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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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RELIABILITY AND PROBABILISTIC RISK ASSESSMENT

(PRA) SUBCOMMITTEE

MONDAY

JUNE 1, 2009

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ROCKVILLE, MARYLAND

The Subcommittee convened at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike at 8:30 a.m., Dr. George Apostolakis, Chairman, presiding.

SUBCOMMITTEE MEMBERS:

GEORGE APOSTOLAKIS, Chairman

SAID ABDEL-KHALIK, Member

DENNIS C. BLEY, Member

HAROLD B. RAY, Member

MICHAEL T. RYAN, Member

WILLIAM J. SHACK, Member

JOHN D. SIEBER, Member

JOHN W. STETKAR, Member

DESIGNATED FEDERAL OFFICIAL:

GIRIJA S. SHUKLA, ACRS Staff

Reported By: Toby Walter

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

8:30 a.m.

CHAIRMAN APOSTOLAKIS: The meeting will come to order. This is a meeting of the Advisory Committee on Reactor Safeguards, Subcommittee on Reliability and Risk Assessment. I'm George Apostolakis, Chairman of the Subcommittee.

Subcommittee members in attendance of Said Abdel-Khalik, Dennis Bley, Bill Shack, Jack Sieber, John Stetkar and Harold Ray.

The purpose of this meeting is to discuss draft regulatory guide 1.205. This conformed -- performance based fire protection. The development of guidelines for performing human reliability analysis in fire probability risk assessments, and risk methods for new light worker reactor risk informed applications.

The subcommittee will govern information, analyze relevant issues and facts and formulate proposed positions and actions as appropriate for deliberation by the full committee.

Mr. Girija Shukla is the designated federal official for this meeting. The rules for participation in today's meeting have been announced as part of the notice of this meeting, previously published the Federal Register of May 14, 2009. A transcript of the meeting is being kept and will be made available as stated in the Federal Register notes. It is requested the speakers first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

We have received the request from the Nuclear Energy Institute to make an oral statement, which we will hear at the end of this morning's staff presentations.

We will now proceed with the meeting, and I call upon Mr. Steven Laur of the NRC staff to begin. Mr. Laur?

MR. LAUR: I'd like to turn to my distinguished colleague.

CHAIRMAN APOSTOLAKIS: Mr. Cunningham, it's a pleasure to have you here.

MR. CUNNINGHAM: Good morning, I'm Mark Cunningham, the director of the division of risk assessment at NOR. I want to thank the committee for the opportunity to get you up to speed on one piece of the fire protection work that we have underway. This is -- you're going to get a snapshot, if it will, of -- in time of -- of what type of changes we've been making to our regulatory guidance on fire protection for plants that are transitioning to NFPA 805.

We have -- the public comment period has ended, as Steve and Margaret will discuss, but we haven't had a chance to assemble all the comments and look at them.

Sue, get a snapshot of where we are on this particular issue.

I think -- I want to look forward to the opportunity over the summer and fall to coming back to the committee on a variety of fire protection issues. This is -- as I mentioned, this is with respect to NFPA 805. We have a lot of work going on -- and this is regulatory guidance with respect to NFPA 805. We have the two pilot plant reviews under way, and we also have work in regulatory guidance for plants that are not transitioning to NFPA 805. So we have a lot on our plate on fire protection, and we look forward to a continuing dialog with the subcommittee and the full committee on that.

CHAIRMAN APOSTOLAKIS: So at some point you will require a letter.

MR. CUNNINGHAM: At some point we'll request a letter, yes.

CHAIRMAN APOSTOLAKIS: That will be when, in the fall?

MR. CUNNINGHAM: September.

CHAIRMAN APOSTOLAKIS: September.

MR. CUNNINGHAM: At your full committee meeting, yes.

CHAIRMAN APOSTOLAKIS: Okay.

MEMBER SHACK: Let me ask just a procedural question. You know, the rule calls that NFPA 805-2001. The copy we're looking at now is 2006. Do we have to sit around using 2001 until we make a rule change, or how does this work.

MR. CUNNINGHAM: That's -- procedurally, that's correct. At this point, there is -- there are not any immediate plans to switch to the newer version, if you will.

CHAIRMAN APOSTOLAKIS: Who is joining us on the phone, Girija?

MR. SHUKLA: No, I do not know the name.

CHAIRMAN APOSTOLAKIS: Are you there?

So, Mark?

MR. CUNNINGHAM: Well, with that I will turn it over to Steve and Margaret to proceed. Thank you.

CHAIRMAN APOSTOLAKIS: Okay, all right.

MR. LAUR: I'm Steve Laur. I'm a senior

level advisor in the Division of Risk Assessment, and I'll be presenting the first part of this presentation, and then Margaret Stambaugh, to my right, will be presenting the initial feedback we heard as a result of some public meetings.

The objective of today's briefing is not to get a letter, but basically to foster ACRS understanding of the changes. We submitted a request for a waiver from ACRS review prior to public comments, I want to say back in February or March. I think it was discussed in the March meeting, and at that time we were granted a waiver but ACRS asked that we come in and explain the rationale and summarize the changes to the reg guide, and that's what we're going to do today.

So, basically, the first bullet here is we're going to look at Reg Guide 1.205, the proposed revision which is Draft Guide 1218, and then very briefly talk about the new Standard Review Plan, and I said very briefly because they basically are compliments -- one tells the industry one acceptable means of meeting the regulation, and the other tells our staff how to review an application. So when all is said and done, those two will -- so any changes we make as a result of public comments or other input to the reg guide will be reflected in the standard review plan.

So I'd like to cover a couple of very brief slides on the framework for both the standard review plan and the reg guide, and then talk about why are we revising it. It was issued in April of 2006 originally, after the usual vetting through the ACRS, the public, and then all the way up the line. So why are we changing it? I'll talk about what those drivers are, and then pretty much go into a detailed discussion of the key changes.

Now this assumes a familiarity with the -- with the documents that I'm sure that you've looked at, so -- but any time you have any questions feel free to ask even before that last bullet that -- that talks about questions.

Okay, so the standard review plan. In NUREG 0800 --

CHAIRMAN APOSTOLAKIS: So no change in the way we operate? We never ask questions while the speaker is speaking.

MR. LAUR: I have no -- feel free.

CHAIRMAN APOSTOLAKIS: Okay.

MR. LAUR: In the existing NUREG 0800 there is a -- or there was 9.5.1, it had to do with traditional fire protection programs, and that has now been renumbered to add another decimal. So let us add a new SRP section for the Risk and Form Performance Based Fire Protection Program, pursuant to 10 CFR 50.48, alpha and Charlie (a) and (c). In both cases you have to meet paragraph A, and for traditional it's alpha and bravo, and for risk informed performance based it's alpha and Charlie.

But the only other thing on this slide that we want to point out is we are developing a safety evaluation report template to aid in efficiency reviews and consistency, and that will follow exactly the format of the standard review plan; in fact, it's already been drafted. Now we're just filling out the details, and that will be fleshed out when we actually issue the two pilot plant safety evaluation reports.

Now the reg guide, as I mentioned, when the risk informed performance based rule was -- was published in 2006 the staff drafted Reg Guide 1.205, and the industry drafted a document, NEI 04-02. The current version of the reg guide endorses NEI 04-02, revision one.

In March of last year, the industry put out revision two to that document, and one of the purposes of this reg guide is to endorse the new revision, and once again with -- with some clarifications and exceptions.

And that leads into the drivers. Why are we making the change? Well, the first thing is we have a new NEI industry document, revision two. Part of the rationale for that change had to do with resolution of frequently asked question issues that have arisen during the scope of the pilot plant reviews.

In general, what we're doing is we're trying to integrate lessons that we learned from pilot plant observation visits which have been going on for several years now; from prior PRA reviews that we did in February and March 2008 for the two pilots; and also the license amendment request reviews. The license amendment requests were received in May of 2008 from both Shearon Harris and Oconee. We've been reviewing those ever since, and we actually had on-site audits in February and March of this year. From all these sources we have -- have gained a better understanding of how this regulation and the guidance is being interpreted and applied by the licensee, leading to the need to do a revision to the reg guide.

I'm going to put the table of contents. This matches as far as the A,B,C,D, virtually all the reg guides out there, all but one. But what I want to point out is that in the reg position there are four subheadings. These are from the original reg guide and the current 1.205. They first talk about the NEI 04-02 industry guidance, then we talk about how a licensee transitions from its current fire protection program to one that's based on NFPA 805. We talk about the fire protection program itself, and then in section four is analytical methods and tools, both fire modeling including V and V and other aspects, and the fire PRA.

Okay, we're not proposing to change that big picture structure, although we have made some changes within that. I'm going to go over those.

Okay, so I've got three or four or five slides here. I can't remember how many, but there in a two-column format to try to put the key changes in Section Charlie of the reg guide, the regulatory position. There are some changes up front in Section A, and there are some other changes. But this is where the meat of the material is, and, hopefully, you had a change to read the more voluminous crosswalk that was provided. So this is just a summary; and feel free to ask questions, George, or any other --

CHAIRMAN APOSTOLAKIS: Go ahead.

MR. LAUR: Well, so in Section One, C-1, the existing reg guide endorses NEI 04-02, and there's a couple of sentences buried in paragraphs that say, for instance, you don't endorse the -- the references. We don't endorse all the appendices and that sort of thing.

But then when you actually get to the rest of the reg guide, which is relatively large for something that's endorsing an industry document, you realize that there are subtle changes, subtle differences between that and the NEI document. And so what we tried to do here is go through and explicitly list the exceptions that we're taking. Now they're explicitly listed in terms of the topic. They're not explicit in terms of paragraph and verse -- or chapter and verse. They're basically saying, for instance, if there's a conflict between the rule language and what's written in NEI 04-02, the rule language shall --

Section 2.2, several changes. This is the license amendment request content, and -- yes, sir?

CHAIRMAN APOSTOLAKIS: Yes, I was reading it. Is it standard for the NRC staff to say that they're endorsing a new industry document but not the references?

MR. LAUR: Yes.

CHAIRMAN APOSTOLAKIS: Yes, that's pretty much standard, because if you did not say that what would happen? Somebody could pick up a reference and say, well, gee, this is great, we'll do it?

MR. LAUR: I'm not sure.

CHAIRMAN APOSTOLAKIS: Well, there's a list of references at the end, say 10 references --

MR. LAUR: Right.

CHAIRMAN APOSTOLAKIS: -- some papers from the International Journal of Heat Transfer and so on. Are you explicitly stating that these are not approved, yet precluding the possibility that somebody might pick up one of those papers and say, well, gee, that's great, I'll do it?

MR. LAUR: Well, okay, don't -- we're neither endorsing nor the opposite, condemning. We're basically being mute on the topic.

CHAIRMAN APOSTOLAKIS: Yes.

MR. LAUR: The -- the -- and since the reg guide is only one way of demonstrating compliance -- one way that's acceptable to the staff, then someone can certainly say well here's a paper, and we used this method. It just means that we're going to have to review it, and they're basically either going beyond the reg guide or taking an exception to the reg guide.

CHAIRMAN APOSTOLAKIS: But the fact of the cite is irrelevant, that's really what you're saying?

MR. LAUR: In general, right.

CHAIRMAN APOSTOLAKIS: That's interesting. Actually, that's the right thing to do.

Okay, let's go on.

MR. LAUR: In Section 2.2 we have several things under content. Actually, the content hasn't changed that much. What happened was in 2.2 of the existing reg guide it talks briefly about two paragraphs of 10 CRF 50.48, and it mixes them, but it references them. And the first one is 50.48(c)(2)(7) which says notwithstanding the -- this is the NFPA -- notwithstanding the -- this won't allow you to use performance-based methods for the chapter three fundamental fire protection program and design elements. But the rule says, yes, you can if you ask in a license amendment request.

Then Section 50.48(c)(4) says you may use risk informed performance based methods not described in this book with a license amendment request and, you know, approval by the staff. Those two sections are fundamentally different, but they have very similar criteria, like difference in depth and safety margins and risks shall be acceptable. So they look similar, and they were combined in the original reg guide into one section, 2.2, and then they were also later in Section Three in more detail. We thought it was clearer and cleaner to have it in one place and to separate it into the two thoughts, because they are different thoughts.

For example, the pilots, neither one them are invoking 50.48(c)(4), and it's unlikely that very many people will do that.

CHAIRMAN APOSTOLAKIS: Can you tell us what 58.40 (c)(4) is? Don't assume we know.

MR. LAUR: Okay, in the rule itself there are -- it provides -- in the standard, which is part of the rule --

CHAIRMAN APOSTOLAKIS: Yes.

MR. LAUR: -- it has two -- basically two performance based -- so-called performance based methods. One is fire modeling. If you can show that it's sufficient to the hazard or that the maximum limiting or some other scenario. If you compare the --

CHAIRMAN APOSTOLAKIS: Right.

MR. LAUR: The other one is fire risk and you show that the risks increases, if any, are acceptable, etcetera, and you consider defense in depth and safety margin.

Okay, so those are the two performance based methods allowed or described in the standard. What (c)(4) would allow is someone to come in with -- we don't know what it might be -- but some other different risk informed or performance based method with prior NRC approval and apply that to their fire protection program.

CHAIRMAN APOSTOLAKIS: You keep saying (c)(4), but here it says (c)(2).

MR. LAUR: I'm sorry, I thought you'd asked about (c)(4). (C)(2)(vii) -- in the standard it says -- in Chapter Three which is things like fire pumps and stand pipes and hoses and fire brigades and a lot of other stuff, but it says you may not use performance based methods for chapter three. An off-the-top-of-my-head example would be you couldn't do a risk assessment and say that a three-man fire brigade is acceptable. Those -- those requirements are fundamental parts of the program.

Our rule modifies that and says, yes, you can use performance based, but you have to submit a license amendment request and have the staff review and approve it. That's the (c)(2)(vii). The (c)(4) has to do with let's come up with some totally different risk informed performance based method. Maybe it doesn't use a fire PRA. Maybe it uses some other thing we haven't thought of. We're not precluding that in the rule. And that's the one that the two pilots did not ask for 50.48(c)(4).

So we've combined -- we've combined -- from Section Three it's no longer there. It's moved into Section Two, but then we split it to talk about these two different --

CHAIRMAN APOSTOLAKIS: What is it that prompted this change, say, about the fire brigade? Are the PRA methods sophisticated enough to tell the difference between three and four members.

MR. LAUR: Probably not.

CHAIRMAN APOSTOLAKIS: I mean, did somebody request that change or --

MR. LAUR: No, I don't think so. It's strictly a hypothetical.

CHAIRMAN APOSTOLAKIS: Many times, identify yourself with sufficient clarity and volume. I mean, why --

MR. LAUR: This is Paul Lain with the NRR

Fire Protection staff. I think you were just using that as a hypothetical. No one has suggested using a three-man fire brigade staff, but I think what you're talking about is being able to --

It also has the -- the standard for the sprinkler system and the standards for the penetrations and that kind of thing, and those things were supposed to be if you were going to use performance based methods on those the staff wanted to see them.

CHAIRMAN APOSTOLAKIS: Thank you.

MR. LAUR: Also in Section 2.2 there's a statement that basically talks about risk evaluations that should be performed, and we've beefed this up a little bit. There seemed to be some confusion about what's required in NFPA 805 and what the pilot plants are actually doing. And specifically there's an overall thing called a plant evaluation. It says if you change a previously approved fire protection program, assess the risks -- an integrated assessment of risks -- safety margins, okay.

And that's in here and it -- and that's what everybody seems to be sending us in terms of the license amendment requests. But there's another part that says if you're not going to meet the deterministic requirements of chapter four of the standard which has to do with a given fire area maintaining, for example, one train of equipment free from damage so you can safely shut down.

If you're not going to -- if you're not going to be able to meet that deterministically, then you can use either fire modeling or fire risk, and there's a second risk assessment that's required in that part of the rule that says compare your proposed alternative to these deterministic requirements, okay?

Those are -- they sound very similar but in the one case if you didn't change anything from your existing fire protection program through the transition to 805 there would be no change in risk. You could still have that happen and not meet the requirement -- the requirements in the rule so you'd have to do that other piece of the risk. And they both have the same requirements in terms of acceptance criteria and it's integrated, the calculated -- early release frequency, etcetera.

CHAIRMAN APOSTOLAKIS: I get the impression that the main thrust of all this is that risk assessment is allowed now everywhere. If you don't need something and you don't convince us you're doing a risk analysis, that you are still within acceptable limits, that's fine. Is that the correct impression?

MR. LAUR: I think so, yes.

CHAIRMAN APOSTOLAKIS: That's a good step forward I think.

MR. LAUR: Anyway, in Section 2.2. we have added explicitly that not only do you have to do the plant change evaluation but where you have used fire risks to demonstrate compliance, you have to demonstrate that compliance. I don't know if I'm stealing your thunder here, but this really only comes into play from a practical standpoint, or so far it seems only to come into play when you have an operator manual action that becomes what's called a recovery action in here, because there's a statement in here that says -- this is paraphrasing but I can read it if you want.

It basically says if you have a recovery action that's necessary to meet this deterministic requirements, that shall imply use of the performance based method.

In Section 2.2. we've added two, I guess what we considered missing areas in the original. 2.2.5 has to do with non-power operational modes, and 2.2.6 has to do with radioactive release transition.

I don't know why they were left out, but in going through this with a team of experts we discovered this was -- there were basically holes in the original document.

2.3 in the existing reg guide talks about what's called existing engineering equivalency evaluations, which is actually a section in NFPA 805 that allows you -- it says when applying the deterministic approach of chapter four you may basically show an equivalent level of fire protection with engineering equivalency. And virtually everything we have in here in the new version was some place in the -- the original version of 1.2.5, but it was very confusing, at least to novices like myself, that came in late in the game. So what we think we've done here is to make it more clear how your existing fire protection program may or may not comply with your new fire protection program if you're going to be an NFPA 805 plant.

So, for example, if you're using an existing engineering equivalency evaluation, Section 2.2.7 of this rule allow you to -- allows that to meet the chapter four deterministic requirements, and you see in the orange there we added that recovery actions must be evaluated using performance based methods because that's actually in the rule.

The next one, the bottom row, operator manual actions and recovery actions, a recovery action is a defining in the 805 standard, and it's something like actions necessary to achieve the nuclear safety performance criteria that are performed outside the main control room or primary control station or stations, including repair and recovery.

Yes, sir?

MEMBER STETKAR: We need to spend a little time on this, because quite honestly I'm mystified by the -- the definition of the term recovery action. You know, I'll call it RALF for now because I don't really understand what it means.

So, let me give you a couple of examples here that I've tried to think about. Suppose I have a motor-operated valve that must be operated to respond to a fire scenario. It's one of the valves that must be operated to, you know, align some system. If the hand wheel for that motor-operated valve is located, let's say 20 feet outside the main control room door and the operator must go to that hand wheel and open the valve manually -- mechanically with the hand wheel, is that a recovery action?

MR. LAUR: Yes, that's what I thought.

MEMBER STETKAR: Suppose that that valve is normally controlled from a panel, an electrical panel, that's located in the basement of a building that I'll call the service building which is in a different building from even the main control room, but its control switch is there, and the operator must leave the main control room or call a local operator and tell that person to go to that control panel and turn the switch to open that valve. Is that a recovery action?

MR. LAUR: That's the place where the valve was normally operated?

MEMBER STETKAR: That's correct. That's where its switch lives.

MR. LAUR: Not according to NFPA 805 and not according to how we've written the reg guide.

MEMBER STETKAR: Okay, does that make sense?

MR. LAUR: I can't answer.

MEMBER STETKAR: Well, to me it doesn't. To me it makes absolutely no sense whatsoever to the fact that -- that just simply because a human being must walk 20 feet and mechanically open a valve, that is defined as a recovery action -- or a RALF that I'll call it.

And in a second case either someone from the main control room may need to go perhaps two or three hundred feet or get on the radio and call someone else and have him go from wherever he is in the plant and turn the switch, and that is not a recovery action. That second action is not defined as a recovery action. It is not a RALF and, therefore, the second action need not be evaluated within the context of our risk informed performance based analysis, while the first one must. It doesn't make any sense at all. Thank you. As does, I understand, the transition from the main -- the transition from the main control to a remote shutdown facility is a recovery action, but only in the sense of transferring the power in the control; is that correct?

MR. LAUR: Oh, okay. Now -- let me just clarify -- now what you're talking about is how we have tried to define primary control station.

MEMBER STETKAR: That's exactly correct, or it's defining the term recovery action. Why isn't it just simply defined as any action that involves control or operation of equipment from a -- from a location that is not normally manned. It's a very simple definition.

MR. LAUR: Yes, it is. But the

definition of recovery action as I stated is in this --

MEMBER STETKAR: But that's fine. That's an industry document.

MR. LAUR: Well, I'm trying --

MEMBER STETKAR: The staff can define it --

CHAIRMAN APOSTOLAKIS: To clarify, why don't you just say human actions?

MEMBER STETKAR: I prefer that, except they want to restrict it to things inside the control room don't need to be evaluated. I disagree with that concept.

CHAIRMAN APOSTOLAKIS: Why -- why does it have to be restricted?

MEMBER STETKAR: I don't know. I disagree with that concept. I think we'll come -- we'll get it -- well, but the definition isn't part of this afternoon. This afternoon is methods.

MEMBER BLEY: And the requirements.

MEMBER STETKAR: And the requirements. Okay, so this -- this defines what those methods need to be applied to.

CHAIRMAN APOSTOLAKIS: Why does this discussion on operator human actions or operator actions, why do we need to restrict it?

MR. LAUR: Okay, I believe there's -- your points are very well taken. I think there's a couple of aspects here. If you use fire risks at all, if you develop a fire PRA, which both pilots are doing and it looks like as far as we can tell most of the people coming in after the pilots we'll be using, the standard requires that the PRA match the as-built, as-operated and maintained plant. It doesn't say reasonably, it says match.

Okay, so the operator actions in the PRA sense of the word are modeled, if they meet the criteria in the standard. They'll be modeled with the human reliability analysis. That part of it -- and so whether the guy does it with a hand wheel and it's right outside and, therefore, the performance shaping factors are such that it's very easy, or if it's a remote switch, he's got to crawl through a tunnel or something, in theory that all comes out in the evaluation of the human error probability, okay?

That's -- that's not really what we're talking about here. What we're talking about here -- and by the way that would be in the fire core damage frequency and the fire release frequency, it would be in there, and in the licensee's assessment of the results of this application they would have to identify key sources of uncertainty, and if any of those that were operator or manual actions or human error probabilities or whatever you want to call them would be evaluated and assessed for sensitivity or other means.

But what we're really talking about here is compliance. How do you comply -- and for whatever reason I don't -- I don't know -- well, there's two things that happened here. One is we have -- we didn't endorse this in the rule. We incorporated the language in our 10 CFR, so it's different than, for example, the ASME/ANS PRA standard where we used a regulatory guide to say where we do and do not endorse that.

If that were the case we could very easily say this definition of recovery action --

CHAIRMAN APOSTOLAKIS: I'm getting confused now. Why do you need the word recovery at all? Can you explain that?

MR. LAUR: Why do you need it?

CHAIRMAN APOSTOLAKIS: Yes. Why not operator actions? Why do you have to specify recovery and then you have the problem --

MR. LAUR: I think I've got my colleague

getting ready to help me here.

MR. WEERAKKODY: This is Sunil Weerakkody, Deputy Director of Fire Protection. I'm going to -- obviously we're going to take a hard look at the definition of the PCS or primary control center and how we are using it in the reg guide, because this is one area we have gotten some comments from the industry, so we will -- I want to first say that we will take a hard look at it.

But I also want to say that why -- not as -- it may not be as critical as it looks superficially. A couple of key things here is that -- and then Steve kind of mentioned this -- we are evaluating the risks of both of those scenarios whether the -- the valve is 20 feet away from the control room, or whether it is in a service ward or intake structure that's 300 feet away with the control switch. So they will be both evaluated.

The question -- one of the things that we are trying to do is when -- when people transition to -- we're trying to figure out what are the things that the plant is trying to change. In fact, the plant came in designing a particular way. In this particular case, the plant was originally designed the switch in the intake structure. Now is the licensee got that plant designed that way, that's one thing. So now they are trying to change something. If you do a change analysis, that's when this definition comes into play and where are the -- where the definition makes sense.

For example, in the case where they had the switch in the service intake structure, if the licensee tried to rely on that switch as opposed to a switch that they had in the control room, then you need a change analysis, in addition to the realization. But if the plant was designed with simply a switch, then the licensee is not doing a change. Obviously, you're -- I'm just saying this because --

MEMBER STETKAR: Wait. But they're not changing the plant design; they're changing the fire protection program. If, for example, I change the suppression system for a particular plant area. It might be a cable spreading room in the control room. So it's not the main control room, it's not the service water building. But I'm changing the fire protection system, suppression system for a cable area that would affect the operation of some systems, not even the service water system, some systems such that the fire impact from the change in that suppression system now requires the operators to use this valve.

It's a change to the fire protection plan, the fire protection system design, if you will, which comes under NFP 805, but the plant now needs to take credit for that valve. They didn't in the current condition, and I'm not changing the design of that system. I'm not changing the design of the valve or the design of that valve control, except that now the licensee needs to take credit for that valve.

You're saying that because the valve switch is in the service building the licensee need not perform a risk informed evaluation of that change; however, if the valve only had a manual handle that was located outside the control room, the licensee would be required to perform a risk informed evaluation. Simply because one action is defined as "a recovery action," then the other action is not defined as "a recovery action." Or am I not understanding this?

MR. LAUR: No, that's not correct. No, if you change something in the plant or the fire protection program, the plant change evaluation requirement here, which is different than -- it does not invoke recovery action. It just says a change to a previously approved fire protection program.

So if you go from relying on Valve A to Valve B or whatever your change is, you would have to do an assessment of that, a risk assessment of that. Okay?

MEMBER STETKAR: I understand.

MR. LAUR: And it has nothing to do if it's a recovery action or not. What we're strictly talking about is -- and I think this would usually happen when you're adopting 805 or if you're an 805 plant and you discover something that you've missed or something, but how do you demonstrate compliance on a fire area by fire area basis as required in Section Four here?

There's two big picture ways. One is meet the determinacy requirements, which you can do with one of these engineering equivalencies or by meeting them directly, or by the performance based, okay?

So let me give you a quick couple of examples. The deterministic requirements in here are very similar to Appendix R, so if I go into a room and I find 15 feet of separation instead of 20, but NRC has approved an exemption of 15 feet instead of 20, then we have basically said that that's equivalent level fire protection, and that meets -- that's -- to meet Section Four.

Okay, if we have an operator action, operator manual action in today's parlance, that would meet the definition of recovery action in this standard. It says in this standard that cannot be one of the deterministic requirements. You have to go performance based.

Now they can do either the fire modeling or fire risk. If they choose fire risk they're going to have to evaluate that risk and we're going to compare it to our acceptance guidelines.

MEMBER STETKAR: But only if that action is defined as "recovery action."

MR. LAUR: Yes.

MEMBER STETKAR: And in my example one action is a "recovery action," and the other is not, even though I'm operating the same -- precisely the same valve.

MR. LAUR: Right.

MEMBER SIEBER: It depends on how many things the operator has to do. If you're just going to consider the one segment that you have allotted duties for this guide, the chance of making a mistake is greater.

MR. LAIN: This is Paul Lain again from the NRO Fire Protection staff. The reason I've been told by the people who wrote NFPA 805, the reason for having recovery action separate from operator manual actions is that in Appendix R base to go to hot shutdown you're not necessarily allowed to repair things, where in 805 you're allowed to repair things to reach a nuclear safety performance criteria, and in that thought it's also going to be analyzed in that aspect, also, so where in Appendix R it wasn't. It was analyzed for feasibility, but it wasn't necessarily analyzed to the depth that it was analyzed here in 805.

MEMBER STETKAR: I understand repairs --

MR. LAIN: Yes.

MEMBER STETKAR: -- you know, somebody going out and getting a new set of bolts and, you know, some tools and disassembling something --

MR. LAIN: Oh, right.

MEMBER STETKAR: -- and putting a new part in. I understand --

MR. LAIN: And I was just trying to -- that's the baseline of why we have --

MEMBER STETKAR: Why we have new wires, you're right.

MR. LAIN: -- why we have recovery actions versus they wanted to step away from operator manual actions and make a distinction, so that's why we have the new -- new term recovery actions.

CHAIRMAN APOSTOLAKIS: So where does that leave us?

MEMBER STETKAR: Well, it's a follow on of a 30-year-old mythology that people put certain types of actions into a box that had a name recovery on it. It used to be that those actions were labeled recovery because they had no procedure written for them. That -- that was the 30 year old.

Now we're perpetuating this myth that somehow an action in that box is somehow fundamentally different from an action in a box with a different label on it, but indeed it's the same fundamental performance.

CHAIRMAN APOSTOLAKIS: So how would you change the bottom box there on the left? If you were presenting it what would you say, operator actions?

MEMBER STETKAR: I would say any -- any manual actions taken in reaction to a fire scenario.

CHAIRMAN APOSTOLAKIS: Or operator actions?

MEMBER STETKAR: Manual actions, which could be the manipulation of a switch. It could be a push button. It could be a, you know, mechanically operating valves.

MR. BARRETT: My name is Harry Barrett. I work for the fire branch in NRR. I think what you have to -- you have to put this in the context of the use of recovery action in the definition of 805, and that's related to the fire damage to the control wiring.

Okay, if you end up having a fire that damages the control wiring for a valve you haven't protected, then you have to end up doing a recovery action in order to regain functionality of that valve.

Okay, now in the case of -- of -- of the prior control station definition, if you picked a locally operated valve that was not in the fire area as far as the control cable -- so it was not damaged and you haven't lost functionality of that valve, then you can end up using that valve from that location, pretty much free of what happens from the fire. It's just a standard, you know, risk assessment. You have to look at whether or not the guy can do it in the time frame he needs, but in the case of --

The way the rule is constructed is basically looking at standard 3(g)(2) concept or the separation between trains and anything that goes through where you have both trains and one wire, and you pick and you protect it. And what it's really saying is if you have some that are not protected, you've got to assess your ability to go out and make that -- that component go to the position you need it to, so the recovery part of that is to regain functionality after fire damage.

CHAIRMAN APOSTOLAKIS: Let me ask the question different. Would you object to just calling them manual actions? What would be the downside of that, as Mr. Stetkar is proposing?

MR. BARRETT: I wouldn't necessarily object to that. It's just not the rule language. The rule language is very specific about recovery action and -- control station. We tried to stay within the bounds of the rule.

CHAIRMAN APOSTOLAKIS: So we're talking about something else now. Legalistically, there cannot be --

MR. BARRETT: I wouldn't say we can't change it.

MEMBER BLEY: Well, they decided not to. Well, they adopted the rule though in their own writing.

