UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

November 30, 2011

MEMORANDUM TO: ACRS Members

FROM: John Lai, Senior Staff Engineer /RA/
Technical Support Branch
Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE SUBCOMMITTEE OF RELIABILITY AND PRA ON FIRE HUMAN RELIABILITY ANALYSIS GUIDELINES – NUREG-1921 ON SEPTEMBER 21, 2011, IN ROCKVILLE, MARYLAND

The minutes for the subject meeting were certified on November 3, 2011. Along with the transcripts and presentation materials, this is the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc w/o Attachment: E. Hackett
C. Santos

cc w/ Attachment: ACRS Members

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

MEMORANDUM TO: John Lai, Senior Staff Engineer
Technical Support Branch
Advisory Committee on Reactor Safeguards

FROM: John W. Stetkar, Chairman /RA/
Subcommittee on Reliability and PRA

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE SUBCOMMITTEE OF RELIABILITY AND PRA ON FIRE HUMAN RELIABILITY ANALYSIS GUIDELINES – NUREG-1921 ON SEPTEMBER 21, 2011, IN ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on September 21, 2011, are an accurate record of the proceedings for that meeting.

/RA/ Date 11/3/11
John W. Stetkar, Chairman
Subcommittee on Reliability and PRA

Certified By: John W. Stetkar
Certified on November 3, 2011

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MINUTES OF THE MEETING OF THE SUBCOMMITTEE ON RELIABILITY AND PRA ON FIRE HUMAN RELIABILITY ANALYSIS GUIDELINES – NUREG-1921
ON SEPTEMBER 21, 2011, IN ROCKVILLE, MARYLAND

INTRODUCTION

On September 21, 2011, the ACRS Subcommittee on Reliability and PRA held a meeting in Room T-2B1, 11545 Rockville Pike, Rockville, Maryland. The purpose of the meeting was for the staff to brief the Subcommittee on the latest development of fire Human Reliability Analysis (HRA) in NUREG-1921. Mr. John Lai was the designated federal official for this meeting. The subcommittee received no request from the public to make oral statements. The entire meeting was open to the public. The subcommittee chairman convened the meeting at 1:00pm and adjourned at 4:11pm.

ATTENDEES

ACRS Members
John Stetkar, Subcommittee Chairman
Dennis Bley, Member*
Said Abdel-Khalik, Member
William Shack, Member
Joy Rempe, Member
Gordon Skillman, Member

ACRS Staff
John Lai, Designated Federal Official

NRC Staff
Richard Correia, RES/DRA
Susan Cooper, RES/DRA
Mark Salley, RES/DRA
Steven Dinsmore, NRR/DRA
Dan O'Neal, NRR/DRA
Kendra Hill, RES/DRA

Others
Erin Collins, SAIC
Stacey Hendrickson, SNL
Jeff Julius, Scientech+
John Forester, SNL+

* Present in person and by telephone
+ Present by telephone

SUMMARY OF THE MEETING

Major Issues discussed during the meeting are described in the following Table.

Table 1. Major Issues Discussed During the Meeting

Major Issues Discussed	
Issue	Reference Pages in Transcript
Chairman Stetkar stated that the planned presentation of this topic at the October full committee meeting will be rescheduled to a future date.	5
Chairman Stetkar stated that the draft report still did not correct the fact that the staff had made presentations only to the Subcommittee, not ACRS (Full Committee).	8
Chairman Stetkar asked if some operating plants still have self-induced station blackout (SISBO) in their fire procedures. Erin Collins of SAIC said that some plants have preemptive actions that include SISBO.	16
Chairman Stetkar stated that much of the methodology in this NUREG follows a procedure-oriented context for evaluating human performance. In the future, there will be links between this effort and the more "holistic" approach to HRA that is being developed to address the Commission's SRM. Some of the material in this NUREG seems to reinforce the "traditional" notion that procedures are the predominant factor that determines operator performance, which is not supported by operating experience or current research.	37-50
Chairman Stetkar stated that the operators at H.B. Robinson completely ignored an overcooling transient and a loss of reactor coolant pump seal cooling because they were distracted by other things that happened in the secondary side of the plant. However, in the fire HRA guidance, it is implied that one doesn't need to consider multiple spurious operations (MSO) or fire-related damage to equipment that is not modeled in the PRA. For example, as long as one train of the required instrumentation is available, one can ignore other spurious indications because they do not directly affect the particular action that is modeled in the PRA.	54-56
Members and staff discussed how to treat the effects from MSO and fire damage to instrumentation that is not directly related to the specific task at hand. For example, the HRA analysts should be aware of the fact that if all the control cables for a non-PRA system go through a room, something might happen to that system if there is a fire in that room. That damage may distract the operators, despite the fact that the PRA models do not contain the affected system.	56-68

Chairman Stetkar suggested to reexamine the guidance in Table 2-3 and Section 5 to clarify the MSO issues.	71
Members and staff discussed the time lines in Section 4.6.2. Chairman Stetkar stated that it is important to make clear what is time required and what is time available in the qualitative analysis section. It is also important to identify and quantify the uncertainty in each time estimate because those uncertainties may affect decisions about the feasibility of a particular action or the available time margins in the scoping analyses.	109-118
Member Bley commented that the HRA methodology should reflect the real-world events.	126
Chairman Stetkar stated that the two most important issues of concern are (1) how to treat the effects from MSO and fire damage to non-PRA signals, and (2) the treatment of uncertainties in the time estimates.	130

Table 2. Action Items

ACTION ITEMS	
Action Item	Reference Pages in Transcript
None	

BACKGROUND MATERIALS PROVIDED TO THE SUBCOMMITTEE

1. Draft NUREG-1921,"EPRI/NRC-RES Fire Human Reliability Analysis Guidelines", August 2011(ML112351123).

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NOTE:
Additional details of this meeting can be obtained from a transcript of this meeting available in the NRC Public Document Room, One White Flint North, 11555 Rockville Pike, Rockville, MD, (301) 415-7000, downloading or view on the Internet at http://www.nrc.gov/reading-rm/doc-collections/acrs/ or it can be purchased from Neal R. Gross and Co., 1323 Rhode Island Avenue, NW, Washington, D.C. 20005, (202) 234-4433 (voice), (202) 387-7330 (fax), nrgross@nealgross.com (e-mail).

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Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Reliability and Probabilistic Risk Assessment

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Wednesday, September 21, 2011

Work Order No.: NRC-1154 Pages 1-139

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

SUBCOMMITTEE ON RELIABILITY AND

PROBABILISTIC RISK ASSESSMENT

+ + + + +

WEDNESDAY

SEPTEMBER 21, 2011

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 1:00 P.m., John Stetkar, Chairman, presiding.

SUBCOMMITTEE MEMBERS PRESENT:

JOHN W. STETKAR, Chair

SAID ABDEL-KHALIK

DENNIS C. BLEY *

JOY REMPE

WILLIAM J. SHACK

GORDON R. SKILLMAN

NRC STAFF PRESENT:

JOHN LAI, Designated Federal Official

RICH CORREIA

SUSAN COOPER

MARK SALLEY

STEPHEN DINSMORE

THERON BROWN

ALSO PRESENT:

ERIN COLLINS

STACEY HENDRICKSON

JEFF JULIUS *

JOHN FORESTER *

* Present via telephone

C-O-N-T-E-N-T-S

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

1:00 p.m.

CHAIR STETKAR: The meeting will now come to order. This is a meeting of the Reliability and PRA Subcommittee. I'm John Stetkar, chairman of the Subcommittee meeting.

The ACRS members in attendance are Said Abdel-Khalik, Dick Skillman, Dennis Bly, Bill Shack, and Joy Rupee. John Lai of the ACRS staff is the designated federal official for this meeting.

The subcommittee will hear the latest developments with fire HRA guidelines in NUREG 1921. We'll hear presentations from the NRC staff and NRC contractors. There will be a phone bridge line. To preclude interruption of the meeting, the phone will be place in the listen-in mod during the presentations and committee discussions. We have received no written comments or requests for time to make oral statements from members of the public regarding today's meeting. The entire meeting will be open to public attendance.

Simply, we will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate for deliberation by the full committee.

The rules for participation in today's meeting have been announced as a part of the notice of this meeting previously, published in the Federal Register. A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice.

We request that participants in this meeting use the microphones located throughout the meeting room when addressing the subcommittee. The participants should first identify themselves and speak with sufficient clarity and volume so that they may be readily heard.

I'd like to, for the record and also for the subcommittee members, give you some information on recently breaking news.

For a variety of reasons, we've made the decision not to present this topic at the October full committee meeting. It was originally slated on our schedule for the October meeting, and as I said, for a variety of reasons, we've decided to pull that back. So it will not be presented to the full committee in October. I don't yet know whether it will be scheduled for our November or December subcommittee meeting. But those of you who are interested, as I said, now we have it on public

record.

With that, we'll now proceed with the meeting, and I guess Rich Correia would like to say a few things.

Rich.

RICH CORREIA: Yes, thank you.

I'm Rich Correia, Division Director of Risk Analysis and Research. Thank you to the subcommittee today for yet another opportunity to present to you the fire HRA guidelines, We already went over that. We've been here three times, I believe. Hopefully, this is going to be one of the last.

The project started in 2007 as a joint NRC-EPRI effort. We've had the benefit of a peer review and a pilot at two sites. We went though a public comment period. We actually utilized the guidelines in a fire-protection training course. We feel it's important that we complete the work on this effort as soon as possible to give licensees following the NFPA 805 licensing process some final guidelines.

With any comments we receive today, and I understand there are some other issues we need to address, we'll get the final report to you as soon

as possible.

With that, I'd like to turn it over to Mark. Any comments?

MR. SALLEY: No.

CHAIR STETKAR: Susan?

MS. COOPER: Okay.

First of all, I'd just like to recognize the other speakers here in addition to myself -- Susan Cooper from the Office of Research and Stacey Hendrickson from Sandia National Laboratories, a contractor to the NRC. We also have Erin Collins from SAIC, who is one of EPRI's contractors in this joint effort.

It's also my understanding that there should be a few of our team members on the phone, although on mute. If we need to use that lifeline, we'll --

CHAIR STETKAR: We can open it up.

MS. COOPER: Anyway, I believe that Jeff Julius and Katie Kohlhepp from Scientech will be on the line, and also John Forester from Sandia National Laboratories should be on the bridge line.

I guess before I get started, I see that John Peters, my branch chief, has arrived.

Did you want to add anything before we

get started?

(No response.)

MS. COOPER: All right. So I guess it's up to us.

As Rich mentioned, this is the third or maybe even the fourth time that you've heard about this, but certainly -- is it four? Okay -- we weren't here that long ago, just in April. But I will try refresh your memory on a few things, starting off with our first set of presentations, which is introduction and summary on the joint guidelines.

I'm very briefly going to go over the background because you have seen it before -- yes?

CHAIR STETKAR: Susan, let me interrupt you quickly, one more thing. I mentioned it in April, and that's, the document in Section 1 still suffers from a big misperception. Indeed, you've been before the subcommittee; this is your third time.

MS. COOPER: Yes.

CHAIR STETKAR: You've not yet been before the ACRS. Chapter 1 still says that you've been before the ACRS four times, so --

MS. COOPER: I apologize. I thought

that was one of the things that we had that --

CHAIR STETKAR: Just of note. We've pretty sensitive to this and the subcommittee does not speak for the committee.

MS. COOPER: Okay.

CHAIR STETKAR: And indeed, whenever we have that full committee presentation, it will be the first time that the full committee has seen this topic.

MS. COOPER: Right.

CHAIR STETKAR: So, if you could, please, please make that change.

MS. COOPER: Yes, we will --

CHAIR STETKAR: And with that, I'm sorry for the interruption, but since we've talking about how many times we've been here, it sort of reminded me to bring that up.

MS. COOPER: Okay, thank you.

All right, I'm going to briefly go over the background because we have gone over this before, as well as the project summary. It is our intention today, because we have spoken to you about details of the document, that we won't be going into all the details in the document. So, in this introductory presentation, I just remind you what

the content consists of insofar as topics and sections and stuff like that. So that's the summary. And then I'll talk about the agenda for today.

So, just in brief, the reason why we're here really is because there is such a thing as an NFP 805 that roughly half the plants are transitioning to using for fire protection regulation. That requires a fire PRA, NUREG/CR 6850, which is a joint NRC/EPRI document that addresses fire PRA but did not fully treat HRA in that document. It did talk about identifying, advance screening, at some level, and the kinds of performance-shaping factors that might be relevant.

What it does not do, 6850 does not provide a methodology for developing BEHFP -- that's the best estimate human failure probabilities -- and it doesn't s specifically address the HRA requirements that are in the PRA standard. So it was recognized that we needed to do something beyond what was in 6850, and I think, even before 6850 was published, that was recognized.

So, a number of things happened, then with that recognition, and this may not necessarily be in order, but in any case, the Office of Research

has, with the ongoing fire search, a user need from NRR and a task added to that user need asking the Office of Research to develop guidance for HRA using existing methods in order to address fire.

We had an existing relationship with EPRI and we developed, under the existing memorandum of understanding, we developed another initiative, teamed together, and got started on work with the objective of trying to put together another joint document like the NUREG/CR 6850.

The intent was, in addition to what's stated in the User Need from NRR, to use existing methods, also to move forward with state of the art and fire HRA.

So, a little bit about the history. We started, as Rich Correia mentioned, back in 2007. That's when we started identifying people to work on the project. We had our first integrated draft about a year later, followed very quickly afterward by a peer review and some testing at two different plants.

We got a lot of good feedback from those reviews, the peer review and testing, so we actually made quite a few changes and came out with another draft in April 2009 and made sure that NRR and NRO

had a chance to look at that. We've always had interactions with NRR.

We had a number of other activities then, including coming here, the PWR Owners Group, tested, piloted the guidelines. We issued it for public comment at the same time.

We got our comments in March of 2010, resolved most of them by this last summer, came back and saw you guys again and then I started doing our first run of training and the joint EPRI-NRC fire training course. The first full track on fire HRA was a year ago. We wrapped up our final public comment resolution over this past summer, and also comments from you and the subcommittee in April.

We're in the middle of the two fire PRA training courses right now. We did one in August. There will be another one in November. We're here today, and we're hoping to try to get this published as final. It says Fall 2011, but anyway, that's our aim.

So that's the overall history. I just want to remind those of you who have already seen and maybe who haven't been here that the basis of this guidance, first of all, was to build on what existed already in HRA.

So we have a standard process or it's built on the standard process for HRA; in other words, there were basic steps that are recognized as being important in HRA, and that includes the ASME-ANS standard, the good practices NUREG 1792. Also, input from NUREG 1852 on fire manual actions. EPRI's SHARP1 document -- and NRC's ATHEANA, which has a process of its own.

However, it was recognized, in order to address the specifics of fire, we needed to do some additional things and write additional guidance to address those needs, especially in an the area of information collection, evaluating the feasibility of actions, and so on and so forth.

So here are the process steps, which also comprise some of the major sections in the document NUREG 1921. One section specifically addresses the identification, definition of human failure events that are put into the model.

One thing that's different for fire HRA that we have very explicitly included in this section is the notion of a feasibility test; in other words, before you're going to put it into your PRA model, you need to make sure that the actions associated with that human failure event actually

can be performed. So there is go/no-go, very explicit feasibility test included in that particular section.

We then have an ever-increasing-in-length chapter on qualitative analysis --

CHAIR STETKAR: Which is actually a good thing.

MS. COOPER: Some of us are getting attached to it.

But in any case, the qualitative analysis chapter is trying to recognize, first of all, something that's well known to anyone who does HRA, and that is that it's important to collect and evaluate good information. Otherwise, your results are to be exactly what you put into it. So we've chosen among the team to make an explicit chapter on qualitative analysis process, whereas that's not often done.

So it's a collection of general guidance on how to do qualitative analysis and also some specifics that are related to fire. And then, when we get into some is the details or the changes that we've made since the last time we were here, there are some discussion sections on special topics

related to fire, such as main control abandonment and so on and so forth. So it's become kind of collection point for discussion topics that might be, what we think are important for analysts to think about when they're going through their analysis.

CHAIR STETKAR: Just out of curiosity, Susan, one of the special topics is the self-induced station blackout or fault-clearing process however it's characterized. Are you going to discuss a little bit more about that in the detailed discussion of the changes?

MS. COOPER: Well, Well, it is one of the topics. There's not a lot discussed of the technical issues on any of those.

CHAIR STETKAR: Okay.

MS. COOPER: But we did do something with it, especially with respect to your suggestion.

CHAIR STETKAR: Yes, I don't -- and I don't speak for the subcommittee --

MS. COOPER: Right.

CHAIR STETKAR: -- and certainly not for the committee. I kind of like what you did, but that's me.

My only question is I actually had

someone from industry, who shall obviously be unnamed, express surprise that indeed there were operating plants out there that indeed had in their current existing fire procedures self-induced station blackout.

As far as you know, is that still the case?

MS. COLLINS: There are -- as far as I know, there still are some.

MS. COLLINS: -- as we know --

CHAIR STETKAR: Okay, well, that was my understanding.

MS. COLLINS: So one could say that are still procedures that include the concept of what we might call preemptive action.

CHAIR STETKAR: Yes.

MS. COOPER: So it's similar enough in --

CHAIR STETKAR: It may not be a total blackout, but stripping a large fraction of -- okay.

As I said, somebody, you know, in passing over the last month or so, from industry expressed honest surprise that there were plants out there doing that.

MS. COLLINS: Right.

CHAIR STETKAR: And I just wanted to make sure that we weren't addressing something that was, you know, not at all relevant anymore.

MS. COOPER: No, it still lingers. Now I think, as we go through and do fire PRA, there's a recognition that that is not a preferred state of being and that the fire PRA can assist and HRA can assist in identifying which of these actions you want to retain and which ones you want to remove, or perhaps an entire revision of your procedures accordingly.

CHAIR STETKAR: Yes, okay. Thanks. I just wanted to make sure of that.

MS. COOPER: Okay.

CHAIR STETKAR: Because I personally like what you've done with that, but it's just a question of whether it was at all relevant to --

(Simultaneous speaking.)

