability of off-site support.

Requests for Additional Information

- 53 RAIs out of 65 Sites
- Completeness based on comparison of information in responses and information on equipment, etc., in earlier submittals

Discussion

- B.5.b guidance contains limited detail on maintenance, training and control of equipment, training requirements, and validation of feasibility of strategies
 - Phase 1 Guidance Document of 2/25/2005
 - NEI 06-12, Revision 2, as endorsed

Maintenance, Testing and Control of Equipment

“Equipment associated with these strategies will meet standard industry practices for procuring and maintaining commercial equipment.”

Off-site Support

- B.5.b Phase 1 effort included verification and evaluation of memoranda of understanding, etc.

Responses (Questions 1-3)

- Evaluation of responses resulted in synthesis of “Standard Industry Practices” for maintenance, inventory control and testing
- Maintenance items and periodicity
- Engineering judgment based on vendor or manufacturer recommendations, informed by site characteristics, different utilization of equipment and industry standards (e.g., NFPA)

Responses (Question 4)

- Configuration change evaluations
- Procedure validation
- Design change process
- Systematic approach to training

Responses (Question 5)

- Off site support arrangements

Bulletin 2011-01 Effectiveness

- Compliance re-verified comprehensively
- This dialogue with Industry resulted in identification of areas where improvements were possible and directly attributable to the Bulletin and Requests for Additional Information

Questions?