CHAIRMAN APOSTOLAKIS: This is a regulatory guide. They cannot deviate from the rule here. I mean, the rule is a rule. That's what I'm saying, if it's in the rule then the whole point is moot. I mean --

MEMBER SIEBER: That's right.

CHAIRMAN APOSTOLAKIS: Unless they change the rule. The guide cannot change the rule.

MEMBER SIEBER: That's in 50.46.

CHAIRMAN APOSTOLAKIS: And it took us 20 minutes to get there, right? Sunil, you said that the industry commented on this. What did they say? Did they agree with Mr. Stetkar?

MR. WEERAKKODY: I didn't -- I didn't have a --

CHAIRMAN APOSTOLAKIS: That's fine.

MR. WEERAKKODY: I just know that they had a number of comments. I don't know whether Steve had a chance to go through them.

MR. LAUR: I don't know if they would agree with that definition, but they definitely don't agree with what we're saying.

CHAIRMAN APOSTOLAKIS: They do not agree?

MR. LAUR: They do not agree that -- right. Where it really comes into play is previously approved operator action in today's licensing basis that meet the definition of recovery action in a new licensing basis. Since it's previously approved do you need to do that risk assessment, and we're saying yes because you have to show compliance with the rule which --

And to be honest with you my whole goal in this particular aspect is to ensure -- I want to say regulatory stability, but I'd like this thing to be such that that we understand it, the licensee understands it, the inspectors understand it all the same way. And when there are two places in the rule that say very similar but different things for different purposes. I mean, you either have to change the rule or abide by the rule.

And we have a little bit of latitude because primary control station is not defined.

MEMBER STETKAR: I was going to say -- if I could -- and I don't have the 2001 version of NFPA 805. I only have the 2006 version that I pulled up here, so I don't know whether it's appropriate to quote from this, but I think I will anyway.

In the 2006 version there's paragraph 3.3.2.2.2 that says recovery action. Activities to achieve the nuclear safety performance criteria that take place outside of the main control room or outside of the primary control station, parenthesis s, for the equipment being operated, including the replacement or modification of components.

Now the question is what is the intent of the rule. If the intent -- I don't know what the intent of that statement is. This is the 2006 version.

CHAIRMAN APOSTOLAKIS: This is the standard, not the rule.

MEMBER STETKAR: This is --

MR. LAUR: It's the standard.

MEMBER STETKAR: But the standard is incorporated into the rule, so effectively this is the rule.

MR. LAUR: It's the same -- same language.

MEMBER STETKAR: It's the same language. So there seems to be some question about what that primary control station is. It's clear that the intent was to examine repairs, what we would normally call repair of the equipment, because it does call out replacement or modification of components. And I think it's an area where there can be interpretation of what the intent was because it certainly does not -- is not very explicit in terms of defining the particular type of actions, not nearly as explicit as the reg guide is, and not nearly as explicit as the NEI document is, which is different from the reg guide.

MR. LAUR: That's true.

CHAIRMAN APOSTOLAKIS: So the question is with respect to the regulatory guide --

MEMBER STETKAR: The interpretation --

CHAIRMAN APOSTOLAKIS: -- are you objecting to what they're proposing, because this is where they can do something. I mean, the rule they cannot touch. So is the interpretation they're proposing agreeable? I mean, that's where we can make a difference. I mean, the rule is out beyond --

MEMBER STETKAR: The interpretation that they're proposing right now I have a problem with.

CHAIRMAN APOSTOLAKIS: You have a problem with, okay, and it's clear what the problem is to you, Steve?

MR. LAUR: Yes, and we'll be addressing your problem when we address the industry comments.

CHAIRMAN APOSTOLAKIS: Okay, that's good.

MEMBER ABDEL-KHALIK: The two examples that you gave of about 20 feet away from the control room, is that the only way to operate the valve why is that considered the recovery action?

MEMBER STETKAR: No, it is not. No, it is if it is a mechanical manual hand wheel. Is that correct?

MEMBER BLEY: Everybody said it was a minute ago.

MR. BARRETT: This is Harry Barrett again. If that's the only way the valve can be operated, then that would not be a recovery action. If it's a motor-operated valve and if it was normally operated from the control room and you end up having to go to the local area of the valve and de-clutch it and operate it, that would be a recovery action. So it depends on -- it's very specific as to whether or not it's normally operated in that location or not.

If it's a manual valve, it's a manually rising stem gauge valve with no motor on it and it's 20 feet outside the control room, that would be a recovery action, because the only way you can operate that valve is locally.

MEMBER STETKAR: And if that valve is a rising stem gauge -- that -- I thought I read that it was a mechanical operation. It was different.

MR. LAUR: But your example was MOV.

MEMBER STETKAR: My example is specifically an MOV, so I could get the switch in in the mechanical hand wheel, but a recovery action would not be manual operation of a mechanical manual valve located, for example, inside the containment. That's not a recovery action?

MR. BARRETT: If that's the only way the valve could be operated, no.

MEMBER BLEY: Well, I think this is a little confusing. I think, John, you can correct me if I'm wrong, but I think what John's saying if normally there was a power operated valve of some sort that you could operate but because of the fire in this particular case now you have to go and operate that manual fire and containment as a result of the fire.

Normally, it's the only way you can operate that valve, but normally you would not have had to operate that because there was another valve that was automatic. That would make it a recovery action, even though it's the normal way that valve would be operated. Under normal conditions it would not have been operated at all. It wouldn't have been needed.

MR. BARRETT: I understand what you're saying, but I think the way the reg guide has been written it's still not a recovery action because the only way you can operate that specific valve is locally.

MEMBER STETKAR: Well, I used a motor operated valve to get the concept of the switch and the hand wheel. I didn't really think of a purely mechanical --

MEMBER BLEY: I hate to -- but I need to ask one more. John, second example if I remember it right was there was a valve that normally you could operate from the control room.

MEMBER STETKAR: No, no, no.

MEMBER BLEY: Oh, it wasn't, okay.

MEMBER STETKAR: It could not be operated from the control room. It was only from a local panel in the service building, which is the normal -- the only place that you could find a switch for that valve is in the service building. It's -- it's clear that the -- reading NFP 805 and the reg guide, it's clear that if a component can be operated from the main control room and the operator must go to a different location to operate that component, regardless of whether it's a switch or a hand wheel, that is -- that is always defined as a recovery action. It's the definition of what is the primary control station outside of the main control room and how is that definition linked to the definition of a recover action, I believe is the source of the problem.

CHAIRMAN APOSTOLAKIS: Have we exhausted this topic?

MEMBER BLEY: I have one last related question. No valves in this one at all.

We've said we don't incorporate NFPA 805 by reference like we do some other things. We've written it into the rule, but 50.48 is the rule, right? And it has references to 805 and exceptions to 805, and there's no language about recovery in 50.48, so I'm a little confused about those two statements.

MR. LAUR: I'm sorry. I may have misspoke when I said -- let me just read what it says here. Approval -- this is 50.48(c)(1), approval of the incorporation by reference. NFPA standard 805 title which is referenced in this section was approved for incorporation by reference by the director of the Federal Register pursuant to 5 U.S. Code, etcetera, etcetera. Okay.

Talking to OGC that is equivalent -- that -- in other words is not referenced, it's incorporating by reference. That is equivalent to having retyped this into the rule.

MEMBER STETKAR: Okay.

MR. LAUR: That's the difference.

MEMBER STETKAR: And by those words that means all of NFPA 805 is in there except the places where you specifically said it isn't in 50.48?

MR. LAUR: Right, and I believe the references are excluded and the appendices are excluded.

MEMBER STETKAR: I lost a legal versus real -- thank you.

CHAIRMAN APOSTOLAKIS: Okay, let's move on then. And, Sunil, you promised to look into --

MR. WEERAKKODY: Yes, Dr. Apostolakis, what I'd like to do is -- and what you said is correct. This is the perfect opportunity to bring this in because we are now addressing the public comments. What we will do is we will look at the transcripts and make sure we understand in a summary way what the issue is and then work -- address the --

CHAIRMAN APOSTOLAKIS: Very good. Thank you.

MR. SHUKLA: We do have a representation this morning.

MEMBER SHACK: Yes, but as I understand it their focus is really on that last phrase, whether or not previously approved by the NRC. That's, you know, if you were putting something in orange, that would have been the one that should have been in orange. I mean, the recovery action's performance based methods is current. The contention is whether you get grand fathered.

MR. LAUR: Right.

MS. STAMBAUGH: And the orange here is just to what's different between Rev 0 and Rev 1. It's not meant to highlight key issues or anything like that. It's just this is what's been added to the reg guide.

MEMBER SHACK: I guess my problem is that the orange isn't really a change. The clarification is the fact that applies to even previously approved ones.

MR. LAUR: And then in the bottom orange I used better guidance, but maybe I should have said additional guidance. I made a judgment.

Okay, before we have any comments on this -- in the existing reg guide 1.2 --

CHAIRMAN APOSTOLAKIS: Can you clarify something. Maybe it's a naive question, what is the difference between risk and form and separately performance based methods? When you say performance based, do you imply risk and form?

MR. LAUR: No. This is an interesting --

CHAIRMAN APOSTOLAKIS: Well, you're referring back to that.

MR. LAUR: It's an interesting document. In the definition section it defines performance based similar to how NRC defines performance based in terms of measurable parameters. Anyway --

But then when it actually uses it it doesn't really mean that. It means more like performance or how are things --

But anyway performance based in this standard means either fire modeling in accordance with 4.2.4.1 of this standard or fire risk in accordance with 4.2.4.2 --

CHAIRMAN APOSTOLAKIS: So fire risk is a subset of performance based?

MR. LAUR: Yes, and fire modeling is a separate non-risk -- well, it's risk in the sense of showing --

CHAIRMAN APOSTOLAKIS: Well, you mean those maximum -- I remember.

MR. LAUR: So, which --

CHAIRMAN APOSTOLAKIS: I thought that was a screening method, okay, because you make worst case assumptions all the time, right?

MR. LAUR: Right. You could probably

conclude --

CHAIRMAN APOSTOLAKIS: Each community has its own terminology, I suppose.

MR. LAUR: Shall we move on?

CHAIRMAN APOSTOLAKIS: Yes.

MR. LAUR: Okay, in the existing reg guide there is a sample license condition. A little bit of history, the -- I guess virtually every plant has in their license a fire protection license condition that was granted to them while, among other things, self-approval of minor changes under Generic Letter 86.10, or something.

We are proposing to modify that license condition in a couple ways, and let me stick the orange because we'll talk about that more.

But there's a couple of things. In their -- in the current version it talks about a risk-informed change. There's a frequently asked question that has to do with, well, what about 86.10 changes that are strictly sufficient for the hazard or Chapter Three type fundamental things that we can do today. Why can't we do them under 805.

Well, as a result of resolving that frequently asked question there's an answer as to how you can do those, and we're going to add that as a second part to the license condition. And you can also do these Chapter Three changes.

Another thing that's not in there now, we will require licensees to tell us what modifications they need to implement in order to meet 805. That gives us the first two rows here. In fact, it's easiest if I go to the little chart here. This is kind of, I don't know if busy's the right word, but the scale is delta CDF on the left and delta LERF on the right, would be in the order magnitude.

And then the two columns are the current version of the reg guide and what we're proposing. And basically for very small changes, in other words 10 minus seven per year CDF or 10 minus eight LERF, they do not need prior NRC review and approval, provided they've maintained defense-in-depth and safety margins and that sort of thing.

In the existing version, there's an intermediate range between 10 minus seven and 10 minus six per year or an order of magnitude that says submit a summary description of the change to the NRC, and if you don't hear back in 90 days then you have tacit approval. And we decided to remove that or we're suggesting removing that in this next version, for a number of reasons. I can go into those if you'd like. But we really believe that 10 minus seven is sufficiently low that you're not going to run into cumulative risk issues, and cumulative risk is mentioned in NFPA 805 as something that needs to be tracked.

It's sufficiently low that with a peer reviewed PRA if the NRC had reviewed the application there's a sort of high likelihood that we found find it less than 10 minus six CDF or 10 minus seven for LERF. And there's a couple of other reasons. For instance, industry mentioned that -- it didn't say get rid of it but their comment in a public meeting last October was that it -- that the tacit approval was kind of problematic. They would much prefer us to write a letter saying, yes, we don't need to see this one. We don't need to see this one. We do want to see this one.

We do already have a method for granting approval in writing and that's 50.90, license amendment request. So -- to us it seemed like an extra range that doesn't -- it creates more problems and it -- well, anyway.

We're suggesting it goes away and at 10 minus seven or lower handles this cumulative risk issue and it give us that reasonable assurance.

MEMBER STETKAR: Two questions. The first one on this, and then we'll get to the cumulative risk in a minute.

This seems, if I interpret this correctly, if I'm a licensee and I do my analysis and I determine that the change in core damage frequency is 1.1 times 10 to the minus seven, I must then submit that change for full staff review; is that correct?

MR. LAUR: Yes.

MEMBER STETKAR: Do you think that this is going to tremendously increase the number of submittals that you're required to review in detail?

MR. LAUR: Compared to the previous version?

MEMBER STETKAR: In other words, you know, there's a big difference between one times 10 to the minus seven and one times 10 to the minus six in risk assessment space. It looks really small on this slide where it's kind of a linear, but it's a huge difference. And does this place additional burden on both the industry and the staff in terms of review by requiring that the staff perform an actual in-depth review and formally approve any change above those really small criteria, whereas before there was kind of a gray area where -- where you could take a look at

-- the licensee would need to submit something. You'd take a look at it and say, yes, this seems -- this seems reasonable. It's still less than one to the minus six.

MR. LAUR: It's difficult to answer that, but I think that our gut reaction is that many changes that licensees wish to make are either going to be risk neutral or -- or indeterminate so that they will be smaller than one e minus seven, but as to how many will be in that middle range, I don't know.

But -- but in recent public meetings, industry has also commented that they think that the fire PRA methods are not mature. The fire PRAs are giving way -- you know, closely conservative results. The fire PRAs are basically not ready for prime time.

Whether we agree with that or not, there's uncertainty as to the maturity of the fire PRA models and the ability to apply them to applications that would likely would result in us cutting the middle range and willing to see all the changes for the first couple of years on a given plant, until we get some experience with -- with the kind of changes that people are doing.

MEMBER STETKAR: But -- but --

CHAIRMAN APOSTOLAKIS: Yes, go ahead.

MEMBER STETKAR: But won't this even ratchet the bar up even higher, if I understand what you're saying, you know, with the existing words. Your concern is that that you would need to look at a lot of stuff over the next two years, and I guess my concern is you might need to more formally look at even more stuff over the next -- over the first couple of years.

MR. LAUR: Oh, because -- because --

MEMBER STETKAR: Because -- because you look at -- formally review and approve anything that is greater than 1.00 e to the minus seven.

CHAIRMAN APOSTOLAKIS: There is a statement in the original regulatory guide 1.174 that these lines are not bright lines, so I don't know how the staff, you know, with the experience of the last 10 years has been handling this issue. If you are just above the line what do you do? Nothing fire PRAs, in other applications, because I'm sure the issue has come up.

So if it is a -- I think you are ready to say something.

MR. HARRISON: Yes, this is Donnie Harrison, PRA licensing branch in NRR.

It's slightly different here. This is

actually the fuzzy lines in reg guide 1.174 are what's acceptable as a result of our review. We have flexibility of saying something's acceptable even though it may be just slightly above the threshold. This is actually a submittal criteria. And so, therefore, it's a hardline, and because this is a decision that the licensee would have to make based on their analysis, so do they submit to the NRC or not, and right now if it's a -- 10 minus seven you would need to submit -- with the revision you would need to submit it.

Under the old guidance you would still have to submit something, you'd just submit a summary description and then you'd wait your 90 days to see if the NRC would respond to you that says we object, you need to submit more.

And, again, under -- I think what Steve was trying to say was even with the existing reg guide the way it is, for a few years after we granted this we'd probably be asking for all those submittals anyway, because there would be uncertainty with how that was being conducted, so in the short term there probably wouldn't have been much gain from that middle range.

The other thing it adds is some

instability because every time a licensee sends in that summary description they don't -- they're at risk to get a follow on them that says send the rest. This kind of just short cuts that and just says send it to us.

CHAIRMAN APOSTOLAKIS: Well, let me ask you this question. The way the 2006 version is formulated is that inconsistent with the regulatory guide 1.174?

MR. HARRISON: It's not inconsistent, it's different.

MEMBER RAY: George, you don't get an option for self-approval under 1.174.

CHAIRMAN APOSTOLAKIS: So why should we get it here?

MR. HARRISON: To me, they're going consistent with the new version.

CHAIRMAN APOSTOLAKIS: That's what I'm saying. The revision makes it consistent with the regulatory guide.

MEMBER RAY: We thought you were objecting to the revision, George.

CHAIRMAN APOSTOLAKIS: No, no, no. I'm saying that the revision really makes it consistent, but I'm troubled by this business of hard lines. I thought from day one we said that, you know, these 10 to minus sevens, six, and so on are indicators where you are, and all of a sudden I hear this is a hard line, and if it's 1.01 ten to the minus seven you have to do something. I mean, some judgment is required here, it seems to me. I mean, 10 to the minus seven is a pretty low number.

So if you want to play hardball in the beginning and say, no, we want to see that at least for the first year or two just to get a better feel as to what's going on, I might say okay, but it seems to me you're already down there. I mean, some judgment is required.

And among us boys if it's 1.1 ten to the minus seven, can't I go back to one of the distributions and change it a little bit and come down. Come on.

MEMBER RAY: George, this has got to be subject to enforcement in the field. This is not the kind of stuff that goes on here. This is -- if you're going to do this with your self-approved changes you've got to have hard lines. You can't go and mess around with it like you're saying.

CHAIRMAN APOSTOLAKIS: But a hard line of the ten to the minus seven level gives me heart burn.

MEMBER RAY: Well, that's the way enforcement works.

CHAIRMAN APOSTOLAKIS: No, in this new world of risk informed decisions we have to change the attitude. I mean, it can't be that.

MEMBER RAY: No, we need to discuss this --

CHAIRMAN APOSTOLAKIS: 1.01 ten to the minus seven, if you have ever looked at the PRA you realize that this isn't something that can't be easily changed.

MEMBER BLEY: Round it off to a reasonable number.

CHAIRMAN APOSTOLAKIS: Yes.

MEMBER BLEY: Just when I read it and when you said it, something struck me. I mean, both places said the industry didn't like this thing, and so we're doing what they wanted, and I kind of suspect this isn't quite what they were talking about. I wonder if anyone wants to say anything about that.

Ken, do you have a comment to make.

MR. CANAVAN: I'll be up at 11:30.

CHAIRMAN APOSTOLAKIS: Very good. I think that's a larger issue, Harold. I mean, can we really have hard lines down to that level. I understand the issue of enforcement.

MEMBER RAY: I agree, it is -- it is a separate discussion, but I just felt what you were saying needed some comment..

MEMBER SHACK: But I mean all hard lines are like that, George. I mean, even if you're doing design basis analyses, you know, and the design basis pressure is 59 PSI and you get 60 PSI, you know, can I adjust the analysis to get rid of one PSI.

CHAIRMAN APOSTOLAKIS: So what is the issue we're discussing?

MEMBER SHACK: I just -- I sort of withheld. I mean, I think, you know, for submittal and enforcement you have this -- when it comes to judging the acceptability of the result, you know, that's the time the staff can then look at it and make some judgment, but in terms of submittal --

CHAIRMAN APOSTOLAKIS: The way I understand this is you have a result of this several times 10 to the minus seven, that makes sense. Three, four, five, ten to the minus seven, I can see that, but to start arguing what 1.01 mean, I mean, I --

MR. HARRISON: But George -- and this is Donnie Harrison of the PRA licensing branch again -- wouldn't you just be moving the discussion then.

You'd be discussing 3.01 to the minus seven, as opposed to 2.99 to minus seven?

CHAIRMAN APOSTOLAKIS: No, I'm not --

MR. HARRISON: We're going to make a line somewhere, and the question is --

CHAIRMAN APOSTOLAKIS: No, I'm not saying to move the line. With these limits, the way I understand it is you have a result that is three ten to the minus seven. That's clearly within the range, submit it.

Now to start going way down and play with the limit, it's not really worthwhile, it seems to me. I don't know what the discussion is about anyway. Do we all agree this is the case?

MEMBER STETKAR: Well, the reason that I brought it up was not -- not to argue about 1.01 versus .999, it's -- it was a concern that does this new version of the reg guide -- it's a regulatory burden issue, not a numerical, technical issue. I admit that there's -- pragmatically there has to be a line, and if you're above the line you must do something, and if you're below the line you need not do anything. The question is where the line is drawn and the way that it's drawn in the proposed reg guide more burdensome to both the industry and the staff compared to the way that line was drawn in the current version of the reg guide.

CHAIRMAN APOSTOLAKIS: But the revision makes it consistent with the original regulatory guide 1.174, so I'm happy with that.

MEMBER STETKAR: Okay.

MR. WEERAKKODY: This is Sunil Weerakkody. I just wanted to make sure that just like the previous one where there's an action for us to read the transcript and get back to you on this.

CHAIRMAN APOSTOLAKIS: I don't think that John Stetkar disagrees with the change, right? You're just pointing out that there will be more burden?

MEMBER STETKAR: And questioning whether that was actively considered -- whether that additional burden is worth making this change.

MR. WEERAKKODY: We'll take a look at that because that -- that was an important point that I know Steve and the rest of the staff discussed. I think Steve did mention this, but we were trying to also eliminate the burden that a different part of the rule was requiring through the -- different part of the rule says tracking of cumulative risk. That could be very burdensome to everybody. And when we went to the lower threshold we were trying to address that.

Now if we get into a situation where we are getting too many amendments, obviously we will have to deal with this. Right now we don't know the answer whether we will get too many or not.

MR. CANAVAN: George, Ken Canavan with EPRI.

CHAIRMAN APOSTOLAKIS: Sure.

MR. CANAVAN: Just a couple of quick comments. I was going to wait until 11:30 but decided that A while it's up and while we're in this deep discussion, I would tend to think that when the industry made comments on this chart they got the change that they didn't want. It's not really consistent with 1.174 in that it changes the thresholds. Right off the bat, one e to the minus six is a very small change in 1.174, and that's what changes to the licensing basis of a plan.

This is now one e to the minus seven, which will represent a significant burden, and will represent a number of changes that the industry has to prepare for submittal to the NRC and the NRC has to review. So it is a big burden.

Aside from that I might also make the comments that Steve made the comment that it was helpful for tracking the cumulative changes and now we wouldn't have to do that at one e to the minus seven. I would suggest that it might be easier to track those changes at one e to the minus -- the cumulatives that are above one e to the minus seven, but below e one to the minus six.

It might be easier then submitting all the changes, and also I heard in the discussions that the rule changes where we'd like to see everything for a year or two -- once this reg guide becomes permanent it's not a year or two. It's forever, until it gets changed again, which we don't know when that will occur, and the NRC always has the opportunity to audit any utility which they have an interest in seeing those results.

Also, we have two pilots, so we can easily track the cumulatives and draw some results from those, using the existing criteria before we change it, relatively arbitrary and not really consistent with 1.174.

CHAIRMAN APOSTOLAKIS: 1.174 for delta CDF is one line a ten to the minus five, and the second one a ten to the minus six. So why is this inconsistent with that?

MR. HARRISON: George, I'd also -- yes, this is using a decade lower, but this is Donnie

Harrison of the PRA branch, but the point here is this is submittal guidance, not acceptance guidance. So it's a decade lower because we want them to submit if they see a delta risk change in that range so that we can evaluate it. This doesn't say that this is not acceptable if it's above ten to the minus seven, it just says you have to submit it to us for review.

So it's -- you've got to understand this is different than acceptance guidelines in reg guide3 1.174 in the sense of -- that's what we end up approving based on whether fuzziness in that -- in that line.

This is what do we want to see you actually submit to us. If you calculate a number below ten to the minus seven, we're saying you've got the ability -- that you don't have to submit that to us. If it's above ten to the minus seven, delta CDF, we want you to actually make a submittal. That's all this does.

CHAIRMAN APOSTOLAKIS: Remind me, 1.174, figure three, region one, ten to the minus five; region two, ten to the minus six; region three, ten to the minus seven; below we don't care.

MR. CANAVAN: Well, that's not true. Those are for risk-informed licensing actions. Even if it's ten to the minus nine, if it's a risk-informed change you would make a submittal, and we would evaluate whether that's acceptable. We would approve it if it was ten to the minus nine, but you'd have to still make a submittal.

MEMBER STETKAR: I wanted to -- a couple of the comments mentioned tracking cumulative risks, and I think it's -- they're kind of integrated here.

Recognizing that this ten to the minus seven line in the sand is for self-approved evaluations versus formal staff review, as I understand it there -- in the new reg guide, and correct me if I'm wrong here, there's no requirement to refer cumulative changes so long as all of my individual changes remain less than ten to the minus seven; is that correct?

MR. LAUR: I believe that's correct, yes.

MEMBER STETKAR: So that I could implement a thousand changes at 9.99 e to the minus eight, and I would never be required to -- to report the fact that my cumulative risk was increased by a factor of ten to the minus four.

CHAIRMAN APOSTOLAKIS: I think we address that on the next slide or not? The next slide keeps talking about combined changes.

MR. LAUR: I don't talk about -- but look, I think -- I think you're correct. If -- if you have --

MEMBER STETKAR: I was looking for it yet.

If you have ten thousand -- do the math, if you had a hundred of them it would be ten to the minus five, if I'm rounding up.

MR. LAUR: But no, we basically said what you said that the --

MEMBER STETKAR: Now is that inconsistent with 1.174?

CHAIRMAN APOSTOLAKIS: Well, why don't you talk about the next slide, and then we'll address the question.

MR. LAUR: Okay.

CHAIRMAN APOSTOLAKIS: Is this addressing part of it?

MR. LAUR: Yes. There's not a whole lot of words on the slide here, but there are two parts -- well, there's actually one -- one very busy paragraph in the NFPA 805 that basically mixes cumulative risks and -- and bundling, if you will.

And so we try to -- I believe it may have been separate individual reg activity. We tried to clarify what it meant, so the first thing I want to point out here is for the 3.2.4 is a list of types of things that require NRC approval. It's things you may not self approve, and obviously one of those is things that aren't allowed by the standard license condition, but we also added a combined change, any part of which would by itself exceed the minus seven guidelines, or whatever the guidelines end up being. You'd have to come in for approval.

So, in other words, we reserve the right to review bundled changes.

MEMBER STETKAR: Is that different though in concept from NFPA 805, because I thought NFPA 805 said you could submit a combined change and evaluate the net risk --

MR. LAUR: Yes.

MEMBER STETKAR: -- change from that combined change.

MR. LAUR: Right.

MEMBER STETKAR: And you're not allowing people to --

MR. LAUR: Self approve.

MEMBER STETKAR: -- self approve --

MR. LAUR: Right.

MEMBER STETKAR: -- that change?

MR. LAUR: Yes. And, no, it's consistent with 805 which is, I believe, patterned after reg guide 1.174. It uses very similar words. So that's what 3.2.4 is.

3.2.6 we talk about cumulative risks and combined changes as discussed in 2.4.4.1 and for the cumulative -- let me just see if I can find the paragraph here -- we say that after transition to 805, cumulative risks to subsequent changes to the fire protection program is the change in risks compared to the post transition base line risk. That's the same that was in the existing reg guide.

In the sample license condition we've chosen the acceptance criteria low enough to provide reasonable assurance that the effect of self-approved changes on cumulative risks would be acceptable; however, when they submit a change they should address cumulative risks -- cumulative impact of all changes since adopting 805.

MEMBER STETKAR: Whenever they -- whenever they have to -- if I have a change now that's 1.01 e to the minus seven rather than 9.99 e to the minus eight, at that time I'm required to submit that change for approval and inform you of the cumulative change from all changes up to that point?

CHAIRMAN APOSTOLAKIS: But the way I understand it is there is no guidance as to what to do regarding the cumulative change?

MR. LAUR: That's correct.

CHAIRMAN APOSTOLAKIS: And 1.1.7.4 is also silent on that.

MEMBER STETKAR: That's right. I -- I just wanted to make sure that I understood that as long as I -- as a licensee, as long as I evaluated changes and determined that the risks increase from those changes remains less than one e to the minus seven individually, regardless of the cumulative number of changes, I never need to report --

MR. LAUR: Right.

MEMBER STETKAR: -- the cumulative change in risks?

CHAIRMAN APOSTOLAKIS: In 1.1.7.4?

MEMBER STETKAR: In this reg guide.

CHAIRMAN APOSTOLAKIS: This one?

MEMBER STETKAR: I could implement a thousand changes, each of which are 9.99 e to the minus eight and never report the cumulative change in risk, until and unless I had one that was 1.01 e to the minus seven?

CHAIRMAN APOSTOLAKIS: Or until the staff finds out.

MR. LAUR: But they have no mechanism.

MEMBER STETKAR: But they have no mechanism to require --

CHAIRMAN APOSTOLAKIS: You never know, accidents happen. This is something that the original regulatory guide is silent on. The only statement -- I remember two things. In this room, a very senior member of the staff said they can submit the request every Monday, but also there was another statement that the intent of the regulatory guide is not to allow licensees to move up to ten to the minus four, which is a goal eventually there.

So some action will be taken when the cumulative risk increases to an unreasonable level, but there is no guidance or no numbers. There's nothing. Is that the correct perception?

MR. LAUR: Let me just question somebody in the audience here, Steve Dinsmore.

CHAIRMAN APOSTOLAKIS: Because this committee when the large local rule was discussed at some time ago, and they made an explicit statement regarding cumulative risks. This committee objected, objected in the sense that it was inconsistent with 1.1.7.4, not that it was not a good idea.

MEMBER SHACK: No, only that we thought that was a change, a difference.

CHAIRMAN APOSTOLAKIS: Right and we said you go back and --

MEMBER STETKAR: We didn't say that. We objected to it.

CHAIRMAN APOSTOLAKIS: It was -- well, some of us did.

MEMBER STETKAR: Some of us did.

CHAIRMAN APOSTOLAKIS: But it didn't find its way to the letter, as is usually the case.

MR. LAUR: I just want to clarify one thing. You said there's no guidance, and I don't know of any, but I'm going to ask Steve Dinsmore who --

CHAIRMAN APOSTOLAKIS: Yes, Steve, shed light.

MR. DINSMORE: I'm not sure it's going to be a pleasant light. This is Steve Dinsmore from the PRA. I think with 50.46(a) there was a big difference in whether it was total change in risk from all changes --

This is a little different. This is -- we were talking about a change in risk associated with the fire protection program applications. In other words, the implementation of this new rule, and this comes back to this old question about whether all changes associated within an application should be compared and the total cumulative risk increase for all those changes under that application should be ten to the minus five, as opposed to having just individual.

And I think in this one the -- the standard says that the change in risk shall be acceptable to the AHJ, or we could put a limit on that if we desired. I personally think that that's the easiest way to do things. There's other opinions around. And I think the reg guide probably addressed that in what is called -- being called fire modeling user's guide, and that one is slated to come later this year.