MS. COOPER: -- and Erin would be one of those that would know that because I know that she has had projects with them, and I think SAIC in the past, because in a previous life, I did some work with those kinds of plants.

CHAIR STETKAR: Sure.

MS. COOPER: But I'm not --

CHAIR STETKAR: No, there's enough positive feedback from your group that --

MR. SALLEY: Yes. That's not going to be something that any plant's going to want to advertise.

CHAIR STETKAR: No, I understand that.

MR. SALLEY: I mean, the poster child for this years ago was Trojan, and I think Trojan was one of the first plants where this was really identified as being risk-significant. Of course, we all know the Trojan is no more.

I believe Brown's Ferry also had this, and that was part of their findings that they dealt with last summer. So there still are a few plants there if for no other reason than if somebody, the next generation thought, hey, this may be a good idea if we capture this information. They can read it and say, maybe this is not such a good idea. So if nothing else, for historical reasons, I think that's valuable.

CHAIR STETKAR: The only reason I bring it up is, as I said, it was somebody from the industry who expressed -- because I said, gee, you know, we were talking about the procedures that, part of the guidance addresses this -- and they sort

of raised the question of, why is that an issue? I said, gee, it's my understanding there are some plants that still have that in their fire procedures and said, gee, I don't think that's the case. Apparently, they were wrong.

Thanks.

MS. COOPER: Okay. And now we'll move on. After the qualitative analysis, at least in the serial approach -- well, the way it has to be presented in the report has to be serial.

The next thing is the quantification methods. We have three different types of quantification methods that are included in our report. We have retained and borrowed from NUREG/CR 6850, the screening quantification approach that we had introduced in that document; a slight change there, but not much. And we've talked to you about that in the past.

Then there's a new method that's been introduced in the document called the scoping fire HRA method. It's a decision-tree format and it was developed principally to try to provide less conservative values than the screening values, but with some savings on the effort and resources required to do detailed analysis.

Also, another motivation was to try to have an approach that was easy to review and easy to reproduce results. And that request came not only from the industry side but also from our NRR reviewers.

Finally, we have detailed fire HRA methods. In this case, we built on or used expanded existing methods to fire context. Those two methods or two approaches that we used, first on the EPRI side, we have the cause-based decision tree supplemented by the ACR/ORE and FERC methods, and then from the NRC side, we've got ATHEANA.

The final technical chapter addresses three topics, dependency, recovery, and uncertainty analysis. The focus in this particular section or chapter is to highlight any differences that an analyst would need to be aware of that are new for the fire context.

For the most part, everything that you would do in an HRA from an internal events PRA is the same. There are two things that are a little bit different in the fire context and that's what we've try to highlight in this particular section, and then also just indicate what the latest resources are for the those particular tasks in HRA.

So that's the guts, if you will, of the document.

There are appendices, I think it's now appendices A and B, that present the details on the two detailed HRA methods are -- or is it D and C, or --

CHAIR STETKAR: B and C.

MS. COOPER: We've reorganized so often that I kind of lose track.

CHAIR STETKAR: In the version I have, it's B and C.

(Simultaneous speaking.)

MS. COOPER: Yes.

Then there's one that goes into the scoping. In any case, there are other things that are supporting it.

One of the appendices also summarizes the results from our various peer reviews and public comments and so on and so forth.

So the focus for today is just so look at how we've changed the guidelines since we were here back in April, and we had provided the subcommittee a draft report in March of this year. So we're just going to focus on how things have changed at a high level; not every edit. But in any case, that's what we're going to talk about today.

We have tried to categorize how we've responded to various comments. There are some things that were carryovers, also changes that came from public comments that we tried to address. But principally, this is coming from the suggestions or comments and questions that came out of the meeting last April.

So that's it for introduction and summary, and we'll move on to the next presentation unless there are any questions or comments.

MEMBER ABDEL-KHALIK: I've got a question raised by John about some plants having a self-induced station blackout in their fire procedures. Do we have any idea about how many plants have that?

MR. SALLEY: I would think it would be a very small minority that the inspectors in the regions will eventually pick on.

You've got to remember, though, where that came about. That's some old technology, because when Appendix R was first introduced in 1980, the electrical engineers were trying to understand it. The idea of associated circuits gave them a problem because there'd be so many.

The second thing is a lot of people

interpreted Appendix R to say that you need to take a loss of off-site power with your fire. They didn't want to read exactly what the regs were --

MS. COOPER: It just happened.

MR. SALLEY: -- what the regs were saying. So they thought they were doing a conservative worst-case scenario, was what they were thinking about back in the 1980s. And we can see that it isn't really a worst-case scenario. It's kind of a, not a good scenario, because you're now as good as those diesel generators, basically, to shut the plant down. It becomes a very risky.

So that goes back to the early 1980s, is where that was first conceived. And again, because of the loss of off-site power, they thought they were doing a good thing.

CHAIR STETKAR: And I suspect -- and I don't know. I mean, I've not looked at the fire procedures, and I suspect they're different from plant to plant.

Generally, people speak about this as self-induced station blackout. And I know some plans actually did that. I suspect that there's probably -- and Erin, you may know better than I do -- a gradation that some plants strip selected buses

because the notion is they've identified those buses as their preferred power supplies, or that faults on those buses may give them spurious indications that they don't want to deal with or things like that.

So I suspect there's probably a mix out there in terms of degree of severity, in terms of shedding loads and selectively reenergizing things that you might find --

MS. COOPER: Exactly. No, you're absolutely right.

CHAIR STETKAR: -- where the self-induced station blackout is at one end of the spectrum. But apparently, there are plants that do that, surprisingly enough.

MS. COOPER: And to echo what Mark had said, I think it is primarily confined in, let's say, older plants based on a previous philosophy. But, as you say, there are different iterations of that depending on wholesale SISBO or whether there are different facets of it.

So each of the plants is --

CHAIR STETKAR: It's actually, though, true, anybody who is not transitioning to the NFPA 805, if they have self-induced station blackout in their procedures, will indeed retain self-induced

station blackout in their procedures. Right? I mean, as long as they aren't challenged to look at those activities in the context of a, you know, fire PRA if you will.

MR. SALLEY: There are other things happening. For example, the enforcement discretion on the multiple spuriouses is being lifted, so the inspectors are going to be going back out and looking for it. I think if you do see something as egregious as like Trojan was, that they'll be on that and the inspectors will pick that up.

CHAIR STETKAR: If they have that inspection vehicle to --

MR. SALLEY: Yes. The inspectors are pretty good. They'll pick that up.

CHAIR STETKAR: Thanks, Mark.

MS. COOPER: Okay. Well, I think we'll go ahead -- unless there's another question or comment, we'll move to the next presentation, which is pretty much the meat for today, and that is to discuss the updates that we've made to the guidelines. And the three of us that are here at the table will be taking turns at this. I'm going to start off.

So, as I mentioned at the end of the

last presentation, the starting point for modifications was our March draft of this year that we provided to the ACRS. Revisions were agreed to by the team and were motivated by individual reviews by team members if needed. Team discussions leading to consensus were held.

The two principal inputs to revisions or motivations for revisions were either comments and discussions and so forth from the April 20th meeting with the subcommittee and also any outstanding issues or concerns that came out of the public comments or actually from the team.

I mean, we have constant feedback from our team members, well, principally through our EPRI counterparts as they're applying this method, and we also get feedback through the training as well. So we're getting a pretty steady diet of feedback on how things are going on and what's important out there.

In order to facilitate the report revision, we needed to develop some categories of changes, which can be organized by the report section or by topic. Today's discussion uses a bit of both, and I'm going to try to streamline our discussions and minimize the overlap.

The categories of updates that we'll be talking about are Section 1, 2, 4, 5, and 6 edits, and there are some associated edits to the appendices.

Section 3 is not mentioned here because most of those were editing edits, and otherwise, any sort technical changes are going to be addressed by another issue or two that are coming up, specifically clarifying treatment of spurious cable fires and multiple spurious operations and how that's treated in HRA.

And then we also have some discussion on exploring uncertainties in timing information, some more discussion on main control room abandonment, and then there's also some editing that's been done with respect to an appendix that we had in the March version on self-induced station blackout.

So changes to Section 3, as noted on this particular slide, have been captured under these other topics.

So, just to organize things with respect to presentation, I'm going talk about the changes to the guidelines for the first two sections. Erin's going to talk about changes to Section 4, which is the qualitative analysis as well as treatment of

multiple spurious operations, main control room abandonment, and SISBO. And then Stacey will talk about Sections 5, 6, associated appendices, and then certainties and timing information.

As you've already pointed out, I guess we didn't get this first one right. But we did try to edit it.

CHAIR STETKAR: Some of it was okay. You got more than one out; not all. So the first bullet is actually correct. The implication that they're completely expurged is not correct.

MS. COOPER: Okay. All right.

CHAIR STETKAR: Expunged, I guess, is the right term.

MS. COOPER: Otherwise, Section 1 principally had some text edits made and additions. There already was a paragraph in Section 1, which is the introductory chapter, talking about the likelihood that there will be future improvements to the methodology for fire HRA just because this is one of the first times something's been put into print. But what we've done is we've added some additional text to say some things explicitly about maybe that a maybe need for guidance to address main control and abandonment in a little bit more detail

than we've done.

Another topic that I know that was of interest in our April 20th meeting was the treatment of a fire-induced cable failures, specifically those that lead to spurious indications that are currently out of the scope of fire PRA as defined by the standard requirements for, say, Capability Category 2.

We also included, added a reference to other work going on in the Office of Research with regard to response to SRM on HRA model differences and how that might play a role in any future improvements and also, just recognizing that, as people do perform and submit their studies for NFPA 805 transition, that that kind of feedback may also indicate the need for places where improvements can be made.

Moving to Section 2, there is quite a bit more that was added to this particular section, and there is a little bit of overlap here with some of the other topics that will be discussing. But since there's quite a lot added to Section 2, I'll just discuss it here.

Those of you who were here may recall, we had a fairly extended discussion on April 20th of

this year about multiple spurious failures and their impacts on operators in the control room. So the team took that as an initiative and actually did a lot of work and had quite a lot of discussion, conference calls and so forth, on this topic and, as a result, has added a new section to chapter 2, a new section 2.5, called fire-induced spurious failures and electrical faults.

The purpose of this is to help the HRA analysts understand what the rest of the PRA is doing so far is addressing cable failures, fire-induced spurious cable failures, the inputs that they might be getting from those other PRA tasks, fire PRA tasks, and what you might do with them or what you might need them for.

Along with that, there is a table 2.3 that's been added that's tried to help the analysts understand these interfaces and their actions and so forth, and just clarify who's doing what so far as who's handling this part of that problem. And if it has an HRA impact, how is that represented in NRA.

So I guess one question I have -- in a sidebar,, we talked about, I guess, the report that we sent over had a little trouble with table 3. If there's an interest, we might be able to bring that

that up if we have the ability to hook up another computer and look at it.

CHAIR STETKAR: You can read it. The sentences. Just look a little strange, so --

MS. COOPER: Okay. All right --

(Simultaneous speaking.)

CHAIR STETKAR: -- assuming that the vertical letters accurately represent the horizontal thoughts, we're okay.

(Laughter.)

MS. COOPER: We spent a lot of time on that, so we're anxious for you to be able to understand that.

But in any case, that was the principal change to Section 2, was to add that discussion and a supporting table for that discussion.

So now we move to Erin's portion of the presentation where she's going to about Section 4 changes generally, but also which will include treatment of multiple spurious, main control abandonment, and so on and so forth.

So, Erin, your turn, and I assume you have a microphone nearby.

MS. COLLINS: I assume that's functioning.

CHAIR STETKAR: That is. It's fairly sensitive, so you should be okay.

MS. COLLINS: Okay. That's great.

As Susan mentioned, I'm going to go through some of our, an overview of what we did in Section 4 on qualitative analysis to address some of the concerns that have been raised by this subcommittee as well as some of the internal issues in our team that we wanted to take a better look at and reflect in our document and some of that particular topics that were addressed.

CHAIR STETKAR: Just because the woodpecker's in the attic, just move the mic, just pull it a little bit closer to you.

MS. COLLINS: No, I don't want to drag this across the table.

CHAIR STETKAR: It's really sensitive but it helps pick you up a little bit because of the background noise.

MS. COLLINS: Okay. Good enough. I hope that works.

Again, three of the main topics that had come up for discussion the previous meeting with you folks were MSOs and MCR abandonment and the whole self-imposed station blackout consideration.

So, in general, to go through an overview to some of the changes that we made to qualitative analysis, there was some discussion on part of the team as to whether or not we should make this section Chapter 0 -- is qualitative analysis that substantial, that important, the basis for everything -- that we should put it up front and say, start with this and go through the rest of that? However, amongst our team, there was some discussion as to, but, you know, first you need to identify, then you need to define.

I think, hopefully, the consensus of the group was that we really felt that it, to keep it where it was, is Chapter 4 because you have a certain progression in the study and to set the stage for what one needed for quantitative analysis, but to provide further discussion of qualitative issues in that context of identifying, defining, and then quantitative.

I think this is a topic that one can discuss until the cows come home as to where's the proper place for this. But for the time being, we're keeping it as it is.

CHAIR STETKAR: The important thing is that it's in the documents and its coherent

technically.

MS. COLLINS: Right.

CHAIR STETKAR: There are certainly preferences. I think we've learned a lot since perhaps several of the traditionalists regarding how one might approach doing a modern human reliability analysis, and as you said, we could discuss it forever and it's probably not worth it.

It's more important, the context of that. It's just a concern that the impression of putting it in the middle of the document leaves with people who are perhaps not as familiar with the modern HRA methods practitioners, the people out field actually doing this.

MS. COLLINS: Yes, I understand there is a risk.

CHAIR STETKAR: Presuming -- you know, I'm presuming that not necessarily as applicants will use, you know, contracted HRA experts, if I can call it that, to do the work and that, you know, we need to write this guidance for people at the nuclear power plant, PRA groups who might be doing this.

So it's an impression, the technical content is the most important part, so --

MS. COLLINS: Well, I --

CHAIR STETKAR: -- if you've decided that that's where it belongs --

MS. COLLINS: We did. However, I would say I believe that what we decided to the other sections. An indication of you recognize that many of these tasks are iterative, particularly qualitative analysis.

CHAIR STETKAR: Right, but the follow-on sections do that. It's not as clear that the lead-in sections do that. But that's okay.

MS. COLLINS: Yes, at some point, when we went back and reviewed, it seemed like every paragraph, we were hammering on them, you need to iterate, you need to iterate. Okay, we get it already, you now.

Well, there was the other issue of, once you have it there as Chapter 4 and then you move it to Chapter --

CHAIR STETKAR: No, I understand the editing part of the process. That's obviously a nontrivial exercise.

MS. COLLINS: Yes. I was concerned about that as well.

CHAIR STETKAR: Yes.

MS. COLLINS: All right. The second issue, that -- again, to clarify, we have an ACRS comment but that's more ACRS PRA subcommittee comment; let's make that clear. The comment was, it might be worth emphasizing that we had a section on special cases where little to no credit is given. And we essentially took that almost directly from 6850. And so we have clarified that in there. It specifically says, as mentioned in the Section umpty-squat of 6850, here are particular cases where, if you're asking for heroic actions in SCBA, don't do that. Don't give them credit for that. You know, things like this.

Another comment was made regarding the impact of security issues. As security is increased, might there be an impact on accessibility? Are keys going to be available? Is Mr. Security Guard going to prevent you from going through this particular door when you need to? So we have added to some of our feasibility assessment sections, when you're considering travel paths and the likelihood of being able to perform an action what are the security issues that might impact that feasibility assessment.

And finally, in some of these summaries

of changes, do we address the possibility of being in multiple procedures the same time because, as we discussed, there are your standard set of EOPs and then there are fire- specific procedures. So there is a significant likelihood that, at least for the time being, you're going to be looking at both sets of procedures. So we have reviewed our particular sections and the appendices, where we discuss detailed HRA.

There are points in the EPRI HRA calculator method where you can actually select; are there multiple procedures? Yes or no. Things like this. And it's used as, let's say, performance-shaping factor on your ATP.

CHAIR STETKAR: By the way, Erin, we did have some discussion regarding, the term I've coined is, the procedure-centric notion of this entire NUREG.

The methodology is very strongly oriented toward the traditional notion of, the operators will follow a procedure. At a particular step in the procedures, the operator will either successfully implement that step or they will unsuccessfully implement that step. And then we go to the next step in the procedure. And if you have

three procedures, you need to understand how they will use those procedures.

One of my concerns, quite honestly, is -- it was mentioned earlier -- that there will be links perhaps between this effort and the larger SRM on, if I can call it a holistic approach to human reliability analysis.

A lot of what we've learned about modern HRA is that this notion of step-by-step following of procedures is not the way to think about the way people respond to a real event.

MS. COLLINS: Yes.

CHAIR STETKAR: In practice, there's nothing that can be done to undo the procedure-centric notion of this document. You'd pretty much have to change it substantially. I think a lot of the qualitative information in Section 4 should increase the awareness of someone who wants their awareness increased to the fact that perhaps you shouldn't just focus on procedures.

MS. COLLINS: Yes.

CHAIR STETKAR: But I tell you, when you get back in Chapter 5, it's procedure, procedure, procedure.

MS. COLLINS: Yes, it's --

CHAIR STETKAR: So, as I said, we had some discussion about this in April, and in fact, some of the material that's been added to the document in the last few months, you know, constantly reinforces the notion of procedures.

MS. COOPER: I guess I would like to respond a little bit to that, specifically with respect to the focus of Section 5. The majority of the text in Section 5 is related to the scoping method.

CHAIR STETKAR: Right.

MS. COOPER: There are entry conditions for the scoping method that are intended to help analysts only consider a certain number of performance-shaping factors. And then, if they don't meet that criteria, they need to consider a broader set and use one of the detailed methods.

We use procedures and how well they match the scenario as an important criteria to indicate, how difficult is this going to be? Are they going to have to think outside the box? Are the procedures not going to work? And if they don't, then you can't use the scoping approach; you need to use detail. So that's why, if you look at Section 5, which is predominately discussion of

scoping, there is going to be that emphasis.

The detailed methods ought to be able to think a little bit more broadly. Well, the two approaches are different and will have different ways that the analysts might arrive at that or they might be driven to that because the method, in some ways, does drive the qualitative analysis.

CHAIR STETKAR: I know you want to be done. On the other hand, at least some recognition in the exceedingly short section on uncertainty or somewhere in the qualitative analysis, you could talk about consideration of situations in which the operators might be driven through alternative paths through the procedures to identify cases to consider to approach the uncertainty analysis. That might be a possibility.

MS. COOPER: Yes, okay. We'll consider that.

I guess one thing I'd like to add is that my impression, which -- I'm getting feedback second hand from the EPRI site because I'm not doing this work anymore -- it's my impression that on the fire procedures and the viewpoint of the operators of the fire procedures has been evolving as part of this overall transition effort in the sense that

they're more likely to be using them, they're making changes to them, format of procedures are being contemplated or made. So there's definitely an evolution, I think, in the way procedures may be playing a role in fire events.

I don't think that evolution is done yet, and I suspect that there's going to be something on the order of how we move from the procedures we had before TMI to the EOPs we have now, maybe not but in that direction but I think they're going to be, eventually.

Now some changes that are actually going to change the way not only the operators' use of the procedures but the way we might want to model them.

So, at this point in time, my impression is that many of them haven't experienced fire events, so they are to feel more comfortable within a procedure environment --

D. They have lost confidence that they won't have trouble. If they've thought carefully about the Robinson event, maybe they'd change their minds. Under different modes of how many people were available in the control room and what their capabilities are -- I mean, they're all licensed, but they have different capabilities --

MS. COOPER: Yes.

D. You know, even just the fact that one of them may be dragged off of everything else might just be the one who could best diagnose other things.

You know, there are things there that at least affect the uncertainty and I think --

MS. COOPER: Sure.

D. -- although this is changing, giving some recognition to that and raising that as an issue seems to me really appropriate.

MS. COOPER: Yes.

CHAIR STETKAR: I was going to bring up Robinson in a different context, but we might as well bring it up.

There, there was clear evidence that, for whatever reason, they focused on what they thought was born and him and him wanting some sort of, several fundamental indications that, if you just took a procedure centric viewpoint, you'd say, well, of course, your emergency operating procedures would keep you away from an overcooling event, at least force you to look for it; of course your emergency operating procedures would point you in the direction of verifying cooling for your reactor cooling pump seals -- both of which were completely

ignored in a real fire because, for whatever reason, the crew know what they needed to respond to.

That's a bit of the problem of an abstract analyst within the context of a narrowly defined, precisely square, black-and-white PRA model saying I, in the context of the PRA, am only interested in the operator successfully performing this particular action. And what information do I have available regarding that particular action and focusing only on the procedural guidance that may or may not lead me to that particular action?

It's not the way we drive an automobile down the street. It's not the way pilots fly an airplane, and it's not the way nuclear power plant operators operate in the heat of battle. So that's the whole notion of, be really, really careful about sort of this procedure view.

And as I said as an introduction, as a pragmatic sense, I think you'd have to do a substantial amount of rewriting of the current document to remove that sort of pervasive notion because there are a lot of explanatory examples, you know, a sentence here and a sentence there that come back to EOPs and fire procedures, and the operators will be doing this, and of course they'll be

following the EOPs, or of course they'll be following the fire procedures. Well, of course they may not be following either one of them.

MS. COLLINS: Well, some of this procedure-centric focus may come from discussions within the fire PRA standard of, if you don't have procedures, you'd better have a pretty good justification for why you're crediting a particular action in terms of training, et cetera, so that's part of it.

The other part of it may be that, frequently, when you get to into the heat of battle of looking at your CDF on your fire PRA, you begin to investigate all sorts of different sorts of recovery strategies for reducing the risk.

CHAIR STETKAR: Sure.

MS. COLLINS: And in that sense, you may be requested as an HRA person to -- well, gee, aren't they going to go down and do this and take this action and blah blah, where it gets into, no, we don't have any procedures for that and we really need to have strong operators entries and walk-throughs and talk-throughs to see if we can give any credit to that.

So there's a concern, I think, that we

do -- you're right; maybe we're too procedure centric -- but we don't want to open the door to, hey, if Operator X says he can do it, then, yes, sure, he's going to be able to go down and take this heroic action.

CHAIR STETKAR: I fully agree with that. Nobody's ever thought about it to the extent of at least writing it down on a piece paper or telling operators they might need to think about a particular type of scenario. You need to be very careful about kind of creative solutions to problems. That's the lack of procedures.

My concern is the opposite of the spectrum --

MS. COLLINS: Right.

CHAIR STETKAR: -- where people point to precise procedures and make the presumption that they will be following those precise in that precise procedure because that's what I need to know for this particular action.

MS. COLLINS: Yes.

CHAIR STETKAR: And again, I don't read this from the perspective of, let me call it the human reliability analysis professional. I read it from the perspective of a PRA analyst out at a

nuclear power plant doing a fire analysis, and they've been given the task to do the HRA. For whatever reason, they're not going to go out and hire a PRA expert or HRA expert. And how will they then think about the problem. That's really the --

(Simultaneous speaking.)

MS. COLLINS: So if it --

CHAIR STETKAR: -- path that I find --

MS. COLLINS: -- they may have the tendency to just go through and say, look at the procedures.

CHAIR STETKAR: Absolutely, we have that sense. They know their procedures. They know what they have. They know their goal is to demonstrate the human error probability for failing to pick up this cup is 10^-6.

MS. COLLINS: Right. No, I --

MS. COOPER: Yes, I think this i8s a good point. I guess we may well also have been influenced by a substantial amount of feedback from some of our students in training courses where they've been asking us for guidance on format for fire procedures.

We did some presentations as part of the training this year on different types of procedure

formats that our various contractors that are involved in the project have run across, and in the worst-case scenario, but not infrequently, it's been the fire protection engineer that has written the procedure -- actually, they've written the procedure -- and it's absolutely clear to them that everything that anyone would need to know in order to respond to a fire in this particular location is there. But it doesn't look like any procedure any operator is familiar with, and it seems to be missing things from that perspective.

MS. COLLINS: Yes.

MS. COOPER: So we've had a lot of feedback about, gee-wiz, these things look really different. How are they going to use them? Can they use them? And do they know how to use them if it's even possible. Have they tried to work with them and understand what the paths are, where to find things and so on and so forth.

So in a certain sense, we're sort of back in '70s days, if you will, with some of these procedure formats. So we're kind of in different spaces if you will.

CHAIR STETKAR: That may be very true. I just hope we're not back in the '70s days where you

look at each step in the procedure and draw a little THERP tree that says "success" or "fail" and you go to the next step in the procedure and it's success or fail. That's --

MS. COOPER: No, no. We're not doing --

CHAIR STETKAR: That's the fear that I have.

MS. COOPER: It's certainly not our intent to do that. It is just simply recognition that the procedures are different and we can't think about them in the same way --

CHAIR STETKAR: Yes.

MS. COOPER: -- that the EOPs have been structured and modified, in order to really support the operators in their response.

CHAIR STETKAR: And as I said, I think there are some things in Chapter 4 that sort of say things like that, which is good. You know, reading it as a -- I don't want to characterize myself as an HRA professional because that's a brand -- reading it as someone who's sort of familiar with the methods, I can see the message that's trying to get across.

But then, putting the other hat on, when I go to the actual implementation and some of the

explanatory text, some of that, I think, would quickly get lost.

MS. COOPER: Okay.

CHAIR STETKAR: So I think that's enough on procedures.

MS. COLLINS: No, I know that it comes from all over the map. We've had people who have talked to us and said, please, if the 805 and the PRA process give us a way to change our current fire procedures, we would like that because we'd like to be able to do it within the context of --

CHAIR STETKAR: Okay, but then, sure --

MS. COLLINS: -- mitigate risk.

CHAIR STETKAR: -- which was great. But the fact of matter is they're the licensee. They should know best how to --

MS. COLLINS: Yes.

CHAIR STETKAR: And if, indeed, there's some, you know, industry efforts in the same way as structuring format and content of EOPs, you know, that's fine, but that's not the purpose of this NUREG, certainly.

MS. COLLINS: No. It's just nice that we're being asked to help fix the problem --

CHAIR STETKAR: Sure.

MS. COLLINS: -- Which has not always been a capability of HRA.

MS. COLLINS: And I hope that we've tried to emphasize in our document the need to do these walk-throughs and talk-throughs with Operations when you get down to the meat of what you are really crediting in these PRAs so that we do understand the realities versus what the --

CHAIR STETKAR: It does except, if I go to an operator and say, show me the procedure that leads me to picking up this cup of coffee, the operator will show me that procedure. If I say, what happens if this room is full of smoke and, you know, that thing is there and this alarm is going off there, how might you come to the decision that you're going to pick up the cup of coffee? I might get a different answer.

MS. COLLINS: Different answer, yes. I agree; it all depends on how you ask the question.

CHAIR STETKAR: Indeed.

MS. COLLINS: All right, moving on to another fun topic, multiple spurious operations -- there were discussions in our previous meetings with you folks, and then we had discussions amongst ourselves, as Susan mentioned, and then subsequent

discussions, sidebars. And so we have attempted to address the issue.

I'll start by saying one of the first issues that was brought to our attention were various references that discussed multiple spurious operations, such as the Reg guide and NEI documents and whether we should add references to these. And we have added references to these.

However, ever when you look at these particular documents, the focus is primarily circuit analysis, component selection, fire modeling. So the intent of these regulations and guidance documents are that the multiple spurious operation issue is primarily addressed by other fire PRA tasks, and provides input for the fire HRA.

With the component selection task, I'm finding more and more, and rightfully so, that one needs to speak very closely with component selection because part of their tasking if you read 6850, is to identify instruments that, if they have spurious impacts, can impact the HRA. So I need to obviously make sure. What are they saying in their notebooks and in their analysis that impacts me as the HRA person?

However, again, it is an issue that

impacts HRA, but it is not, from the document standpoint, stated as an HRA subtask. But we do need to be mindful of it, and it is an important issue. So it's with that perspective in mind that we have added a new section and the table hopefully will be clarified to identify, here are particular ways in which spurious operations are modeled in the fire PRA, and here are the interactions with the fire HRA, accordingly, that be a fire HRA person needs to be aware of, such that the MSO issues are addressed and incorporated.

And I think also, in the quantification standpoint, we do have ways we get into detailed analysis of saying, if we have a case of multiple indications that can potentially provide a situation of lack of clarity or confusion to the operator, we know that there are certain procedures and guidance that are provided at certain plants to indicate which indications are trustworthy, and which are not potentially, so that gets fed into our human reliability analysis.

I know, myself, I factor it into the calculation of the human error probability by looking at, is there additional delay time I need to be adding to my diagnosis time to account for that?

Are there additional performance-shaping factor tweaks I need to be doing to make that HEP less optimistic by virtue of this.

So I think we have reviewed the issue. We have discussed it amongst ourselves. And I think we are providing good guidance to our users at this point in terms of a table. There's never going to be something that's going to cover every situation, but I think we're raising awareness of the need to interface with other pieces of the PRA where this issue comes up.

CHAIR STETKAR: Thanks. I love quoting from things because, regardless of what's said orally, what's written is important.

MS. COLLINS: I understand.

CHAIR STETKAR: In Table 2-3, the fourth row in that table does address multiple spurious actuations, multiple spurious cable failures and electrical faults. It says, "Quantification of the HEP focus is on reliability of the operator, given at least one good train of instrumentation, regardless of whether there are one, two or 20 spurious indications on non-credited components.

"In scoping in the equity approach, the additional spurious instrumentation impacts on a

scenario are currently outside the scope for HEP development but may impact on certainty.

"There's a potential source of modeling uncertainty issue. For example, if one area has action HFE 1 and those spurious indications in another area as the same HFE but somewhat distracting spurious indications, then the HEP for each area may appear to be the same HEP using today's methods, but the uncertainty associated with each development should be assessed as being different."

This says to me, there's no real effect on operator performance. Yes, we've got to do this and some uncertainty, sensitivity stuff, but if you read the uncertainty guidance, that's an afterthought. We don't really need to do that because point estimates are okay anyway. So, essentially, the decision of the team is w3e don't need to treat multiple spurious actuations. And indeed, the guidance, as you get back in Chapter 5, reinforces the notion of all I need to do is consider whether or not I have one train of instrumentation available that, according to my procedures, says I shell pick up this cup of coffee because that is precisely the action that I want to

evaluate.

H.B. Robinson completely ignored an over-cooling transient, completely ignored loss of all cooling for the reactor coolant pump seals, because they were distracted by things over in the secondary side of the plant, non-safety electrical things, and what was going on had no bearing on either of the safety functions that they missed. I can't understand how this rationale in this guidance can give me any reasonable approach to modeling human performance.

MS. COOPER: Yes.

CHAIR STETKAR: You've obviously put some thought into this, so if that's sort of the position that the NUREG is taking, I want to make sure that I understand that because, from my perspective, it is woefully deficient this area and it's kind of reinforced that notion that as long as I have one train of instrumentation. And I can assume I have it because my deterministic fire protection says that I'm protecting that train.

As long as I have that, I don't need to worry about the fact that the ceiling fell down over there or that, you know, Joe's screaming for help in the other part of the control room because he's

losing feedwater and of that non-safety stuff that I don't care about for this particular action in my PRA.

MS. COOPER: If you don't mind, Erin, I'll respond first.

I don't think that exactly matches the way everyone on the train team thinks, and we probably should look at the exact wording of that table because when you get to table summaries, sometimes the summary and the table doesn't necessarily represent all the details of the description.

CHAIR STETKAR: I couldn't find anything else is the problem. The problem is if I look at the -- the table is meant to define the scope of what analysts will look at, and indeed, that narrowly focused scope is reinforced again when I get back to the more detailed guidance in subsequent chapters, regardless of what the middle Chapter 4 may say in a more general perspective about, be careful of things.

MS. COOPER: I wouldn't be surprised if the appendix on the EPRI approach is consistent with that, but I don't know that for a fact. I'll let Erin answer that. The ATHEANA appendix doesn't have

very long content because it already was trying to address areas, errors of commission as its intent.

However, if memory serves me -- and it may not -- one of the examples in there, or maybe the only example, which was taken from the 2010 training, I actually developed with the Robinson event in mind.

CHAIR STETKAR: Okay. There's two --

MS. COOPER: There's things that -- there were problems with how the procedures were used and potential distractions on the part of the operators, the shift supervisors, and so forth. It's not the same event; there are other things that are going on.

The problem, I guess, is, and this is what we tried to say in Chapter 1 and what we were trying to sum up in Section 2 is that, given the way fire PRA is done right now (specifically the circuit analysis), we don't have inputs that would help us understand what other things are going on to then evaluate if it's important.

We also don't have the ability to say, if these indications were doing something funny and I was trying to do this, that would be important. I mean, there are just too many different things to

pick from. We can't come up with a set, and certainly not generically, can we figure out a set of rules to do that. So we do not have that capability right now.

So we are trying to represent in the table the way the interfaces and interaction and the input development and what's done with it now -- what are we doing it now?

Your point is well taken. I think that text probably needs to be looked at, because I don't necessarily agree with it the way you've discussed it, but --

CHAIR STETKAR: Well, I quoted it and --

MS. COOPER: -- well, I mean, when --

CHAIR STETKAR: -- editorialized my own impressions.

MS. COOPER: Right.

CHAIR STETKAR: My biggest concern is, and I recognize certainly, first of all, that one of the reasons why I think we requested the references to the documents that are in the first bullet on screen there is that those documents explicitly state that there is no limit to the number of spurious actuations that should come from circuit analysis. So the circuit analysis is not limited

for a particular fire area to examine the only a single spurious signal.

Fire analysis for this area may identify a thousand spurious signals. In a deterministic sense, as long as I've protected another train, I don't care. From a probabilistic sense, I need to deal with it. So, saying, well, we don't get the information from the circuit analysis isn't quite correct. It, in principle, should be there if they're doing the analysis according to that guidance in terms of a potentially large number of spurious actuation.

Whether they look a spurious actuations in non-safety secondary systems is admittedly a question.

MS. TOOPER: Yes.

CHAIR STETKAR: Should they? Perhaps they should, from HRA. Perhaps the HRA analysts should say, gee, are there any secondary systems in this particular fire area that might cause additional problems for the operator if, for example, you know, they're losing all feedwater and blowing down the secondary side of the plant and could get distracted by that. So it's not clear division as you might want to make it.

The bigger concern is if we have actual operating experience evidence of people either doing the wrong thing or not doing something that we would hope that they would do in the context of our PRA model. For example, we store cooling to the reactor coolant pump seals.

Simply saying the current methods don't address this and we can use the current methods to develop a 10^-4 probability for the human error for failure to do that, because we don't need to worry about distractions, will lead to optimistic assessments of operator performance for the NFPA 805 submittals. And that's a bit of concern, that guidance in the sense of saying we don't quite know how to treat multiple spurious operations, but if you have a fire scenario that gives you a lot of spurious actuations in the control room, you may want to be pretty doggone conservative about your operator performance.

MS. COLLINS: Yes, and I think there is -- personally, I think there is more of a tendency to go that direction. We usually get more flak from the HRA in going more conservative and then things pop up more frequently in cutsets and then we have to scrutinize them, and I'm --

CHAIR STETKAR: Following this guidance is -- as, again, that PRA practitioner on the plant, not an HRA professional --

MS. COLLINS: Yes.

CHAIR STETKAR: -- Following the guidance, this guidance, both in terms of things that might prompt an undesired action or error of commission or what I need to consider in terms of errors of omission (There is those two line items in that table 2-3 that addressed those issues a bit differently, separately), I'm looking for things that I don't need to do.

I'm looking for guidance that says I can point to a line item in a table, I can point to a subsection in report that says this NUREG guidance told me that I didn't need to think about this. And there's a lot of that here in the sense of multiple spurious. can point to many things as a PRA analyst that says, well, they said I didn't need to look at this because we don't know how to do that, so I had 10^-6 for the operator, you know, opening that, picking up the coffee cup or opening up that valve.

MS. COLLINS: You're right. I --

CHAIR STETKAR: I'm honestly looking for that --

MS. COLLINS: I think that may be --

(Simultaneous speaking.)