CHAIRMAN APOSTOLAKIS: It was very nice thing. They compared the experiments with the predictions of the codes. You could see things like this particular code did very well predicting the -- temperature, but not as well doing something else, so that was really a very, very insightful study.

Okay. Yes, John?

MEMBER STETKAR: One thing quick, Stevie, before you get off this. And this is curiosity because I'm not familiar with the NEI document. In

Section 3.3.1 which is skipped over here, Section 3.3. of the reg guide talks about circuit analysis, and it effectively endorses NEI 00-01, ref 1, as an acceptable methodology to perform circuit analysis.

I know that there's a new revision out for that in the NEI report, and I happen to not be familiar with it. I'm --

My question is is rev 1, which is endorsed in the current draft, are the methods in that NEI document consistent with what we've learned about coincidence of hot shorts and conditional frequency or conditional probability of hot shorts from the recent Carroll fire experiments and things like that. In other words, are we endorsing in this draft reg guide a methodology that doesn't -- is not necessarily consistent with what we know about hot shorts today? And I just don't know; I'm not familiar with the NEI.

MR. LAUR: I'm not either, and I've had to call off --

MR. KLEIN: Let me take -- my name's Alex Klein. I'm the NRI fire protection branch chief. John, with respect to your question for NEI 00-01, you're absolutely correct. Revision one is being revised to a revision two. We have been working with NEI over the last year or so with that revision. We expect that final rev two basically any time, hopefully within the next couple of weeks.

With respect to the -- to the actual methods, if you will, or approaches different between rev one and rev two, there are some changes. I don't know the specifics. Harry Barrett might be able to provide you with additional details, but what I can say is that the -- the impetus behind the revision two to NEI 00-01 was not with respect to the work that we're doing in NFPA 805. It's really the other side of the house. It's the existing deterministic side, the Appendix R side of the house. That's what drove the changes to NEI 00-01.

Because of the way we're addressing resolution of multiple spurious operations from the Appendix R side of the house, that's what drove that -- that change. So we will be looking at -- you know, I think once we receive that rev two in house, seeing how that compares to rev one and look at that, whether or not we want to now reference that in the new reg.

MEMBER STETKAR: My biggest concern wasn't necessarily the technical details. That's why I didn't bother to try to go dig out the documents. It's -- it's whether we're getting caught in a moving situation here where the reg guide as it hits the street endorses something that is not necessarily up to current understanding, you know, with the recognition that -- that that NEI document indeed is being revised even as we speak. So --

MR. WEERAKKODY: This is Sunil Weerakkody. Again, in fact, we would be coming to you for presentation on that document and that reg guide at the end of July. I don't think the date is fixed.

MEMBER STETKAR: That being a month from now?

MR. WEERAKKODY: Yes, sir.

MEMBER STETKAR: Okay.

MR. LAUR: Moving on to the standard review plan which will be given short shrift unless -- it's consistent with the Draft Guide 1218. There may be a few places based on when we published it a month or so earlier, and we will be straightening it out.

And we also received comments. The comment period for both of these documents ended May 22nd, so we're still assimilating the comments.

But basically we talk about that the same areas in our standard review plan. There is something different or unique here. We've added an acceptance review matrix as part of the standard review plan. This implements in our office instructions with 109 which is acceptance review procedures, and it basically just goes through all the topics in the SRP, but it's kind of a completeness check. It's not a review, but it's to make sure if you're supposed to submit, for example, your license conditions that need to be revoked or revised and your tech specs. It's basically a check list in a little more detail so that the reviewers can quickly do the acceptance review.

I don't think that's in any other SRP section, but it seems like a good home for it.

But if you go to the actual Section Three of this SRP, it's broken into seven major parts which, as I said, the SER is going to be written basically in the same areas, and it basically covers -- starts off with some housekeeping things, which is a programmatic review of the license amendment request itself and then goes on to basically walks through the process that the licensee uses to transition and adopt his 805 license.

The -- the order of this table of contents virtually -- well, it's very similar to what the two pilots submitted, which was also in turn very similar to what the NEI guidance for submittals had at that time. Each -- each part plant changes slightly because it made more sense, and we changed it very slightly because we thought it made more sense, and it may change slightly again, but basically it covers all aspects of the fire protection program under NFPA 805 so that we're sure we've reviewed everything submitted.

And now I'm glad you held your questions, so here's --

CHAIRMAN APOSTOLAKIS: Any other comments or questions? Okay, we'll recess until 10:30.

(Whereupon, the above-referenced matter went off the record at 10:08 and went back on the record at 10:29 a.m.)

CHAIRMAN APOSTOLAKIS: We're back in session. Now Ms. Margaret Stambaugh will talk to us about feedback, right?

MS. STAMBAUGH: Yes. Good morning, I'm Margaret Stambaugh. I'm an engineer in the PRA licensing branch in NRR. The presentation I'm going to give today is to give a flavor of some of the preliminary feedback that we've gotten recently from various public meetings that we've had.

Since the public comment period for the two documents just ended a little over a week ago, we're not ready to discuss the actual official comments that we have. We're not even sure that NRR has all of the comment from admin, so we're not prepared yet to speak to the official public comments, but we can give you a flavor of what we've heard in public meetings so far.

Let me see here. Okay. So the objectives for this talk, again, to give -- to discuss a little bit of the feedback that we've heard in public meetings. Speak -- I will speak briefly about the schedule that the two documents are on for completion, and then finally the final objective is to hear your views on these -- this feedback that we've gotten so far so that we can come back to you in July with, you know, good responses and be able to address the public comments most expeditiously.

CHAIRMAN APOSTOLAKIS: Well, you will obtain the subcommittee's views.

MS. STAMBAUGH: Right.

CHAIRMAN APOSTOLAKIS: Individual views.

MEMBER STETKAR: Usually not.

MS. STAMBAUGH: So the public comments that we have received in these public meetings cover a wide variety of topics. I've chosen two of them to speak about here today. You've heard quite a bit from Steven a lot of the other topics, so that's why I decided to just focus on these two, first being the methods that I used for the fire PRAs, both the base PRA methods and the applications, and then on what ties into that is the self-approval process.

Second topic is the recovery actions, those that require previous approval and the in-general definition and treatment of recovery actions. Just so you know the way that this talk is set up, it's set up in a question format, so it's preliminary for us to be saying how we're addressing these comments. So I'll present a type of question that we've heard and then be able to speak to some of the regulatory framework that applies to that question, but we haven't finalized our views yet. We haven't finalized the NRC positions on these comments.

CHAIRMAN APOSTOLAKIS: So you had all these meetings?

MS. STAMBAUGH: We've had quite a few public meetings, but --

CHAIRMAN APOSTOLAKIS: November 29th and then the seventh?

MS. STAMBAUGH: Yes.

CHAIRMAN APOSTOLAKIS: What -- do people go home and come back, or what?

MS. STAMBAUGH: They're not all

specifically on this guidance. There have been other public meetings on other reg guides that all of -- various public meetings will talk to the same types of issues, you know, when do you -- what PRA methods do you use? When are PRA methods audited, that type of thing. So there's been quite a few meetings, not all of them specifically on reg guide one, two and five, and all of those have given us feedback, but, you know, we'll play into how we respond to public comments, so --

CHAIRMAN APOSTOLAKIS: And all these meetings were here in Washington? That's okay, it's not important.

MS. STAMBAUGH: I'm not sure. I'm not sure 21 and 22 were.

MR. LAUR: Yes, they were. I don't know about the May 7th. All the April ones were.

MS. STAMBAUGH: Yes.

CHAIRMAN APOSTOLAKIS: Oh, they were private meetings, the gentleman said.

MR. LAUR: Well, on the 29th was a full --

MS. STAMBAUGH: That was a full --

MR. LAUR: -- four hours of public comment on these two documents.

CHAIRMAN APOSTOLAKIS: Which one?

MR. LAUR: This was on April 29th.

CHAIRMAN APOSTOLAKIS: Which -- we keep saying pilots. Which pilots were these?

MS. STAMBAUGH: Shearon Harris and Oconee.

CHAIRMAN APOSTOLAKIS: Oconee?

MS. STAMBAUGH: Yes. And if you're curious to look at the public comments that are publicly available so far, they can be found on the Web at www.regulations.gov.

Okay, so starting with the first question, this is in the area of PRA methods. It's a base PRA method question. Usually when the NRC is reviewing a license amendment request that involves a PRA we focus on or review on the application of the base PRA to the proposed plant change.

However, in NFPA 805 there's language that says that the PRA approach methods and data shall be acceptable to the AHJ. That's part of 805 which is incorporated into our rule, so it is rule language.

The question that arises is will the NRC need to need to review a licensee's base PRA methods, and there's other correlated questions dealing with what metaphors the definition of AFJ. I'm focusing on the base PRA methods here.

Now as we've spoken before, that 805 language is now rule language, so we need to address what is acceptable to the NRC as far as PRA approach methods and data. The draft guide proposes some guidance on what methods are acceptable to the NRC. Specifically, in section 4.3 it discusses reg guide 1200, which has protocols for implementing plant changes, and --

CHAIRMAN APOSTOLAKIS: So let me understand this. The question is if some -- a licensee comes to you in the context of NFPA 805 and the regulatory guide, will you in that context then have to go back and review the base line PRAs; is that what you're saying?

MS. STAMBAUGH: That's the question. That's the question at hand.

CHAIRMAN APOSTOLAKIS: It seems to me the answer is yes.

MS. STAMBAUGH: Well, we do have -- as we say the guidance that we have right now is in -- we have proposed language in 1205, and that proposed language points to reg guide 1200 which has established protocols for what is expected for the base PRA and how to handle changes to the base PRA.

It references the standard for that, the PRA standard for that, and as part of that is the PRA review process. And along with that is the SRP section 19.1 and 19.2 which discuss situations in which the NRC would audit the base PRA.

So usually with -- with PRAs that are very mature, for example, the internal events, we can rely on the base -- we can rely on the peer review process to handle base PRA changes. It becomes in question for the fire PRA, which is less mature.

So what we can tell so far is that the LARS and the two pilots and what we expect to see for future LARS is that they will rely heavily on fire PRAs to implement the risk informed performance based rule, and that compliance then becomes a question of the PRA technical adequacy. And we have other reg guides and other regulatory structure in place that discusses when and under what circumstances the base PRA methods would be audited by the NRC.

So the reg guide 1205 itself may not necessarily say this is one we are going to audit a base PRA. There's other reg guides and other regulatory measures set up to handle that.

CHAIRMAN APOSTOLAKIS: But doesn't it stand to reason that if a licensee decides to switch to 805 that licensee should have a base line PRA that has gone through the NEI peer review process and made sure that, you know, it's appropriate for this application. Why is it even a question? I mean, if they haven't done that it seems to --

MS. STAMBAUGH: Yes, the reason that this question comes up is because in NFPA 805 there's language that says that the approach methods and data shall be acceptable to the AHJ.

CHAIRMAN APOSTOLAKIS: Right.

MS. STAMBAUGH: So, that would mean --

CHAIRMAN APOSTOLAKIS: And the AHJ is new?

MS. STAMBAUGH: -- that it would be us, so it would mean we would have to approve all of their methods.

MEMBER BLEY: But you refer to 1.200, which actually lays out all the guidance for --

MS. STAMBAUGH: That's what we've proposed in the reg guide.

CHAIRMAN APOSTOLAKIS: The answer's is still forward.

MS. STAMBAUGH: That's what we've proposed in the draft guide, so then it's, you know, a matter of dealing with the public comments, too --

CHAIRMAN APOSTOLAKIS: Right.

MS. STAMBAUGH: -- to see how that will be responded to, so --

Okay, so that's the first question on base PRA methods. The second question in future --

CHAIRMAN APOSTOLAKIS: Let me ask this question, excuse me. Is it your question or somebody else's?

MS. STAMBAUGH: I -- these questions, but they're based on what we heard in public meetings, so there were questions that we heard, not necessarily verbatim.

CHAIRMAN APOSTOLAKIS: Okay.

MEMBER BLEY: I just confused myself. At the meeting on the 29th when you delegated the four hours to these particular issues, were these questions put before the -- the group and you asked for their response on these questions, or did this come out of that?

MS. STAMBAUGH: These are actually out of that.

MEMBER BLEY: Okay, but you must have gone in with questions for them.

MS. STAMBAUGH: We went in with -- with a layout of the documents and the issues that we saw as key issues and then heard what the assembled group had to say about that, so --

CHAIRMAN APOSTOLAKIS: Mr. Canavan.

MR. CANAVAN: Ken Canavan, EPRI. Just two quick clarifications. When you -- board base PRA as you said a whole bunch of times -- when you use the word base PRA do you mean the internal events PRA?

MS. STAMBAUGH: There's a base PRA for the fire PRAs, as well.

MR. CANAVAN: Yes, I'd suggest we move away from the word base if we could and just say internal events and fire PRAs, just because when you say base I think internal events, so --

MR. LAUR: Well, before you move off that, this is Steve Laur. I don't know what the terminology should be, maybe Gareth can help us but the -- we're contrasting base as opposed to the application --

MS. STAMBAUGH: The fire PRA.

MR. LAUR: -- and so, therefore, you have whatever your as-built, as-operated plant is with all the hazard groups that you've chosen to address, and that was your base PRA>

MR. CANAVAN: I might suggest just sticking with the hazard group then, if you're specifically referring to one, because, for example, will the NRC need to review a licensee's base PRA methods, depending on if that's fire based PRA method or internal events PRA methods. It could be misinterpreted. For example, I look at that and say that they're asking you -- and this is really your next question, but the question that I interpret is will an NFPA 805 submittal result in the NRC reviewing your internal events PRA methods? That's how I interpret the question.

MS. STAMBAUGH: Well, that's certainly -- that's certainly a consideration that we're looking into. This is all coming out of the public comments, right? So the question is, you know, at what level is the NRC going to scrutinize people's PRA internal events, fire PRAs, applications, all of those things. And we're trying to look at what regulatory framework do we have to deal with this giant PRA, you know, bundle that we've got.

And -- and in the instance where the base of the fire PRA links back to the internal events PRA, it may be scrutable under -- under the standard review plan 19.1 or 19.2.

MR. CANAVAN: Excellent. Second clarification was you were saying that reg guide 1.200

-- you were in agreement with Steve's slides that said reg guide 1.200, rev. two and the peer review and all those associated items were indeed acceptable for showing -- for showing an acceptable base PRA method, right? So 1.205 is not necessarily taking the place of 1.200 -- 1.200 is the --

MS. STAMBAUGH: It references 1.200/

MR. CANAVAN: Okay.

CHAIRMAN APOSTOLAKIS: I would also add the NEI peer review. I think that's important.

MR. CANAVAN: Yes, the peer review and reg guide 1.200 and all those items are not being superseded or supplanted with 1.205; is that correct?

MEMBER BLEY: On these language issues, now that reg guide 1.200 rev two is out there, the language from there is probably sticking. They were pretty precise.

MS. STAMBAUGH: Okay, so this is the next question. In future, would a licensee violate their licensing basis by implementing a new method in their base fire PRA without NRC approval?

The part that's of concern is again that the methods and approach have to be acceptable to the NRC. That language that's in the rule means that all of the methods that are used need to have at some point then approved by the NRC, or need to have been found acceptable to the NRC by whatever method, whether it be by whatever protocols. I should get away from using the word method too much, whether that protocol be through reg guide 1.200 or not.

The draft guide -- the reason that this is of concern is as we mentioned before the draft guide proposes a license condition which allows for self approval of plant changes. Now in the long term it's conceivable that some new application of the PRA can come up to a point of change, and then the licensee would then be allowed to then make that plant change with this, you know, risk that is now to be below -- say, it's one e minus nine, something like that, would they be allowed to use this new method even though it wasn't in their original LARS submittal. So that's the question that we're dealing with.

We want to make sure, you know, the things that -- to consider, we want to make sure that self approval is viable in the long term, and we also want to make sure that the -- in the long term we have a very clear and consistent licensing basis that is enforceable.

In -- so regulatory framework, in reg guide 1.200 and the standard they mention that PRAs are expected to be living entities. They're expected to be updated with due methods and technologies. Specifically, reg guide 1.200, section 1.4 says that models will change with improved methods and techniques, and the standard requires that a peer review to deal with PRA upgrades, so that's the framework that that question fits into. Any other comments on that question?

CHAIRMAN APOSTOLAKIS: Well, it seems to me these are obvious, the answers to the questions are obvious, but --

MS. STAMBAUGH: This is the flavor of the feedback that we're getting so far.

CHAIRMAN APOSTOLAKIS: But I'm probably coming from a different world. You have to have a good base line PRA it seems to me if you want to use risk information.

MS. STAMBAUGH: Yes, it really comes down to the nuts and bolts, making sure that what we set up right now sets up a long term, stable environment for the licensing basis, and that, you know, the things that are written into the license commission remain viable. So these are the things that we want to address now.

MR. CANAVAN: George, if I may interrupt.

Ken Canavan again.

CHAIRMAN APOSTOLAKIS: Yes.

MR. CANAVAN: I think there was some early confusion which is what we're seeing reflected in the public comments as to whether or not reg guide 1.200, rev two, and the peer reviews were acceptable for use in NFPA 805. What I'm hearing now is that they are.

CHAIRMAN APOSTOLAKIS: Yes.

MR. CANAVAN: Is that correct?

MS. STAMBAUGH: That framework still exists.

CHAIRMAN APOSTOLAKIS: I mean, it is necessary.

MR. CANAVAN: Necessary, yes. Okay.

MS. STAMBAUGH: Yes, we certainly don't want to be reviewing every calculation for every PRA.

CHAIRMAN APOSTOLAKIS: Because it makes sense if a licensee wants to take advantage of a risk-informed approach is to have a good PRA. Ultimately, a level three.

MR. NAJAFI: Bijan Najafi. I think there's a settled thing that we need -- still there is a -- needs to be dealt with. I mean, I sit on the NFPA 805 committee and the line approach that it's there, it presents some problems or issues in the risk informed application. The difference is that if you ever use the reg guide in the peer review process, you've found the PRA acceptable. You don't review necessarily and endorse or acceptability of the method. So there's a subtle difference, whether the method has to be acceptable or the PRA has to be acceptable. While the two may be 99 percent of the time the same, they're not always the same. This is an example of what it could create if you make method approval versus PRA itself.

I think there's a subtle difference between the two.

CHAIRMAN APOSTOLAKIS: Well, I don't that the PRA would be acceptable if the method is not acceptable.

MEMBER BLEY: I mean, there was effort in voting these standards not to approve specific methods but to say, well, whatever method you used had to consider and deliver. That's what the standard said, and that's what reg guide 1.200 points to.

CHAIRMAN APOSTOLAKIS: But then the peer review looks at also how you got the results.

MEMBER BLEY: Exactly.

CHAIRMAN APOSTOLAKIS: So there is new

implicit approval of the way you did it, right? I mean, you I could use black magic but then you like my number and you say, okay, the PRA's acceptable, but your method was not. That doesn't make sense. There may be some cases when you are right.

MR. NAJAFI: Because the methods are more fluid. That's one of the reasons.

CHAIRMAN APOSTOLAKIS: That -- that's probably true. Okay, in the future. Oh, no, what information? Yes?

MS. STAMBAUGH: Okay, next question what information needs to be in a license amendment request, LAR, to enable self approval. This is following on to that previous question.

The draft guide proposes language for a license condition allowing self approval where for a certain risk limits. Reg guide 1.174 is a typical guide for PRA applications. 1.174 does not provide a guideline for self approval. We've sort of already discussed these types of things, and this -- we've gotten public comments to that effect, and this is what we're going to address.

CHAIRMAN APOSTOLAKIS: So should the next revision of 1.174 then include the self approval?

MR. LAUR: This is Steve Laur. You'd

have to change the title. The title of 1.174 is for license -- change it to the licensing. It's included in the title, but I would say that may be good for the future when we get more and more of these risk-informed regulations that allow self approval adopted, like I think 50.69 has that, if anybody ever adopts that; 50.46(a) if that rule comes out will allow that; and this one allows that.

But I would say it's premature now, in my opinion.

CHAIRMAN APOSTOLAKIS: Donnie.

MR. HARRISON: This is Donnie Harrison from the PRA licensing branch. I would essentially echo Steve's comments that, you know, after reading reg guide 1.174 is a general guidance, so you wouldn't necessarily want to change it to establish a self-approval threshold without knowing what applications were being done. This is in the context of a specific application, so just like 50.46(a) on the large ECCS requirements, it's on a specific application that you could apply. Then you can think it through all the way and not get surprised.

As a general guide, I think my preference would be to leave it as it is.

MS. STAMBAUGH: Okay, the next question

again is tied very closely to that second one. In the long term a licensee may wish to make a wide range of low-risk plant -- this is low risk not having any correlation to the 1.174 limits. I know that there's specific language used there, but the lowest plant changes through the self-approval process yet the methods used to evaluate the risks of the plant change must be acceptable to AHJ. Can flexibility be built into the program to enable self approval using novel PRA application methods?

There was proposed language in the draft guide that says if -- if, you know, you can put something in your license condition that says if generic -- if a method is approved on a generic basis then, you know, this licensee will be able to implement that method, or if there's some sort of topical report that has a bunch of methods that becomes approved on a generic basis, then it can apply.

So that was something that was proposed in the draft guide. Anything else? Again, in the context of this question is we want to make sure that there's a clear definition for long term regulatory stability of what is in a plant's licensing basis that is enforceable, that meets the rule, and also will minimize burden so that, you know, we're not getting those -- we're not getting superfluous amounts of license amendment requests in the long term.

CHAIRMAN APOSTOLAKIS: Well, let me understand this. You will not allow them to use a PRA method that you are not aware of; is that correct?

MS. STAMBAUGH: That has not already been found to be acceptable to the NRC.

CHAIRMAN APOSTOLAKIS: Right.

MS. STAMBAUGH: Right, whether generically done or through a specific license amendment.

CHAIRMAN APOSTOLAKIS: What do people mean by novel?

MS. STAMBAUGH: For instance, one of the pilots has proposed a list of -- it's the cause-effect relationship between the base PRA and the application. They've proposed a list of potential methods that they might use to apply their base PRA.

It's conceivable that they could add another cause-effect relationship, another method in there -- another application method. Would they be allowed to use that for self approval? It wasn't -- if it's not in their original LAR, if it's not approved on a generic basis and they don't have that, because the rule language says that the method must be acceptable to the AHJ data, they wouldn't be able to use that.

So it's important -- or the question is can we make a license condition that allows flexibility for using those new application methods that would not be enforceable?

CHAIRMAN APOSTOLAKIS: As long you are aware of this new method and you have approved.

MEMBER BLEY: I'm a little confused, and I just have to ask this. Maybe I missed the boat somewhere, but I'm not aware of any PRA methods that are generically approved by NRC for anything. Is this coming out of the old use of five for things as a method? I mean, that was not PRA specifically. I'm confused because you can't refer to -- I mean, there just aren't any. We now have the joint standard on how to do PRA, and we have reg guide 1.200 that tell you what you need to include to have an acceptable PRA, but if you're not anchoring things to approved PRA application methods, I think you're going to be in a world of trouble, because I don't think you have any.

Can anybody from staff say something more about that?

MR. LAUR: This is Steve Laur. Let me try. And I'm not trying to answer the question here. Obviously, we need to work through this, but what we proposed in the draft reg guide, as Margaret mentioned back in Section 4.3, is that for the base fire PRA model which relies on the base internal risk model, that the reg guide 1.200, revision two, and our -- our standard review plan 19.1 and 19.2 are already staff positions on how our licensing may meet --

MEMBER BLEY: Yes, but they don't -- they don't point to specific methods or computer codes of any kind.

MR. LAUR: No, they don't, and so that is acceptable methods of the technical adequacy of the -- of the so-called base PRA.

MEMBER BLEY: Agreed.

MR. LAUR: Now this is talking about the self-approval process, and what we're trying to differentiate here is that we want to review the cause and effect relationship -- we're saying method but that's the primary one we can think of -- the cause and effect relationship that a licensee intends to use for the various flavors or types of changes you may wish to make. And the reason you want to do that is, I guess in the course of reviewing many non-fire related risk informed submittals and requests, we have seen over the years various degrees of proficiency in identifying the cause and effect relationship and translating a plant condition into a model.

MEMBER BLEY: No, this is a requirement that goes beyond reg guide 1.200. This goes beyond -- it's a little fuzzy to me because I don't know quite what it means.

MR. LAUR: Well, the self-approval process we're proposing a license condition that says the methods have to be approved by the staff.

MEMBER STETKAR: Let's take a very simple -- get away from fires. Just let me use the word data. In particular for fires I need to estimate the frequency of a fire in a compartment. Now there are different data handling methods that have been used in PRA community to estimate that frequency, anywhere from reasonably ad hoc methods to quite involved two-stage Baysian methods with priors that are developed from a very expert elicitation process. Which of those methods have been approved for just evaluating the frequency of a fire in a compartment?

MR. LAUR: None to my knowledge.

MEMBER STETKAR: So nobody can do this analysis because it's not --

MR. LAUR: No, that's not what I'm saying.

CHAIRMAN APOSTOLAKIS: Steve.

MR. DINSMORE: Hi, this is Steve Dinsmore. Can you hear me this time? Okay. I'm from the PRA branch. I think this is getting more complicated than it's really intended to be. Methods that have been approved by the staff, for example, the WKUP and EPRI methods to do risk informed ISI is a big thick documents that describe how to do that.

There's methods how to extend AOTs. There's ILRT extensions. Pretty much everything has a description of methods that we've -- that's why Steve was speaking about topicals.

MEMBER STETKAR: Those are application methods, not --

MR. DINSMORE: And this is what we're talking about.

MS. STAMBAUGH: Theory applications.

MEMBER STETKAR: From what I think we were hearing from this question and perhaps what the genesis of the concerns may have been may be at the level that Dennis raised regarding the actual methods used within the risk assessment to derive frequencies of fires, human error probabilities -- you know, you name it, any of those types of things that indeed would -- would contribute to that analyses that are either in the self approval or eventually submitted to the -- to the staff for formal review.

So perhaps the reg guide needs to be a little bit more specific about the use of that word method.

CHAIRMAN APOSTOLAKIS: I guess if, let's say, there is another Nathan -- someplace who does a thesis and develops his own code to do fire propagation, I would say this is a novel method, because nobody else has done it. Nobody has used it. It's new, so it would have to be --

MEMBER STETKAR: But George you're getting into that area that -- it's the same area we were talking about, and that's different from what either Steve is saying in terms of the intent of NRC approval.

CHAIRMAN APOSTOLAKIS: No, I agree that maybe it's a matter of language, really. The word methods, I don't know.

MS. STAMBAUGH: That's definitely something that over the course of the various public meetings we've identified as a source of confusion. You know, what methods are you talking about? You know, what is the definition of your term methods? That's definitely something that we're aware of to clarify.

CHAIRMAN APOSTOLAKIS: Let me, for example, the base line PRA will have a fire bar, because it has gone through the NEI peer review process. That implies to me that the methods that have been used are okay, so if I keep using those methods then I'm okay.

If I use something else that has been used in another PRA someplace that the staff has reviewed, that's also approved. But if it's completely outside the set of methods people have used, then it seems to me it deserves to be called novel, that somebody should look at it.

But is that the way to run a business? I don't know. So what is your final answer to this?

MS. STAMBAUGH: We don't have a final answer at this time. This is, again, just the questions that we're dealing with, that we're going to come back to you in July with how we're addressing public comments.

Okay, so now we're sort of transitioning into the second topic that I was going to talk about today, and I call it recovery actions. There's all sorts of different ways to bend these issues. They're very overlapping and meshed, but beginning with prior approvals, there's various types of prior approvals, so the first question when does a previously approved Appendix R exemption satisfy the requirements of NFPA 805? It's very general.

The second question then gets more specific. Some licensees have approved exemptions to their Appendix R license which involve operator manual actions. How should those previous approvals be transitioned to the NFPA 805 licensing basis, with an emphasis sort of on the how -- how do we transition those previous approvals?

It's -- the 805 language is -- there's quite a bit of 805 language about previous approvals. They allow -- 805 allows for a valid, prior approvals to be transitioned. In Chapter Three which -- we call things Chapter Three, Chapter Four quite a bit, so bear with us.

Chapter Three is fire protection program design elements. It contains deterministic -- that's not the right word to use, but it contains specific design elements, and then Chapter Four, again, is the fire protection program systems and features, and that has the performance based methods for compliance.

Now this 805 has two different compliance strategies for the two different types of compliance, deterministic versus performance based. Chapter Three, prior approvals has language that says that prior approvals to determine criteria take precedence over deterministic compliance criteria of Chapter Three. So, in other words, if you have a deterministic criteria that you're trying to meet and you have a previously approved exemption under Appendix R, that takes precedence over the deterministic requirements in Chapter Three.

Chapter Four is a little bit different. It's the performance based side of the boat, so Section 2.2.7 describes -- and I always get the four Es wrong, but the EEEEs can be used to demonstrate compliance, and 4.2.3.1 specifically says that recovery actions -- the use of recovery actions shall imply the performance based evaluation method. So that gets to the second part of the question which is how should previous approvals dealing with operator manual actions be transitioned, and in Chapter Four of NFPA 805 there's language that says they should be treated in a performance based space.

So that's some of the regulatory framework. The draft guide that's out, sections 2.3.1

and 2.3.2 propose guidance that -- guidance that the prior approvals needs to be valid at the time. That comes out of the rule. The main reason why these are an issue is that it's important to have the prior approval -- prior approvals under Appendix R to transition cleanly or clearly at least into 805. There isn't direct correlation between those exemptions and the new 805 licensing basis, so we need to have a consistent and clear way to transition those prior approvals.

CHAIRMAN APOSTOLAKIS: I thought the -- if I remember correctly -- an approval, an exemption now becomes part of the licensing basis, period, right? That's it?

MS. STAMBAUGH: Yes.

CHAIRMAN APOSTOLAKIS: Okay. So in the transition, as I remember, the licensee's expected to look at all the requirements of the NRC, of the regulatory system, and if they meet them, then it's fine, including the exemptions. If they don't some of these may not be satisfied, then they have to do a fire risk assessment, calculate the difference in delta CDF and delta LERF from the ideal situation where they meet everything and the real situation and then involve regulatory guide 1.174 to justify whether they don't meet certain is acceptable.

So that seems to me to be a clean process, so this question doesn't make sense.

MS. STAMBAUGH: Right, the difficulty is that the prior approved exemptions are exemptions to their Appendix R licensing basis.

CHAIRMAN APOSTOLAKIS: Yes.

MS. STAMBAUGH: They don't have any exemptions to 805 right now, right?

CHAIRMAN APOSTOLAKIS: No, no.

MS. STAMBAUGH: They're just trying to --

CHAIRMAN APOSTOLAKIS: But they are a part of their licensing basis now.

MS. STAMBAUGH: Yes, so the question is how do you take those Appendix R exemptions and transition them into an 805 basis? That's the question. How do you -- how do you make that transition? That's what we're trying to get at.

CHAIRMAN APOSTOLAKIS: But what -- I still don't understand what the transition means. I mean, that's part of the license --

If somebody meets all of the regulatory requirements, then does a PRA, okay, and that's the base line PRA now that will be used for all future NFPA 805-related changes, what's the problem?

Exemptions to Appendix R are part of the licensing basis.

MR. LAUR: This is Steve Laur again. Let me see -- this may be a different way of looking at it then. Maybe when you heard when the original reg guide came through, and, in fact, if you look at reg guide 1.205 it talks -- there's a very complex sentence in there that talks about two different risk assessments which --

CHAIRMAN APOSTOLAKIS: Yes.

MR. LAUR: -- quite frankly none of us can figure out what they mean, or some of us can't figure out what they mean, and we're trying to clarify that in the draft guide, okay.

But from a big picture standpoint, compliance with regulations is presumed to provide adequate protection of public health and safety, and the Commission has said a licensee may either implement a fire protection program under 50.48(a) and (b) or (a) and (c). So between either one of those is an acceptable way, okay.

But the current reg guide 1.205 risk evaluations appear to do is assume that you can mix and match from the two sets of requirements, and it becomes confusing because they're so similar -- in a case of deterministic like almost identical in most cases, 20 feet, three-hour suppression detection, etcetera, that you probably could mix and match them, but that's not the intent. I mean, you meet a and b or a and c, okay.

Now built in to NFPA 805 are legitimate ways to -- to do some of the things that were done by exemptions without needing an exemption. The obvious one's performance based method. You do a risk assessment and it meets all of the risk guidelines and the safety margins, and we say that's good enough, even though it doesn't meet the 20 feet.

But one of the other ways is for -- to use a pre-existing exemption or other document or other licensing basis and say, well, basically it meets this through an engineering equivalency or through the Section 3.1 words that say previously approved alternatives are okay.

So what we'd like to do is when all of the dust settles from the transition and a licensee has implemented 805, that's very clean. How do they meet this rule? And those exemptions, if in fact are a recommendation from OGC and the working meeting was to rescind or revoke the exemptions because they're not necessary. Exemption was just a base to say we'd already found something that had equivalent fire protection. But if you leave it laying around it's an exemption to a rule they no longer meet, but it's still valid. It just doesn't have a context. So that -- anyway.

Having said words like that in the draft guide has led to some questions like this from the public.

MEMBER STETKAR: See if I can get it straight because I don't have the benefit of the history the Appendix R licensing process and the exemptions under that. I'll use my example from earlier this morning.

Suppose that a particular plant had an approved exemption under Appendix R that allows credit for the operator, locally, mechanically, opening that motor-operated valve that I talked about earlier this morning, and that was approved under their Appendix R exemptions.

How would that particular action be treated in the transition process? Would it be transitioned and allowed, or would it be necessary to include that action as a risk informed, performance based evaluation?

MR. LAUR: Our draft guide says that

because Section 4.2.3.1 of this thing says that recovery -- it says one train or one -- anyway.

You go to shut down the plant without using recovery actions. If you use recovery actions you shall use or shall imply use of the performance based methods.

MEMBER STETKAR: Okay, so that action, even though it was approved under the --

MR. LAUR: That's what the draft guide is saying.

MEMBER STETKAR: I just want to get it straight so I understand it.

MR. LAUR: Yes, and the public comments are to the opposite.

CHAIRMAN APOSTOLAKIS: But wait a minute now. So that action would have to be approved again?

MR. LAUR: No.

CHAIRMAN APOSTOLAKIS: It's part of the licensing --

MS. STAMBAUGH: But the way that you would transition it would be through the Chapter Four process.

CHAIRMAN APOSTOLAKIS: Which means?

MS. STAMBAUGH: Which means doing the performance based process, which then would involve an engineering equivalency evaluation, and that engineering equivalency evaluation could be unit approved in the past.

MR. LAUR: For operator action it doesn't allow.

MEMBER STETKAR: That's why I asked operator action.

MS. STAMBAUGH: I'm sorry.

MR. LAUR: The problem, George, in my mind --

CHAIRMAN APOSTOLAKIS: Yes.

MR. LAUR: -- is there are two different but very similar sounding risk assessments in this rule, and if you say that here's an exemption and, therefore, we're going to say it was allowed today; therefore, it's allowed tomorrow and that's all we do, then you are not going to be able as a licensee to demonstrate how you meet this rule.

You say, well, it was okay under Appendix R, but you don't demonstrate that you meet this rule, because an inspector or anybody could come in at a later date and say how does this room meet your criteria, this fire area? And he says, well, it doesn't meet the deterministic requirements. We have a cable over there that's the other train cable, and we didn't wrap, but we have offered a recovery action.

So, okay, show me the change in risk and the defense-in-depth and safety margin analysis, and he says we don't have that. We have an exemption, and that exemption is going to say in Appendix R (3)g)(2) you're not allowed to do this but we let you do it for some reason. That's all it's going to say. It's not going to be a risk argument there, because risk was not a part of Appendix R.

And so they're not going to be able to demonstrate compliance with this document if they don't have that risk assessment, and that's what we're asking, and that's what their comment is --

CHAIRMAN APOSTOLAKIS: That's not the way I understood it. I thought that the licensing basis -- everything that has been approved is there, and now in NFPA 805 you do your fire risk assessment and you say with this approved licensing basis of my plant, my fire risk is this, thank you very much.

And from now on every changes I propose will use that base line risk to request approval and so on, but it doesn't say that, oh, show me again that this action is right. No, it has been approved. It's part of my licensing basis.

In the new world, I will have to add some probability that it will not be carried out correctly, but that's my base line now. That's the way I understand it.

MEMBER STETKAR: But George you couldn't -- an approved action as having a de facto error rate of zero, because it was absolutely approved. It's a deterministic approval --

CHAIRMAN APOSTOLAKIS: No --

MEMBER STETKAR: -- the same way that --

CHAIRMAN APOSTOLAKIS: -- you are in a new world now. It has been approved. It is acceptable, but now in the new world there is a probability it will not be carried out, and from now on --

MEMBER BLEY: Which is in that risk assessment.

CHAIRMAN APOSTOLAKIS: Yes. From now on, if I want to -- let's say -- let's not talk about human actions but instead of 20 feet I have approval for 18 feet.

MEMBER STETKAR: Well, let's talk about human actions --

CHAIRMAN APOSTOLAKIS: Okay, human actions.

MEMBER STETKAR: -- because the

deterministic stuff is actually cleaner.

CHAIRMAN APOSTOLAKIS: But I don't have to argue again on the basis of risk that this action is a legitimate action. That is part of my licensing basis.

MR. LAUR: I agree with that 100 percent for the 18 feet.

CHAIRMAN APOSTOLAKIS: Yes.

MEMBER RAY: But you used the example that he used of the other train that isn't fire protected in this fire zone.

CHAIRMAN APOSTOLAKIS: If I'm violating a particular requirement, deterministic requirement, then I have to go through this exercise of doing a PRA for the ideal case where I do meet it and then a PRA for the case the plant is now and argue that the difference is acceptable under regulatory guide 1.174.

MEMBER RAY: But isn't he just talking about the mechanism to track that? Transition is the word you used.

CHAIRMAN APOSTOLAKIS: But a human action is not a violation of existing criteria, because it has been approved. It's part of my licensing basis. That's the way I understood it. We're opening up again a whole host of problems.

MR. DINSMORE: Yes, this is Steve Dinsmore of the PRA branch. Steve had mentioned earlier there's two calculations in the rule, and what you've just keyed in on is that there's a difference between those two calculations.

The second calculation, the way we've been reading it is, you do -- even though this thing -- human error, specifically recovery actions -- the way that the rule is written is if you have a recovery action even if it's previously approved, you have to evaluate the risks associated -- or the additional risks associated with that action.

Now if that -- if the total risk is still less than the acceptance criteria, I don't think -- it doesn't seem like you'd have to do anything. That action would just carry over, if total risk from everything might be a little above what your acceptance criteria is, you still don't have to do anything with that recovery action, per se.

CHAIRMAN APOSTOLAKIS: What are the acceptable criteria?

MR. DINSMORE: Well, it's ten to the minus five of the transition.

CHAIRMAN APOSTOLAKIS: Delta?

MR. DINSMORE: Yes.

CHAIRMAN APOSTOLAKIS: No, but that's my point. You're not calculating the delta.

MR. DINSMORE: It says additional.

CHAIRMAN APOSTOLAKIS: You're talking the base line PRA. That was my --

MEMBER STETKAR: Well, we don't have a base line PRA after the transition.

MR. DINSMORE: No, this was before the -- this would be during the transition. It's the delta. It says additional risk. That's why we keep talking about it.

MEMBER STETKAR: During the transition?

MR. DINSMORE: Yes.

CHAIRMAN APOSTOLAKIS: It's additional if you don't meet some of the requirements. If it has been approved then you meet it.

MR. LAUR: No, I disagree, George, I'm sorry. Steve Laur again.

CHAIRMAN APOSTOLAKIS: Then you're opening up a whole world again.

MR. LAUR: A licensee is going to submit -- and what the rule says is tell us the license conditions that you have to supersede or revise and request the 805 and the Commission can grant you to be an 805 plant. That's all you need is identifying the license conditions that have to change and things like that.

So at some point in time, let's say all the mods are done, all the dust settles, this is the plant's licensing basis, not Appendix R. And if you can't show me how you meet something in here, you're not in compliance.

And so if I come in here and it says deterministic approach -- this is 4.2.3.1 -- one success path of required cables have to meet the requirements, okay, without the use of recovery actions. Use of recovery actions shall demonstrate -- I'm sorry.

Use of recovery actions to demonstrate the availability of a success path shall imply use of the performance based methods. So they don't have to do risks. They can do fire modeling or they can do fire risks. Or they can propose under 50.48(c)(4) some other performance based risk informed method. But if they don't do that delta risk then we're in danger of recreating the Appendix R scenario where any inspector can come and say how did you meet this, and the answer is I have an exemption. That doesn't meet this.

CHAIRMAN APOSTOLAKIS: There is no acceptability criterion for a base line risk.

MR. LAUR: That's true.

CHAIRMAN APOSTOLAKIS: It is what it is. The acceptability is for delta.

MR. WEERAKKODY: Dr. Apostolakis, I understand what you're saying because I was here three years ago with the old reg guide. What I propose is is that since this has been an area of contention and we have had feedback like what you're saying from the public comments, can we -- does it true that process as opposed to -- I see it as different opinions --

CHAIRMAN APOSTOLAKIS: You understand the position?

MR. WEERAKKODY: I fully understand your point of view.

CHAIRMAN APOSTOLAKIS: Okay.

MR. LAUR: And, in fact, working with the Office of the General Counsel to resolve this. If this can be resolved, you'll hear one way or the other come July --

CHAIRMAN APOSTOLAKIS: All I'm saying is just as you accept that the previous exemption allows you to have a separation of 17 feet, and you don't question nothing --

MR. WEERAKKODY: That's right. That's correct.

CHAIRMAN APOSTOLAKIS: Why should you question a recovery action that was approved? You shouldn't. That's part of the deal. And there is -- the moment that you get a base line fire risk, delta CDF and LERF, that's what we want to do in the future.

MEMBER BLEY: George, if you'd -- I'm not sure why you'd transition to 805 if you didn't want to do the PRA, but you don't have to. You can transition to 805 which has deterministic criteria. So you haven't done that PRA you're talking about just because you transition to 805.

MEMBER STETKAR: You can do something that Steve talked about, which is a fire model, a fire model to determine according to, you know, an approved method to say that it's acceptable that I have 18 feet rather than 20 feet. That's not a PRA. It's a fire model, period. No quantification of fire frequency. No quantification about human action. It's not a risk assessment.

CHAIRMAN APOSTOLAKIS: So this 18 feet is going to be questioned again?

MS. STAMBAUGH: No.

MEMBER STETKAR: No.

CHAIRMAN APOSTOLAKIS: No, so why should the recovery action be questioned again? That is my point. That is my licensing basis now. Everything that has been approved and I meet it is my licensing basis. In the new world, it's still my licensing basis.

MEMBER RAY: Okay, but how do you get that everything that was approved into the context of this red book that he keeps holding up, that the inspector is going to go out and enforce? How do you make it happen, George?

MEMBER STETKAR: Seventy mile an hour speed limit. When the U.S. put in a 55 mile and hour speed limit, they changed the law. The state had to change -- you couldn't justify that you were driving 70 in your state because the law has changed.

CHAIRMAN APOSTOLAKIS: If it is a deterministic situation, that has been handled already.

MEMBER RAY: I know, but how do you get the already into the context that people in the field can understand?

CHAIRMAN APOSTOLAKIS: I have a licensing basis. I don't understand that.

MS. STAMBAUGH: I think it's -- deterministic.

MEMBER RAY: The licensing basis doesn't

have the significance that you're attributing to it when you have to go out in the field and enforce it. You have that thing.

MS. STAMBAUGH: And it's easier with a deterministic, because when you're in Chapter Three it says that deterministic prior approvals -- what was the term?

CHAIRMAN APOSTOLAKIS: They carry over, or something.

MS. STAMBAUGH: Specifically, they supersede the Chapter Three deterministic requirements. For the performance based things they do not supersede. You're supposed to use the performance based method. That's what 805 says. That's why it's complicated and why this question comes up.

MR. LAUR: For recovery --

MS. STAMBAUGH: So that's exactly the question that we're dealing with. That's exactly the comments that we're getting.

CHAIRMAN APOSTOLAKIS: I'm completely confused.

MEMBER STETKAR: It's really confusing. The only way I can figure it out is specific examples.

CHAIRMAN APOSTOLAKIS: I thought I

understood it at the subcommittee meeting a long time ago, but, you know, you do this imaginary -- the PRA for the imaginary situation where you meet everything. The PRA for the plant and you look at the difference in delta CDF and delta LERF.

The imaginary PRA, if there is any recovery action that has been approved includes that and say I'm meeting it, so I'm not going to consider it as a change, right?

MEMBER RAY: But that's not the question. The question up there is how should those previous approvals be transitioned in the NFPA 805 licensing basis. That's a mechanical process question.

CHAIRMAN APOSTOLAKIS: And I'm saying the way the -- I mean, it's part of the plant. I mean, why do I have to worry about it.

MEMBER RAY: Because the reference is to NFPA 805 licensing basis, and unless you do something to take these previous approvals and make them part of that, you're going to wind up with this god awful experience we had before that nobody in the field can figure out what the requirements are.

CHAIRMAN APOSTOLAKIS: But it doesn't refer to approvals. It refers to exemptions, and that's what I don't understand. Do you mean by approval everything? The whole thing is up in the air and now we are starting questioning again the fire zones, this and that and everything? No, I don't think that's what they intend.

So you are making a distinction between exemptions and the standard stuff. I don't know what word you use for that. And I'm questioning that. I'm saying if your exemption has been approved it's part of the standard stuff. Don't pay extra attention to it. But you guys say no, so I don't know.

MEMBER BLEY: I'm just trying to read it. I'm looking at it now, George.

CHAIRMAN APOSTOLAKIS: And what does it say?

MEMBER BLEY: Let me go to the risk informed or performance based. It doesn't say anything about past exemptions or anything like that. It just says you have to satisfy the performance goals, performance objectives, and performance criteria in 805.

CHAIRMAN APOSTOLAKIS: Okay.

MEMBER BLEY: So it's divorced it from the old licensing basis, and it's -- to the new one.

CHAIRMAN APOSTOLAKIS: And in terms of practical thing, what does it mean, that I question again everything?

MEMBER BLEY: You have to meet the requirements that are in 805 for that condition.

MEMBER RAY: I don't think -- you're using the word questioning as if it has to be redone, whereas the issue at hand up here is simply how do you do it into this thing called the 805 licensing basis?

CHAIRMAN APOSTOLAKIS: No, the issue is --

MEMBER RAY: Just list them all down and attach it. I mean, I'm just being simplistic here, but you've got to do something or people won't understand how to make this work in the field.

MR. HARRISON: This is Donnie Harrison, and if I can just clarify. I think we hear what you're saying, George, and, again, that's why we're getting this question.

The real, I think, bottom line issue is there's a sentence in NFPA 805 that when we read that sentence it says if you've got these recovery actions you need to do the risk assessment or you need to do the fire modeling. You need to go to that performance based pack, if you have them. And it doesn't give you an out if it was part of an exemption before.

So if you're going to do that then NFPA

805 says do the performance based approach. That's the dilemma and that's why it's focused strictly on the exemptions related to operator manual actions and the recovery actions. So it's that one sentence in that NFPA 805 guide that's driving this question, and, again, that's -- that's -- pardon me if I'm wrong about that. That's the crux of what we need to come to grips with on this question.

MR. CANAVAN: Donnie, Ken Canavan. Quick follow up on your question. A quick follow up on your question or your take on it. According to risk analysis, could it be an interpretation problem, I guess? Could the risk analysis be the base line risk of the -- of the area of zone?

I want to give you an example to George's point. The as built, as operated plant -- we're not doing that calculation. We're doing the calculation of the four Appendix R, as built, as operated plant, and then we're assessing Appendix R as if it was delta, which it's not because it's in place. So the as built, as operated plan should consider the changes in accordance with Appendix R.

I do understand that I think we need to make a list of the exemptions that are in that area, but maybe the question is how you interpret the -- the risk assessment.

MS. STAMBAUGH: There's more along those lines, so can I move on to the next question.

CHAIRMAN APOSTOLAKIS: Of course. We're going to have another subcommittee meeting before this thing is final?

MS. STAMBAUGH: Yes.

MR. LAUR: I'd like to show you how we answered this question.

CHAIRMAN APOSTOLAKIS: Good. Now you've got the flavor of the concerns of the subcommittee.

MEMBER SHACK: Sure, that's why these questions are on there.

CHAIRMAN APOSTOLAKIS: Okay, so where are we now? And I think we're running out of time soon.

MS. STAMBAUGH: Okay, first question. I'm going to focus on the bold part here. How should the performance based risk evaluation be performed for plants which are not purely deterministically compliant? So, again, it's focusing on the how -- how do we perform that risk evaluation, and should the evaluation be different for a pre-transition process than for post-transition plant changes?

Okay, so starting with that second question first. We've sort of been talking around this already. I'm not sure if we need to talk about it more, but as -- as George noted or began the discussion, there's a difference between the risk evaluations that are performed to transition than the risk evaluations that are performed subsequent to transition. That meaning that the risk evaluations performed to transition formed the base line to which subsequent changes are compared.

So -- so what's described in 805 is slightly different. There's the risk evaluations from 4.2.4.2 compared to the plant change evaluations. They have similar nuances, but the base line ends up being slightly different.

Okay. The rule says that risk is quantified by comparing the risk of a plant change to deterministic compliance. That's from 4.2.4.2. This question comes up because it's hard to conceptualize a plant that's fully deterministically compliant, but 4.2.4.2 says that the risk associated with the implementation of the deterministic requirements with the proposed alternative to a deterministic requirement. So this is what, you know, really understanding what that part of the rule means and getting the guidance appropriate, and the draft guide is, you know, is what this question is getting to.

The draft guide sections that deal with this question, the proposed language is in Section 2.2.4, if you want to review that part. And this is an area that we've had quite a bit of discussion on recently in --

CHAIRMAN APOSTOLAKIS: Is that where you invoke regulatory guide 1.174 --

MS. STAMBAUGH: I don't know if that's the section.

CHAIRMAN APOSTOLAKIS: -- of the first question?

MR. LAUR: I don't think so. Maybe it's in Section 4.3. It may be in both.

CHAIRMAN APOSTOLAKIS: How should a performance based risk evaluation be performed for plants which are not purely deterministically compliant? That's when you do those two --

MS. STAMBAUGH: Yes.

CHAIRMAN APOSTOLAKIS: You take the delta CDF and you go to 1.174 and say, yes, I am not purely deterministically compliant, but I'm requesting a change which is acceptable under this guide; therefore, I'm a happy fellow. Right? I mean, it doesn't take much to make me happy, right?

I thought that was the approach, and I get smiles all over the place. Okay, let's move on to slide 10.

MS. STAMBAUGH: Okay.

CHAIRMAN APOSTOLAKIS: There is a transcript, so --

MS. STAMBAUGH: Part of -- part of what plays into this recovery actions is as we discussed before the definition of recovery action and, therefore, the definition of primary control station, which is the term that is not defined in the NFPA 805 standard, so the question that comes up is what guidance is available to treat recovery actions for which a quantitative risk assessment is very challenging or involves a great deal of uncertainty.

The reason that this becomes an issue is that with this being a new technology, fire PRA not being as mature as the internal events PRA, the concern is that if you have too much conservatism built into that model then you're making decisions based on an information that, you know, may not be useful. So when you're trying to model these recover actions as a result of, you know, what we define as a primary control station then modeling those recovery actions could be very difficult or could be -- involve a great deal of uncertainty. So that's, you know, what we're playing with to try to make sure that the regulatory framework is appropriate for the maturity of the technology and for regulatory stability.

CHAIRMAN APOSTOLAKIS: And how is this different from other contexts like NRR has to make decisions all the time, right? I mean, you faced this issue, Steve, so why is it -- I mean, why don't you go here. What you do in general, which I don't know what it is, but --

MR. DINSMORE: Yes, this is Steve Dinsmore. I guess that question is that we will treat it the same. This is a question that we're getting from the public. We haven't answered them yet, and so I think that the general answer is we'll do -- well, there are different ways and --

CHAIRMAN APOSTOLAKIS: John?

MEMBER STETKAR: Margaret, you said something and I just wanted to make sure that I understood it again because it goes back to this definition of recovery actions. You said something to the effect of how does one model recovery actions in the risk assessment?

The implication to me of that statement is that if something is not a recovery action it need not be modeled. Is that the staff's interpretation?

MS. STAMBAUGH: No, there's -- there's other --

MEMBER STETKAR: I just wanted to make sure.

MS. STAMBAUGH: Okay, that's my last question in the recovery action section.

CHAIRMAN APOSTOLAKIS: Good. Now you are telling us you want the ACRS to come back in June and July?

MS. STAMBAUGH: Yes. Just to be brief, we just finished the public comment period so we're going to be addressing those public comments. They're tentatively on the schedule for July 23rd I think it is for the next subcommittee meeting.

CHAIRMAN APOSTOLAKIS: I not going to be here.

MS. STAMBAUGH: That's why we had this meeting. And then we're tentatively on the schedule for the beginning of September of 2009 for the full committee.

CHAIRMAN APOSTOLAKIS: So we -- I mean, I would really like to have a subcommittee meeting before the full committee. No, nothing's wrong but we should have a meeting because there are a lot of questions that have been raised, and during the -- you know, you will get an hour and a half at the full committee meeting, so I doubt that --

MR. SHUKLA: And also if you plan to submit any new documents it has to be with us one month in advance --

MS. STAMBAUGH: Yes.

MR. SHUKLA: -- of that subcommittee meeting.

CHAIRMAN APOSTOLAKIS: Of the full committee, too.

MR. LAUR: Sunil might throw something at me, but I'd be perfectly happy with August, as long as we can still get the full committee in September. That's the --

MR. SHUKLA: That's fine.

CHAIRMAN APOSTOLAKIS: And what I'm saying is that, yes, unless we have a subcommittee meeting before I would be very reluctant to write a letter. So, Sunil, you have a proposal?

MR. SHUKLA: I have to talk to the ACRS staff and see how we can do it. There must be a way. I just don't know.

CHAIRMAN APOSTOLAKIS: And you need the full day?

MR. LAUR: Well, if we're going to be

answering these questions -- well, if you look at the questions there's probably two or three major issues we've discussed, okay. There's a whole bunch of comments, but the bulk of them come down to this last one that we've spent most of the time on with the -- with the additional risks of recovery actions. That's the big one.

The license condition may be the second, and there's another. The rest of them are probably going to be fairly straightforward.

CHAIRMAN APOSTOLAKIS: There is a week in August where we have a meeting on digital I&C. We will probably add half a day on safety culture the day before, correct?

MR. FLACK: It's under discussion. This is John Flack of the ACRS staff. Yes, it looks like that in the direction we're going, but there's a reluctancy to put subcommittees, you know, in August because this is the time when staff has a chance to take R&R --

CHAIRMAN APOSTOLAKIS: We already have --

MR. FLACK: -- so we have to work that through the system. So we're trying to avoid August at this point.

CHAIRMAN APOSTOLAKIS: But we already

have a digital I&C.

MR. FLACK: I understand, I understand, but it all needs staff support and that sort of thing, so -- So late July would work better, but now we can't do late July, so --

Well, Girija has got the lead on this committee. I don't want to take that responsibility away from him.

CHAIRMAN APOSTOLAKIS: But you are saying that the safety culture subcommittee meeting is up in the air?

MR. FLACK: No, we're trying to make that work. Since the I&C has now come down in size we're trying to add it on there, which would make sense.

CHAIRMAN APOSTOLAKIS: I think my question is whether we could take the morning of that day and do this? If you need more than half a day, then we can't do it.

MR. FLACK: Well, we'll try and go in that direction.

CHAIRMAN APOSTOLAKIS: That saves also in trips. People then don't have to fly to Washington. Now why do you say we need a full day, Jim?

PARTICIPANT: I was just being -- Wait till you hear his presentation.

MR. CANAVAN: Yes, why don't -- why don't we go through my presentation, and maybe I'll change your minds.

CHAIRMAN APOSTOLAKIS: Maybe we need a week. Okay, any questions for the staff? Maybe we should move on then and then have a discussion. Let's have the industry presentation now. Okay, Ken. Are you going there alone?

MR. CANAVAN: I think so.

MEMBER STETKAR: George, you know the digital I&C subcommittee is two and a half days?

CHAIRMAN APOSTOLAKIS: Yes. That's Wednesday, Thursday and part of Friday. So the idea was to add something on Tuesday so people don't have to come back another day.

MR. CANAVAN: I think I'll just stay here forever. So instead of making it four days out of my life that week, it becomes five days out of my week, or maybe six.

CHAIRMAN APOSTOLAKIS: Absolutely, absolutely. So we have a copy of your slides, Ken?

MR. CANAVAN: I think you do. Good morning, George.

CHAIRMAN APOSTOLAKIS: Good morning.

MR. CANAVAN: It's always good to be here with the subcommittee. My name's Ken Canavan. I'm the program manager for the risk and safety management program at EPRI. I was supposed to be joined by Biff Bradley, but he is doing his civic duty, jury duty.

CHAIRMAN APOSTOLAKIS: Good.

MR. CANAVAN: Guilty. That's one of the reasons why I'm a little bit behind schedule, but I'll try and put us back on schedule. I do have one confession to make. I pulled these slides together with the help of many others in a very short period of time, so it might be a little terse.

I also started by summarizing everything in the presentation on slide two. This way if we didn't get past slide two I'd gotten my major points across. So with that I'll give you slide two and with the caveat we're going to talk in detail about all these other -- all these bullet points in the remainder of the slides. So this is sort of the summary first.

The first one -- I didn't know how familiar the subcommittee was with the current status of the development of fire PRAs and specifically the application of those fire PRAs to NFPA 805. I knew the subject of this meeting was reg guide 1.205, which is really the latter part, the application of fire

PRAs to NFPA 805.

I did want to start with a little bit about fire PRA methods in NUREG/CR-6850 to give you some background. Recently -- and as another just summary point before we get into the presentation, I realized after -- after the two previous presentations that we're in agreement on at least one point, which I will reiterate in my slides, which is good.

So starting with NUREG/CR-6850, which is also a joint publication with EPRI, which is EPRI 101.1989. We have to get a better numbering scheme so people will quote our number.

The recent pilot results that we have of that method which is the Duke Oconee pilot and the Shearon Harris pilot shows that the results that are coming out of those studies don't comport with fire experience in the industry. And when I say don't comport, it's on a variety of levels. It's the ignition frequencies. It's the severe fire experience. It's the suppression experience. It's the overall core damage experience. So on a variety of levels when we do the -- when we take the numbers and we build the models and we quantify them we find that on a variety of levels that they're not comporting.

And that's really driven by some of the methods and some of the data.

MEMBER BLEY: This may be a dumb question, but if you're doing a fire PRA in one of these pilot studies and you're generating frequencies of these fires, and then you say the answers you get don't comport with -- what's going on?

MR. CANAVAN: We'll talk a little bit about that.

MEMBER BLEY: Okay, good.

MR. CANAVAN: Slide three -- we'll start with slide three, a couple of the other ones. But I wasn't sure how familiar you are with these issues, but some of that's to be expected. I mean, we need to understand that this was a method that wasn't fully piloted before, and so some of these adjustments to the methods and the data and the treatments we're going to have to work on. And we were and are working on them. And I'll get into some more detail.

Well, the impact of having a gross overestimation of fire risk and gross overestimation was my turn. Maybe it's a little over the top, but it certainly is a significant overestimation in that if you combine these with other risk contributors you can mask them, and it can be very difficult to make decisions in that.

MEMBER STETKAR: But when you say mask of the contributors, that's perhaps a little bit too strong also because doesn't the risk of small LOCA mask the risk from large LOCA in internal events in that same sense. If the risk -- if in fact is driven by fires the risk is driven by fires, and that's important information. It isn't masking anything. It's just what it is.

MR. CANAVAN: And when I use the term mask, I don't mean mask as in just its larger and you don't see the other one, I mean in terms of its overestimated -- and hides the other one because if I was to reduce it the other contributor might be more equal or greater.

So in other words if we have fire and its only a factor of two times internal events -- power is still important, but if it's a factor of 10 times greater the power is unimportant from internal events.

MEMBER STETKAR: Well, but maybe that's the world really is.

MR. CANAVAN: And in fact if you're realistic in your fire methods that's true. If you're not, that's not true.

CHAIRMAN APOSTOLAKIS: And so are you --

I hear you saying Ken that NUREG 6850 is useless; is that what you're saying?

MR. CANAVAN: No, no, no.

CHAIRMAN APOSTOLAKIS: Maybe the results are unusable or methods --

MR. CANAVAN: They're unusable for other applications other --

CHAIRMAN APOSTOLAKIS: That is what you're saying to make it useless.

MEMBER STETKAR: Why are they unusable? I mean, let's -- I know you want to get on with your presentation, but I think you have to be careful to differentiate between two pilot applications of some methods that may not have been completely extended, either in the pilot application itself or the methodology may not have been extended to the level of sophistication as internal event models. And that's one issue.

Given an integrated assessment of fire risks, according to those methods if they've been extended, I don't understand why the modeling results aren't useful for applications.

MR. CANAVAN: Specifically, we'll -- we'll talk a little bit more about details as I get through. And I'll caveat all this in their current form and as 68 is written. So let's go through the rest of the presentation, because there is good news later -- or better news.