CHAIR STETKAR: -- as guidance from those --

MS. COLLINS: -- the sections where we talk about evaluating things in detail, but --

CHAIR STETKAR: Yes, but if I --

MS. COLLINS: -- you're right, it's has not been brought up here.

CHAIR STETKAR: -- never get to the detail because I haven't flagged that action, it's never shown up in the cutsets --

MS. COLLINS: Yes.

CHAIR STETKAR: -- so I've never had to re-examine it in the scoping --

MS. COLLINS: Yes.

CHAIR STETKAR: -- and certainly, I never examined it in the detail; it's just never risen to the surface.

So, if we don't have know how to treat it, we ought to at least have some backstop, if you want to call it that, that makes sure it gets flagged, other than just saying it's an issue of modeling uncertainty and, you know, we'll deal with that somehow differently.

MS. COLLINS: No, I mean, at this point in time, I don't think we have a strategy for how we would treat it if we had the information. It would take more work to develop that strategy is my is my sense.

CHAIR STETKAR: Yes.

MS. COOPER: I think we've got some tools out there that can help address that. The ATHEANA deviation search process may help try to focus certain areas. I don't know. You know, which things, if they went wrong, would it matter? Maybe. I don't know.

MS. COLLINS: And as I say, within the context of the calculator, for example, when I'm looking at things, and there have been instances on very recent prior PRAs that I've worked on where a separate HEP has been developed for a case of degraded instrumentation as a catchall type of concept to address this.

I am uncertain as to how many things I have going on at the same time and I don't know exactly what type of effect that's going to have, but I can presume that, again, if there's confusion there, it may take longer for the person to diagnosis what's going on and to allow myself to use

different performance-shaping factors within that calculational tool to reflect that multiple things are going on at the same time.

So, again, it's not perfect, but it is a way of discriminating between perhaps a best case and a, you know, funky things are going to be going on and they're going to have more difficulty diagnosing it. It's not --

MS. COOPER: I mean, other than that, I would say, other than a blanket multiplier, I mean, I don't really know how you would address saying, well, there's a possibility that we don't know, but because we don't have the information, there might be some things going on that could be distracting and that could have a negative impact on the operator performance, and it would raise the probability by X factor.

I don't know what other strategy we would have. In the scoping approach, which -- I mean it would depend on the analyst as to whether or not they decide whether or not that kind of situation would be within the scope of the scoping approach, but if they did, we've already been asked to remove certain conservatisms because of double-counting of factors and stuff like that. But

I --

CHAIR STETKAR: I understand you've been asked, if I'm out in the plant, I will ask you to make sure that I have the guidance in a written document that is endorsed by the Nuclear Regulatory Commission of the United States of America that I can point to so that I can calculate a 10^-6 number for this. Remember, this is an NRC document. It is not an EPRI technical report.

MS. COOPER: I know. It wasn't --

CHAIR STETKAR: It's an NRC NUREG.

MS. COOPER: Yes, it was more of a technical review in that you guys really counted this here and now you're counting this here, and you're really double-counting, that sort of ting.

So, but anyway, I think Dennis was going to set something.

MEMBER BLEY: Yes, I mean there's some minimal things, I think, at least, you could do. You know, flagging these kind of things is one.

Another is suggesting to look at the scenarios and what might be going on. What might the initiating event be beyond the fire? And under things that throw you into the emergency procedures, acknowledging that there's multiple paths of

activities, and they can certainly cause problems, and referring to a few of the events in which those problems have occurred.

You know, we're seeing already that pressure on the plants' training programs to begin to run drills that aren't plain-vanilla drills that are giving people lots of other things going on, trying to replicate that situation at Robinson, and there are other events; we keep flagging that because that's the most recent and most interesting. Also, other folks who look over plants and come in and do exams are doing the same kind of things.

And we need not to just run drills that are not just this one thing at this point but have multiple things going on, like happened in these kinds of events, especially fire events. You know, some years ago, the San Onofre event created a lot of difficulties. They didn't end up in the same kind of tough spot but they could have. They were operating under the same kind of problems.

So, acknowledging that unless it's a very localized fire and it's not affecting operations at all, it really is going to be the kind of event that can create overloads, burdens, wrong focus, pull the crew apart, that kind of stuff, and

put some emphasis on that and at least flag it in the uncertainty analysis.

It seems to me, says there are some things you can do to look at every possible combination of --

CHAIR STETKAR: You can't do that.

MEMBER BLEY: You can't do that, and --

MS. COLLINS: You can't do that.

MEMBER BLEY: -- what you can acknowledge that it's out there in real flyers and happens, and not extremely rarely, when you get bad fires that those kind of things are going on. So I think you could do that to make some emphasis.

CHAIR STETKAR: And in practice, a large fraction of the cables and equipment in a nuclear power plant have nothing to do with safety systems that we primarily deal with in a PRA on the secondary side of the plant. On the other hand, a large fraction of a typical operator's life also deals with keeping that equipment running. They don't ignore that stuff simply because the PRA isn't interested in whether or not I wiped the bearings on the main turbine. They're probably pretty interested in that. And just blanket saying that we don't care about the stuff that's outside of the PRA

because we happen to be doing the PRA lends the wrong impression.

So, so this notion, of you can't do a deterministic analysis of all signals might be occurring, I mean, it's just impractical, certainly, perhaps impossible, for any given fire scenario.

But I think that you can ask the people who are doing those fire analyses, who are doing those circuit analysis not to do a circuit analysis for every wire, for every valve out there in the turbine building, but to at least be aware of the fact that, oh, yes, all of the controls for the turbine systems go through here, so, even though I haven't looked at those circuits, yes, the turbine could be doing funny things in here.

So, yes, maybe you ought to think about that in the context of your HRA, whereas another fire location maybe doesn't have anything to do with any of that stuff, and you may have a better foundation for focusing on more of the y-related things.

MS. COLLINS: Yes.

CHAIR STETKAR: You know, how do you treat that? Yes, simple multipliers might work. Anything, to at least acknowledge that that

environmental situation, if you will, exists in terms of the operating team response.

MS. COLLINS: From the standpoint of PRA quantification, it comes down to multipliers on the HEP, but that also raises the question of qualitative insights that one gains from that, because as these things surface and as you go through your successive modifications, if this thing is dominating because we've given it a relatively conservative value, we as HRA people have to justify, why are we doing this?

CHAIR STETKAR: Sure. Sure.

MS. AOLLINS: So part of the assumptions, then, is for us to go back and scrutinize again and talk through again to make sure that we understand a better, and then perhaps going back to fire modeling or circuit analysis and getting further information --

CHAIR STETKAR: Yes.

MS. COLLINS: -- I think your point in terms of, have we clarified well enough that perhaps some of the initial estimates should be enough to allow that not to get down into the 10^-6 range so it does continually get scrutiny. Maybe that could be --

CHAIR STETKAR: You know, obviously, I'm pretty interested in this topic.

But at a current snapshot in time, recognizing that you prefaced the whole presentation, we all recognize that this is important input to the NFPA 805 submittals, there may be nothing wrong in the context of those submittals to say, look, we've identified the following situations in our plant. There may be some scenarios that indeed we can't do much with because they may be driven by multiple spurious operations affecting human performance within the limits of our ability to identify details of those and our ability to qualify human performance in whatever the context might be.

MS. COLLINS: Yes.

CHAIR STETKAR: This is an area for additional research, kind of like what Chapter 1 says, you know, we need to do more work on this.

But at least for this point in time, for the snapshot in time, let the transition process identify that as a particular issue, that if a particular --

Don't touch anything. Theron gets really upset if you will try to fix this. It will

come back.

MS. COLLINS: Oh, it does.

CHAIR STETKAR: At least identify that as something. You know, maybe for a particular plant, it's not an issue; maybe for a larger plant, it might be a larger issue.

MS. BOLLINS: Yes, depending on how well things are traced.

CHAIR STETKAR: I think you get the notion.

MS. COLLINS: Yes.

CHAIR STETKAR: Because, as I said, it's not good enough for that PRA practitioner out in the plant looking for things in NRC-endorsed guidance that I can point to, to say I didn't have to do this because I was told I didn't need to do this. I can I can point to a lot of pointers here in that in MSO issue.

MS. COLLINS: Yes.

CHAIR STETKAR: So you may want to relook at that not only in Table 2-3, which probably could be cleaned up pretty easily, but back in Chapter 5, there are several examples that sort of reinforce this notion of, well, I need to consider, as long as I have a single train of instrumentation

available that points me towards this, that's all I need to consider.

MS. COLLINS: Yes.

CHAIR STETKAR: You know, or even editorial comments that says is, as long as I have a procedure and one train of instrumentation, it's very likely that the operators will be successful. You know, that sort of biases my selection of performance-shaping factors, for example, in the scoping stuff.

MS. COLLINS: That's funny. I need to look back through the document. When I was looking through --

(Simultaneous speaking.)

CHAIR STETKAR: I could point you to sections, but it's sort not -- the problem is, if I point you to specific sections, I'll probably miss a few.

MS. COLLINS: Oh, I understand. No, that's good. That's just as well, I --

MS. COOPER: We may be getting to the point that when we read, we can't read anymore.

CHAIR STETKAR: The problem is, this office -- as I said, I read the document as someone who is looking for help or something I can point to,

to tell me that I don't need to do something that might be difficult, quite honestly. You know, that's a very cynical attitude, but we all know that, indeed, some people may be looking for that. And indeed, some of these problems are really, really difficult and probably not soluble at our current state of knowledge.

MS. COOPER: I would agree with that completely. I mean, I'm just trying to think ahead. There may be some instances, and we've had quite a lot of discussion on this topic, where perhaps you might be able to say that, for a particular fire location, you know that there aren't going to be any other extraneous or additional spurious indications just because there aren't cables going through there.

But on the other hand, it seems that there are going to be a lot of events, potentially, that you're just not going to know, and to have to put, minimally, a factor 2 on every HEP where you don't have that information, or you know -- I'm struggling a little bit with what that kind of impact will be. It's not going to necessarily highlight anything because it's going to be everywhere. It's can bring to the top --

CHAIR STETKAR: It's not, it's --

MS. COOPER: -- anything in particular.

CHAIR STETKAR: You know, at one level, I don't particularly care, the numerics of product. I don't care if it's a factor f two or five or 100 or 300 or 1,000 or 1.0 for the HEP. It's instilling a notion in the guidance that people will follow if the circuit analysts have not provided information about multiple spurious operations, which they should at least for the safety-relevant equipment that they've been instructed to do the analysis for.

If they don't provide it, at least the HRA folks should have enough sensitivity to go back and say, hey, in this particular area that you're now giving me this fire scenario, is there anything else in there that might affect what the operators are seeing in the control room?

Don't do a detailed analysis of the old circuits, but they should know what cables are routed through there. If they don't know that, they don't know their power plant and they shouldn't be doing a fire PRA of that power plant anyway. They should know what types of cables are run through there without necessarily tracing every single circuit on the secondary side of the plant, and

ought to able say, well, yes, there are rad waste signals here. Fine; you know, I don't particularly, necessarily care about rad waste signals.

Oh, all the feedwater control signals are run through this room. Okay, that might be interested even thought I haven't modeled feedwater in my PRA. I don't necessarily need to know. You know, as an HRA analyst, I don't necessarily want you to go out and do a detailed analysis of every one of those circuits because that's not something. But when I do the HRA of this particular focused action to pick up the coffee cup, I need to know that I'm doing that in the context of, feedwater might be going, to use a technical term, "nuts".

MS. COOPER: Right.

CHAIR STETKAR: It just might. And, you know, my priorities, for whatever reason, might be focused more on feedwater because that's something I deal with all of the time.

MS. COOPER: Okay. We'll try to come up with some kind of crude rules on that perhaps.

CHAIR STETKAR: You'll probably get pushback. So it's --

MS. COOPER: Well, it could be. I think there are --

CHAIR STETKAR: It's probably enough on that topic, I think.

MS. COOPER: Yes, I think there are other cases where we have tried to sprinkle it throughout, but just seeing that particular statement in table --

CHAIR STETKAR: As you do, I mean, read that statement, take kind of my ranting sort of approach to life, and then try to read through the rest of the document and see where there might be examples where either very specific guidance or explanatory comments in the guidance tends to focus you in a particular direction. It might help.

MS. COOPER: Yes, just giving some of the other one is, I see where we had talked about cue parameters and how there is a need to consider --

(Simultaneous speaking.)

CHAIR STETKAR: As I said, I have a list of subsection numbers here but I don't want to read them on the road --

MS. COOPER: Oh, sure.

CHAIR STETKAR: -- because there tends to be -- I did not read the document line by line in its entirety, and I probably would have missed

several places.

MS. COOPER: Right.

MR. SALLEY: Yes, I'd like to interrupt saying I'm little confused following successes here in this document, and I'll tell you why.

I listened to your rant. There's a lot of good stuff in your rant, but I have some counterparts on it. One of them is, if you have a bad circuit analysis, that they don't give you the correct information, I don't care how good the HRA is, it can't make up for the circuit analysis; it can only give you the correct pieces.

Now, when you talk about the MSOs, we just don't throw the MSOs. First of all, we have one train of equipment free of fire damage for safe shutdown. Now, typically, if I was doing the analysis, I would say this is the train you're going to watch and these are the gauges; this is the instrumentation. And for a fire in this area, this is the stuff you want to focus on. The other stuff is going to be going crazy.

And I could take you into the circuit stuff now, where if it's thermoplastic or thermo instrument cable, how it can possibly give you bad indications, which is a whole other section of

research. So I have that train of equipment ice should procedurally know to use.

If I have MSOs. If I identify them electrically, I just can't walk away from them. I mean, one of the things is, if, for example, there's valve positions that are going to change. I have to protect them or I have to do something to eliminate that. So I'm controlling that from an Appendix R or a post fire-safe shutdown analysis. They're not just letting all these signals come in.

On the second part, for the secondary side, you know, just like at San Onofre, if they can get the turbine on the turning gear, you want to turn it, which they did. And I understand that some AUO is probably going to be over there putting it on the turning gear and making sure the, the lift pumps are running or whatever. But still, the function of the operators in post fire-safe shutdown event is the reactor.

CHAIR STETKAR: You would hope that the function of the operator ought not to be ignoring the fact they've lost all cooling for the reactor coolant pumps seals and doing nothing --

MR. SALLEY: Yes.

CHAIR STETKAR: -- except for the fact

that in the year 2011, we have evidence that well-trained operators with fire procedures let that happen under a fire the wasn't something like a massive fire of the cable spreading room. It was an electrical fire and they had things going on. You can't ignore actual operating experience, regardless of what you say about deterministic fire analysis saying I'm protecting that train.

MR. SALLEY: And I agree with you, and that's why --

(Simultaneous speaking.)

CHAIR STETKAR: -- be that deterministic.

MR. SALLEY: But, you know, for example, just like you said though, for other systems that may be of interest to you, are affected, let's go to the cable spreading room. The answer: all.

So, for that fire in the cable spreading room, if you're not abandoning and you're going to try to stay in the main control room, which systems are affected? All. So what does it buy you? I mean --

CHAIR STETKAR: Perhaps nothing for the cable spreading room because the cable spreading

room is a fairly unique, difficult, interesting beast.

I'm thinking about plants that have other fire susceptibilities in instrumentation control areas where you where you might have separation between train A and train B. But you lose a lot of secondary things in one train. These things exist.

MR. SALLEY: Yes, I mean --

CHAIR STETKAR: -- I'm not going to analyze every plant in the United States, but you can't the presuppose, just because we think about cable spreading areas, that that's the only area that might be confusing or important to the operators.

MR. SALLEY: And I agree with you. And some areas -- for example, if someone used 20 foot [sic] of separation and you have the same fire area, you have 20 separation between train A and train B and they have a fire in that area. Which instrument do you believe if your strategy was separation and they're in the same fire area? I don't know. So that's one that would require some more prompting.

But, you know, that being said, you mentioned cable locations. Now, I need Dana Power

is here because he'd be doing cartwheels across the stage, because this is something Dana has been saying for years. The fact of the matter is that if you talk to the plants, they're going to tell you that the biggest expense of a lot of this is the electrical engineers trying to find these circuits, and that's for the required, main, post fire-safe shutdown circuits. Now we're asking for ancillary circuits.

I just don't see us getting all bunch of traction.

CHAIR STETKAR: Let me just say, I've a hell of a lot of people tracing in my life, and it's very, very difficult to determine that the control cable for this particular valve is located in that specific cable tray at that specific location in the specific room. That's really difficult.

MR. SALLEY: Yes, it is.

CHAIR STETKAR: Understanding that this valve goes somewhere through this room is pretty easy to do because I can trace cable trays even if I have to do it hand over hand. Seeing that the cable comes from the valve and goes into this room isn't that difficult to do. Knowing also that a bunch of feedwater stuff that I haven't model in the PRA also

comes into this room somewhere isn't all that difficult to do.

Knowing precisely which cable is in which microscopically identified geographic location in this room is really difficult to not, and I'm certainly not proposing that that needs to be done for out every cable in the entire plant, but the people who have done enough of the cable trays seem to get to the point where they can actually implement the guidance for those other multiple spurious operations, and do know a heck of a lot about the general routing cables in that power plant by the time they get done with that exercise.

They've not been tasked to think about all of those other cables.

MR. SALLEY: But they've --

(Simultaneous speaking.)

MR. SALLEY: -- John. They were told to go after certain cables. They normally have crossed a lot of golden nuggets that they throw away and it's not documented, which means they need to re-walk it down.

CHAIR STETKAR: Mark, no, they don't necessarily the re-walk it down because -- I'm trying to pull back from this notion of very

detailed circuit analysis, which needs to be done for some critical set of equipment according to the guidance; I'm not arguing with that. It will be done. People are struggling with that. It's a huge amount of effort even for that critical set of equipment.

What I am struggling with is guidance from Human Reliability Analysis that sort of is a catch-22 that says, well, because the circuit analysts have not looked at anything else and they haven't fed me information about everything else, I could ignore everything else in the plant and simply focus on those particular actions that the PRA, for whatever reason, have identified that the operators must perform.