Okay, draft reg guide 1.205 bringing us all to why we're here is to talk a little -- prescribes the use of 6850 in it's -- in it's -- in its current form, and that deviations from 6850 will require NRC acceptance.

CHAIRMAN APOSTOLAKIS: Right.

MR. CANAVAN: This is a big change in how we do applications for other PRA initiatives where we don't go in and we don't request NRC approval, and once this gets into a draft reg guide there are some -- or a reg guide permanent, there are some implications that we need to probably think about a little bit.

Okay, that was the hard part. If I got through that, the rest gets better.

CHAIRMAN APOSTOLAKIS: You got through it because you didn't explain.

MR. CANAVAN: Excellent. That may be the -- that's probably the strategy or a good use for it.

So I'm going to step through this now one by one, so let's talk a little bit about some conservatisms in the study. Why is this the way it is? And there are a lot of frequently asked questions out there. The frequently asked questions that are on the PRA portion on 6850, the PRA portion of NFPA 805, those are all addressing in some way shape or form normally a conservatism or a clarification, which is usually in the treatment of a conservatism in 6850.

And if I take an example of what's not a frequently asked question yet and bring it to you, I'll give you an example of what in terms of electrical cabinet ignition frequencies, what I would predict. So if I take 6850, the generic ignition frequencies for electrical cabinet's about 4.5 times ten to the minus two per year.

If I look across the industry that's about five fires due to electrical cabinets across the industry throughout the year. If I use the 6850 assumptions that grows to a peak heat release rate in 12 minutes.

The probability of non-suppression' given a fire of 12 minutes, assuming a 10 minute brigade response is about point eight. So -- so eight out of 10 times that fire's not suppressed, and that results into four fully developed electrical fire cabinets that are predicted per year based on 6850. And that doesn't comport with experience because approximately zero fully developed cabinet electrical cabinet fires are predicted or suppressed very early or weren't even fires. They were smoking relays. They'd end up being counted as fires because --

MEMBER STETKAR: Clarification for purposes of the committee here. When you use the words electrical cabinet, what pieces of equipment in the plant does that include? Does it include only protection and control cabinets, or does it include motor control centers and switch gear cabinets of all voltages up to 13 8kv and higher?

MR. CANAVAN: No, it's just really control cabinets, not including --

MEMBER STETKAR: In the -- in your context here, but I believe in 6850 it includes everything; doesn't it?

MR. CANAVAN: No, it's a separate category.

MEMBER STETKAR: Okay. I just want to make sure we're comparing the numbers of --

MR. CANAVAN: Yes.

CHAIRMAN APOSTOLAKIS: I must say I'm a little bit surprised by your criticism.

MR. CANAVAN: You might be.

CHAIRMAN APOSTOLAKIS: 6850 is co-authored with EPRI.

MR. CANAVAN: Yes, it is. Because we were piloting.

CHAIRMAN APOSTOLAKIS: Because you were what?

MR. CANAVAN: Because there are two pilots, Shearon Harris and Duke, and we expected to find these out. This was what we normally -- there was an earlier scheduled pilot that never fully finished piloting methods.

CHAIRMAN APOSTOLAKIS: Come on, Ken. Four point five ten to the minus two per year generic ignition frequency for electrical cabinets, you don't need the pilot to give the argument that that's equivalent to five fires per year across the industry; therefore, it's stupid.

MR. CANAVAN: No, the thought was --

CHAIRMAN APOSTOLAKIS: Was it a different EPRI group that did it?

MR. CANAVAN: As in any PRA that's being done, they're different in nature. You find the contributors, you back, you put in the effort or the efforts needed to reduce the amount of conservatism in the analysis.

We expected to go through the exact same process here, but the things that have resulted in a change is that we now have a bunch of utilities waiting to do NFPA 805, chomping at the bit, trying to get -- trying to meet some artificially enhanced schedules.

CHAIRMAN APOSTOLAKIS: It seems to me --

MEMBER ABDEL-KHALIK: Is your example meant to question that appropriateness of the ignition frequency or the heat release model?

MR. CANAVAN: Actually, the first bullet is the -- I haven't gotten to the second bullet yet, but the first bullet is the frequency. And what I'm bringing up is an example of -- in the methods.

MEMBER ABDEL-KHALIK: Without the heat release model predicting a peak heat release reached in 12 minutes, the result of this argument could be quite different.

MR. CANAVAN: Yes. We can talk about the 12 minutes too. That would be another bullet.

MEMBER BLEY: Just to put George's questions in perspective, I suspect that these different pieces of the analysis were developed by different groups independently, and this is really the first time the pieces were put together.

MR. CANAVAN: That's correct. Each piece

--

MEMBER BLEY: If, in fact, we don't have five fires per year in the industry, that's something that we should have been able to spot all along because I assume they use some data, but a lot of the fire data can be characterized as fires?

MR. CANAVAN: Yes.

MEMBER RAY: But Dennis you could have five ignitions --

MR. CANAVAN: Right.

MEMBER RAY: -- on each point.

MEMBER BLEY: You could but they don't progress this way, and you wouldn't be aware of it. I'm saying we don't get five ignitions a year. I know we certainly don't get five cabinets burning up a year.

MR. CANAVAN: No, we get five ignitions, some self-extinguished. Some are extinguished promptly without the use of suppression, de-energization, turning something off. Some are extinguished with a fire extinguisher. Zero produce fully --

MEMBER SHACK: Then you're arguing that the ignition frequency is okay. That's reasonable. It's the model that's --

MEMBER BLEY: Or the coupling of the ignition frequency. This might be a model for one kind of ignition and then for other ones, maybe not.

MR. CANAVAN: And this is a good start. Let's discuss it a little bit more. I only have half an hour, so I truncated all these discussions.

CHAIRMAN APOSTOLAKIS: By the way, I don't understand why you only had half an hour. It seems to me at the next subcommittee meeting they should have as much time --

MR. CANAVAN: I suggested a day.

MR. SHUKLA: Because it was a last-minute add on.

CHAIRMAN APOSTOLAKIS: Yes, so next time, Ken, you can 45 minutes.

MR. CANAVAN: Forty-five whole minutes.

CHAIRMAN APOSTOLAKIS: Just tell us how much time you need because these are serious points and I think the subcommittee and the committee will have to understand that.

MR. CANAVAN: Yes, also keep in mind to make a point I did choose one of the more --

CHAIRMAN APOSTOLAKIS: Yes.

MR. CANAVAN: -- examples that I knew would strike a chord. There are several others that are very interesting. There are also many really good treatments in 6850. Please, let's not throw the baby out in the bath water. We do have an opportunity for improvement.

When we brought all this together -- excellent straight man -- when we brought all this together the individual conservatisms and everybody's little parts all came together to produce something that we hadn't expected, which was a much larger result of --

CHAIRMAN APOSTOLAKIS: But I do understand now why your numbering scheme is cumbersome, so EPRI doesn't appear anywhere here.

MR. CANAVAN: Right.

CHAIRMAN APOSTOLAKIS: It's all NUREG.

MR. CANAVAN: It's all 6850.

CHAIRMAN APOSTOLAKIS: We are criticizing NUREG.

MR. CANAVAN: I see you caught that. Okay, well, the second bullet on the page is talking about the heat release perspective and just to give you an example again, originally when the authors were pulling together 6850, you know, and choosing what they wouldn't and would scream at, they would choose the 98th percentile of the p key release rate that would be experienced from electrical comments, and that was roughly 700 kilowatts, which is about a two foot diameter pool of gasoline burning, and the would use the 75th percentile as the representative. And this just sort of -- I always liken this in my peer experience as this is sort of like modeling a large LOCA. A large LOCA is actually a range of LOCAs, but you choose one to represent, and you build the access sequences around the representative size. This is the same concept.

But if we look at what that really is, if we look at the vertical cabinet test results from NUREG/CR-4527, another NUREG you'll notice. The 98th percentile -- or we have some experiments and they're all below the 100 kilowatt, just for example we showed the 700 which is the screening, which you can run the fire scenario and the fire modeling, and if a 700-kilowatt fire produces no damage in the room we'd screen the room and move on, or if the risk was acceptable at that level.

Then we run a 200-kilowatt fire as being the representative, but, again, if you look at the results, we have a less than 100 kilowatt fire as a result from the experimental data.

Now as part of doing a pilot, this is a

very acceptable approach to modeling. Then we drew the pilot and if the electrical cabinet's contribute, we need to revisit the electrical cabinet treatment. The problem is we're on such a fast pace, we're not always getting to do the revisiting, and the revisiting is being done through the FAQs.

And so this is one example of the one conservatism in the model. It's one of the biggest ones, by the way. That and the emission frequency, which are coupled, are two of the biggest ones. So I pulled the two big ones out so that we could talk a little bit about them.

The regulatory process -- this goes back to reg guide 1.200 and it was pushing a little bit of some of the -- when reg guide 1.205 was originally put out there was some presentations and some miscommunication on the reg guide 1.200 might not be sufficient along with the peer reviews to address that type of adequacy. I understand that at this meeting and in previous meetings that that's not the case anymore. There was a misconception, so now that that's been cleared up I don't think we even have to talk about that slide.

Fire PRA and NUREG/CR-6850, we talked a little bit about this already. NUREG/CR-6850 is not fully piloted prior to NFPA 805 use. So in other words, in this particular case we didn't have the luxury of doing these pilots, getting lessons learned, incorporating those lessons learned back in refining the models in a very deliberate path. We got an application prior to the methods being "mature."

The initial 6850 results are a little bit over-predicting and a little bit disconcerting when viewed individually. The current pilots have produced lessons learned in a wide variety of facts, and all the concerns as well as the facts -- the facts are being frequently asked questions are being worked on, and the concerns were provided in a January letter to NRR. I think that came from NEI, that letter.

MEMBER SIEBER: That's January 2008?

MR. CANAVAN: Yes, January of 2008.

MEMBER SIEBER: A year and a half ago?

MR. CANAVAN: Which is about a year and a half ago. It's over 18 months. The second bullet goes to exactly what you said, over 18 months of continuous interactions, with sort of mixed results in those interactions.

Some of the things that we're -- we're noticing in -- in -- in some of the items that we're working on is that there's a deterministic approach.

If you go back and look at the heat release rate curve shown in this presentation, that's a very deterministic bound to everything sort of approach. Okay, let's say it's been reading at the 98th percentile because nothing will ever exceed. Well, if you look at the chart nothing exceeded the 200. That could be bounding. But it was putting a lot of margins, see what happens, so it was a very deterministic approach, and you'll see that in terms of some of the data too, as well. There's a lot of, well, it was -- yes, it was a smoking relay, but if that person wasn't there and didn't turn that off it would have been a fire. Maybe. Maybe not.

The problem is it's okay to include it as long as you make sure that your prompt suppressed it on the other end, but then when the person who does the prompt suppression says, well, I don't know if that was prompt suppression. Maybe we shouldn't include that. You start getting into a sort of thing that sort of snowballs pretty quickly.

And the reason for some of the mixed results in the FAQs is that the level of proof required sometimes to justify the more realistic methods has been unprecedented as far as my experience with other PRA methods and showing that, for example, that the mean is the acceptable value.

MEMBER ABDEL-KHALIK: I'm trying to understand your argument. If you were to limit the heat release rate to 100 kilowatt per the data that you have, would the argument that you presented in slide number three disappear?

MR. CANAVAN: It would largely go away, because what would happen is this would limit damage to other components. So what happens is in the fire modeling when we assume a peak heat release of so high at such an early time, there's no chance to suppress it before damage to other equipment. But if the peak heat release was lower, it was a 100 kilowatts there would be more time before damage of other pieces of equipment. Hot gas layers may not progress as low in the room or not develop at all. Zones of influence would be smaller. As you can see from the size of the gasoline fire assumed the effective.

So, yes, it propagates itself into the amount of equipment damaged, as well as the timing that that equipment is damaged within.

MEMBER ABDEL-KHALIK: Okay.

MR. CANAVAN: EPRI and NRC, and this should really say NRC RES is spending a significant portion of our available research efforts on developing the improved methods, and, again, I had mentioned the mixed success. There are some great success stories in there. The purpose of this wasn't to tell you about the successes, it was to alert you to some of the areas that we find challenging and can improve. That's why the presentation has the tone it has. Yes?

MEMBER STETKAR: Interrupt you. You mentioned research and EPRI collaborative methods on -- collaborative work on methods. Are you also doing tests to better refine actual experience for heat release rates in typical electrical, electronic cabinet configurations, and cables and so forth?

MR. CANAVAN: We were discussing this. We are not currently. We are doing some work. It's related to DC circuit testing, and it's the NRC testing program, and they invited us to participate, so it's very --

MEMBER STETKAR: I was thinking in terms of actual heat release rates for, you know -- which may be one of the --

MR. CANAVAN: We're thinking of a two-step approach to this. This first was some of this information comes from expert elicitation. And so there might be a revisiting of that expert elicitation based even on this test data. So, you know, their expert elicited based on the test data and came up with some numbers.

The other part of that might be to perform new tests. We're looking at both.

MEMBER STETKAR: Thanks.

MR. CANAVAN: Testing just become very costly, but if it's worth it, it's worth it.

MEMBER STETKAR: It's going to be pretty costly to the whole industry.

MR. CANAVAN: Yes. Again, if it's worth it, it's worth it, and so we are looking into it.

This says the NRC, but, again, I'm going to say the group, taking away any -- I really do think that in some cases as the group continues to default to conservative methods, and that, if you're very conservative, it's contrary to generally accepted practices. So my concern is that occasionally in the interests of moving quickly or not doing, for example, a test or to just simply get agreement after arguing for so long, we can default to conservative. And a little conservative NPRA is fine, but if you do it on a routine basis and you do it all the time you end up with a skew, and a skew is not appropriate and can result in --

CHAIRMAN APOSTOLAKIS: How can you blame them for anything when they recommend the use of a report that is jointly authored by the NRC?

MR. CANAVAN: Again, I would have left off NRC, because I really do think that it is a combination. I also believe that this isn't a report. This is as we revisit things and we try to refine them, so we get into a discussion, for example, of the database, or a discussion of the heat release rates, or a discussion of any one of the number of conservatisms that are in the FAQs, and we, for example, we have enormous difficulty agreeing on the -- the -- how the treatment of a main oil pump fire in a feed water pump, both the zone of influence, the frequency, the size. Now some of these feed pumps have a thousand gallons of oil in them, and trying to decide, well, what should we model this small oil fire.

And if you assume the whole thousand gallons goes up, the turbine building burns down, so you can't just arbitrarily assume that with 1.0. We need to partition it and assign it. It takes a lot of judgment. There isn't -- there's some data, a lot of judgment. Again, we defaulted in the interpretation of N -6850 often to these conservative methods.

And, again, I don't want to ascribe blame to anybody in particular. We do want to say that's where we are, and that in the interests of getting these things closed the default is naturally to conservative methods.

A broader concern is that there are a few, given the uniqueness of this issue, there are some -- 805 is pushing us in sort of a new course for PRA and regulatory applications, and that is, you know, there is a definite possibility of design basing the PRA, of taking design basis-type assumptions, those bounding values assumptions and not taking the opportunity to go back and revisit them. And we're in the process of revisiting them, but we need to continue to do it.

And, again, if we're not careful about just putting in design-based assumptions into the PRA, you can imagine where that brings you, and that is worrisome in some respects. And we're worried also about the mischaracterization about fire risks, if it is indeed being mischaracterized, which I think if you're not careful about your conservatisms could happen and could lead to a misunderstanding of fire risks. In other words, for some plants I don't -- I'm not sure they're a dominant contributor like South Texas. I'm not sure they're a dominant contributor.

So there are some places where -- but if were to go do 6850 we might find that that might change.

Path forward, well we're moving to publish the improved methods addressing several areas, and, again, the EPRI probably shouldn't be in here because this is EPRI. NRC already asked for both moving to publish the improved methods as quickly as we can, where we have them, and we do have several.

Like I said, you might not have been in the room, George, but like I said earlier this is -- I'm bringing to you the challenges and the problems, not the success stories, so there -- and there are some.

The methods that we are going to publish comport with 1.200 which was the discussions.

CHAIRMAN APOSTOLAKIS: When was 6850 issued?

MEMBER STETKAR: 2005, September. We reviewed it in June.

CHAIRMAN APOSTOLAKIS: Yes, sir?

MR. NAJAFI: If I may, please. I guess just to add to something here. I mean, I look around. I was the only leftover from the 6850 team. I have to say something.

MR. CANAVAN: It's John's fault.

MR. NAJAFI: It's all his fault. I think the point of the matter here is that this, by the way, was brought into this same committee around I think either the first or second quarter in 2005.

CHAIRMAN APOSTOLAKIS: June.

MR. NAJAFI: June.

MEMBER SHACK: Five hundred forty-third meeting.

MR. NAJAFI: And this is a topic that I believe -- I don't know if -- I'm sure somebody will pull out the records and say that's not exactly how it happened, but I recollect that this topic did come up -- whether the method is ready, ready to go and what's the pedigree of it.

And even at that time we did say -- did we go through a list of maybe a dozen or more that made its way to the final reporting, as areas that we considered the method to be still in its evolution, weak.

I mean, I may give you some other examples that can, but the method needs to go through some maturation process. There are areas that are -- clearly there are weaknesses that can only be solved through -- I wouldn't even venture to say through pilots, through practice and use and industry-wide use. It has to go through that process. It's not going to solve it in itself.

So there was originally a recognition that there are these weaknesses, and it needs to be worked out. Is it ready to be compared to the internal event PRA? We said at that time -- I said at that time, no, and I say today, probably not because it needs to go and become --

We gave them a PRA three, four decades to get where it is now, and this other train of 805 came in -- and we knew in a way this pilot started in '97, '98 time frame, because we knew this freight train, and we tried to get ahead of it, unsuccessfully.

CHAIRMAN APOSTOLAKIS: It depends on when you start counting. The first fire PRA for Zion Indian Point in 1981, now we're 28 years later.

MR. NAJAFI: Yes, but imagine -- there was basically a very long period of no development.

CHAIRMAN APOSTOLAKIS: Anyway, we are not looking for that.

MR. NAJAFI: No, all I'm saying is that these are -- even stuff that was anticipated at the time, the whole thing --

CHAIRMAN APOSTOLAKIS: But I am a little

surprised at the language that he's using.

MR. CANAVAN: Well, let me get to the last --

CHAIRMAN APOSTOLAKIS: Considering that his organization was -- otherwise, we are used to it.

MR. NAJAFI: And by the way, I wasn't the only one. There were a dozen people with 300 years of working in PRA fire protection, fire modeling. I was not the only one.

MEMBER STETKAR: A lot of them were young boys.

CHAIRMAN APOSTOLAKIS: Okay, Ken, go ahead.

MR. CANAVAN: Well, I think talking about -- we need to talk about the language a little bit. The language in this presentation was designed -- and I guess we accomplished our goals to get your attention. So, I mean we did pick the most egregious of all the issues. I do believe that there are -- my personal opinion is that there are a dozen of significant issues that once resolved could --

MEMBER SHACK: I mean, you make it sound so convincing to us that these methods and data are conservative.

MR. CANAVAN: Yes.

MEMBER SHACK: Now behind the screen I assume that you're debating this with other people, and they're not so convinced that your data is sufficient to make this sort of sweeping -- you know, I mean, that's where we end up. When we don't have enough data we end up conservative.

MR. CANAVAN: That's an excellent question. Actually, we get banked agreement that it's conservative all the time. So we don't have that discussion. What the discussion we have is where to put them. Okay, so where do we --

CHAIRMAN APOSTOLAKIS: Are you proposing, Ken, that 1.205, the issuance of 1.205 be postponed? It all comes down to that.

MR. CANAVAN: My concern about 1.205 is that 1.205, if it does indeed impose prescriptive and conservative methods through endorsing 6850 and requiring NRC approval of 68 -- any deviations from 6850 leads to a bunch of unintended consequences. So this is sort of the middle bullet here, and it really says it's the inability to, you know, it would be very difficult to change the methods or improve the methods once in a reg guide.

It would be difficult. I think we will end up with some lack of innovation, and there'll be some -- there could be in the interim some inappropriate decision making and resource allocation.

CHAIRMAN APOSTOLAKIS: But you heard the staff earlier. They want or they're asking for an ACRS letter in September. Are you saying that should not happen?

MR. CANAVAN: I don't know. What's your letter going to say? Not to be flippant, but I think the major points of this presentation are that the methods are conservative, and that 1.205 if it endorses 6850 and says, you know, I know there's always -- this is the one way to approach it. It doesn't go on to say but if you choose something else we'll make it really difficult. It doesn't say that part.

So there is a tendency to try and follow 6850, and my concern of 205 endorsing 6850 when there still are some conservative issues in 6850 and saying that anything that's not there requires regulatory approval will really slow down the ability to improve the methods in the short term.

CHAIRMAN APOSTOLAKIS: So, I -- yes, Sunil?

MR. WEERAKKODY: Just to clarify, I said there is a meeting between Ken and NCRS. I think the staff is basically saying that the number of statements that are factually incorrect, so if at the end NCRS has any questions regarding Ken's presentation, we would be happy to answer them.

CHAIRMAN APOSTOLAKIS: Well, let's --

MR. CANAVAN: I'd be interested --

CHAIRMAN APOSTOLAKIS: -- let's have Ken finish.

MR. CANAVAN: -- in getting the factually incorrect items, as well.

CHAIRMAN APOSTOLAKIS: Are you done with your conclusions --

MR. CANAVAN: I think so, aside from the fact that we -- that we are in violent agreement on the reg guide 1.200. And we did not, just as another one, we didn't have the staff's presentation. At least I didn't have the staff presentation when I was pulling this together, so that's why the reg guide 1.200 stuff's in here.

MEMBER ABDEL-KHALIK: So what does the last bullet mean?

MR. CANAVAN: Well, originally, a statement was made in a public meeting when 1.205 first came out and it was -- it was publicly questioned, and it was stated that reg guide 1.200, rev two, and the peer review were insufficient for NFPA 805. And there was a question asked, and at least that was the impression of most of the folks in the audience. Maybe they got the wrong impression, and so this bullet and the references to reg guide 1.200 have been resolved by today's meeting, which state very publicly that reg guide 1.200, rev two, and the peer review are sufficient for NFPA 805.

And that changes a lot of stuff, because the original concern was that if you change your data analysis approach and you're one PRA, your internal events, that that could be subject to moving you out of compliance of NFPA 805, and I don't believe that was ever the intent, but that was the impression. So now that that simple communication has been fixed, a large part of this presentation is, you know, not appropriate.

CHAIRMAN APOSTOLAKIS: Shall we have more general discussion now on what we've heard? And I repeat that at the next subcommittee meeting I would like Ken to have more time, so we'll have a more detailed --

Any questions on the last slide? Sunil, I know you're dying to say something.

MR. WEERAKKODY: Not a lot, I'm just very thankful that we had this meeting, and I'll tell you why. I recall three years ago we came to this committee -- actually the full committee after we received public comments, and then we didn't get the endorsement. It took us three more additional months to address your -- the committee's comments. So this really helps in the sense that we got a chance to hear your concerns at a time when we can address them fully in context of other public comments that we got.

What I'd like to do is -- and I'll say what we like to do but I have to work all the details with the NCRS staff -- we want to go back and look at the transcript and try to summarize in our own words as to what the committee expressed as their concerns, which will be a challenge, but we will do that, and we would like to have an opportunity to come back to the committee and make sure that we are addressing the right concern.

And then I really like the idea of having a subcommittee meeting. It's going to be a challenge, but I think that would save us a lot of time and energy in the full committee. So we'll get back to you, and I just have to discuss it with the staff. That's all I wanted to say.

CHAIRMAN APOSTOLAKIS: But I would like

you to also say a few words -- not today, necessarily -- on what Mr. Canavan presented. I mean, do you guys agree?

MR. WEERAKKODY: We -- a number of those things, and when I said they are factually inaccuracies, I basically said the staff -- this is not our meeting at this point. But I saw some bullets in these slides which are factually inaccurate, and we had a public meeting and we told, you know, that's not what -- what we mean, and I still see them.

So -- and that kind of creates a sort of an emotional investment from the staff, because we have a lot of staff whose been looking at these issues, and like I said, Dr. Apostolakis, if you go back to the creation of NUREG/CR-6850 it was created by a joint effort between NRC and EPRI, and we were thankful to EPRI at the time because the licensees was asking for a method that they can use -- or methods that they can use.

What happened was after that of course there are new information that we learned, but in terms of what -- then we start rolling back. What's the guidance in the document? We, the staff, looks for a little bit more evidence than the industry, so if the industry says that something is conservative we will ask for a higher burden of proof, and that's where the challenge is. But I think the staff should do that, and that's our role, so that is the recourse but I don't want to say anything more about -- that's the general context of it.

CHAIRMAN APOSTOLAKIS: What I think is happening here is that I just -- I mean, given that in August it may be problem having a subcommittee meeting, that means it's going to be, maybe the first week of September, and then the full committee meeting is the second week, I believe. I just don't see how we can write the letter then.

We will have -- maybe we need more than a day, actually, if we have to go down to the details of the disagreement. I would certainly like to have a more detailed presentation from Ken and his colleagues, if you agree Ken.

MR. CANAVAN: Yes.

CHAIRMAN APOSTOLAKIS: Half an hour is obviously not enough, and then plenty of time to discuss.

MEMBER SHACK: Although in some cases, George, I mean, you know, with 6850 the question is whether the -- the reg guide is too prescriptive in its use, not that you're going to solve all the problems with 6850 by August.

CHAIRMAN APOSTOLAKIS: The objections that Ken raised seem to me to be so fundamental.

MEMBER SHACK: Well, but, you know, if you're saying that you don't have a PRA method, you know, maybe you're just not ready to go to 805. You can't manufacture data. You can't manufacture models that agree until, you know -- that sort of has to be worked out, you know.

CHAIRMAN APOSTOLAKIS: But my concern is that if we have -- well, we will have a subcommittee meeting and then there is only five days till the full committee, I don't think anyone will have any time to revise the regulatory guide.

MEMBER RAY: I think you're right, George. Also, let me emphasize something that's important to me anyway that Bill said which is at this stage of the game I don't see what choice there is but to be conservative.

To me the conservatism in his example is not the initiating frequency because believe you me I might be in plant once every 10 years to have an initiating event would not be a surprise. It's the rate of progress that's the issue, I think, and in terms of how to get that number right, well, that's obviously something that needs to be worked on, but as an initiating -- or initial condition at least being conservative is the obvious way to go. But I think your point, which is being rushed under circumstances where we don't see how we can grapple with the issues in the time available I think is correct, also.

CHAIRMAN APOSTOLAKIS: So, okay, let's -- let's have the ACRS staff talk to the NRC staff and the industry to make sure we find the date that is agreeable to everyone. Somebody mentioned September 1st. What day is that?

MEMBER BLEY: I have a calendar. September 1st is a Tuesday which is when that safety culture thing is on the calendar.

CHAIRMAN APOSTOLAKIS: So maybe that Tuesday and the following Wednesday of that week we can have tentatively -- let's say tentatively. You guys --

MR. LAUR: This is Steve Laur. I'd like to lobby, if possible, for us coming as early as possible, the subcommittee for the reg guide and SRP. And these issues sound extremely related, but they are separate in the following sense.

The reg guide -- first of all, the reg guide is, I think, is a misunderstanding. The reg guide in section 4.3 says 1.200, and it makes a very, very weak reference to 6850 which can come out or not come out as we go to address the comments.

This other issue of how you develop methods is of much more involved process. I would like to not delay our reg guide schedule if possible, even to the extent of leaving things out that can be addressed later.

CHAIRMAN APOSTOLAKIS: I'm offering the eighteenth of August, and I hear that the staff doesn't want to do it. The staff says that they want to do it.

Why don't we come here the full week of the seventeenth of August? Have a lovely week in Washington, the weather is nice, because, you know, if the staff really wants something early enough so they will have time to respond to the comment, it seems to me the first of September is really very late.

MEMBER RAY: Plus the safety culture is going to be held then, I'm sure.

CHAIRMAN APOSTOLAKIS: So we can have the safety culture for half a day, and then for a day and a half --

MEMBER RAY: That's September.

CHAIRMAN APOSTOLAKIS: August, I'm trying to move it. I'm trying to move it. Would you object? If you object, we don't move it.

MEMBER RAY: I'm not objecting. I just --

CHAIRMAN APOSTOLAKIS: I'm thinking of you, in fact, who is coming from the west coast.

MEMBER RAY: And John, of course.

CHAIRMAN APOSTOLAKIS: So anyway it's up in the air. It may be the seventeenth and eighteenth of August, which if it is not feasible it will be in September, first and second, in which case it will create a problem for the staff.

Bijan.

MR. NAJAFI: Very quickly, I'm just going to echo what Steve says. This issue with the fire PRA method is not going to be something that is going to be solved in two months, three months. It's going to be a few years. As far as I'm concerned, it's going to be a few years. So that --

CHAIRMAN APOSTOLAKIS: I would have to understand then what the pilot is doing. I mean, I agree with that.

MEMBER STETKAR: I think that's important. I think you need some specific examples.

MEMBER SHACK: You can look at the

language in the reg guide. I mean, 6850 is mentioned in one place. Well, there's a footnote, a reference, but in the text it's mentioned in one place, and it says it's an acceptable method. Licensees that use a fire PRA, you know --

CHAIRMAN APOSTOLAKIS: Yes, you know, but Ken's point is also -- it's an acceptable method, yes, right.

MEMBER SHACK: Except for reg guide 1.200, and I guess -- for me I had a couple of surprises here, and I hope they can get clarified when we have this next meeting. The first surprise when the stuff was talking about -- about as we transition to 805 and then for a deterministic 805 into PRA and performance based how that -- how that works. That's one.

I never, even when I read through this, never thought of the 6850 as proscribed data -- everything from it exactly as it is. And I didn't read it that way. If industry's going to read it that way, that's a key problem to this document, and if that can be taken out, that would be even better.

The third thing, I'd like to hear something more of what's come out of these pilot studies and is there -- and a joint NRC effort industry continuation program? Where does this thing start and come together. It makes sense you put together a method, you test it, you revise it, you make it work. What's the plan for that, and does that have to be locked into here? I mean, that's a key piece --

MR. CANAVAN: And if we had more than half an hour I think I could go through a lot of the wonderful successes we've had. You know, 6850 is the best method for doing a fire PRA available. It was out for pilot. We're getting awesome feedback that we need the feedback in. That's an important step that we can't forget to do.

My credit goes out to those people who worked on that and who continue to work on 6850 and EPRI 101.1989. It will be revised, and it will be even better than it is today.

So, you know, just to be clear I wanted to get your attention.

CHAIRMAN APOSTOLAKIS: Okay, so you tell us how much time you need.

MR. CANAVAN: I will.

CHAIRMAN APOSTOLAKIS: John and others may want to think about having a meeting seventeenth and eighteenth of August combined with a digital I&C. If not, then it goes to September first and second, which creates problems for the staff, and unless there are any other comments from anyone --

MEMBER SHACK: Well, I just want --

CHAIRMAN APOSTOLAKIS: Sure.

MEMBER SHACK: It was on one of Margaret's slides where, you know, she has this question about too broad a definition of primary, because that gets us back to this recovery action and all this, you know, the whole problem we come up to.

You know, maybe the solution is to look back and provide a definition of primary control station that does what you want it to do, rather than trying to get the OGC to agree whether, you know, that clause in NFPA 805 is really applicable or not to your pre-existing licensing basis.

You know, maybe you really need to come back and make sure that your recovery actions are really what you mean -- you really intend to be by recovery action. So it might be that since you have some flexibility since it doesn't define primary -- that's your one thing where you have some -- some flexibility, and it just seemed to me that was a -- something that could be examined.

CHAIRMAN APOSTOLAKIS: Okay, anything

else? So will reconvene at 1:30.

(Whereupon, the foregoing matter went off the record at 12:26 p.m. and went back on the record at 1:29 p.m.)

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

1:29 p.m.

CHAIRMAN APOSTOLAKIS: We are back in session. We are joined by Michael Ryan. This part of the subcommittee meeting will be chaired by Dr. Bley.

MEMBER BLEY: Thank you. Before we begin, I guess I need to mention that many years ago I was involved in some open meetings that started all this, and I haven't been since then, but I do have continuing contract with Sandia, and I have a waiver for the meeting here.

Before we begin, I guess I had just a couple of things I wanted to get on the table for all of you, and I'm sure you'll get to these, but we're looking forward, I think, to hearing why we need new methods for this problem and why the existing ones aren't quite adequate.

Also, at least I'm interested in learning -- I know you had a draft fire methodology report a year ago, but that hasn't come to us, and we're kind of interested in maybe why and also what came out of your peer review of that document.

And the last thing I'd ask is as you go through this mentioned in the paper that we did receive, there are four areas -- five areas, I guess, data collection, methods, development, peer review, testing and documentation. Item by item on those things since the paper came out. Are there places where you've actually moved the knowledge forward. We're real interested in hearing that.

I think Susan will have the lead on the technical discussions, but I understand Mark Salley will make the introductory remarks for NRC.

MR. SALLEY: Yes, yes, if we're ready. We haven't talked to you about fire in I guess a year or so, which doesn't imply that we haven't been doing much. We've been quite busy. I brought a few -- I guess the commercial part. This is brought to you by the Office of Research. I brought some propaganda down to share with you, and then I'll turn it over to Susan, and if you work for Rick this past year this was out Rick poster that we put out. Just some information for you. You can see that today's topic HRA is one of the many tasks that we're currently working on.

I also brought our fact sheets for you for our major programs. Again, the one on top is the HRA that Susan and company will be talking to you today about.

Two other things that I just wanted to share with you for knowledge management, knowledge capture program. We put together the information on the Browns Ferry fire, and we captured all the history we could, which will come in. As we see the next generation of folks coming in, we kind of refer to them as the post-Browns Ferry or actually the post-TMI generation, and that's the young engineers they were hiring today. You know, they were born after these events occurred. So we felt it was important to capture this knowledge and capture this history.

Why is everybody laughing?

But we wanted to collect that history and capture it, so we did that, and we also have our Rick CDs, which is the knowledge base of everything they have in fire -- information notices, generic letters, any NUREG reports we could find, and, again, we shared this as the reg with all our state folders. I wanted to make sure you guys had a copy.

One final thing that Dr. Woods just finished, you'll be seeing here just went to publication, but we actually did a history of all the fire research in '75. And this is quite a little fascinating -- it's written in the tone of the Samuel Walker type reports in the historian.

Roy is one of our more senior members, and he kind of went back in time, and this just went to publication. You don't have it.

CHAIRMAN APOSTOLAKIS: Do we have that?

MR. SALLEY: No. It just went to publication. I wanted to share that with you, and I'm sure that I'll get you on the mailing list, and we'll mail it to you.

CHAIRMAN APOSTOLAKIS: I'd appreciate that.

MR. SALLEY: With that, the topic to talk about today is Fire HRA. It's an interesting program. This is basically the third or fourth joint EPRI NRC project. If you remember 6850 was the first one we completed.

MEMBER SHACK: You keep blowing words about it.

MR. SALLEY: Oh.

CHAIRMAN APOSTOLAKIS: EPRI is on board here.

MR. SALLEY: Yes. The -- we finished the

fire model V and V a couple of years ago. We have two programs right now. They're both joint under the MOU that are the front runners that are kind of in a horse race to see which one comes in first.

Today we're going to talk about the HRA and, of course, George, is your favorite. That's the Fire Model User's Guide, where we're still wrestling a little bit with the uncertainty, but we think we have a handle. That will be coming out soon.

So with and without further ado I'd like to turn it over to Dr. Cooper, and Susan will take you through the rest.

DR. COOPER: Thank you, Mark. It's a pleasure to be here. As Mark said we're going to be talking today about the joint EPRI, NRC Fire HRA guidelines. This is for information only. Dennis, most of your questions are answered, especially in this beginning presentation, but please remind me if we've missed something.

I'm going to start things off with the help of Dr. Erasmia Lois and also Jan Grobbelaar from Scientech, representing EPRI. There are other members of the team here, both on the NRC and the EPRI side, and in the course of my presentation here we'll get to meeting them. Not everybody's here today, but we have almost everybody.

So overall for this afternoon we've got three high level things that we're going to be addressing. First of all, Erasmia is going to be talking about coordination with the staff's response to the SRM. We know that's of interest to you so we want to address that up front. I'm going to continue then and give you an overview of the project and give you a status of the project and our documentation, as well. And the remainder of the presentations will be providing a technical summary.

So at this point in time I'm going to turn over to Erasmia. Even though this particular project effort originated before the staff's project on the SRM, we certainly have been thinking about that, so Erasmia's going to be talking about that.

MS. ERASMIA: My presentation will be pretty fast, just to the point. I'll put over again what use of the SRM. The SRM actually is recognized to figure out whether or not we need so many models, and can we live with just one. If we need more than one, explain why and develop guidance as to how these models will be applied.

And I believe underlying this direction from the commission is issues related to the quality, traceability and reproducibility of HRA. So probably we can look from that perspective for the interface of this project with the SRM.

And I believe that the project is really interfacing from the beginning with this specific activity, with respect to what we do and how we are going to address the SRM and HRA, keeping in mind that the methods, the existing methods have been developed for control room human actions for internal non-special initiating events. And fire is a special initiating event.

MEMBER STETKAR: Erasmia, if I can interrupt you there. Why do you say that the current methods have been developed for control room human actions? They've been applied extensively for local actions outside of the main control room, local operations of valves controlled from other locations outside of the control room during a wide variety of types of internal initiating events, and are being used for those.

So I'm not quite sure why you say the current methods don't apply to those types of scenarios.

MS. ERASMIA: Applied and being used, I'm not disputing that. Whether or not the methods from the beginning were developed with the concept of addressing local human actions is -- is what I'm indicating here, and --

MEMBER STETKAR: A year ago, technology, I don't care about. I care about what's the situation in 2009.

MS. ERASMIA: And right now we are trying to address this issue, because we are using 30 year old technology. For example --

MEMBER STETKAR: The industry is not. And when you say we this is a joint NRC, EPRI approach. I don't understand this notion that we need a different methodology simply because we must go out in the plant and manipulate a valve after a fire, compared to going out in the plant and manipulating a valve after a loss of DC power.

MS. ERASMIA: And let's say --

MEMBER STETKAR: A valve, same location, same people?

DR. COOPER: Not necessarily the same conditions.

MEMBER STETKAR: Different conditions, different performance shaping factors --

DR. COOPER: Right.

MEMBER STETKAR: -- might be different.

DR. COOPER: Yes.

MEMBER STETKAR: But the methods that we have today evaluate performance shaping factors for accessibility and things like that.

DR. COOPER: But not other things like power effects.

MEMBER STETKAR: Perhaps an existing method might need to be enhanced.

DR. COOPER: Well, that's -- that's part of what we have done is enhance existing methods.

MEMBER STETKAR: Okay.

DR. COOPER: That is part of what we have done.

CHAIRMAN APOSTOLAKIS: But your objection -- or comment, John, had to do with a line had been developed mainly for control room human action, and that's not quite true.

MEMBER STETKAR: That's right.

CHAIRMAN APOSTOLAKIS: It has nothing to do with fires.

MEMBER STETKAR: Well, it has to do with how this program is being developed as a fire HRA for fire PRA, for fires that occur at full power operation. My concern is that -- that two years from now we will then have a fire HRA for fire PRA for fires that occur during low power and shutdown because perhaps this methodology doesn't handle extremely long time windows, and then we'll need a fire PRA, HRA methodology for other little niche things.

The concern that's in error when we're trying to --

MS. ERASMIA: So if we go back and you mentioned that the industry has been given methods for spatial initiating events --

MEMBER STETKAR: Not the spatial initiating events. Think of loss of DC power. Think of station blackout where operators must go out in the plant and perform local actions, in some cases disconnecting DC power supplies, in some cases manually operating valves that have no AC power available. Those types of actions have been used in the industry for, oh, 30 years, using existing HRA methods.

DR. COOPER: But you have to realize -- I mean, you have a good point. When we get to fire for low power shutdown there may be a few added conditions or performance shaping factors that we're going to have to address. I mean, the point is that we do not think it's technically appropriate to use a method that does not allow you to address the factors that can most affect performance. And unless we do something to either enhance or modify or whatever, you're not addressing the important issues.

MEMBER STETKAR: Susan, I agree with you whole heartedly, by the way.

DR. COOPER: Okay.

MEMBER STETKAR: And from what you just said there are indeed in the industry -- I'll include the NRC as part of that for the moment. In the community, let me say that, there are a large library of methods, some of which are probably totally inappropriate to evaluating these types of actions. There are actions that are local in the plant; actions that are required under perhaps high stress, difficult accessibility, whatever performance shaping factors you want to allocate to those things.

Shouldn't the staff and the industry as part of this effort identify those methods and say we shall never use those again because in the sense of risk assessment it's not appropriate to think of a fire risk assessment as separate from a seismic risk assessment as an internal event at full power, as an internal event at low power and shutdown, as a seismic at low power and shutdown. They are not separate risk assessments.

MEMBER BLEY: I'm going to come back to this later. I think you've made your point.

MS. ERASMIA: And this actually -- we are doing that, and we are doing that as part of the -- what we call SRM project. That's exactly what we are doing.

CHAIRMAN APOSTOLAKIS: Is it more appropriate to say that this effort is an adaptation of HRA methods --

DR. COOPER: That is part of it. I mean, when I get to my part of my presentation I'll tell you what we have done, which is a combination of things, and there are reasons for what we've done. And I don't recall what Erasmia is going to get to in her next couple of slides, but, you know, her project is looking at -- I mean, because, you know, the SRM response project is ongoing. The fire HRA response project is ongoing. They didn't start at exactly the same time, but we're in communication. But, you know, things aren't going to get done at the same time, but we're trying to get as many things done as possible addressing these issues.

CHAIRMAN APOSTOLAKIS: When is the SRM -- when are we going to finish the SRM? I mean, when are we going to respond to the commission?

MS. ERASMIA: Reg nine in 010, so we plan to come. We're in the process of doing exactly what you recommend, and we would like to come and --

CHAIRMAN APOSTOLAKIS: Okay, good.

MEMBER STETKAR: I think it's important to keep that in perspective, because if we're not careful the concern is that we're coming together but at the point where we're coming together we're starting to diverge again, which is not --

DR. COOPER: It's going to look that way for a little while.

MS. ERASMIA: So with respect to the fire HRA and its interface with the SRM project, at least my appreciation for the fire HRA method project is that it does ensure the domain specific human performance issues are being addressed in the last part we were taking before. For example, on the initial conditions, the accident progression or progression aspects, we thought that human actions have performed outside the control room, and environmental influences of the fire, smoke, etcetera.

In addition to -- and I do believe that this is also part of the SRA issue addresses the aspect of transparency and traceability of the method, which is very important for the NRC reviewer. And it does address the user needs, which is a simplified model, and we believe that also it evidences the reducibility of from analyst to analyst. And I think I don't have another slide. Okay?

It does allow the use of a few methods, but it does give very good, explicit accommodations as to when and why should we use it.

And with that I turn it back to --

CHAIRMAN APOSTOLAKIS: Does it also address the reproducibility between method and method? That has been a problem in the past, as we know.

DR. COOPER: You're talking about the same method addressing the same problem?

CHAIRMAN APOSTOLAKIS: No, different. The same --

DR. COOPER: Two different -- multiple methods, the same problem?

CHAIRMAN APOSTOLAKIS: Yes.

DR. COOPER: We have not as yet addressed that. For the most part, we're anticipating that we would recommend -- and we haven't advanced quite to that point -- that -- that specific approaches would be used for specific problems, for specific limits. So --

CHAIRMAN APOSTOLAKIS: I mean, as a side

remark, in 010 we should say something about the infamous ESPRY exercise. We can't just leave it there, okay? Address it, say something. You remember --

MEMBER BLEY: Okay, let's go on. Since you brought that up but not to delay this too long, one thing the current -- I'll call it a benchmark, although it has a fancier name -- I don't think yet has addressed, and I'm not sure if it's in the plan is the same people using different methods.

CHAIRMAN APOSTOLAKIS: Yes.

MEMBER BLEY: Right now it has different people using different methods.

CHAIRMAN APOSTOLAKIS: No, that's what I just told Susan, and she said they are not there yet. They will be there next week.

MEMBER BLEY: And I'm going to start pushing because you've only got 15 minutes to finish this.

DR. COOPER: So in this overview I want to address three different topics. First of all, the issue that we're trying to address are development approach and then the status of our current project.

First of all, the issue. NUREG/CR-6850 addresses a number of important things with respect to

HRA, including the identification of human failure events, how we assign conservative screening, values, and also it has some discussion about performance shaping factors; however, it does not provide guidance on how to develop best estimate probabilities through quantification.

CHAIRMAN APOSTOLAKIS: Best estimate is the median, right?

DR. COOPER: You'd have to ask that one.

CHAIRMAN APOSTOLAKIS: I think we should use terms that are not well defined.

DR. COOPER: Let's just say it doesn't provide information on how to perform a detailed quantification using HRA.

CHAIRMAN APOSTOLAKIS: I understand that, but I think that in the future let's not use best estimate.

DR. COOPER: Okay, all right.

CHAIRMAN APOSTOLAKIS: That's for the thermohydraulicist.

DR. COOPER: So I'll make a note of that. So at the same time then we have approximately 50 percent of the U.S. plants that are transitioning to NFPA 805, last count. So our overall objective then is to -- to fill this gap that NUREG/CR-6850 left us addressing, you know, providing new methodology and guidance and the product will be a report similar to the joint EPRI/NRC report that was put out through NRC 6850.

It is a joint effort. I'm listing here the team. Not quite everybody's here. On the upper side the project management is Doug Hance and Bob Kassawara. Kenda Hill and I shared the responsibility on the NRC side, and there are technical staff on every staff we have Jeff Julius, who is not here today, Bijan Najafi who is back here somewhere, Jan Grobbelaar who's sitting next to me, and Kaydee Kohlhepp also of Scientech. Kaydee's not here. Bill Hannaman's back here from SEIC, and Erin Collins over there. Okay, and then on the NRC side, in addition to myself, John Forester and Stacey Hendrickson from Sandia.

We also had an independent review team. I'll talk about them later, which included NRC and utility representatives.

CHAIRMAN APOSTOLAKIS: You've got too many people. Why do you need all these people?

DR. COOPER: Why do we need all those people?

CHAIRMAN APOSTOLAKIS: Yes. I mean, it's

supposed to be an adaptation of existing methods to a different environment.

DR. COOPER: Well, I mean, laying aside the management for a moment, we have a lot of experienced practitioners here, but they also -- at least on the upper side they're also very busy, and actually we're keeping our NRC contractors pretty busy on things too. So not everybody's -- you know, nobody's full time on this, so, you know --

Okay? Does that work for you? Never anticipated that question.

All right, development approach. We had three main tasks. We did a fire data review. We developed methodology and guidelines and we reviewed and tested.

Data review. Here what we wanted to do would make certain that we were addressing the issues that we need to address for fire specifically, so we -- we did a number of reviews of existing information, including sources like NRC's good practices 1792 that says something about what you need to have and need to think about with respect to performance shaping factors. Of course, NUREG/CR-6850 talks about the kinds of performance shaping factors that you need to think about for fire specifically. And then we did a quick review of recent fire events for a nuclear power plant, review of historical events and also talking to plants and so forth, basically to assure ourselves that we hadn't missed something that came up as being new since 6850.

So then the development of the guidelines and methodology. We started off looking at the HRA process.

CHAIRMAN APOSTOLAKIS: Let me interrupt here.

DR. COOPER: Yes.

CHAIRMAN APOSTOLAKIS: This is a description of what you did.

DR. COOPER: Yes, it is.

CHAIRMAN APOSTOLAKIS: Are you going to tell us what you actually did?

DR. COOPER: Yes.

CHAIRMAN APOSTOLAKIS: When, after --

DR. COOPER: After -- after I'm done.

CHAIRMAN APOSTOLAKIS: Okay.

DR. COOPER: I'm telling you how we developed what we did. I thought you might be interested. If you want to skip over this, I mean, that's certainly your prerogative.

CHAIRMAN APOSTOLAKIS: No, that's fine.

I just didn't want this to be the whole presentation.

DR. COOPER: I understand. Okay, so we identified what tasks in the HRA process that might need to be changed. We identified the categories of fire-related actions that we needed to address, and we decided on an approach for the quantification. I will take just a little bit of time here.

So we have three different quantification approaches, and they're progressive. We start off with the left screen that's in NUREG/CR-6850. I'm not sure if we have a specific presentation on this. We refined that a little bit based on feedback from having done some -- some actual use of 6850. We refined it a little bit.

Then we have a scoping fire HRA approach, which is new. And then we have detailed fire quanitification methods in which we have modified or extended EPRI's CBDT, HRA, HCR/ORE and also NRC's ATHEANA.

Yes, John?

MEMBER STETKAR: Question.

DR. COOPER: Yes.

MEMBER STETKAR: The scope and fires, are you going to talk more about that?

DR. COOPER: Yes, quite a bit actually.

We have about an hour on that --

MEMBER STETKAR: Good.

DR. COOPER: -- specifically, but I wanted to say something just -- okay.

Let me just say this about -- I mean, I want to say something about the approach, why we did it this way.

Okay, we wanted to retain the screening from 6850. We knew from the outset that we were going to be modifying detail methods, but what we were hearing from like NRC reviewers is that we need something that we can understand easily. We need to be able to trace back where this number came from.

MEMBER STETKAR: My question's going to be, and if you have an hour on this we'll get into it, but it's just a thought is if this scoping approach, if this sort of tiered hierarchy applies for actions during fire scenarios, would that same type of tiered hierarchy apply for any actions during any type of scenario?

DR. COOPER: I think the same principles, yes. The actual numbers may change, but that is -- what we decided was an important thing to do and that is to provide a simplified method that can be -- the user can actually use, and that the reviewer can understand and trace. It's based on the detailed methods. It has -- has its technical basis in the detailed methods. The scope of the use for the scoping approach is defined, so in other words -- and there's actually a series of questions that are laid out in what's going to be presented to you later as to, you know, if the answer here is yes, you can -- if not, you cannot use the scoping approach. Either use the conservative screening value if you can tolerate it, or use a detailed method.

MEMBER STETKAR: What I'm trying to do is tie back into the earlier model. Is part of that, the last bullet there you apparently endorse EPRI's CBDT HCR ORE as one method or ATHEANA.

DR. COOPER: We provide those methods. I look to my management. I don't know the publishing of new reg actually says that we actually endorse something, per se. I'm not sure exactly --

MEMBER STETKAR: Before I stop, let me say that if you publish it they will come.

DR. COOPER: Well, that's --

MEMBER STETKAR: The question is what type of assessment process did you use to identify those two methods in particular as most applicable to this problem. In other words, why -- why were other methods excluded from this -- this new reg -- even within the context of the new reg?

Did you do some type of assessment to say why HEART, for example, is not appropriate or why SLIM or THERP or any other type --

CHAIRMAN APOSTOLAKIS: Hold on, John. What's the --

MEMBER STETKAR: CREAM, CREAM. I'd forgotten all of the acronyms and I didn't want to short anybody.

DR. COOPER: I mean, I think in the sense that we certainly built on previous NRC work, the good practices and then the methods compared against the good practices, strengths and weaknesses and 1842 I believe is the new reg number on that one. You know, I think -- I mean, there is certainly the fact that the NRC came with what they thought -- the NRC authors came with what they thought was the strongest of their methods, and the upper side came with theirs. And I think that's pretty much where it laid out, but, yes, we did put some consideration in it.

MS. ERASMIA: One incentive is we are focusing on those methods are used either by the NRC or the industry, and if a method is not being used it's the resources needed to examine whether or not it could be one method.

MEMBER STETKAR: No problem at all. Just in the sense of focusing onto a unified field theory of human reliability analysis that this is -- this could be viewed as an important step in that process in terms of this new reg accepting these two particular methods, and by implication no others.

MR. GROBBELAAR: On the AP side we basically started with the methods that the industry used right now, the CBDT -- most of the U.S. users use that. And we did a comparison of the good practices and also against ASME standard to see how do we meet the ASME standard using this method and what would be the impacts of fire on that. Can we still meet that as opposed to going out and developing a new method.

And as part of this we did not go out and systematically develop with all of their methods .

CHAIRMAN APOSTOLAKIS: I'll come back to their side though, because the other side was issued as the result of an ACRS recommendation, and I'm really worried about it.

If you follow this path, what is the downside? The downside is that you will have France saying you Americans you use our method. We use our method.

You will have maybe others like NASA saying well we decided CREAM is better, and I'm not sure we're making much progress that way.

And the second one that I really am worried about is that because this is a joint NRC and EPRI, the final response to the SRM will be here is EPRI, HCR, the good and bad. Here is ATHENA, the good and bad similar to the best practices which looked at each method and had something nice to say about each one.

In my mind, that would defeat the purpose of the SRM. It's a matter of negotiation. It's not a technical conclusion. It's, you know, you and I are doing it. You have some good stuff. I have some good stuff. Let's shake hands. That's not the SRM.

DR. COOPER: Well, it wasn't quite exactly that simple, and a number of us on both sides of this team are involved not only in this project but also now in the SRM project, so we're not completely unaware of the issues. It is an unfortunate fact that this fire HRA work has to come in ahead of the SRM. It would be nice if the SRM work had been done before, but to be real honest right now people are saying we're about a year late for the fire HRA work. I mean, they've been wanting it for a long time, so we have to be cognizant of the realities of --

CHAIRMAN APOSTOLAKIS: I think it's the other way. It's the other way. The insights from you, from this work should inform the SRM response.

DR. COOPER: Well, it will. It is.

CHAIRMAN APOSTOLAKIS: Which means though that somebody should use both methods and try to see what results they're getting and how different they are. Why they're different and so on, because if you use either one or the other, again, you don't know..

This mobile to mother variability has been, you know, informed for a while.

MS. ERASMIA: I think probably quickly I should bring you up to date as to what we're doing.

CHAIRMAN APOSTOLAKIS: I understand. I think it's important to not lose sight of what we're trying to do ultimately in response to the commission's request, and not raise the issues at the last moment.

DR. COOPER: Okay. This is a actually a review. So once we finish the development or actually as part of our overall thing, I'll give you the time line next.

We did have a peer review. It was actually done last June, June of 2008. I've listed here the NRC reviewers, Gareth Parry, Erasmia, J.S. Hyslop, and on the industry side Stuart Lewis, Ken Kiper, Young Jo, and Zouhair Elawar.

The types of questions we asked them was in general was the right approach taken and implemented, sound, reasonable, so on and so forth, and we did quite a lot of good feedback, and we spent -- we actually spent a lot of time responding to those comments.

CHAIRMAN APOSTOLAKIS: So you will tell us what they said?

DR. COOPER: I don't know that we were planning to tell you that today. That wasn't one of our presentations. At some point in time if we have some time we can talk about the kinds of things that they did say, yes.

We also did some testing in last August and September at two different plants, and there we specifically tested the scoping methods noted here as flow charts.

So this is our status. It's kind of a busy thing, but I wanted to get everything on here. We started in 2007. We had our first integrated draft in May of 2008, and that was followed by a peer review in June of 2008. I just mentioned that we did the testing at two plants in summer and fall of 2008, and then based on the peer review and the testing we had quite a lot of good feedback, and we spent quite a bit of time actually revising our draft which we had in April of 2009.

We had a quick review from folks from NRI and NRO. Finished in April 2009. We are here today giving you this information only as a presentation. We are simultaneously trying to get a draft report for public comment out. I can't say exactly right now what the date is. We're working hard to try to compress the schedule, but it looks like it's going to be probably July, next month that we're going to have that out for draft and public comment.

In parallel with that we have members from the PWR Owners Group who are interested in trying this out and giving us some feedback. Later this month we're going to the fire PRA course and giving a for information only day long presentation on this work.

We plan to be back here in October to give you a more formal presentation and will probably be asking for a letter at that time, and we're hoping for publication of the final report in 2010.

MEMBER BLEY: Would we see the report before it goes out for public comment or do that simultaneously?

DR. COOPER: It does not look like that's going to work out, no. We wanted to be here in a timing such that we could get your response here today in this, you know, for information only thing so that we could incorporate feedback you might have at this point in time in the public comment period, but it was recommended to us that there are some fixes that needed to be done to the report before we could give it to you, and we wanted to keep this date, and we still had to move forward. We just kind of missed -- missed the wave to get a report to you in a timely fashion so you could look at it before this meeting.

MEMBER BLEY: Will one of the presentations today walk us through any of the results of your tests so we can understand how it actually works?

DR. COOPER: That was not planned, no. We can talk about that, and that is in the report in one of our appendices. For the most part we got feedback on revising some of the flow charts, and between that and --

MEMBER BLEY: The flow charts are --

DR. COOPER: The scoping approach, that's the scoping approach. So between the testing and also peer review comments we've actually made substantial changes to the flow charts, and we've also developed an appendix that provides a justification for the numbers that are in the flow charts and, you know, basically sort of lays everything out.

So those were some of the big -- big items that we addressed in our revisions.

MEMBER BLEY: Let me ask you one more question. You want to come back to us in October, and you're looking for a letter then, but we won't have seen the report.

DR. COOPER: The report will --

MEMBER BLEY: Well, we'll that this summer.

DR. COOPER: You'll see the published comments.

MEMBER BLEY: We don't have a meeting previous to this October time frame to talk over what we think of the report.

DR. COOPER: But we don't have that in our plans as present. I guess if you --

CHAIRMAN APOSTOLAKIS: We will have a report at least three weeks before this subcommittee, right?

DR. COOPER: Yes, you'll have -- you'll

have the draft for public comment this summer.

CHAIRMAN APOSTOLAKIS: Okay, and then after the subcommittee meeting in November, I guess, or December you will come to the full committee for a letter; is that correct?

DR. COOPER: I think that's something like what the schedule is. Something like that, yes.

MR. NAJAFI: This is Bijan Najafi. This is typically the same way the past two reports worked in. We go first through the public comments sometime in the summer around June through 60 days, which takes us July and August, and we make the changes for a month, and it's September. Then provide 30 days, a report to you for your review and then come to the subcommittee 30 days after we give you the report.

Then at that time then depending on your comment you have to do the full committee.

CHAIRMAN APOSTOLAKIS: Well, then we schedule --

MEMBER BLEY: Okay, John.

MEMBER STETKAR: You mentioned that testing had been done at two plants. Were those Shearon Harris and Oconee, the plants that are --

DR. COOPER: It doesn't sound familiar. Nine Mile Point and Diablo Canyon.

MEMBER STETKAR: It would seem that it would be useful to test this methodology in the midst of people who are actually struggling with trying to apply the NFPA --

DR. COOPER: Okay, that's actually happening in the form of -- actually, a number of different of ways. First of all, Scientech and SCIC both on the EPRI side they have their own projects where they are trying to apply things.

Then at the same time we have this PWR Owners Group who was planning a piloting of the work, as well, so that's -- that's -- and we are expecting to get feedback from them.

So we have at least three different avenues by which we will be getting additional information on how the method is being tested and used.

MR. NAJAFI: And these two plants are going -- transitioning to NFPA 805? The pilot plants, they were way ahead of this project. They already submitted their LAR.

CHAIRMAN APOSTOLAKIS: Well, they can still do work on this. Was it an administrative issue?

DR. COOPER: What?

CHAIRMAN APOSTOLAKIS: Why are the two plants that are implementing the joint NRC PRA report, 18 what? I don't remember. The transition to the NFPA 805 -- 6850. Why aren't they the same pilots for this project?

DR. COOPER: Simply it's the timing.

CHAIRMAN APOSTOLAKIS: It's what?

DR. COOPER: Timing, principally. Who was ready and where we had contacts available.

MEMBER STETKAR: Part of the concern that we heard this morning is that, well, the industry is only now recognizing some of the problems in NUREG/CR-6850 because the NUREG was developed before the industry had the possibility to actually benchmark it, to actually look at it, think about it, really figure out where the problems are.

Now we have people who are actually struggling in real time apparently with those precise issues, and you're proposing a methodology that those people will use in the future, but we're not asking those people to help us find the problems in the methodology.

MR. GROBBELAAR: No, this methodology is being developed in conjunction with working closely with these plants who are doing this transition.

That's where we get a lot of our feedback from and a lot of the development work that's ongoing there in support of these plants.

MR. CANAVAN: Maybe I can try and give you an answer. Ken Canavan, EPRI.

The pilots were piloting the 6850 method and trying to develop their LARs at the same time when we politely asked them how would you like to pilot another piece?

CHAIRMAN APOSTOLAKIS: Were they politely returned?

MR. CANAVAN: They politely returned a response that perhaps they would love to hear all the things that we were working on. They would incorporate the maximum amount of that information to what they were doing, but that they would have difficulty being a pilot given the amount of work that was going on.

MEMBER STETKAR: That's good, and I'm glad it's on the record because two years from now we should not hear the fact that this particular NUREG didn't have the opportunity for real time testing by people who were trying to apply it.

MR. CANAVAN: The two plants that are doing the testing now are NFPA 805 transition plants, so they're trying to apply the NFPA 805 and NUREG/CR-6850 at the same time.

MEMBER BLEY: Ken, I think that's good. Thanks. Susan, you have one more slide that you want to --

DR. COOPER: Only really to introduce the rest of the presentation. The rest of the presentation is going to be on specific technical aspects of the report and the approach. Identification and definition is going to be the next topic, then we'll have presentations on qualitative analysis, a couple of different ones on quantification, and then on recovery, dependency and uncertainty.