I don't care that I'm burning up my main turbine. I don't care that I'm spilling feedwater all over the plant. I don't care that steam relief valves are open all over the place. I don't care about that stuff because the circuit analysts haven't told me that I should care about it and the guidance says I don't need to care about it. So I don't care about it.

Operators in the real plant will care about that. They will care. In fact they may care

more about that than this particular valve that the PRA has identified in a specific sequence that they must open. They might eventually get to that valve given enough time and given enough guidance and given enough indications and alarms. But the reliability of on opening that valve may be much different than the fact that the only thing that I need to do in life is worry about that valve. That's a concern.

MR. SALLEY: So, with that, again, with this document and where it's at, if you could help me, please define success because that's what I need.

CHAIR STETKAR: The ultimate success -- for the document?

MR. SALLEY: For the document.

CHAIR STETKAR: The document, in my opinion -- and again, this is my own opinion; it's not the subcommittee's opinion. I'm hoping that other subcommittee members may chime in if there are different opinions. Certainly the ACRS as a committee would weigh in -- but my own opinion is that the document should at least provide guidance to the HRA analyst that says, it's incumbent on you, if you're evaluating human performance, to at least

go out and make sure that each fire that the circuits in each fire area are limited to only the circuits that the circuit analysis feeding you. Or, are there other things in that area that I need to think about?

At least raise the question that the HRA analyst needs to ask that.

MR. SALLEY: So, if we put a piece in that suggested that they would consider this, that would be success in this document?

CHAIR STETKAR: Well, the document goes on further to -- you know, that gets into, if there are areas, how do you treat that? You know, that's some Susan's concerns about, well, if there are, do I tell them to increase the HEP by a factor of two or five or 10? Do I told them to fail the HEP? Is it something that only affects the time?

You know, that's --

MS. COOPER: Definitely, that is the question. That could be any of those things.

MR. SHACK: And in principle, that could be all of them.

MS. COOPER: And in practice.

CHAIR STETKAR: But, I mean, at least you would kick them into the detailed analysis

rather than the scoping analysis.

MS. COOPER: Yes. In principle, it shouldn't be there anyway, but yes, I think you would --

CHAIR STETKAR: I that's probably as much as John could expect.

MR. SHACK: That's as much -- you know I --

(Simultaneous speaking.)

CHAIR STETKAR: -- some sort of guidance that would --

MR. SHACK: You know, I have to have faith that --

CHAIR STETKAR: -- yes.

MR. SHACK: -- at least kick him into the --

CHAIR STETKAR: Let me give you an example. Under SISBO, self-induced station blackout from the record, there's explicit guidance that says, look, if you get into this situation, you need to do a detailed analysis. You know, it says don't use scoping analysis for these particular -- you know, if you get into that part of the procedures, you can't do that.

MS. COOPER: And, if they do the more

detailed analysis and --

CHAIR STETKAR: You have to have faith --

MS. COOPER: -- too many signals to figure out --

CHAIR STETKAR: It's a limitation on the detailed analysis right now.

MS. COLLINS: Yes, there's not any way that we would --

MS. COOPER: But see, part of the problem is we can't -- John has given some very good examples of things that operators might care about it, and there may be more plant-specific things that we weren't going to be able to dream up, but there may be some specific things like feedwater systems and so forth that could be distractions if there was something funny going on.

But specifically for a particular fire location or for a particular scenario with a particular initiating event, we don't know what questions to ask, what would be distracted? We can't turn that question that way and say, circuit analysis guys, these things would be important to us it was also going on. Go tell us if this is a factor. We can't develop that list is the problem.

We can't generate the question to ask.

Now, if we knew that certain things were going on, we could factor it into the context of everything else, but that's the problem. It's not --

CHAIR STETKAR: That's impractical. If you had the ultimate, perfect, complete circuit analysis of every wire in a nuclear power plant, you would, in principle, have that information available. You will never have that nor is it reasonable to even suggest that somebody try to do that.

MS. COOPER: Right.

CHAIR STETKAR: I mean I don't know what else to say. I mean, I think Bill said it correctly that there needs to be an awareness on the part of the HRA analyst that simply what they're given by the circuit analysts is the minimal amount of things that the operators will have to deal with, because that's been defined by the scope of the circuit analysis. That's the minimal complexity of what they'll need to deal with.

In some cases, it might be the only complexity because the other circuits that are routed through here might indeed not have anything

to do with any systems that might distract the operators. On the other hand, the amount of complexity that they may have to deal with, with fires in this particular location could be substantially larger if the HRA analyst at least knew, for example, that a fire in this location might also be affecting the main turbine and main feed water or something like that.

The circuit analysts have no incentive to feed that information forward because they've not been instructed to do that, and right at the moment, the HRA analysts have no instructions to go back and check to see if that's the case, so both sides are now happy that they've completely define the problem and can move forward so that the human error probability is 10^-6.

(Off-mic comment.)

CHAIR STETKAR: 10^-3 then. I don't care -- 99.9% success is good enough for me.

MEMBER SHACK: Well, the expert panel that's supposed to generate a generic set of multiples, would they be identifying things like that?

CHAIR STETKAR: No, because they're only focused -- it's a, indeed, in the guidance, it's

gone through a couple of evolutions, but there are tables of the types of multiple spurious operations. But they're focused on PRA-type scenarios. You know, can you get a LOCA? Can you get a loss of all feedwater.

MEMBER SHACK: Okay, so they're --

CHAIR STETKAR: They're still focused on --

MEMBER SHACK: Okay, but they would tell you at least that much.

CHAIR STETKAR: They tell you that much. They tell you the type, but they tell you the guidance of multiple spurious operations that you need to think about. Are you susceptible to those types of things in this location? They don't really help you in the HRA.

MS. COOPER: They should be focusing on the equipment that the PRA's modeling and on the instruments that are on the safe shutdown, what equipment and instrumentation the operators need to know about in order to, in principle, do a safe shutdown. But, as John has pointed out, all kinds of other things could be happening if those tables happen to be in the same location.

MEMBER SHACK: Right.

MS. COOPER: And it could be a distraction. It could be a minor distraction; it could be a big distraction.

CHAIR STETKAR: It could be minor; it could be -- I mean, you know.

MS. COOPER: There's no, unless you know the specifics, you don't have any hope of guessing.

CHAIR STETKAR: That's right.

MS. COOPER: You don't have any hope of guessing.

CHAIR STETKAR: That's right. And to presume in a generic sense, you can't do that, nor should you, in a generic sense. It's more the sense of -- the biggest concern I have in this area is that in the NFPA 805 transition process, that we optimistically characterize human performance for fires in certain locations at specific power plants because, if you will, both sides of the problem, the circuit analysis and the HRA, have been given guidance that they don't need to think about such that, if we have a fire later -- perish the thought -- at one of plants that have transitioned and the operators don't perform correctly, what kind of confidence do we have then in all that risk-informed evaluations that were done as a basis for

transitioning into this entire licensing framework? Because, gee, we missed that one. That's the biggest concern.

In the limit, you say, gee, I have multiple spurious operations, you fail the human error probability. I don't know; maybe all the fire analysis and things to all of the gymnastics and you say, well, the likelihood of having multiple spurious operations in this area is 10^-7 and I don't care that the human error probability is 1.

MS. COOPER: that's pretty - I kind of broke down in the transition, "optimistically characterize the human performance." Again, maybe it's the disconnect between having someone come in from the outside who has a perspective on this versus someone picking up the guidance document who may not have that.

But it's pretty rare that -- I'm usually getting beat on the other way in terms of, look at all these things that are surfacing. How can that really be that critical? How can that be that pessimistic?

CHAIR STETKAR: How can the operators at H.B. Robinson ignore the loss of cooling to the reactor cooling pumps?

MS. COOPER: I agree. Well, again,, then, that part of a give and take that I have with them saying, all right, I will look at it again; however, based on what I've already evaluated, I don't think we have a strong case to make for lowering this probability any further.

So my standpoint is I'm usually in the game of defending my potentially pessimistic result against those who would like me very much to reduce that.

CHAIR STETKAR: Well, and I think that all say you're the you outside HRA experts have faced that pressure.

MS. COOPER: Right. Oh, no I --

CHAIR STETKAR: Again, I don't read this from the perspective of you doing the analysis or Susan doing the analysis or Stacey doing the analysis or me or Dennis doing the analysis. I read it from this perspective of the person who is putting pressure on you to make those human error probabilities 10^-6 because that's the easiest way out of that scenario.

MS. COOPER: Yes, yes. This is obviously something that's pretty important and we'll talk with the team. I'm still very much

concerned about how we would --

CHAIR STETKAR: However you decide -- you know, I recognize that this --

(Simultaneous speaking.)

MS. COOPER: -- every other performance-shaping factor or contextual element that we went to look at it because, otherwise, it's like, why do you do the rest of the qualitative analysis if, in the end, the uncertainty of whether or not there's spurious stuff going on that can take people off the reservation, you know, that's going to swamp any result that we have. That's where I don't know where to go right now, and I have concerns about it.

CHAIR STETKAR: You know, we raised it in April. I'm raising it again. I'm an individual.

MS. COOPER: Right.

CHAIR STETKAR: You know, you need to go back and talk about it; you may decide not to make any changes at all. When you come before the committee, you know, maybe the committee -- I'm not going to try to presuppose anything, so it's not -- I think we said enough about it certainly for this afternoon, but --

MS. COOPER: Okay, well I think we've --

CHAIR STETKAR: -- there are only a couple of --

MS. COOPER: -- we've had some useful discussions that I think went beyond what we had last time, certainly. I mean, last time I didn't think we were necessarily always talking on the same page and I feel like we are talking on the same page.

But I do think this is very clearly not just pushing the state of the art, if sleeping.

CHAIR STETKAR: It is.

MS. COOPER: I'm really leaping the state of the art.

CHAIR STETKAR: It honestly is, and it may be an issue that, there may be other ways to deal with that issue in the context of the NFPA 805 transition. I don't think that we can solve the ultimate treatment of this in the context of fire analysis during the NFPA 805 transition process.

I think it is an area of continuing research, both in the HRA and in the fire characterization part, if you will, of the problem. I'll go back to notion that that I don't want a situation to occur where a plant has submitted an analysis that's been reviewed and accepted by the

staff to support transition to NFPA 805 and then that plant have a fire where the operators don't perform an action that's modeled in the PRA because they've been distracted by something else going on, and then people saying, well, nobody said we needed to think about that. That's the biggest concern.

MS. COOPER: Hi, Steve.

CHAIR STETKAR: Hi, Steve.

MR. DINSMORE: I've been trying to avoid this, but I guess I'd better -- is this thing working today?

My name is Steve Dinsmore from the NRR PRA staff.

I guess I'm trying to figure out what you're talking about interacts with the fact that when they do transition, what we're worried about is VFDRs. So if there's no VFDR -- in other words, if the plant satisfies the deterministic requirements for a fire -- but the operators make a mistake because of spurious actions, that's not within our review. We wouldn't look at that. It's only if there are some variances from the deterministic requirements in an area. Then we look at how the operators are credited --

CHAIR STETKAR: Yes.

MR. DINSMORE: -- to resolve that.

CHAIR STETKAR: But in practice, I think, in many practical nuclear power plants, you're more likely to have those variances in locations where the operators may face a fairly difficult and challenging situation not only because of the things that are in the PRA. You're talking about cable spreading rooms; you're talking about locations in the plant that have, you know, multiple divisions of cables and things like that.

So my concern is that precisely the areas where there might be more focus on the HRA is where you may be more vulnerable to these types of issues, not in those areas were you doing indeed have very good separation and you can meet deterministic criteria and check off the box that I'm oaky in this area.

MR. DINSMORE: Yes, but we do have the opportunity to actually focus in on specific scenarios. So I'm not quite sure how much that helps define the problem. Again, all the general actions that they're taking following a fire are not part of the NFPA 805 transition review. It's only those associated with specifics scenarios.

CHAIR STETKAR: Yes?

MR. DINSMORE: That probably doesn't help that much.

CHAIR STETKAR: That doesn't help. . I'm not sure that -- we can talk about some of that other stuff later, but my sense is that some of -- that it seems to me likely that those scenarios may arise out of locations where the potential for other distractions may exist just because of the nature of how you get into those types of scenarios.

MR. DINSMORE: Sometimes, we also could accept a variance by assuming there's no -- well, let's assume it goes to core damage.

CHAIR STETKAR: That's fine. I mean, how they try to work their way around an approval from the transition is sort of case-by-case --

MR. DINSMORE: Right.

CHAIR STETKAR: -- submittal-by-submittal basis.

The subject of this particular meeting is kind of generic guidance that will be applied across the board for doing the HRA to support whatever they need to support. You know, if they decide to take credit for a particular operator action and provide a risk-based, risk-informed analysis to support that action and the human error

probability is 10^-6 -- I keep using that number because it's -- because I will use that number -- 10^-6, you want to have good confidence that that's reasonably well founded.

MS. COOPER: Okay.

Erin, do you want to -- I think you have another few slides.

MS. COLLINS: Yes. Let's see.

I don't know if you want to continue on this topic at all because just pointing out particular sections in which we had text changes, I don't think so. No.

MS. COOPER: I'd like to just stop. I mean, the procedure focus here is that the procedure can help reduce some confusion with respect to what's going on in the sense that some players have gone so far as not only to identify protected equipment by to identify the other instrumentation in that room that could be impacted, and they've listed that.

CHAIR STETKAR: Yes.

MS. COOPER: So, in essence, they're saying, okay, they're doing the job you're talking about. They've done that job. They haven't said specifically, yes, it will impacted, but they're

saying it's in that location and the operator can say okay. Maybe this stuff is wrong and --

CHAIR STETKAR: And I'll ignore that whole chunk of the plant.

MS. COOPER: Exactly.

CHAIR STETKAR: And that's fine. But there are probably plants that haven't done that as well.

MS. COOPER: That haven't done that.

MS. COLLINS: They may not have done that. That's correct.

CHAIR STETKAR: And again, the guidances is going to be picked up by people perhaps at those plants that say, well, I don't need to worry about it because I don't need to worry about it.

MS. COLLINS: Well, the next major topic that came up -- oh, boy, let's start again, was main control room abandonment. So, an attempt to address the subcommittee's concerns, we've added a new section culled from various points in the document issues that we may have mentioned about qualitative analysis related to the abandonment issue and put them in one particular section.

Some of the issues that we discuss are habitability, which has to do with specific guidance

from 6850 on smoke levels and heat flux, at et cetera, and the ability to control the plant from the control room. We're finding that, not surprisingly, there may be a preference on the part of the operator to stay in the control room because they had the full range of things available and not go out to a dedicated shutdown panel, which has much less control capability. So where do you make that decision? And the need to evaluate that decision-making process of when they stay and when they go, and how the timing of the decision-making process may impact your detailed analysis of this scenario.

Admittedly, however, we recognize that this is an area that would benefit from further research, but there are still some brick people in their fire PRAs who are using the screening value and finding that that is not a dominant contributor, and therefore, not going pretty detail. So I think that each fire PRA tends to look at this slightly differently and say what meets our needs? What's a risk significant issue, and how greater detail. Do we need to go into it?

But hopefully, for those who do need the greater detail, we have now provided a specific

section that gives the user guidance on performance-shaping factors and other issues that need to be considered.

Is there anything in particular that the subcommittee had a question on in this new section if you've had a chance to look at it?

CHAIR STETKAR: If you hear silence from me and silence for about 15 seconds, move on.

MS. COLLINS: Okay. I've got my sweep second hand. So we'll put a gavel down.

CHAIR STETKAR: actually, in truth, I think that you did in this section is good. It does -- in the sense of raising consciousness, it does it. It solves the issue.

MS. TOLLINS: that was the intent because we knew previously we had a section that essentially said, well, you know, a lot of people use the screening value. And other people don't and that's about it. But here, we tried to do it.

CHAIR STETKAR: In terms of staff reviews, it also puts into writing the intent of this guidance so that when I look at staff reviews, if indeed people are doing an analysis of control room abandonment, you know, there are issues written here that can be questioned; you know, did you

consider these things? And that's it's all we can ask for at this stage of the guidance.

MS. TOLLINS: Okay.

CHAIR STETKAR: Again, in my personal opinion. . I don't speak for anyone else.

MS. COLLINS: Well, hearing no other inputs, I will forge ahead to the next slide.

And our friend, self-induced station blackout, which was previously discussed in probably more detail than necessary in Appendix D, but recognizing that, again, this issue may still exist in the certain procedures either full scope, SISBO, or the concept of having to deal with preemptive operator actions as we usually call them, that there needs to be some discussion of this because it lingers and it continues to be something that needs to be evaluated.

So the old Appendix D was deleted. However, certain text that we felt was still relevant was moved into sections on identification and definition of response actions and also into a qualitative analysis associated with these procedures that may contain these preemptive actions.

CHAIR STETKAR: And here's a good idea

-- you know, the discussion is very informative. It sort of raises the issue. It says things to be concerned about. It doesn't try to solve the problem. It also explicitly says, look these are probably complicated enough and potentially risk-beneficial or perhaps not risk-beneficial enough that you ought not to do you know an immediate scoping analysis. You really ought to do a detailed analysis for this.

Again, that's all you expect from the type of guidance and it solves that issue and it puts it into the appropriate context on the qualitative stuff.

I, personally, again, I really like what you did with this stuff.

MS. COLLINS: Okay. Since you seem pleased with the way the abandonment in the SISBO were addressed, is it fair to say that, if a similar type of treatment were given to facets of the MSO issue, that that might address concerns in the sense that here are issues one needs to evaluate and we have a limited understanding, we specifically had to do it, however, the user needs to be aware of that, et cetera?

CHAIR STETKAR: Erin, you have to

realize I'm not going to give you answer to that because first of all --

MS. COLLINS: Just trying.

CHAIR STETKAR: I speak for me, and whatever I say is not --

MEMBER SHACK: She' be happy to know what you'd do.

CHAIR STETKAR: well, but I'm not going to try -- I think what I said before. Okay, in my personal opinion, something along those lines -- raising the consciousness of things that the HRA analyst should be thinking about, why it may be a complicated issue, why the information that you received from the circuit analysts may not completely define the problem in the context that you as an HRA analyst think about the problem would go a long way toward helping to solve the problem.

Now, a part of Susan's concerns is where do I go from there? Do I tell them increase the HEP by a factor two, five, 10? Do I set it to 1.0? I don't have an answer for that, and even if I did, it's not my position to sort of suggest one. That's something that I think you as a team need to grapple with. You know, you've grappled with it for SISBO and said, ignore the scope and go directly to the

detailed analysis.

MS. COLLINS: Okay. I just thought it was worth a try.

CHAIR STETKAR: It was.

MS. COOPER: Thanks, Erin.

At this point, then, Stacy was going to end the discussion.

CHAIR STETKAR: Can Stacy -- how long is yours going to be?

MS. HENDRICKSON: Two slides. It's two slides, but that's not counting discussion.

MS. COLLINS: Coffee break time?

MS. HENDRICKSON: This might be a fine time.

CHAIR STETKAR: Let's take a break now because you're talking about uncertainties and I'm going to rant a while. So let's take a break and -- it will be a different ranting, but it's ranting nonetheless.

Let's take a break and reconvene at 3:25.

(Whereupon, the above-entitled matter went off the record at 3:05 p.m. and resumed at 3:26 p.m.)

CHAIR STETKAR: We're back in session.

Let's hear about the next topic.

MS. HENDRICKSON: Thank you.

MR. BROWN: Dennis?

CHAIR STETKAR: You're in here.

MR. BROWN: He's not on the line yet.

CHAIR STETKAR: Theron, if you can just let John know when he comes on so we know he's there because we're going to try to index him to where we are in the slides once he's on.

MR. BROWN: Okay.

CHAIR STETKAR: Thank you.

MS. HENDRICKSON: The changes that are noted here to Section 5 have already been commented on elsewhere, so I'll just briefly review what those were. One was in reference to SISBO situations, and we have explicitly stated that caveat that, for SISBO situations, that's really outside the scope of the scoping method.

Then also, for our discussion on the MSOs for that second sub-bullet there, for the use of the scoping method, really, what's being referred to here would be spurious instruments, spurious instrumentation. That quote that is pulled out there, "Response may be to a single or to multiple spurious indicators but the assumption is still the

same," what that is referring to is the use of the spurious implementation tree, which, in the instance of that tree, it assumes that an error has already occurred, so, if there's one spurious instrument or if there's multiple spurious instruments, it assumes that an error of commission or an error of omission has already occurred.

If there are multiple spurious indicators, what the tree is directing is the recovery of that error. So, if there are multiple spurious indicators, recovery is going to be more difficult and the tree would be used the same way.

Now changes to Section 6 primarily were noted here. The changes to the guidance on dependencies added in some extra references and then also stated that a lower bound should be established, although we did remove that the lower bound of 1E-5 is required.

We removed that requirement but still added some reference and discussion of why a lower bound would be needed and what it's really referring to, the combination of dependent HEPs. Once you're going into doing that combination, you get into an unrealistic HEP level.

We can go on to the next slide, slide

19.

Looking at uncertainties in timing information and realizing there can be significant variability in timing information, we've added in a couple of different discussions of it. It's gone into Section 4, the qualitative analysis, Section 5 with the quantification and then also in the appendix that supports the scoping method to address what would be good practices, how to then establish a range of time that actually establish a range. It's probably a good practice, as opposed to trying to come up with a single-point estimate for timing information.

So those are the issues that have been made throughout the document.

CHAIR STETKAR: Let me -- this is another area, and I'm eventually going to go back to Section 4 again, but let's go through the uncertainty stuff first.

In Section 4.6.2, I mean, you've excerpted parts of the paragraph but that says, "Given the range of sources for timing estimates and that expert judgment will often be a contributor to the estimates obtained from the various sources, there could be significant uncertainty associated

with point estimates obtained for HRA purposes.

"When possible, it would be good practice for HRA analysts to try to get a sense of the range of times possible for a particular parameter -- for example, timing for an operator to want a particular valve locally -- for consideration during sensitivity studies analyses that might be performed for potentially significant sequences."

Again, the only reason I care about uncertainties is I might somehow do a sensitivity analysis later on. There's other guidance, and I want to pull you back to the time line that's been added in 4.6.2 -- it's pulled up from Section 5.1, with, it's the time line from the EPRI HCR methodology in particularly, with the definitions from EPRI HCR methodology.

So it's another case where the Nuclear Regulatory Commission says this is the way to think about the way the world works some of the times, and they weren't so important back in Section 5.1 because it was pretty clear to me what I was conceptually getting at. It's more important in Section 4 because it tells me to think about how the world works and how I should think about timing.

For example, there's a mystical

something called T(subscript 1/2), which is actually the upper rate of cognitive response is a footnote that says, "In every TR-100259, T(subscript 1/2) is described as a medium response time. Depending on the level of detail required for quantification, T(subscript 1/2) can either be a median time or a point estimate."

Okay, in the context of a median response time, that means half the operators successfully perform the diagnosis within that time and half of them don't. Half of them don't. How long might those other half who don't take to perform that diagnosis? I don't know. All I have to do is put a number in there. A point estimate is fine. I don't care about uncertainty; a point estimate is fine. The only thing I care about on uncertainty is for some later sensitivity analysis.

Suppose that I actually go and do the infinite number of simulator experiments that EPRI would like me to go, and I determine that it's a very skewed distribution such that the 50th percentile is 15 minutes and the 75th percentile is 30 minutes and the 95th percentile -- oh, hell, the guys never do it; you had to wait for the next crew to come in four hours later, or whenever your

emergency responders might be. That might give you a different indication about the feasibility analysis than just saying that my 50th percentile is 15 minutes and my available time window is, you know, 30 minutes.

So there's a case where, in fact, doing the uncertainty analysis requiring, if I can use that term, the human reliability analyst to quantify what that range might be can indeed have an effect on the human reliability analysts' judgment regarding the feasibility of an action, regardless of propagating uncertainties -- you know, turning a crank, pushing a button, and getting an uncertainty distribution at the back end of some qualification model, it can actually affect decisions about the feasibility of an action.

MS. HENDRICKSON: Yes.

CHAIR STETKAR: And that's one of the reasons why I think, in the April meeting, we were trying to emphasize the importance of identifying, documenting, and quantifying the uncertainties. At least recognize the fact that there might be a 25-percent probability given what we understand from either our analysis or the operator interviews, a 25-percent probability that I might not meet the

feasibility criteria.

What do I do with that? Well, do I thought it's feasible? Well, it's not infeasible but it's not absolutely feasible, and the same decision that I might make just using whatever the point estimate or median value might give me.

MS. HENDRICKSON: Yes.

CHAIR STETKAR: The same is true obviously for the implementation --

MS. HENDRICKSON: That's a very good point, and I think, in retrospect, as I think you've pointed out, the EPRI approach time line in particular makes it difficult because I think most of us, when we think about feasibility assessment, we're thinking about a demonstration that's then supposed to be representative of a number of people, not necessarily considering that that represents a median value.

CHAIR STETKAR: I sort liked the idea of bringing the -- the time line was brought up into the qualitative stuff, and I like time lines. But I think it's a good idea because it ties back into the scoping analysis where they define the time margin and people pictorially can see the reason.

There are, in my opinion again, a few

problems with that -- not the form of that time line, because I think it's a really good form -- the particular discussion of the individual elements of that time line are derived specifically from the EPRI HCR methodology, which, you know, I just --

MS. HENDRICKSON: Right.

CHAIR STETKAR: -- I just highlighted that median, and some of the discussions anecdotally going down, as they discuss those times, may prejudice the way, you know, the way my PRA practitioner out in the plant may think about these things.

The other thing that I suggest as you're thinking about that time line, it's very, very import that certainly within Section 4 where you're talking the qualitative analysis, that you clearly identify what bits and pieces of that time line are the "time available" and the "time required." That link is never made.

I'll tell you, I can read the words. I mean, I think I know what they are, but I can read the words and interpret things a bit differently such that there's a primer called TSW, which is characterized as the system time window or something like that, and it's a big long time. Okay, well, if

I would like that to be my time available, I can probably infer that that might be what I would use and there's something smaller that I could infer might be the time required such that, when I go back and do my feasibility analysis, I might be optimistic about assessing what the time margin might be.

So I think it's really important, especially in that qualitative area, that you make sure it's really clear because the notions of time required and time available are used in the qualitative analysis section. Here, they're using NUREG 1852 and many other places. And this is the first place where anybody has seen actual bits and pieces of a response time line. And you're not going back to those concepts, just so somebody knows that this, in the context of what this picture means, is what we mean by time available and what we mean by time required.

And if you can be sensitive to some of these other issues, again, in my opinion, I think the guidance should be stronger to tell the analysts to go out and explicitly identify document and quantify those uncertainties not in the sense of turning the crank and quantifying uncertainties in

the PRA model, in the sense of documenting them such that when I look at the uncertainty in the cognitive response time I look at the uncertainty in the implementation time, and I want to assess an uncertainty on the available time window, I at least have a sense of how big is that overlap.

MS. HENDRICKSON: Yes.

CHAIR STETKAR: You know, if it's clear that I have a lot of margin, I can feel quite confident that indeed it's a feasible action.

MS. HENDRICKSON: Yes, right.

CHAIR STETKAR: If I have a substantial overlap, I'd feel much less confident about that and I might want to treat it differently.

MS. HENDRICKSON: Right.

CHAIR STETKAR: I might not necessarily say that it's infeasible but I might say that I need to do a detailed analysis, for example, in that condition rather than just saying it's feasible or infeasible.

MS. HENDRICKSON: Yes.

CHAIR STETKAR: So . . .

MEMBER SHACK: I mean, 1852 has sort of a much more extended discussion --

CHAIR STETKAR: They do indeed.

MEMBER SHACK: -- yes, that sort of takes into account that there's a variability in this and you really ought to think about which value you want to use.

CHAIR STETKAR: I think part of the problem, Bill, is that some of the text in Section 4 sort of paraphrases that, you know, in a more limited sense, but the time line has now been added, and the description of that time line, you know, reinforces, again, the notion of median response time or point estimate --

(Simultaneous speaking.)

MEMBER SHACK: No, I mean, we didn't in that particular response time.

CHAIR STETKAR: Yes.

MEMBER SHACK: I mean, the discussion here in 1852 is really much more

CHAIR STETKAR: Right, robust.

MEMBER SHACK: Right.

CHAIR STETKAR: Yes.

MR. LAI: Mr. Chairman, Dennis is on the line.

CHAIR STETKAR: Good. Welcome, Dennis. We are on slide 19 right now.

MEMBER BLEY: I haven't got up yet, but

I enjoyed your chat.

CHAIR STETKAR: Thanks, Dennis.

(Laughter.)

CHAIR STETKAR: Don't laugh too much. Remember, you're on the record.

MEMBER BLEY: Nineteen.

CHAIR STETKAR: We're on 19, and unless Stacey has something more to add, I think we're finishing 19.

MEMBER BLEY: Okay. I' going to stay on mute. You know, if I have something --

CHAIR STETKAR: Yes, just chime in. You know, you're a member. Just chime in whenever you want, Dennis.

MS. HENDRICKSON: So now we can move on to the overall summary. So I guess, unless we want to go back to talk about something else, we're at the end of the discussion summarizing changes we've made to the report. We have addressed a number of things that were raised by the subcommittee and other issues raised by team members in public comments.

We recognize that there's room for improvement. This is, as far as I know, the first document that the NRC certainly is going to publish,

and probably other people too, that explicitly addresses fire HRA.

We have had a focus that has been related to mail NFPA 805, a different scope and focus. We've tried to address the issues that we think are the most important to this particular process, and definitely recognize that there's room for improvement. As things are identified as being important to research, and regulatory applications, so on and so forth.

CHAIR STETKAR: Yes, thanks. I think, you know, sort of again, in the sense of the summary of at least my own personal ranting, in some cases, there may be benefit, for the purposes of this document, to take the attitude of what specificity is more productive than trying to get too specific, regardless of what pressure you might be feeling from stakeholders or from people you've interacted with in training sessions or the pilot applications, who absolutely want to be told precisely how to do it, and if you do it that way, it's absolutely perfectly acceptable.

In some of these areas where you've identified and our discussions have identified a need for advancing the state of the art, if you

will, in HRA and, in some cases, prior modeling trying to, in some sense, be less responsive to the demands for very specific guidance might better serve the greater purpose.

MS. COLLINS: Well, I think we're very mindful of the fact that there really is a need for this document out thee in the street. Things are ongoing. There continues to be significant interest in this. So we don't want to spend too much more time. We really recognize this needs to get out there now.

CHAIR STETKAR: Yes.

MS. COLLINS: And so we're going to be trying to blend the best of responding to some of the issues you brought up with the need to get it out there.

CHAIR STETKAR: No, I think we're certainly aware of that as a subcommittee, and as a committee also. I think the only concerns are, as Susan mentioned, it's an important document because it's being published in -- pick a number, 2011, 2012 -- but it's being published now as guidance for human liability analysis under very challenging circumstances. It will be used widely by people certainly during the NFPA 805 transition efforts.

And in some sense, it's a very, very important snapshot of how we understand, at least within this context but a challenging context, how to do human reliability analysis. And the concern is to not inadvertently limit the context for the focus of that NRC-endorsed methodology in ways that might be suddenly contrary or -- not necessarily contrary -- at least deviating from guidance in, for example, in NUREG 1852 or in some of the other work that's being done in the broader research project on HRA in general.

You know, I think that's one of the things that certainly I'm trying to be a little bit sensitive to, recognizing the real need to get some guidance out there and also the demands for something that's very specific that the people can pick and read and say, okay, I've off all these boxes, I've followed all of these guides, I came up with a 10^-6, and the staff can look at the 10^-6 and say they've checked off all the boxes, they followed all the guides, and yea, verily, the 10^-6 is okay.

I used 10^-6 because I knew you took the 10^-5 out of there.

(Laughter.)

MS. COLLINS: That's what I said to Stacy during the break. I said, no, no, I had the number in there; it was for you.

(Laughter.)

CHAIR STETKAR: Okay, any quick comments from any of the members on this part of the presentation?

MEMBER BLEY: Dennis, do you have anything?

MEMBER BLEY: Nothing to add. That's a turning point for the discussion.

MS. COOPER: All right, so we have one set of two or three slides just to wrap things up.

CHAIR STETKAR: Yes, no, I said on this part of the discussion. I know you had one more set.

MR. LAI: Control L.

MS. COOPER: Okay, so we're going to wrap up with just a few slides here talking about where we are and where we hope to be going in the future.

Just to remind you, not of all the twists and turns of this project but a few of them, which will hopefully get us to the bottom of this page, which is publication, but just to remind you,

we have done peer review, testing, piloting, public comments and feedback from a variety of sources, including this subcommittee, and we've had a number of traps including the draft for public comment. And actually, I believe the draft was out public and given to the ACRS subcommittee in March was used even as stuff for the last bit of training.

We have been working hard and long at this. And in mentioning the training, last year was our first year in 2010, and we're back doing another round of training two, four weeks. The next one comes up in the middle of November.

Also, as I understand, other members of the Fire Research Branch have been working on documenting the 2010 training into a NUREG/CP that will include the training slides and a CD that follows along with it, with videotapes of the training that was done in 2010.

And we are planning for another round of training for 2012, which will be hosted by NRC this time, so it will be somewhere in this area. I notice that John was out in San Diego last month, although he wasn't taking out --

MR. LAI: It was in the fire modeling session.

MS. COOPER: Yes.

So we're hoping to get this published soon. One or two months was the idea that we had in mind when I put this presentation together. As we mentioned at the beginning, we do anticipate that this will be used by those who are transitioning to NFP 805, then possibly other issues.

This report, we believe, that addresses fire PRA goes beyond -- well, it does go beyond the screening level from 6850, and we think there are number of things that could help us identify potential future improvements, especially as additional plants complete analyses and submit their studies to the NRC and so on and so forth.

So, anyway, that's it, and there's everybody on the team. Everyone's logo. So that's all that we had planned to present today. Are there any other questions or comments that you want to add at this time?

CHAIR STETKAR: I don't have -- do any of the members have any questions or comments at the moment?

Dennis, anything?

MEMBER BLEY: Well, just a little reiteration. The area of bounding for possible

complexity for uncertainty or anything else, I think back in the appendix on AHTEANA, there's at least a few words about that, that are important. And I certainly hope you can get some kind of caveats up in front that talk about that and tie it to the significant events we've had that, if one's doing risk analysis, one has to account for the unlikely but data code situations and, you know, at the very least, raise that and get it clearly stated in a place where it will be observed rather than just in an appendix.

You know, the other things we've talked about, I think, are all important, but that's one, to me, that's overriding. If you pull out events from the real world and you're not clear that the methodology would somehow --

(Telephonic interference.)

CHAIR STETKAR: Dennis, You cut out right at the end, so if you could, repeat the last sentence or two. I don't know where you cut out.

MEMBER BLEY: That would imply I remembered what I said.

CHAIR STETKAR: Yes, well, you could make up something different.

MEMBER BLEY: I was just saying that I

think it's important we at least get something there, such that -- two things -- one, if somebody looking at this and looking at real-world events says how would these somehow be accounted for, and they can't see it, that's troublesome.

More troublesome is the fact that analysts won't be looking for that sort of thing. And I don't think just having a couple sentences in Appendix D is enough to cover that.

CHAIR STETKAR: Thank you.

Let me ask -- we'll go back around the table here and get any final comments from the members, but first, I don't think we have any public comments from the multitudes in the room here, since it's empty.

Do you have any comments? I mean, anybody else in the room want to make any?

Mark, you're --

MR SALLEY: Do you want to go first, or us, or how do you --

(Simultaneous speaking.)

CHAIR STETKAR: Let me ask first -- there may be somebody on the bridge line, so I just want to make sure that -- somebody other than Dennis, if anyone's listening in, could you say

something to make sure that we know the bridge line is open first.

MR. JULIUS: Hi. This is Jeff Julius.

CHAIR STETKAR: Hi, Jeff. Thanks.

Now, given the fact that we know you're online, is there anybody out there who wants to make any additional comments?

MR. JULIUS: I would. This is Jeff Julius. I would like to say that I thought the discussion on the procedure-centric view of the document and the MSO was a good one.