So with that I'm going to turn it over to Jan, and he's going to do the presentation for identification and definition.

MR. GROBBELAAR: Thanks. All right. And the scope of this HRA development is limited to past initiator operator actions. Pre-initiators can use existing guidance as the pre-initiators are not dependent on the initiator.

Fire detection is excluded as such. Fire suppression is also excluded as fire suppression is modeled using empirical data from which no suppression probability curves are derived.

Of course if a plant chooses to model the fire suppression explicitly, they can do so with existing guidance, or the guidance that's available.

There are three categories of prior actions for consideration. The first category is existing internal event operation actions that are inherited from your base line PRA model. Right now about 80 percent of the actions that are occurred in the fire PRAs are from the existing internal event operator actions.

Now the second category is fire response operator actions, and these are new actions that are based on fire procedures that would be implemented in the event of a fire. These actions can also be to address recovery of spurious actuations or indications and main control room abandonment is considered a subset of these fire response actions that are driven by the fire response procedures.

MEMBER BLEY: Jan --

MR. GROBBELAAR: Yes.

MEMBER BLEY: -- as I recall the way -- I don't know if all plants do this, but I think most plants -- if you have a fire and you go into the fire procedure, you're also in parallel carrying out your normal emergency procedures, right?

MR. GROBBELAAR: Correct, yes.

MEMBER BLEY: John.

MEMBER STETKAR: When you say that it's an existing internal event operator action, do you mean -- for example, the internal event model includes an action that the operator must open valve X.

MR. GROBBELAAR: Right.

MEMBER STETKAR: But the performance shaping factor for that action the context may be different, so we're not just --

So we're not just -- you're just defining an action as a goal of the human performance.

MR. GROBBELAAR: At this point we're only identifying the prior actions that need to be credited. It's independent of the actual quantification method --

MEMBER STETKAR: Yes, it's just a goal of that performance --

MR. GROBBELAAR: Right.

MEMBER STETKAR: -- open valve X?

MR. GROBBELAAR: Right. So when I start there I start with the type of entry, everything in there gets into the fire PRA.

Then as a third category, human first

events corresponding to undesired operator responses. These are well-intentioned operator actions in response to spurious indications where they aggravate the situation.

CHAIRMAN APOSTOLAKIS: I assume in the previous two categories you also include undesirable operator.

MR. GROBBELAAR: In the previous, excuse me?

CHAIRMAN APOSTOLAKIS: The previous two bullets.

MR. GROBBELAAR: No.

CHAIRMAN APOSTOLAKIS: No?

MR. GROBBELAAR: Not in our definition.

CHAIRMAN APOSTOLAKIS: So the new actions to address recovery things can go wrong there, but that's a desired operator response? No, you don't mean that.

What is this last one, fire PRA methodology standard; what is that?

MR. GROBBELAAR: It's the fire standard developed by the ANS.

CHAIRMAN APOSTOLAKIS: And that's applicable to --

MR. GROBBELAAR: It has requirements in

there for actually a fire PRA.

CHAIRMAN APOSTOLAKIS: Requirements, anybody can write requirements. It's how to do it that's a problem.

MR. GROBBELAAR: That's the problem, yes.

MEMBER BLEY: But as I take it the requirements tell you certain acts that you have to do.

MR. GROBBELAAR: It's not a problem of principle, though; it's a scope problem. I mean, how many spurious to you have to consider -- multiple spurious issues. It's a big issue.

Next, internal use operator actions basically you start with the general transient event that you're going to modify for fire. We are not concerned with any operator actions that are related to initiators that are not fire induced. For example, SGTR and the PWR is not caused by a fire. Accuracies discarded based on low frequency arguments. Of course, that could change in the future if we find for some reason that this high frequency is associated with this. But mostly we're interested in general transients, loss of support systems, and locus caused by spurious actuation. Based on PWR , find all prior actions that apply to the fire induced initiators, and it's your first sign that you know you're going to create it and need to investigate for modification.

The second category are the fire response operator actions, as directed by fire procedures. For example, actions to mitigate specific fire damage to equipment or actions that could act as recoveries for internal event operator actions that are modeled, but for some reason cannot be credited due to fire impact.

There might be something in the fire procedures that can help you out. For example, I did not find what instrumentation channels are protected and available to use in a fire scenario.

CHAIRMAN APOSTOLAKIS: Jan, I'm a bit confused, excuse me. What does recover existing internal events operator actions mean? What does that mean?

MR. GROBBELAAR: It means we start with the existing internal event operator actions, right, the actual type of entry. Then as a first step we go in there and we determine what are the fire impacts in terms of my instrumentation. So we may from just the EOP driven actions see that the instrumentation for this action is not going to be available in this fire.

And you say it's 1.0 is the first step. Then we say, well, how can we recover that action possibly. Let's look at the fire procedures that they're actually going to follow in the scenario. Is there anything in that procedure that could lead to success given that this existing action is now final.

So it's just a thought process. The success criteria would still be the same, but it's getting success for different procedural paths, if you want.

CHAIRMAN APOSTOLAKIS: So if in the internal event analysis -- that's what you mean, I guess.

MR. GROBBELAAR: Yes.

CHAIRMAN APOSTOLAKIS: There's an operator action someplace and there is a distinct probability that it would not be done correctly, you are looking for ways that it will be done correctly in a fire environment; is that what you mean?

MR. GROBBELAAR: No, if an internal event we are seeing these following set of instruments available in the area where you perform the actions --

CHAIRMAN APOSTOLAKIS: Right, because if a fire --

MR. GROBBELAAR: Right.

CHAIRMAN APOSTOLAKIS: So you are re-evaluating --

MR. GROBBELAAR: Right, we look at the --

CHAIRMAN APOSTOLAKIS: The word recoverable --

MEMBER STETKAR: It's not recovering that event. If we define an operator action as --

MR. GROBBELAAR: Yes, I understand your --

MEMBER STETKAR: -- as the performance of a desired event, open valve X. This is still that same action. It's that action under a different set of circumstances --

CHAIRMAN APOSTOLAKIS: Right.

MEMBER STETKAR: -- but it's not recovering a different action.

MR. GROBBELAAR: Right, I understand your comment.

MEMBER BLEY: Do you agree with it?

MR. GROBBELAAR: No, I agree with it. Recovery is more in a general sense in terms of I've got a sequence, and I'm recovering that by following a different --

MEMBER STETKAR: Now are you putting in a different basic event -- multiplies this thing, so I now have two human action basic events in a cut set?

MR. GROBBELAAR: The actual

interpretation may be that you add a new basic event, or you just modify the existing one, but that is very model dependent, you know.

CHAIRMAN APOSTOLAKIS: But in either case you are not recovering anything. That's the point.

MR. GROBBELAAR: Yes, I understand your point about recovery.

CHAIRMAN APOSTOLAKIS: As long as we're --

MR. GROBBELAAR: Okay. Where were we?

MEMBER ABDEL-KHALIK: Can you do this primarily by just looking at the procedures?

MR. GROBBELAAR: No, you need to look at all fire impacts on your cognition which is firing instrumentation, you know, to look at procedural response. You have to look at performance shaping factors that might impact execution of an action, whether it's in the control room locally. Consider where is the fire? Can I still do what I'm supposed to do given that there is a fire in the proximity?

MEMBER ABDEL-KHALIK: In this whole process you're assuming that the procedures are the truth. They're not going to change?

MR. GROBBELAAR: Oh, no, when you're talking about existing operator actions based on the existing EOPs, IOPs, I don't see many changes there. I mean, those procedures have been validated.

I do see as an insight from this whole fire actuation exercise changes to the fire procedures themselves, and the implementation of those procedures, because right now the -- every plant has their own unique way of doing the fire procedures to meet Appendix R. And some plants would sustain the EOPs, while others were doing parallel that in many cases the fire procedures are just seen as supplementary to the EOPs, like the operators say we -- they follow a symptom-based response. They say we have EOPs, we're clear that's a fire that took out that system. I'm going to follow my EOP until it doesn't work anymore, or until we stabilize the plant and then we'll get the fire procedures.

But the Appendix R procedures when the design basis included the assumption that there will be no other initiators in conjunction with the fire and no random fighters, so with fires causing things like OCPC LOCAs, you're suddenly in a very time-driven operator action. You have to respond in a very short time, so the fire procedures might have to be enhanced to provide the actions on -- prioritize the actions based on fire area to possibly mitigate that. So those are insights I see coming from this whole exercise. Yes, the fire procedures may change.

And of course timing will also change depending on how you implement the procedures. You know, there's always a -- for internal actions you could always cause a delay because there's a delay in implementing the fire procedure in conjunction with you have issues of workload. You have enough operators to do everything that you want to do. We don't have time to go into --

MEMBER BLEY: Your thoughts still aimed at identification?

MR. GROBBELAAR: Correct.

MEMBER BLEY: Okay.

MR. GROBBELAAR: The whole identification process can be iterative as required by the fire PRA tasks, or it can be comprehensive based on the fire procedures.

Fire response mainly control the actions. These are a subset of the fire response actions. Operators will abandon the control room if it becomes uninhabitable or due to loss of required control.

The identification process can be iterative or comprehensive based on the main control of the procedure, and the fire PRA can create a scenario in which the operators maintaining the control room but perform local actions due to lack of control. And we found this that the operators tell us they will not abandon the control room unless it become uninhabitable, so the -- typically or realistically when the fire progresses it will cause impacts and the operators will have to go out and perform local actions, which are qualitatively not different from, say, what you have in a station blackout. But you may eventually have a situation where they are controlling outside the control room, but the command of control is still in the control room.

Now from the initial results we obtained the uninhabitability of the frequencies, so this is something that he needs to analyze. But loss of control may be more significant. In that case, we may have to go and look at that in more detail if required by the utilities. Yes?

MEMBER STETKAR: Just out of curiosity, Jan, and I don't know. Do plants typically have specific criteria that say if a and b and c, then abandon the control room immediately?

MR. GROBBELAAR: No, they don't.

DR. COOPER: Judgment.

CHAIRMAN APOSTOLAKIS: But that brings up another issue. The time that it will take them to make this decision is, I presume, unknown, right? It may vary significantly from situation to situation. Will that time be a critical element in your human reliability evaluations?

MR. GROBBELAAR: It could be I suppose, but the control room abandonment criteria as it's defined in NUREG 6850, so that's an input into the HRA.

CHAIRMAN APOSTOLAKIS: But wait a minute now. I thought you just said that --

MR. GROBBELAAR: No, no, no, the plant procedures themselves don't have criteria -- clear criteria to use to abandon at the time.

CHAIRMAN APOSTOLAKIS: The time that it will take them to make this decision is that the critical element here, or not? Let's say in some instances it takes them, I don't know, two minutes. In others it takes them 20 minutes?

MR. GROBBELAAR: It may be, but we haven't at this point had to analyze control room abandonment in any kind of detail because --

CHAIRMAN APOSTOLAKIS: So this is for the future?

MR. GROBBELAAR: Right.

MR. NAJAFI: Let me just add --

MEMBER BLEY: Bijan, say your name again.

MR. NAJAFI: Bijan Najafi. There's a couple of criteria here, as he says. One is habitability, one is control. The 6850 or other fire modeling analyses whichever you use it will establish those conditions upon which the operator have to abandon the control room -- level of the smoke, temperature, the timing. And the timing is defined there. But how do you take into account that timing in your HRA analysis.

For example, the fire modeling tells you to get -- in that size of fire you have to abandon within 15 minutes, because the smoke makes it uninhabitable.

Then you have to take that 15 minutes and put it in whatever you do HRA for alternate shutdown panel.

MEMBER STETKAR: The NUREG and HRA PRA analysts sitting in little rooms know that, but the people in the plant don't know that, so --

DR. COOPER: That's right.

MEMBER STETKAR: -- and our job as analysts is to evaluate how they will perform, not the way the studies assume they might.

MEMBER BLEY: People in the plant aren't going to be conversant with 6850.

MR. NAJAFI: But this is what I was coming to the second part of what Jan said the procedures are not very specific. So in your HRA you have to have a probability to say that what is the probability that the operator leaves the control room before or after when he has to.

Because each one -- we have interviewed that one says I won't leave the control room until my feet is on fire, and another one -- which may be too late -- and another one said I'd be out quick. So there is -- that's part of the HRA. For me there is a fire side of it. You define the condition. Fire generated condition and timing associated to those fire generated condition. The rest is hand off to the HRA.

MR. GROBBELAAR: But to put in perspective, the initial results show that sequence is requiring evacuation due to uninhabitability is so low down in the mud, you know, e to the seven. I can speak on the correction, but it's insignificant compared to the other cuts that you get, so there's no need for a detailed analysis right now.

DR. COOPER: If I could just insert and the team can correct me, I think at this point in time the detail is our recommended approach for dealing with these kinds of situations where you will have to understand the specifics of the scenario and get into timing and probably get into understanding how the specific plant crews may be behaving to these things.

So this is going to be -- hopefully, you know, based on the information we're getting it's likely to be a very rare event, but when you do get it you're going to have to dive in with some pretty detailed analysis.

MEMBER BLEY: Well, the information you're getting though is coming from a couple of limited cases, right? I mean, I don't know if it's considered all the possibilities of smoke becoming so thick you can't -- you can't see or all that sort of thing, so it strikes me --

I guess I'm a little curious as to how -- and this will come up later -- how one can claim if you base a screening assessment on the kind of things that are in 6850 how you can in general claim those are conservative for this kind of a thing, so I guess I'll be asking about that later.

MR. NAJAFI: Yes, part of those reasons

are because you have to when you do your screening early on in your analysis you do not know as much about your fire generated condition, and we do make worst case assumptions to come up with those numbers, and they're not always the worst case fire generated condition in terms of spurious actuation they may cause; in terms of smoke that they can generate, because you haven't analyzed the fire as much when you're in the screening phase.

MEMBER STETKAR: I guess it's difficult to figure out how I can do screening when I don't understand what's happening, but maybe we'll understand --

MR. NAJAFI: You'll understand when you see the numbers.

MEMBER BLEY: Let's go ahead and come back to it because we only have a couple of minutes to finish this up.

CHAIRMAN APOSTOLAKIS: One very last question. You said it's rare -- rare is --

DR. COOPER: Pick and choose.

CHAIRMAN APOSTOLAKIS: -- losing all required control?

MR. GROBBELAAR: Losing habitability in the control room.

CHAIRMAN APOSTOLAKIS: Really, even for smoke?

MR. GROBBELAAR: Well, it's just a rare event, because for the control room to become uninhabitable it must be in conjunction with fire in the ventilation system. So it's a very low frequency event. It's low enough to not be able to consume compared to the other risks that come out of the models.

MEMBER BLEY: It strikes me as one that needs pretty good arguments on that, and we haven't seen this yet.

CHAIRMAN APOSTOLAKIS: Yes, yes. I mean, I'm not saying but I would like to see better argument.

MEMBER STETKAR: Probably not rare compared to three times ten to the minus eight per year, for example.

MEMBER BLEY: Let's go ahead, and that's something you can tell will be interested in.

CHAIRMAN APOSTOLAKIS: Okay.

MR. GROBBELAAR: HFEs corresponding to undesired operator responses. This is a response -- the only thing that responds to the operator in response to his instrumentation procedures on the basis that they generally try to believe their instruments and to follow their procedures.

These are identified within the context of the accident progression fire review of the emergency operating procedures and the annunciator response procedures.

They are defined in terms of the impact on the function system component or --

The issue of this is that when you started developing this guidance it was in 2006, which was prior to the existing fire standard that's out now, and at that time the fire standard was sort of open ended on the number spurious indications that need to be considered, so the fire standard basically said consider any number of combinations of spurious indications for possible undesired operator actions.

The current standard says for category two you need to only consider one spurious actuation, so for application if you have redundant or diverse signals you can basically screen it out to meet category two of the standard, which is what most plants only need.

So we've had comments from the Westinghouse owners group -- actually the PWR owners group that they don't want to have review of emergency operating procedures in place --

CHAIRMAN APOSTOLAKIS: The thing that bothers me was the earlier comment. You say identification and you present this after you presented identification internal events operator actions. So that implies this is different, or a different category.

MR. GROBBELAAR: Yes, this is a different category.

CHAIRMAN APOSTOLAKIS: Well, you probably need a better title though because undesirable operator responses are also under internal events. I mean, making a mistake is not a desired response.

In the first bullet you have there it seems to me that was James Reason's argument years ago that the plant operators are professional, well-trained people, and we shouldn't really talk about human error. We should talk about human failure, blah, blah, blah, blah. ATHENA has all that, so I'm a little bit confused why you consider this as a separate category.

I think what you mean here after you abandon the control room; is that what you mean?

MR. GROBBELAAR: I can still be in the control room.

CHAIRMAN APOSTOLAKIS: Why are these different from the previous one?

MEMBER BLEY: Can I take a try just to see if I understand it?

The other ones were -- you had catalogs from what happened in your normal level one PRA, so you had a list from there. You had another list -- I forget what category two was. This is a new list of things that come up because you're saying I could have erroneous instrumentation. I will respond to that, and that action is an action they want to capture, so all they want to do is capture those. Is that correct?

CHAIRMAN APOSTOLAKIS: Why don't we say that in the title then?

MEMBER BLEY: I think it would -- the title's confusing.

CHAIRMAN APOSTOLAKIS: The title would help if you said that, but also I think, Jan, 10 minutes ago didn't you say that when you revisit the internal event operator actions you are looking at them now from the perspective of the fire environment in which case the instrumentation may be wrong, so -- so, again, the instrumentation is there, as well. So what is it that makes this category separate?

MR. GROBBELAAR: In this category we are looking at -- well, first the HFE term is there because the impact of these actions is equivalent to an IFE in the model, modeling scenes because it fails something, but it is not really an operator failure as such because they are -- in this case we're saying the fire is burning up some control cables. It's actually a false signal, and the operator sees the signal and he responds to it, but he's doing --

CHAIRMAN APOSTOLAKIS: So the way I understand is in the previous category those were operator human failure events that were already there, and now here you are looking for perhaps new events as a result of this misinformation.

MR. GROBBELAAR: Yes.

CHAIRMAN APOSTOLAKIS: Is that accurate?

MR. GROBBELAAR: It's a new category --

CHAIRMAN APOSTOLAKIS: It's a new kind of HFE that is directly the result of the wrong information the operator receives, whereas in the previous one the operator error was already in the PRA model, but you are looking at it now from a new perspective.

Why don't you just say that and change the title. Say new age revisions as a result of wrong information.

MR. GROBBELAAR: Well, thank you. This is revision 50 of the --

CHAIRMAN APOSTOLAKIS: Because all of them are undesirable --

MEMBER BLEY: And now if you wouldn't mind, go ahead to the next item.

MR. GROBBELAAR: Okay, we'll take a bulletin on terminology. If you have any suggestions, please let us know how to make it less confusing because it is a really confusing topic.

In the interest of time, I'm going to skip through this slide.

CHAIRMAN APOSTOLAKIS: Where are you now?

MEMBER BLEY: Slide nine.

DR. COOPER: He's going to skip over this one.

MR. GROBBELAAR: Yes, we don't skip over that one.

CHAIRMAN APOSTOLAKIS: So the abundant -- MCR abandonment actions is kind of obvious?

DR. COOPER: Slide nine.

MR. GROBBELAAR: So the next statement is identify the required operator action that you need in your model. The next step is to define --

MEMBER ABDEL-KHALIK: I'm sorry, I'm still confused. If you go back to slide seven at the very last comment in the last bullet. Although these actions are well-intended and not operator errors as such, the undesired consequences have the same impact as an error and are, therefore, to be modeled as HFEs.

MR. GROBBELAAR: Yes.

MEMBER ABDEL-KHALIK: What is success in this kind of scenario?

MR. GROBBELAAR: There is no success at this point. The success would be you go back --

DR. COOPER: Success would be that they recognize that the information that they're getting is incorrect, and that they would not have responded to that. Another option that we do give them if we get to it later is that we do have an option for recovery. In the way that we're doing right now we have built in that if they -- because they're trained to believe in instrumentation and trained to follow their procedures that if there's wrong information that they will respond to it.

MEMBER ABDEL-KHALIK: How will they respond?

DR. COOPER: No, no, no, no. In other words, their information is wrong and their information is actually a cue for them to do something that we don't want them to do. It's not actually something that they want them to do, let's say turn off a pump.

No, it's saying that, you know, you've got a high level or, you know, something like that and so they turn off a high pressure injection pump. We don't want them to do that because that's not the actual state of the plant. But there is an alarm or an indication in the control room that has been affected by fire and it is telling the operator by their procedures -- you know, first the indication and then match with the procedures. By procedure, you have that indication, you turn that pump off. We don't want them to do that but that's what they're being told by the procedure and by the cue. But it's wrong information because of a fire effect.

MR. GROBBELAAR: As for example -- or a simple example in equipment protection, for example, and I show you response procedures and there are some of them where operators are just trying instinctively to get this along, for example, loss of water to running diesel generator. They trip it and then we've got to investigate. There's no verification at that point involved because they have two or three minutes to save the diesel. Similarly with oil for a big running turbine, they will get the alarm. They'll trip it and say -- if the information you get from the fire alarm is telling you that the cables associated with the annunciators and the fire, you have to consider that normal spurious actuated in that scenario, you will model of the failure of that piece of equipment as an HFE. We call it a basic event. It's just this piece of equipment is tripped by the operator because he gets false information.

That's your first step. And then because of this iterative nature in the 6850 process, you don't look in your model and see if I can live with that or not. If you can't, then you have to go look for recoveries to that. It could be from the context of the scenario, or it could be from something in the fire procedures themselves.

MEMBER RAY: Well, in that regard does this have to be bad information caused by the fire, or can it just be bad information -- the procedure's wrong, for example.

DR. COOPER: They're not assuming anything like that's going to happen, and we're --

MR. GROBBELAAR: Well, it could be -- the answer is it can be -- you could just say it's bad information, but as I point out in the fire standard instrumentation is typically so reliable that we don't model is explicitly in internal events. It's just always there, but for the fire that's not a good assumption anymore.

DR. COOPER: That's right.

MEMBER RAY: I accept that, but what I was thinking was that you were restricting the causes of bad information to the effects of the fire as opposed to a procedural thing.

MR. GROBBELAAR: Yes, you're right as far as that goes.

MEMBER BLEY: They're actually using this to come up with a more complete list of human action events to analyze. That's all they're up to.

And our time has really about run out. Is there a way you can finish very quickly, Jan?

MR. GROBBELAAR: Okay, let's see. Definitions. If you update the definition of existing internal events -- actually it needs to be revised for fire impact. These fires was to be defined -- the definition should address fire impact on instrumentation and the timing of the keys , the response, execution, fire impact on success criteria, manpower, resources, a whole list of things you need to look at.

MEMBER BLEY: This is only for guidance. When we get the report in July will there be examples that show people how to actually realize this in their analysis?

MR. GROBBELAAR: We're trying to do that.

DR. COOPER: Yes. There are a few limited examples in this particular section of the report on identification and definition.

MR. GROBBELAAR: In the attachment the examples we used at the plants are in the attachment, but it's not in very much detail.

MEMBER BLEY: Okay. Go ahead.

MR. GROBBELAAR: Okay, we can move to assessment of feasibility. I can always skip this one. This is just -- initially when you do the definition you can at that point try and make an assessment of whether this action is even credible or not based on timing and manpower, or if the fire is in the same location as that action, are the tools accessible, if you have that information at that point.

All right, let's move on to the next part of this presentation which is qualitative analysis.

MEMBER BLEY: That's going to be Jan?

DR. COOPER: That's Jan, yes.

MEMBER BLEY: I hope you can catch up, Jan.

MR. GROBBELAAR: I think I might

MEMBER STETKAR: By the way, just while Jan's coming up. If this chain in the presentation group that we had this morning could be careful about using the terrible word recovery, because your connotation of that word and your -- you use it extensively -- is much different than either NEI 04-02 or DG 1218. So now we have this word and everybody knows what they mean by that word, but nobody means the same thing.

DR. COOPER: We've run across this problem and we know that we have probably at least two versions of -- meanings of recovery, but they're both -- well, anyway. Yes, we'll take that point. Thank you.

MEMBER BLEY: John. Oh, you're not quite cued up. If we can finish by 3:10 we'll get our full break.

MR. FORESTER: Okay, well, my presentation is actually intended to cover two aspects. One is the qualitative analysis -- the guidance we provide for the qualitative analysis in the guideline. I'm going to give you a quick overview of that. That may be an area where we can move through quickly, unless you have different kinds of questions or different kinds of information.

And then I'll just give an introduction to the quantification approaches.

Okay, in the quantitative analysis and the guidance we provide our main intent here is to address the fire effects essentially. So you want to do a quantitative analysis and you want to understand what's going to be driving performance, but in our guideline here and in the focus for the qualitative analysis is also making sure that the fire effects are considered in trying to understand what's going to be tried in performance.

So this is developed to facilitate the quantification process, and the PSFs that are included in the ASME standard and in NUREG 1792 are still to be considered, but again we want to look at how the fire effects relate to those PSFs and how it's going to affect performance.

I do want to note though that all of the PSFs that are included in those guidelines, for example, may not be explicitly addressed in all the quantification approaches. In some of them they're addressed more implicitly. So that's just a point.

The qualitative analysis itself includes several aspects, developing the fire specific context, addressing the shaping factors. There's also a part where the analyst went over and reviewed the historical experience of the plant and the industry at large in terms of responding to fire scenarios. That information is to be considered.

Then, of course, you know, plant specific review -- a review of the plant operations -- the plant specific types of operations. So these are the user aspects of the qualitative analysis.

Per the ASME standard there is in this context and you defining the human failure events. The -- as in the HRA we're going to look at the accident sequence. We're going to look at the timing issues associated with the accident sequence. How the accident's going to progress. What are the expected progression essentially, the availability of cues. If you're looking at a particular failure -- human failure event what's gone on in this scenario prior to that. Were there other successes or failures, and, of course, the success criteria.

MEMBER BLEY: Did you do all this qualitative work before you start thinking about screening so you know what you're screening?

MR. FLACK: Yes, because the screening analysis itself requires -- it's not just a simply well let's use point one so we can see what happens. The qualitative analysis at some level has to be done prior to even the screening analysis.

MEMBER STETKAR: Is there some way you could change the order of those boxes in your flow chart thing to emphasize that, because if I march through the steps in your flow chart the first step that I do is quantitative screening, and then I do a detailed qualitative analysis of what's left.

DR. COOPER: This is probably something that we're going to be revisiting during the public comment period. The reality, of course, is that you do qualitative analysis constantly throughout your HRA until you finally decide on a number. So the placement of where a qualitative analysis is and the process is a little bit difficult unless you're going to have arrows pointing at everything.

MEMBER STETKAR: Good to make it number one.

DR. COOPER: You could make it number one.

MEMBER STETKAR: And say you'd need to

think about all these things --

DR. COOPER: Yes.

MEMBER STETKAR: -- and that would --

DR. COOPER: We're going to think about it some more, but we've already had that as a comment prior to the draft, and it's not just something we're going to get to before draft for public comment, so we'll be taking that one. And we'll note that from you, and that will be further fuel for trying to get that one -- that taken care of during public comment period.

MEMBER STETKAR: But I would say that this information here, the accident sequence, the timing, all those things, that's done in defining human failure events, so that's done. You're just defining what the human failure event is, so that's done prior to screening.

Now the screening approach itself from 6850 has a set of criteria that has to be examined in order to be able to assign an HEP to those -- you know. So it's -- it has its own qualitative analysis, so to speak, but this stuff is already given prior to that.

MR. FLACK: The last bullet there about fire PRA context, we just note that there are several levels of quantification as described in 6850. You can use in Task 7A as sort of the initial quantification, so they're screening human error probabilities could be assigned there.

Task 12 is actually the HRA. A section of that -- again, there's different levels of quantification, and that's what this is simply pointing out, that different levels of analysis may be appropriate for different levels of quantification.

Then this slide here, again, just lists the PSFs that we're going to address, but obviously the guideline focuses on the fire related risks associated with these PSFs. These things are all addressed as before, but we're going to look at the fire index.

CHAIRMAN APOSTOLAKIS: I will repeat an objection I've stated in the past that timing should not be a performance shaping factor.

MR. FLACK: Well, it's a constraint on performance. We've mixed it in with PSFs, and a lot of these things actually could be discussed in that manner, I believe.

CHAIRMAN APOSTOLAKIS: But timing is really essential to the response. I mean, look at the Holden experiments. What they're doing is they're --

the first thing they're measuring is time to respond, so to just say it's a performance shaping factor bothers me. But anyway --

MR. FORESTER: But we have a very sort of detailed approach for dealing with timing, so it's addressed according to whatever you call it.

DR. COOPER: It's not treated equally to the others, let's just put it that way.

MEMBER BLEY: I'm assuming that when I read a document there will be a discussion up front about finding this part of the qualitative factors that you need to be thinking about and then some specific aspect of timing that appears as a PSF. Is that a fair assumption?

MR. FORESTER: Yes. The next few slides really just takes examples of the what we're calling PSFs and talks about how we consider the fire impacts with respect to these PSFs. I can talk about this first one here. Again -- yes?

MEMBER STETKAR: Susan, are you hitting one of the microphones?

DR. COOPER: Sorry.

MR. FORESTER: We've been talking about, you know, the impacts of fire on instrumentation --

CHAIRMAN APOSTOLAKIS: The desire to do

that.

MR. FORESTER: So in the HRA we're going to examine the effects of the cues and indications given the prior impact. We're want to verify that the instrumentation will not be affected by the fire, so if the fire is not in the area the assumption is that the instrumentation will not be affected.

Alternatively, the fire may be in an area where equipment could be -- or instrumentation could be affected, but -- so the question is asked is that instrumentation going to be sufficiently protected. And there may be procedures that in fact say this information or these cables or whatever will be protected, but there may be others that are part of the procedures that say these are on the suspect list. So if you have a fire in this area, you should be cautious about relying on this type of information.

So that's part of what we do when we look at the performance shaping factors in doing the qualitative analysis. If the primary cues or indications are not impacted, then you have to look to see if there's going to be a diverse chooser or other indications that could be credited.

MEMBER BLEY: You don't have anything here about dependencies between supposedly diverse cues. Do you talk about that in your guidance? And if the things that can be of a mind set that misses those cues instead of them being independent?

MR. FORESTER: I'm not sure we do that.

DR. COOPER: I think that's going to be addressed some in the identification definition.

MR. GROBBELAAR: Well, that would be addressed when you're looking at -- we typically do that in the independence analysis when we look at combinations of HFEs that occur in the same group, where they might have a common element because they use the same cues.

But if we're talking about very small --

MEMBER BLEY: I'm talking about one HFE, but you'd think you'd have three independent cues, and really there's something that means you really only have one, and if somebody misses the one they miss them all. I mean, there's plenty of events that -- where you can find that sort of history happening.