I could see where, like, especially, if you're starting at the beginning where you might not pick up on some of the links or if we needed to better provide guidance on some of those aspects, that some of those in the detailed analyses, especially regarding the procedure-centric view of things -- some of these are the, you know, the interaction between failure modes or performance-shaping factors where the -- you're right, I mean, we certainly have to ask questions.

Like in the EPRI HRA approach appendix, we have questions about what's the likelihood of not following the procedures or getting the procedure wrong. But there are also additional questions

about the man-machine interface and the timing. We got to lengths in terms of, when we're developing these time lines, of understanding and try to make some estimate of the delays and distraction and the, not only getting information and lining up people and the command-and-control aspects.

I know we need to learn more and put more in, maybe explicitly, but also calling out. Some of those factors are there in the methods. They're just not very well called out.

CHAIR STETKAR: Yes, and I think -- Jeff, this is John Stetkar -- I tend to agree with you. You'll notice, in my ranting, I didn't really say much about the detailed fire analyses back in the appendices because the detailed analyses, if you ever get them, tend to have all of those thoughts in them.

The bigger concern is that the people doing the screening analyses, or more in particular, setting up scoping analyses, are equally sensitive to those issues so that they don't inadvertently not think about something that they ought to, or inadvertently make optimistic decisions about something without even the realization that they might be optimistic.

MR. JULIUS: Right.

CHAIR STETKAR: And I think that kind of echoes your sentiment that perhaps highlighting a bit more of that thought process up front without repeating everything that's back in the detailed analyses of might be enough to sort of prompt that practitioner in the plant to know that there's something else that they need to think about. So appreciate that.

Any other comments from out there?

MR. JULIUS: Thanks for the opportunity to discuss this with you again.

CHAIR STETKAR: Thanks, Jeff.

Anybody else?

JOHN FORRESTER: John Forrester's on the line, and I don't think I have any other comments. I think the major issues are in a little bit clearer focus this time, so I appreciate that.

CHAIR STETKAR: Thanks, John.

Hearing nothing else, let me give the staff -- if Mark, you, and --

MR. SALLEY: Yes, but I also have a couple comments I think Rich also too.

CHAIR STETKAR: Good.

MR. SALLEY: I guess, two things I

really want to just have clear, John, is, first, where specifically would you think, really, we need to tweak up here to get the quality of this document to where it's ready for primetime?

CHAIR STETKAR: I have to be careful because I am an individual, but the two areas -- I think we had discussions about the two areas -- one is the general notion of how should an HRA analyst, that practitioner, approach the issue of multiple spurious operations. And I'll extend that out; Dennis used the term 'complex scenarios' where the operators may be distracted or may have conflicting priorities, for example, depending on what else is happening in the plant, that may not necessarily be explicitly identified by the circuit analyses that were performed specifically for the functions that were identified in NPRA and other safety functions. So that's one area.

The other area is this treatment of uncertainties in those time lines because I think that is also an important issue, again, in the purest sense, quantification of the overall uncertainties in the fire analysis, but more importantly, as part of the tools that an HRA analyst ought to have available to make those

determinations of feasibility, for example, because it may affect decisions, depending on what those overlaps in the uncertainty distributions look like if there are any.

And if there aren't any, again, that's confidence builder. But if you've not thought about those and you've only taken something that's either characterized as a median value or some other point estimate number, I think you're very vulnerable to at least being challenged if not making, you know, inappropriate decisions.

So there's the two areas, from my perspective, I think that given the document as it is, might need some thought. And again, it's up to the team in terms of how you deal with them.

I'm an individual. I'm not the ACRS. And occasionally, you know, pragmatically, people make decisions.

MR. SALLEY: Thank you. That helps me understand. I appreciate that.

The second thing -- we had planned, you know we still would like a letter from the ACRS to go forward and publish this. That's kind of a last step we have in this document. When do you see the path forward for us on this now, given that you want

me to go back and do some work on this.

CHAIR STETKAR: I think that's something that you folks need to go back and kind of caucus and decide what needs to be done.

I will tell you that whatever document is sent to the full committee for the meeting ought to be a final, polished document. But whatever changes you may decided to make or not make to the current document to address, you know, the technical issues that we've sort of discussed today, that's up to you, quite honestly.

The document that we've received for the subcommittee meeting obviously needs technical editing and things like that to put it in polished form. So you need to go back and think among yourselves about what changes need to be made to produce a document that the full committee would then review.

The full committee needs that document 30 days in advance of a full committee meeting, so we need to expeditiously schedule a full committee meeting. But, you know, I can't say whether it would be a November full committee meeting or a December full committee meeting. The problem is, we don't have one in January. So, if we don't hit a

full committee meeting by December, then we're looking at February as the first full committee meeting opportunity.

And I'll also tell you that our agendas for November and December are right now pretty full. So dovetailing you in, in that time frame, may require a bit of manipulation on our part. There's a bit more uncertainty, quite honestly, in December. November could be a challenge.

MR. SALLEY: You don't see a need for another subcommittee meeting?

CHAIR STETKAR: I don't, quite honestly, Mark. I think that as a subcommittee, we've discussed these issues. I think we mutually understand what the issues are. I think whatever decisions you make about addressing those issues, certainly in a full committee meeting -- because the full committee hasn't been briefed on this document at all. You need to be cognizant of that fact. So the full committee needs to both understand the basic concepts of the document; the screening, scoping, and the detailed analysis, the qualitative guidance, and the quantitative guidance.

I think the for the full committee's benefit, however you decide to resolve kind of these

two big-picture issues that you've discussed today, the full committee ought to have the benefit of that for people who haven't had the luxury of following all of the detailed ranting.

But I don't see a need for another subcommittee meeting. I think it would not be productive at all. So I think the path forward is make whatever decisions you need to make on the document as it is today, finish it up based on those decisions, get a polished, edited document in place, and get it to us within the 30-day time period.

Keep in contact with John Lai in the near future so that we can start to anticipate when that full committee meeting may be.

And I am planning to be as responsive as we can. I recognize the time pressures. We'd really like to accommodate you according to the schedule, as efficiently as possible. So if we can get it in, in November, that would be great; if we can't get it in, in November, if we can get it in December, that's great. Just recognize that if we don't get it by December, it's going to be February.

You know, we can fit you in, in February.

MR. CORRIEA: We prefer the sooner the

better.

CHAIR STETKAR: Sure.

MR. CORRIEA: I plan to make this a high priority for the staff.

CHAIR STETKAR: Yes.

MR. CORRIEA: We'll go back and consider everything that we've heard today and before. We very much appreciate that, and out goal is to get that to you in November.

CHAIR STETKAR: That could be tight, but as I said, communicate with John because the full committee meeting schedule for November looks pretty tight already. I don't know what options we have. We have some flexibility of moving particular topics around them meetings.

December, there's always a little bit more uncertainty as you go out 60 days, 90 days in the future. But keep that in mind.

Thank you, and as usual, I'll go around the table and just see if there are any final thoughts that any of the members have, and I'll start with Joy.

MEMBER REMPE: Well, I'm an uninformed member in the area of human reliability, and yes, there are some issues that need to be address, but I

did want to say that I thought the document had a lot of good attributes and we informative. And hopefully, the main issues will get addressed.

CHAIR STETKAR: Bill?

MEMBER SHACK: No comments.

CHAIR STETKAR: Dick?

MEMBER SKILLMAN: No comments.

CHAIR STETKAR: Said?

MEMBER ABDEL-KHALIK: No comments.

CHAIR STETKAR: And I certainly don't have anything more to say that --

MEMBER BLEY: Dennis is still here.

CHAIR STETKAR: I'm sorry, Dennis. I thought I got your last shot in. Dennis.

MEMBER BLEY: No, I didn't see that as a last sot.

(Laughter.)

CHAIR STETKAR: Oh, I'm sorry. Then Dennis?

(Telephonic interference.)

CHAIR STETKAR: Dennis, start over again, and you were breaking up.

MEMBER BLEY: Is this any better?

CHAIR STETKAR: Not clear. Try to keep talking and we'll see.

MEMBER BLEY: Let me -- I'm sorry. Let me switch over to --

CHAIR STETKAR: You're real good there if you can continue that.

MEMBER BLEY: Oh, okay. Then I will sit right here.

Jeff Julius raised a few things that kind of triggered some thoughts from me. And I agree, there are a lot of good things in the appendices and detailed analyses.

I did something that I would recommend to the staff to try. I just searched the document for the word "appendix". As you work through, you do see each appendix called out, but generally, in a one-liner, there are some details in Appendix B or in Appendix G.

I think if you had a few caveats about these important issues and had a more thorough reference to the applicable appendices and said what they would find there and why they need to consult it, it could go a long way to help on some of the issues, especially the one dealing with realistic and complex scenario kind of things, but probably with everything.

The appendices are not linked strongly

to the main document, and I think that could help you a lot.

CHAIR STETKAR: In particular, Dennis, you're talking about Appendices B and C that have the detailed methods; right?

MEMBER BLEY: Oh, especially those, but not definitions of terms, but even back to the ATHEANA one and -- but mainly the two you mentioned, yes.

If I pick this up to do an analysis and read that this is how to do it, there's nothing that really pushes me to consider the information in the appendices, and I think that's a shame. And I think people who aren't pushed, some of them won't do it.

And that's it.

CHAIR STETKAR: Good. Thank you. And I'm sorry for ignoring you if it makes you feel any better.

MEMBER BLEY: I'm sure you are.

(Laughter.)

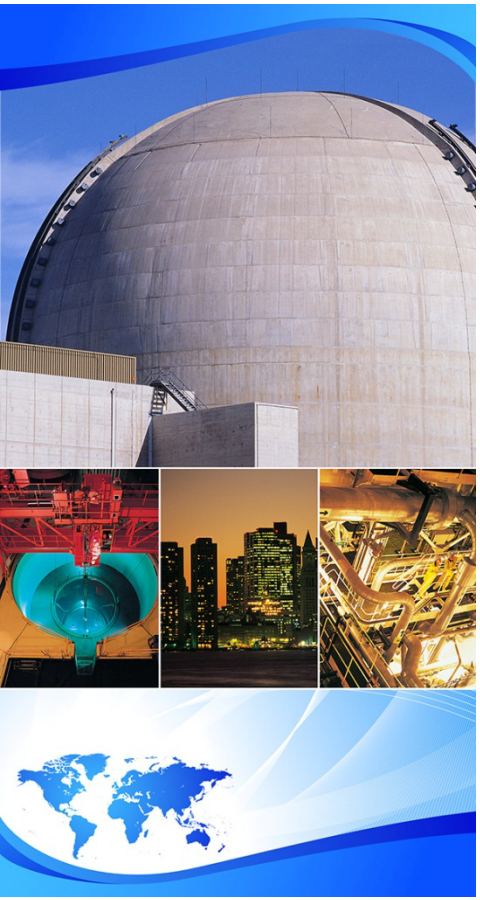
CHAIR STETKAR: Yes, I am.

I don't have anything more to say. Again, I think you. I think we had a really good discussion this time. I really appreciate all the stuff that you've done to get the document.

Honestly, I think it's a really useful document, and I think it will be used, and I think that with what might sound in this environment like a lot of work, looking at the responses may not be that much effort when you stand back and think about it. I think it can be a pretty good document.

So I really appreciate the effort you've put into the discussion, and with that, we are adjourned.

(Whereupon, the above-entitled matter concluded at 4:11 p.m.)



EPRI/NRC-RES FIRE HRA GUIDELINES

Introduction and Summary

Susan E. Cooper (NRC/RES)

ACRS PRA Subcommittee Meeting
September 21, 2011
Rockville, MD

A Collaboration of U.S. NRC Office of Nuclear Regulatory Research (RES) & Electric Power Research Institute (EPRI)

Presentation Outline

- Background
- Project history
- Summary of guidelines content
- Agenda for today

Background on the Issue of Fire HRA

- Almost 50% of USA plants transitioning to NFPA-805
- NUREG/CR-6850 [EPRI 1011989] addresses:
  - Identifying human failure events (HFEs)
  - Assigning conservative screening human error probabilities (HEPs)
  - Fire-relevant performance shaping factor (PSF) information
- NUREG/CR-6850 [EPRI 1011989] does not:
  - Describe a methodology for developing best-estimate HEPs (given fire related effects)
  - Address the HRA requirements of:
    - ASME/ANS RA-Sa-2009, "Addenda to ASME/ANS RA-S-2008, Standard for Level 1 / Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," Chapter 4 for fires
- Consequently, there was a need for fire-specific methods & guidance for best-estimate HRA quantification in fire PRA

EPRI/NRC Fire HRA Guidelines
High Level Objectives

- NRR User Need 2008-003, Rev. 1, Task 13, RES asked to "…expand existing HRA methods, typically used in regulatory applications, to incorporate the effect of fires in full-power PRA models.
- Through joint NRC and industry efforts, address the need for HRA methods & guidance, especially for best-estimate quantification, for use in fire PRAs
    - Expand or modify existing HRA methods
    - Develop guidance for implementing the methodology
- Develop a joint EPRI/NRC report under MOU (similar to NUREG/CR-6850 [EPRI 1011989])
- Consider ASME/ANS PRA Standard requirements and other relevant guidance

➢Move the state-of-the-art for fire HRA a step forward

Fire HRA Project History

- Project initiated: March 5, 2007
- First integrated draft: May 2008
- Peer review: June 2008
- Testing at 2 plants: Summer/Fall 2008
- Revised draft: April 2009
- Quick review by NRR & NRO: April 2009
- ACRS sub-committee information presentation: June 2009
- Piloting by PWR Owner's Group: Summer 2009
- Issued for public comment: December 2009
- Public comment period ended: March 2010
- Resolution of key public comments: June 2010

Fire HRA Project History (continued)

- ACRS sub- & full-committee presentations: Fall 2010
- 1st Joint EPRI/NRC-RES Fire HRA Training Course
  - September & October 2010
- Final public comment resolution: Summer 2011
- 2nd Joint EPRI/NRC-RES Fire HRA Training Course
  - August & November 2011
- Presentation to ACRS PRA Sub-Committee: April 2011
- Presentation to ACRS PRA Sub-Committee & Full Committee: September & October 2011
- Publication of final report: Fall 2011

Fire HRA Guideline Summary

- Standard HRA **process** used
  - Fire HRA process is based on existing processes and guidance:
    - ASME/ANS PRA Standard
    - NUREG-1792 (“Good Practices”)
    - NUREG-1852 (Fire Manual Actions)
    - SHARP1
    - ATHEANA
  - However, additional analyst tasks & emphasis in some existing tasks are needed to address specific needs of fire HRA/PRA, such as
    - information collection and analysis
    - feasibility
    - ability to support Fire PRA successive screening

Fire HRA Guideline Summary

Fire HRA **process steps**:

1. **Identification & definition** of human failure events:
   - Substantial guidance provided, including “go/no go” feasibility test

2. **Qualitative analysis**
   - Iterative process step that continues throughout quantification steps
   - Also addresses evaluation of HFE feasibility under fire conditions
   - As fire PRA develops, fire HRA must consider additional fire scenario-specific details that become available

Fire HRA Guideline Summary

3. Quantification Methods – three levels

- **Screening Quantification**
- **Scoping Fire HRA method**
  - Decision tree format
  - Guidance developed to provide less conservative values than screening without detailed analysis, & to aid reproducibility & reviewability
- **Detailed Fire HRA**
  - Uses existing methods with guidance for application to fire
  - Performance shaping factors modified for the fire context:
    - EPRI Cause-Based Decision Tree & HCR/ORE; & THERP
    - ATHEANA

4. Dependency, Recovery, and Uncertainty Analysis

- As for internal events HRA/PRA, with some modifications for fire event-specific issues

Focus for today….

- Discuss updates to Fire HRA Guidelines, i.e.,
  - Modifications made since the March 2011 draft provided to ACRS Sub-Committee for April 20, 2011meeting
- Includes:
  - High-level summary and categorization of updates
    - Principally based on comments and questions from ACRS Sub-Committee
  - Summary of report revisions (organized by update categories)

Agenda Overview

1. **Introduction and Summary**
2. Updates to the EPRI/NRC Fire HRA Guidelines
   - High-level categories of updates
   - Summary of changes to guidelines
3. Project Status and Path Forward

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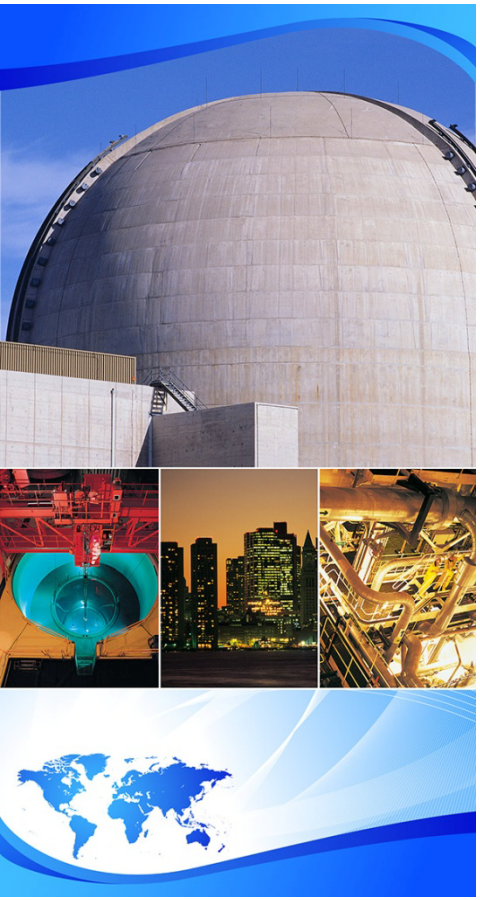


Updates to EPRI/NRC-RES Fire HRA Guidelines

Susan Cooper (USNRC), Erin Collins (SAIC), and Stacey Hendrickson (SNL)

ACRS Meeting – PRA Subcommittee
September 21, 2011
Rockville, MD

A Collaboration of U.S. NRC Office of Nuclear Regulatory Research (RES) & Electric Power Research Institute (EPRI)

Agenda Overview

1. Introduction
2. Updates to the EPRI/NRC Fire HRA Guidelines:
   - Categories of updates
   - Summary of changes to guidelines
3. Project Status and Path Forward

Updates to the EPRI/NRC Fire HRA Guidelines

- Starting point for report modifications was the March 2011 draft provided to ACRS Sub-Committee for April 20, 2011meeting
- Revisions to the report were agreed to:
  - Project team members provided individual reviews
  - If necessary, team discussions were held, leading to consensus
- Revisions were motivated by:
  - Comments and questions from ACRS Sub-Committee (e.g., April 20, 2011 meeting)
  - A few outstanding issues or concerns (e.g., improvements considered useful by project team, further support in responding to a public comment)

Updates to the EPRI/NRC Fire HRA Guidelines (continued)

- To facilitate report revision, categories of needed changes were developed:
  - By report section
  - By issue or topic

- This presentation summarizes the changes by both categorization schemes but is organized to minimize repetitions of overlapping issues (to extent possible)

Categories of updates

Report updates by section:

1. Section 1 Introduction edits
2. Section 2 Identification and Definition edits
3. Section 4 Qualitative Analysis edits
4. Section 5 Quantification edits
5. Section 6 Recovery, Dependency and Uncertainty edits
6. Edits to appendices

Categories of updates (continued)

Report updates by issue:

7. Clarification of treatment of spurious cable failures and multiple spurious operations (MSOs)
8. Add discussion about exploring uncertainties in timing information
9. Add more discussion on main control room (MCR) abandonment
10. Moved old appendix on self-induced station blackout (SISBO); added to Sections 3 & 4

Presentations summarizing changes to guidelines

- Sections 1 & 2 (Susan Cooper)
- Section 4, treatment of MSOs, MCR abandonment, & SISBO (Erin Collins)
- Sections 5 & 6, associated appendices, uncertainties in timing information (Stacey Hendrickson)

Summary of changes to Section 1

- **Edited out:** Several references to ACRS reviews
- **New text added to paragraph on future improvements:**
  - That might be identified via following:
    - Feedback from future NFPA-805 submittals
    - Results of RES' SRM project on HRA model differences
  - Topic areas that might benefit from improvement:
    - Guidance on how to address MCR abandonment in fire HRA/PRA
    - Broadened scope in identifying fire-induced cable failures (leading to spurious indications not currently in the scope of fire PRA but potentially important to HRA)*

* Related to MSO treatment discussed in Sections 2 & 4

Summary of changes to Section 2

- **Added*:**
  - New Section 2.5 - Fire-Induced Spurious Cable Failure(s) and Electrical Fault(s)
    - Summarizes the various ways spurious cable failures are typically modeled in fire PRA task and their treatment in fire HRA
  - Table 2-3 added (supports Section 2.5 discussion)
    - Describes various ways spurious cable failure(s) can impact the plant
    - How the plant impact is typically addressed in fire PRA
    - How the plant impact can be treated in fire HRA (essentially a categorization, e.g., undesired response to spurious failure, potential need for a recovery action, nuisance alarms & indications)
    - Summarizes the treatment of the different categories of spurious failures in NUREG-1921

* In response to ACRS questions and concerns about treatment of MSOs (addressed in more detail in Section 4)

Presentation summarizing changes to Section 4….

- Changes to Section 4
- Clarify treatment of multiple spurious operations (MSOs)
- Add more discussion on main control room (MCR) abandonment MCR abandonment
- Deleted old appendix on self-induced station blackout (SISBO); moved majority of text to Sections 3 & 4

- Changes also made to address uncertainties in developing time information – discussed with Sections 5 & 6

Summary of changes to Section 4 - General

- Make Section 4 “chapter zero” – No changes to report structure (based on team vote)
- ACRS comment “Might be worth emphasizing that we’re copying NUREG/CR-6850 re special cases where little or no credit is given”:
  - Response - Verified call out to NUREG/CR-6850 in Section 4.3.3
- ACRS comment “Suggest adding a comment about impact of security issues on accessibility (e.g., availability of keys).” Text changed as follows.
  - Section 4.3.4 Feasibility Assessment Factors
    - 4.3.4.5 Accessible Location – Bullet on locked doors & the need for keys
    - 4.3.4.6 Equipment/ Tools Available/ and Accessible – Added parenthetical phrase regarding keys for locked doors
- ACRS comment “Do we address possibility of being in multiple procedures?
  - Verified Section 4.6.3 & appendices for detailed HRA address this comment.

Summary of changes to regarding MSO treatment

- Add references to Regulatory Guide 1.205, NEI 04-02, & NEI-00-01
  - NEI 04-02 has been added to list of references in Sections 2 & 4
  - Both NEI documents are referenced in Chapter 3, Section 3.4 under “Cue Parameters”
- Clarify treatment of multiple spurious operations
  - Already discussed adding new Section 2.5 & Table 2-3
    - Also added text to existing paragraph about potential benefit to HRA if scope in identifying fire-induced cable failures (leading to spurious indications not currently in the scope of fire PRA) were broadened
  - Additional changes:
    - Renamed Section 3.4 to “Identification and Definition of HFEs Corresponding to Undesired Operator Responses to Spurious Instruments and Alarms” (previously “Examples of Operator Actions that Result in Undesired Response”)
    - Changes to Section 4 (next slide)

Summary of changes to Section 4 regarding MSO treatment

- A variety of text changes have been made in Section 4, such as:
  - Section 4.3.4.3, Primary Cues Available/Sufficient, two paragraphs added, including mention of how some plants include tables in their fire procedures that identify the instruments most likely to have been impacted by fire.
  - Under development of HFE Narrative, Section 4.5.5 Availability of Cues and Other Indications for Detection and Evaluation Errors, added text on how other fire PRA tasks provide fire impacts on instrumentation that can be a potential distraction to the operator.

Summary of changes to Section 4 regarding MSO treatment (continued)

- A variety of text changes have been made in Section 4: (continued)
  - Under Performance Shaping Factors, Section 4.6.1, Cues and Indications, added discussion such as how:
    - the safe shutdown list of protected equipment will need to be compared to instruments credited in the fire HRA
    - any instruments not included in the safe shutdown list will need to be added to the component selection list for cable tracing

Changes to Section 4 – MCR Abandonment

- New Section 4.8, Qualitative Analysis associated with MCR Abandonment Actions, has been added:
  - Briefly provides guidance specific to MCR abandonment that was scattered across other PSFs
  - Briefly discusses the decision to leave the control room, including:
    - Habitability
    - Ability to control the plant
  - This is an area that would benefit from future research

Treatment of "old Appendix D" on SISBO

- Deleted Appendix D

- Merged relevant text from old Appendix D into:
  - Section 3.3.2, Fire Response Action Identification and Definition:
    - New heading titled "Unique issues for the identification and definition of SISBO HFEs"
  - Section 4.9 (new section), "Qualitative Analysis Associated with SISBO Procedures"

Summary of changes to Sections 5 & 6

- Changes to Section 5:
  - ACRS Comment “There should be a caveat that scoping shouldn’t be used to address SISBO situations”.
    - Section 5.2, list of minimum criteria, last paragraph under #1 Procedures
  - Scoping approach clarification on MSO, under Section 5.2.9 Guidance for …EOC or EOO due to Spurious Instrumentation:
    - “Response may be to a single or to multiple spurious indicators, but the assumption is still the same.”
- Changes to Section 6:
  - Added guidance on dependencies from existing sources
  - Removed statement that lower bound of 1E-5 is required. Section 6.2 now refers to discussions from both NUREG-1792 & EPRI TR-1021081 about the need to establish a lower bound & its associated difficulties.

Added text discussing exploration of uncertainties in timing information

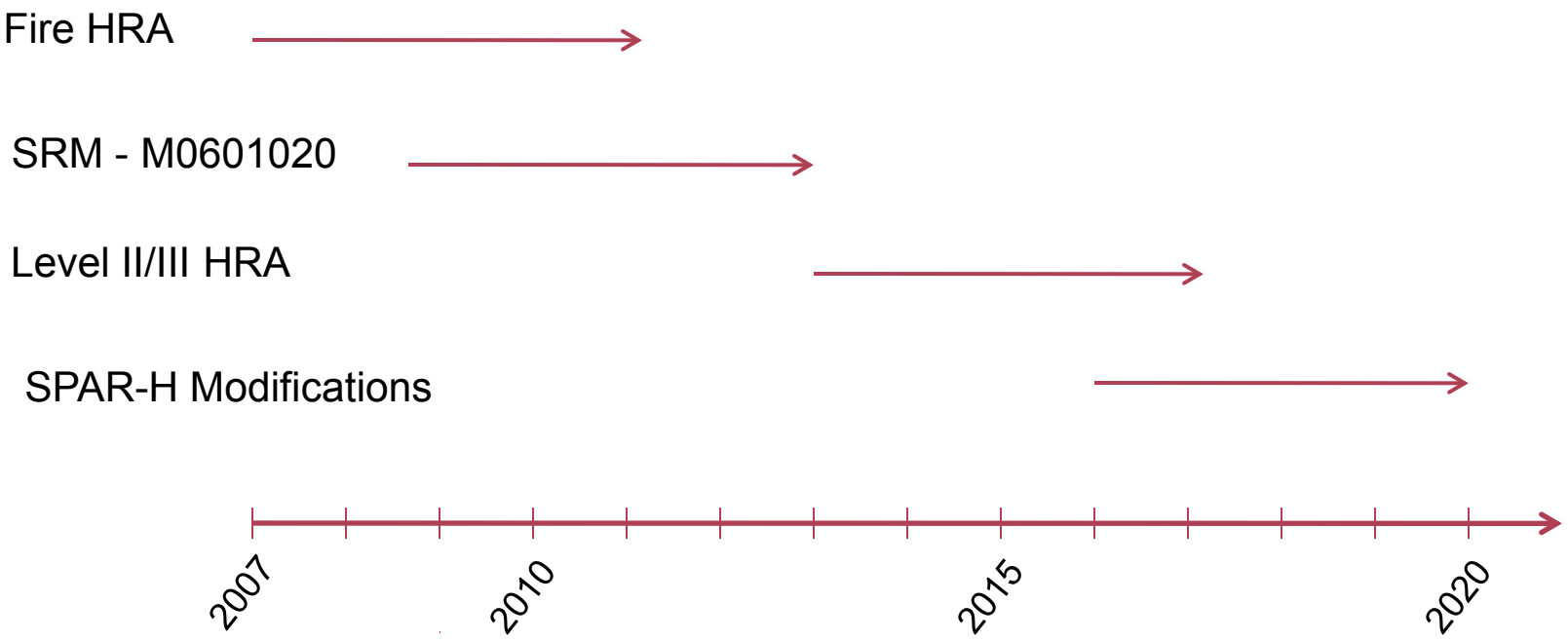
- Depending on location (& associated appropriateness),1-2 sentences have been added in several places to address this issue, e.g.
  - Would be a good practice for HRA analysts to get a good sense of the range of times possible for a particular parameter
- Additions have been made to:
  - Section 4, under Performance Shaping Factors, 4.6.2 Timing,
  - Section 5, under Scoping Fire HRA Quantification, 5.2.2 Calculation of Time Margin
  - Appendix F, Justification for Scoping Approach, F.1 Time Margin

Overall Summary

- Revisions to various sections of report have been made to specifically address:
  - Comments and questions raised by ACRS PRA Sub-Committee
  - A few outstanding issues raised by team members or public comments
- While there is room for additional advances in treatment of fire HRA, the joint team believes that the current report is useful & represents a substantial step forward in the state-of-the-art in fire HRA

Backup Slides

NRC HRA Unification



Summary of changes to Section 4 - General

- Make Section 4 “chapter zero” – No changes to report structure (based on team vote)
- ACRS comment “Might be worth emphasizing that we’re copying NUREG/CR-6850 re special cases where little or no credit is given”:
  - Response - Verified call out to NUREG/CR-6850 in Section 4.3.3
- ACRS comment “Suggest adding a comment about impact of security issues on accessibility (e.g., availability of keys)”: Text changed as follows.
  - Section 4.3.4 Feasibility Assessment Factors
    - 4.3.4.5 Accessible Location – Bullet on locked doors & the need for keys
    - 4.3.4.6 Equipment/ Tools Available/ and Accessible – Added parenthetical phrase regarding keys for locked doors:

      “(especially in light of tighter key controls that some plants may have implemented in response to security needs)”
- ACRS comment “Do we address possibility of being in multiple procedures?
  - Verified Section 4.6.3 & appendices for detailed HRA address this comment. “Implementing unfamiliar or multiple procedures simultaneously could lead to confusion.”

Summary of changes to Section 4 regarding MSO treatment

- A variety of text changes have been made in Section 4, such as:
  - Section 4.3.4.3, Primary Cues Available/Sufficient, two paragraphs added, including:
    - "Many plants include tables in their fire procedures that identify the instruments most likely to have been impacted by fire and provide alternate instruments for the operators' use in parameter verification and scenario diagnosis. These tables provide valuable information to the fire HRA for instrument vulnerability evaluations."
  - Under development of HFE Narrative, Section 4.5.5 Availability of Cues and Other Indications for Detection and Evaluation Errors, e.g.,
    - "In addition to ensuring a minimal set of cues is available to conduct the operator action, the fire PRA can also provide information regarding the additional fire impacts on instrumentation that can be a potential distraction to the operator. This additional information can be used during the quantification of HEPs and/or identified as a potential source of modeling error."

Summary of changes to Section 4 regarding MSO treatment (continued)

- A variety of text changes have been made in Section 4: (continued)
  - Under Performance Shaping Factors, Section 4.6.1, Cues and Indications, e.g.,
    - "The safe shutdown list of protected equipment will need to be compared to instruments credited in the fire HRA and any instruments not included in the safe shutdown list will need to be added to the component selection list for cable tracing. For example, an Appendix R safe shutdown analysis typically does not consider mitigations of a fire causing a LOCA and may not require RWST level indication as part of its analysis. For fire PRA, RWST level indication would be needed to credit operator actions for switch over to recirculation."

Added text discussing exploration of uncertainties in timing information

- Depending on location (& associated appropriateness),1-2 sentences have been added in several places to address this issue:
  - Section 4, under Performance Shaping Factors, 4.6.2 Timing, i.e.,
    - "Given the range of sources for timing estimates and that expert judgment will often be a contributor to the estimates obtained from the various sources, there could be significant uncertainty associated with point estimates obtained for HRA purposes. When possible, it would be good practice for HRA analysts should try to get a sense of the range of times possible for a particular parameter (e.g., time for an operator to align a particular valve locally) for consideration during sensitivity studies/analyses that might be performed for potentially significant events."
  - Section 5, under Scoping Fire HRA Quantification, 5.2.2 Calculation of Time Margin
  - Appendix F, Justification for Scoping Approach, F.1 Time Margin

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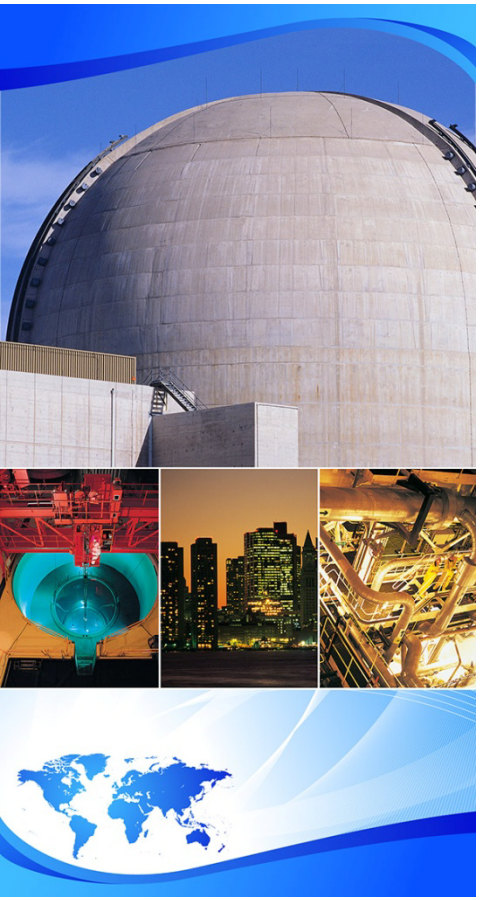

EPRI/NRC-RES FIRE HRA GUIDELINES

Project Status and Path Forward

Susan E. Cooper (NRC/RES)

ACRS PRA Sub-Committee Meeting
September 21, 2011
Rockville, MD

A Collaboration of U.S. NRC Office of Nuclear Regulatory Research (RES) & Electric Power Research Institute (EPRI)

Fire HRA Project Status

- Review, testing, and comments:
  - Peer review: June 2008
  - Testing at 2 plants: Summer/Fall 2008
  - Review by NRR & NRO
  - Piloting by PWR Owner's Group: Summer 2009
  - Public comments on December 2009 draft report (March 2010)
  - Feedback on trial use by authors
  - Feedback from ACRS: April 2011
- Various revisions to report:
  - First integrated draft: May 2008
  - Revised draft: April 2009 (based on peer review & testing)
  - Issued for public comment: December 2009
  - March 2011 draft for ACRS briefing
- Publication of final report: Fall 2011

Fire HRA Project Status (continued)

- Joint EPRI/NRC-RES Fire PRA Training
  - ½ day, "for information only" presentation on fire HRA (June/October 2009)
  - Developed a new "track" for fire HRA in EPRI/NRC Fire PRA Course (Summer 2010)
  - Full-track, Fire HRA Training presented (September and October 2010)
  - Full-track, Fire HRA Training repeated in 2011 (August and November 2011)
  - NUREG/CP documenting 2010 training (with presentation slides and follow-along CD of videotapes) is in progress
  - Full-track, Fire HRA Training for 2012 is being planned

Fire HRA Guidelines Path Forward

- We now expect the final Fire HRA Guidelines report to be issued in 1-2 months (i.e., Fall 2011).
- It is anticipated that this guidance will be used by the industry as part of transition to NFPA-805 and possibly in response to other regulatory issues.
- This is the first report addressing fire-related HRA for fire PRA that goes beyond the screening level.
- As the methodology is applied at a wide variety of plants, the document may benefit from future improvements to better support industry-wide issues being addressed by fire PRA.

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