MR. FORESTER: Yes, but -- I guess, again, if there's some notion that you have the belief that a cue will be affected, then you're going to look to other kinds of cues, other redundant information.

MEMBER BLEY: But that's what this is about?

MR. FORESTER: Right.

MEMBER BLEY: Go ahead.

MEMBER RAY: What you're talking about is what I was suggesting. I think that procedural guidance may be a clause of where, for example, it doesn't cause you to look at the right cues.

MEMBER BLEY: Not exactly the same thing, but, yes, they're related.

MR. FORESTER: Here is a slide on timing. Typically, NHRA you're looking for -- you know, part of doing the analysis is determining how much time is available for the action, given the initiating event occurs, and when they have to make the response by to get the benefit of the action.

Also you look at -- if you're interested in how in the operator performance you need to know when they're going to get the cues relative to the initiating event, because that then defines how much time they actually had, and you can't assume they're going to be doing the action before they know they need it.

And then of course you look at how long it takes them to diagnose the action and also to formulate a response, and also how long it takes to execute the action.

Well, in the fire environment you need to think about the fire effects on estimating these times, these different kinds of times in the sense that because of the fire they didn't have to take different routes. If they had to go outside the control room and take a different route because the fire brigade that's fighting the fire in a certain area, there's water on the floor, or there's smoke.

So in terms of executing your response you need to say, well, how long does that take. If you need to evaluate that you have to consider the fire impacts on how long it would take them to complete the action.

Also, for example, if they have to wear SCBAs in order to implement the action, so you're going to need to consider those kinds of things on the different aspects of time that have to be considered.

MEMBER STETKAR: This would also be true though for actions inside the control room just as well; wouldn't it?

MR. FORESTER: Yes.

MEMBER STETKAR: I mean, you would have a multiple set of failures and the operators need to respond within the control room.

MR. FORESTER: Absolutely. And also

there's other distractions. Given the presence of the fire, you know, normally it takes them this long to diagnose and execute the action, but now you have -- they're interacting with the fire brigade. There's other distractions. Maybe they're having some instrumentation problems.

So, again, those things can all affect the timing, so those needed to be treated explicitly.

Again, we've talked -- everybody seems to be aware of the fact that procedures and training can vary in prior conditions. They may implement EOPs at the same time they're planning the fire procedures. I think some plants may integrate those together. Other plants may complete the EOPs to some point before they begin the fire procedures. Again, these are all issues that because of the presence of the fire have to be addressed by the analyst.

Fire issues, again, you know the impacts of smoke, toxic gas. You have environmental conditions we haven't had to treat before. So we don't need to go into any more detail. There are a lot of PSFs, but I didn't plan on going through all of them. I just wanted to make the point that these are the aspects that get covered in the qualitative analysis.

We did mention earlier about the habitability issue, and I think we'll talk about that a little bit more, but I think there is an assumption, and I don't know whether to say this or not, but in my mind at least there is an assumption that based on the calculations and the guidance that's given in 6850 that the smoke levels will be high enough at this point in time, based on the ignition events and so forth, that operators will have to abandon the control room.

That timing -- I see at least from the scoping perspective is that we assume that's going to be the case. Now there may be some variability in terms of when the crews actually decide to leave, but the bottom line is that based on those calculations they're telling us the smoke is bad enough that they should abandon the control room, and we don't assume there's going to be a huge variability in that.

MEMBER BLEY: This is for some particular fire?

MR. FORESTER: Yes, because the calculation as I understand it assumes they need to know where the fire is at and what's going to be burning, and based on that information and the size of the room or whatever, then they're going to come up with an estimate that I understand is conservative that says at this point in time --

So based on the initiating event because you have an estimate of when they would need to have abandoned the control room. Now if they stay a little longer -- well, they're still going to be doing actions. What if they leave a little earlier, then they'll get started on the actions. So you need to know when they're going to leave because you want to know whether they're doing these actions outside the control room, whether they completely abandoned the control room. But there's still the assumption that they're going to be doing something.

But we do, as I understand it, we do rely on those estimates as to when they will abandon the control room, for habitability issues.

MEMBER BLEY: Oh, have you collected any evidence on how wearing SCBAs will affect communications among the staff?

MR. FORESTER: I can't say that we've collected any data, although Susan did try to work with some folks to look at how people are going to behave in a fire where they have to do a job wearing SCBAs or something to that effect.

PARTICIPANT: There are experiments of

people with them on in smoking environments and trying to communicate and get around, and we -- trials and the like.

MR. FORESTER: And one solution to that problem is that if -- I think in our guidance -- if they are wearing SCBAs and they have to do complex communication and they don't have communication devices within those SCBAs, those actions will get a 1.0.

MEMBER BLEY: Go ahead.

DR. COOPER: Yes, I think that at this point we'll just go on.

MR. FORESTER: This just summarizes one of the points I made about doing a review of plant operations as part of the quantification. We will be talking to plant personnel, looking at staff available during the fire, again how they're going to use their procedures. I think I've covered most of this, but this, again, this just sets up the plant specific analysis that will need to be done.

Okay, the next part now is just a brief introduction to the quantification process. We can do this right now. I think it's three or four slides, or we can come back after to take a break and this will set us up then for a discussion of the scoping analysis and the detail analysis, so whatever you prefer I can proceed.

MEMBER BLEY: I'd like you to go ahead. How long do you think this will take?

MR. FORESTER: Not too long. Good, I think we've talked about a lot of it already, so --

Okay, so we have three approaches to quantification. We talked about the screening approach and we mentioned that it's been slightly modified from NUREG 6850 to cover the long term events. You know, before there was in doing -- in assigning the values we just usually forgot to consider the fact that long after the fire is out, an hour or so or more after the fire is out, you know, the conditions are now getting back to normal, so we wanted to build in a way to treat those longer term events that wasn't there before.

The next approach to quantification is the scoping approach. The idea here is that it will be less conservative than screening, but it's designed to be slightly more conservative than detailed approaches.

Some of the actions as you go into the scoping analysis, and Stacy will talk a lot about this, some of the criteria may not be able to be met, so very early on in trying to evaluate a human failure event and quantify it you'll find that you cannot meet the criteria for the scoping approach, so they get an HEP of 1.0 and so then at that point they'll move on to detailed HRA. So there's two detailed HRA quantification approaches, and we talked about how they were modified for the fire scenarios. We've already talked about both of those.

Okay, in the screening analysis -- and we're not going to go into detail on the screening approach today. It wasn't 6850, and that's already been established, but there are a set of criteria that have to be evaluated in order to be able to assign the screening values on this, per 6850.

But some of the values that come out of that, they can be very conservative, so they may not be acceptable as a final human error probability for a given HFP. So if you need a more realistic HEP then you move on to a different kind of approach.

Of course, doing the screening helps, you know, limit your resources you have to expend and so forth.

MEMBER STETKAR: Since you're not going to talk about screening, I'm going to interrupt.

MR. FORESTER: Okay.

MEMBER STETKAR: I'm not familiar with the screening criteria for 6850. Do they -- do they address the issue of human dependencies, explicitly?

DR. COOPER: Yes.

MR. FORESTER: Yes, I think --

DR. COOPER: Yes, they do.

MEMBER STETKAR: The only reason is we have ample evidence of previous extremely conservative screening criteria that have been applied in isolation to get the ten to the minus six numbers.

DR. COOPER: Yes, it's very explicitly addressed, as I recall.

MEMBER STETKAR: Thanks.

MR. FORESTER: Yes and particularly too you have to evaluate, you know -- at the end you have to look at dependencies within cut sets and so forth.

MEMBER STETKAR: Not at the end. I'm talking about -- the problem is once you assign screening cut sets disappear so you never go look at them.

I've seen screening for internal events that have used all of the very, very conservative screening criteria without the analyst's recognizing that I have six actions multiplied together in a cut set, but then disappears.

MR. FORESTER: I think the second bullet addresses that, John.

MEMBER STETKAR: Does it or am I misreading it? It says for control and abandonment though.

MEMBER BLEY: It does?

MEMBER STETKAR: Yes, that's what that says. I didn't read anything -- I think that's part of the whole, the ASME standard is that you don't -- you don't let cut sets go away just because they have a very low value. You need to go in and look to make sure there aren't multiple human failure events with low HEPs in there.

MEMBER BLEY: I thought there was some requirement that you couldn't chain these things together. After the first one you couldn't just assign --

MEMBER STETKAR: I don't know. That's why I said, I'm not familiar with these criteria in 6850.

MEMBER BLEY: That's a real question we'll want an answer to.

MR. GROBBELAAR: Well, it's really addressed by the standard process of the analysis that's required by the ASME standard. I mean, what we do is we set all the HEPs to one if you have successes in the model, too, and you don't requantify the model. The driver has actually three combinations to the top. And you do that at a lower truncation consistent with required in ASME for quantification.

Now you get all the -- you continue all the truncation until you have 95 percent or whatever of your total risk. Identify the combinations precisely through -- identify that kind of issue, but it's not prior specific in any sense. It's just a normal part of quantification of your model, whatever model that might be.

MEMBER BLEY: I guess when we get back together, we'll try to take a look too, but give us a summary of how you ensure the screening doesn't need to chain together supposedly conservative values and getting very low --

DR. COOPER: Okay, we can do that, unless Bijan can answer.

MR. NAJAFI: This is Bijan Najafi. Just to put it in context. The lowest screening number that is suggested is point one -- nothing lower than point one, and 80 percent of the cases is 1.0. There's very few point one because you know so little, so the chances of driving this ten to the minus nine you don't see the cut set are very low. There is nothing less than point one.

MEMBER BLEY: We'd like something a little more detailed because we both have seen cases where using point ones people have got ten to the minus fives.

DR. COOPER: Okay.

MR. FORESTER: Certainly somewhere in the guideline there is guidance that says you need to look at your events in the cut system and make sure that you haven't considered dependencies.

Within the current screen approach there's main control and abandonment, and alternative shut down actions which is doing some of the actions outside of the control room, for example. The guidance there said 1.0, but then in another part of NUREG 6850 there is guidance that says they can use a single overall failure probability for representing the failure to reach a safe shutdown using alternative means.

They don't specify what that is, but I think they ask about looking at some timing that's available, and they suggest that in the IPEEE some plants that use this kind of approach use a point one value.

In our guidance, we talk about this, and we don't recommend doing that, but if that is a technique that wants to be used, because it is in 6850, we mix cases that there are certain criteria that should be met, like making sure there's always time available to do these actions and looking at the fire effects in general on those actions. So it's not a simple just assign a point one kind of value to it. So we've modified that to some extent.

So that's all we're saying about screening today. The scoping approach is the second approach. It's a flow chart approach that provides less conservative HFEs survival screening, and I would say that, you know, one of the impetus for developing the scoping approach was that the screening analysis, people were using it and they were finding that they weren't -- everything was sticking around. In other words, they weren't getting any screening benefits because of the high HEPs that were in the screening analysis.

MEMBER STETKAR: I'm going -- if that's the case and I do the screening at all --

MR. FORESTER: Fair enough. But that's what drove the scoping approach, because the screening approach is in 6850, so we stayed consistent with that. If people wanted to try to use it, that's fine, but one of the intents of the scoping approach was to provide, again, less conservative values in the screening approach without doing a full-blown HRA, or a more detailed HRA.

So that was one of the reasons it was developed, in addition to the reasons that Susan provided.

So, again, the scoping we want to provide more realistic HEPs. So there is some detail analysis required. It's not as easy to apply as the screening approach, for example.

We did want to require some simply judgments about PSFs just for consistency, so, again, there's problems with making judgments about a lot of PSFs, so we wanted to make that a more simpler judgment.

And we also as part of the scoping approach, one of the key aspects of it that we'll talk about much more later is demonstrating the feasibility of the actions and in showing that there's a time margin available to account for many of the uncertainties that would be associated with the fire scenarios. So we're looking at things like, you know, water on the floor, finding different routes. A lot of different things can happen in the fire context, and we use time margin concept to -- to try and address that, making sure they're having extra time, and also -- well, we'll talk more about that later.

And another goal that I think is -- we do require -- ask that the crews do a demonstration of these actions, to be able to use the scoping approach, and one thing that provides is that you have an assurance that the crews know how to do the actions, they're familiar, and they have an understanding of the fire scenarios. So that's some of the basis for the scoping approach.

But it is designed to address a limited set of PSFs and plant conditions explicitly, so some of the PSFs were treated implicitly. So if you identify particular kinds of factors or PSFs that are not within the scoping approach that may be very important, then you'll have to move on to detailed HRA.

And this is just a quick overview of the detailed approach. If the criteria cannot be met for scoping then you'd use -- or you need a less conservative analysis, then you'd move on to the detailed approaches.

The calculator essentially has guidance

that is -- modifies the guidance for -- to be able to account for the fire conditions, and the ATHENA approach uses the information that I discussed like from a qualitative analysis that considers all of the fire effects in order to generate HEPs.

We haven't gone to the next step and part of the SRM is to try and identify when certain methods may be more appropriate than others. We haven't taken that step yet. You know, when should you use the calculator and when might be better to use it, but that is part of what we plan to do.

And now we're up to the point where we're ready to discuss the scoping approach.

MEMBER BLEY: Thank you. In a second we'll take a break. We started a half hour late. We're now 45 minutes late, so if we stayed on the times that were assigned we'd finish at 5:45. If there's a way we can shorten that, maybe you guys can talk at the break. We'll do that; otherwise, we'll aim at that. We'll be back at 3:30 and start into the quantification session.

(Whereupon, the foregoing matter went off the record at 3:13 p.m. and went back on the record at 3:31 p.m.)

MEMBER BLEY: We're back in business, and a thing I forgot at the end of --

CHAIRMAN APOSTOLAKIS: Are we on record right now?

MEMBER BLEY: Yes, we're back on record.

CHAIRMAN APOSTOLAKIS: Oh.

MEMBER BLEY: You had requested a half hour on the SRN, and Erasmia is willing to stay around to do that at the end.

CHAIRMAN APOSTOLAKIS: Yes, we'll do that.

MEMBER BLEY: We'll do that. We'll stay for that.

Stacy, you have the floor.

MS. HENDRICKSON: Okay, so I want to go through the scoping quantification approach in more detail. And the actions that can be applied to the scoping flow charts include actions that are within the main control room, and I'll actually walk through that flow chart.

There's also actions -- X control room actions, actions that are main control room abandonment, or that would apply to alternate shut down, and then actions that are recovery of an EOC, which is an error of commission or an EOO, an error of omission, due to spurious instrumentation.

So in all of our five flow charts, these four that are bulleted and then the search scheme that helps to direct the analyst to the correct one.

So in applying the scoping approach there's a couple of steps that you go through. The first couple of ones are to direct the analyst if they can even use the flow charts. And it's in these first couple of steps that that they may even just get an HEP of 1.0 and be directed out.

The first one is to ensure minimum criteria are met, and I'll go through step by step what those criteria are. Then to demonstrate feasibility of the actions, calculate time margins, and then there's key conditions or PSFs that are explicitly addressed within the flow charts, and then that's when you come to using the flow charts to quantify the HFEs.

The first step are these minimum criteria that should be met. Three criterion: one is procedures, the other training, and then availability of equipment. So in procedures you assume that the procedures are available. This could include the normal operating procedures as well as fire operating procedures. They lead to support both the diagnosis and the execution of the action, with two exceptions for execution.

If it's a skill of a craft action, meaning it's a very simple just like turn a lever type of action, that execution would not be explicitly covered in procedures. And the second would be the recovery of the EOO, the error of omission, or the EOC, the error of commission, meaning that the recovery itself may not be explicitly spelled out in the procedures, but with the accompanying training or other cues that it may be able to lead the operator to know that recovery needs to be done.

MEMBER RAY: Now who's making these judgments about the procedure quality and so on?

MS. HENDRICKSON: This would be up to the analyst.

Then the second one is the training, that again the training is adequate -- that the crew have received training, not only on the procedures but also the actions they're being asked to take.

And then the equipment that would be necessary is available and acceptable.

MEMBER STETKAR: Stacey, in this context recovery, do you mean recognition that I didn't do something that I should have done, so I'm now going to do it, or that I did something that I shouldn't do so I'm now going to undo that, or do you mean a different action. I turned off those pumps and because I turned off those pumps now I must go open those valves? Or do you mean something that's not in the procedures.

MS. HENDRICKSON: It means in this particular sense that now I know that that information was wrong, and if I can undo what I just did, I will. In other words, if I turn something off and I can now turn it back on and I have not yet damaged anything or changed the plant state irreversibly or to some point, then -- now that I know that I need to do that I will do that. That's the kind of thing that recovery in this sense means.

MEMBER STETKAR: Right.

MEMBER BLEY: Is that defined in the document?

MS. HENDRICKSON: It is.

CHAIRMAN APOSTOLAKIS: So this is the scoping analysis in the way that I understand it is the next level of from the script. So this is intended to be somewhat conservative, as well?

MS. HENDRICKSON: Exactly, exactly.

CHAIRMAN APOSTOLAKIS: But then coming back to Mr. Ray's comment earlier, assuming that the plant procedures are there and they're correct that seems to go against the conservative. Also, assuming that the equipment are available --

DR. COOPER: No, I don't think -- I think she said it correct one time and the other time maybe not. Not so much that we assume that there are procedures. Procedures exist and they cover the action, not that we're assuming them. I think that she misspoke for a moment. We're not assuming that the procedures -- we do know that there are procedures, they exist, and they cover the situation.

MS. HENDRICKSON: Exactly.

DR. COOPER: We know that there is plant equipment that is available and based on what we understand about the situation and where the fire is, it should be accessible.

We know that based on what information we can collect.

MEMBER BLEY: Just so I understand this, that means that if there is no procedure and it's something other than those two exceptions you don't do an HRA and you assume people --

DR. COOPER: You don't use the scoping trees. That's right.

MEMBER BLEY: You don't use -- you have

to go to a full HRA.

MS. HENDRICKSON: If you want to use the scoping trees it would be an HEP of 1.0.

MEMBER BLEY: Okay.

CHAIRMAN APOSTOLAKIS: So what does availability of equipment. I mean, you're going to look at availability or you assume that they are available? Availability also means also the probability, you know. What do you mean by that?

MS. HENDRICKSON: The last bullet on availability and accessibility of equipment.

So primarily I think what's getting out there is that the equipment is accessible in that if you have the fire context ongoing, it could be that the equipment is not accessible because it's in the location of the fire or you cannot get to it because you'd have to travel through a smoke area, or also maybe the keys aren't there so that, you know --

CHAIRMAN APOSTOLAKIS: You're addressing accessibility. I'm asking availability.

DR. COOPER: Same thing. In other words, the fire has not affected the equipment.

CHAIRMAN APOSTOLAKIS: But they could be damaged to other reasons?

DR. COOPER: Well, that would be modeled

already. I mean, yes, that would also be modeled, but that's not part of HRA, at least not this HRA.

CHAIRMAN APOSTOLAKIS: Or the scoping analysis will take into account the possibility that they are down?

MS. HENDRICKSON: Scoping analysis, in order to use it the criteria is to make certain that it is available. It's not affected by the fire.

MR. FORESTER: So if the action -- if they want to credit the action based on this equipment being available, then we have to demonstrate, show that it will be available given the fire context?

CHAIRMAN APOSTOLAKIS: But there may be a probability that it will be unavailable due to other reasons?

MEMBER BLEY: You can only use it for cut sets in which it's operable.

CHAIRMAN APOSTOLAKIS: What's that?

MEMBER BLEY: You can only use it for cut sets where that equipment's operable.

MS. HENDRICKSON: Right.

MEMBER RAY: Wait a minute. Let's go through this about knowing or assuming. You said she'd made a mistake by saying --

DR. COOPER: She misspoke, yes.

MEMBER RAY: I'm going to assert that you misspoke.

DR. COOPER: Okay.

MEMBER RAY: All right, if you take way over half, maybe it's 80 percent of the corrective actions for screw ups, it turns out that they're procedural, or at least that's what they attribute it to. So until you've actually gone through these events and found out what the problems are with the procedures, you're making assumptions about their accuracy and effectiveness and so on.

The reason why the number of trips around the country have gone way, way down is simply that people learn from their experiences, and most often what happens is they improve the procedures so that they don't do what they did before that caused the plant to trip the last time.

And all I'm trying to say is the same thing is going to be true here, particularly when you have somebody who is a PRA analyst judging the adequacy of the procedures, or anybody else for that matter. They're going to have to make an assumption about, well, I think this procedure will work, but I don't really know until I see it happen. And it's, therefore, an assumption.

DR. COOPER: Well, when you get to the rest of Stacey's presentation you'll see that where also there is a feasibility demonstration that requires them to actually demonstrate that the actions can be done. The operators know how to implement the procedure. They have a time for that. And I think that's all I'm going to say right there. I think otherwise we're going to have a diversion.

MEMBER RAY: All right, but I'm going to -- nevertheless I'm going to say what I said before which was -- and you may not want to hear it --

DR. COOPER: Well, I disagree because I don't think -- I think just because people have picked procedures as the fix for a particular event doesn't necessarily mean that that is the problem. It's a common fix cross industry --

MEMBER RAY: All right, let me say to my colleagues here rather than to you. The -- what I'm saying is a provable fact, that the procedures get better because they get improved when they're used, and that's had a demonstrable effect on the industry as a whole.

Sitting and looking at procedures or even going through them on a simulator is what this person is referring to doesn't prove that they will work in practice, and that's why I think it's only fair to say that it's an assumption, not a fact.

DR. COOPER: I don't think that's true.

MEMBER RAY: Okay. I mean, in doing these kinds of analyses you look at the procedures, you look at the cues that are going to be available and try to see if there looks like there's going to be a match, assuming what cues are there. And you talk to operators and trainers and try to understand given these cues this is how they would implement the procedures.

But you're right if there's something faulty in those procedures that the operators or the trainers haven't recognized and it doesn't jump out at analysts based on that analysis then you don't know that is true.

MEMBER RAY: Yes, what you just described is an enormously time consuming and difficult undertaking, not something that's likely going to be pursued in the depth necessary to validate the assumptions that are being made here. That's just the reality. Okay, enough said.

MEMBER STETKAR: What I wanted to ask and it follows on yours, but it's more of the PRA jargon. Is this scoping process applied on a human action basis, or is it applied on a cut set basis? In other words, do I solve my model putting in 1.0 for all my HFEs then examine the cut sets and apply the scoping evaluation to each of those cut sets, or do I simply say that I have an action that during a fire the operator must open valve X? In other words, how is the scoping process implemented in practice?

MR. GROBBELAAR: Could be the latter case.

MEMBER STETKAR: Could be the latter case, do you mean is the latter case or -- what type of guidance. I'm a PRA practitioner now and I want to use this process. How do I think about using this process. Do I think about it in the context of, you know, in the individual cut sets or these groups of cut sets, or do I think about it in a much higher context in the sense of a generic operator action -- open valve X under fire.

DR. COOPER: That's an interesting point. I think -- I think the way the guidance is written right now it's directed toward the first case in the sense that you identify an action, and you use the quantification approach prior to developing the cut sets. That could be done either way, I think.

MR. GROBBELAAR: I think this follows

after your identification process which is to identify the individual events which you are going to then want an HEP for. I mean, for example, let's say you need to -- you identify that you need to locally control the turbine driven aux feedwater, so that's identified as a fire response action in the identification phase.

Now 6850 says that's a 1.0 because it's a fire response action, and now you want to get a better number for it so looking at this criteria the first question would be is there a procedure that covers local operation of matter and driven aux feedwater pump? Yes or no. If there isn't you don't satisfy the criteria. If there is, yes, you continue with the scoping, and the scoping is going to give you the higher, more conservative number than you would get if you actually go to the next step where you look at that procedure and you consider all the other factors that you would do a detail analysis. So that's the kind of thought process, but it's not applied --

The dependency analysis is done on the cutset basis, which I think Susan was alluding to --

MEMBER STETKAR: There's two levels of dependency here. When you say dependency you mean human-human dependencies for two HFEs that appear in the same cutset. I'm talking about a scenario context dependency, where I need to think about what's happening within the context of this scenario, which gets a little bit toward what Harold is concerned about within the context of this scenario, the fact that the operator needs to go manually operate that turbine driven auxiliary feedwater pump.

What else is happening in all of the scenarios when I'm requiring the operator to do that, some of which may indeed make his procedures confusing at best, if not invalid. And I don't know that until I think about that at that context.

MR. FORESTER: It at least has to be done on a sequence level.

DR. COOPER: And there are some question also related to the plant conditions, as well, in the scoping trees. Actually, it asks about procedures matching the conditions, the plant conditions. I think that's the actual -- those are the words that were used. Did the procedures match the conditions, and that is exploring things like is the timing different than you might have anticipated when you were developing a procedure. Are there cues missing? Well, so on and so forth. So there is some discussion of plant conditions with respect to the trees/

Yes?

MEMBER STETKAR: In July will we see some examples of how this is really applied to the real scenarios?

DR. COOPER: I'm not sure. I mean, I guess until we -- there are examples from the testing that we've done last summer, and I believe we have that language in there, but we have modified the trees -- principally, you know, the organization has changed quite a bit to try to make it a little bit simpler and also we've made some adjustments to the ATPs.

But, you know, addressing that particular type of question, that was done in the testing.

MEMBER BLEY: Please go ahead. I see that you have slides you need to knock out in two minutes a slide, and we're taking about five minutes a slide, so --

MR. FORESTER: That's going to be one of the easy one.

MS. HENDRICKSON: So the next one is the demonstration of feasibility, and this is primarily to see if the time available needs to be greater than the time required. In other words, do you have enough time available to actually do the action that's being asked.

So the requirement here is to simulate the conditions as realistically as possible and to walk through the action and walk through the task and see if there is enough time to consider several different factors of PSFs, which I've got listed on the next slide.

If estimates must be made, in other words if you can't walk through some of the tasks then try to use a process that makes the estimate as reasonable as possible and use knowledgeable plant staff, use the staff that's actually at the plant that you're working with.

It would be nice if you could use more than one staff to actually walk through the action, but, you know, if need be you could use the estimate based on one. In a moment I'll talk about time margin and what that is meant to help cover any variability that might be encountered with using multiple staff.

So with the demonstration of feasibility, I meant to cover a couple of different PSFs such as the environment, surrounding action, whether it's the environment within the main control room or the environment that they'd have to be going to, meaning if they're going to be a smoking environment. Can they actually access it. Then the equipment that they'd have to be using. It needs to be when they're going through the walk through, the equipment should be at the same location that it would be at during the actual event, meaning they can't gather all the equipment in one place to make it easier to do the walk through.

The availability of indicators to make a response should be simulated as accurately as possible.

Communications -- and here if they're able to walk through with SCBA it would be best if that's required so you could actually test the communications when that type of equipment is on.

The procedures in training, the staffing -- what staff would be available so if some staff is going to be on the fire brigade that needs to be taken into consideration. And other aspects, such as the travel path to access the action, as well as smoke density, if that would be an issue.

Now in doing the demonstration there's some -- some items that are just infeasible to be demonstrated, such as the smoke level. You know, you aren't going to actually pipe smoke in. So and then you make the requirement of the time margin to -- to account for these potential expected effects, such as those that could not be demonstrated or the availability in crew response times, variability in the individual differences in crews, as well as variations in fire type and the plant conditions.

So this is similar to the time margin that's discussed in the NUREG 1852, and the time margin is actually required for all of the actions. Now in a moment when I walk through the scoping flow chart I'll show you where the time margin comes into play and what is required then to come up with the HEP.

Then actually enter into the flow charts. There are a number of conditions and PSFs that are explicitly addressed. The first one asks how well do the procedures actually match the scenario, and what this is really meant to get at is diagnostic complexity.

So if the cues that they're encountering match the procedures so they're able to really walk through the procedures well, we would consider the diagnostic complexity to be rather low. However, if the cues don't match the procedures -- in other words, they'd have to be using some other interpretation, then you'd see a diagnostic complexity at a higher level, and at that point with using the scoping approach you assign an HPE of 1.0, and if they want to they could then use a detailed analysis method.

MEMBER BLEY: I guess I'm having a little trouble in the last three of these slides thinking how you do this at an action level, a response level conservatively when you're not doing it at a cutset level where many of these things get much, depending on what else has failed, and why that purports to be conservative. I don't quite get it, unless you're only applying it to the most likely conditions that are on the scenario. Can you say anything about that, or is that something to talk about later?

MR. FORESTER: You know, the action -- whatever HPE you're quantifying is you know what's -- if you're doing it at a sequence level you know what's occurred and the scenario --

MEMBER BLEY: You don't know particularly what the particular combinations of things that failed unless you're doing real detailed entries.

DR. COOPER: I guess the only reason why we haven't said explicitly that it's at the cutset level is because we don't know exactly where in the overall PRA process it might be, especially if they've decided not to do -- use the 6850 screening approach. If they've just gone directly to the scoping approach and then, you know, used that and then the detailed approach as applicable.

So -- but the intention is to have an understanding that there may be scenarios or sub scenarios for which this won't apply. Now I have to say that I haven't looked at this recently to know exactly how much guidance we give in this area, but that is the intention that we have to think about are there conditions in which it doesn't apply.

MEMBER BLEY: And that seems essential to me, especially if they're claiming conservatism, and unless you restrict it to, you know, minimum sets of things failed and keep it up at the most likely path through the tree at that sequence level, so go ahead but we're really going to want to dig into that.

MS. HENDRICKSON: Well, that's a good point.

MEMBER BLEY: Because the conservative aspect of it would seem to disappear if you're applying it throughout the model based on some, which could be optimistic view of exactly what things have failed as you apply it throughout that model. I'm sorry, go ahead, Stacey.

MR. FORESTER: We would have the information that's based on the accident sequence, and you're right we would --

MEMBER BLEY: If you're doing -- filtering out of entries you have pretty simplified top level events, and a particular path through there could have lots of different ways the equipment had failed to get you in that condition, some of which would have very different effects in the people.

MEMBER STETKAR: Until you look at the cutsets. You know the cutsets, which you might be able to group, but you need to go through that process --

MEMBER BLEY: You haven't thought that through.

MEMBER STETKAR: -- of grouping them to identify characteristics from the perspective of human performance that all of these cutsets have that same characteristic. It sounds like a mechanistic process, but it's really important.

MS. HENDRICKSON: I don't know exactly how we do that, do all this.

MEMBER BLEY: In that same sequence in the -- of entry of the PRA, now you've got fires taking out different kinds of instruments and things. That's a vast different ways that could be happening.

MR. FORESTER: That would be taken into

account, and since you know what's -- there are some assumptions about getting where the fire's at. You have information about which cues will be failed or not failed.

MEMBER STETKAR: You may not know that if you're looking at hot shorts and open circuits for -- for indications going up or down or saying where they are, for example. You can't presume that just because you have a fire necessarily unless the guidance gives you instructions, but because you have a fire, for example, in the cable spreading room what is the set of indications that's available to the operators, or the status of DC power, for example. You can't infer that from a high level event sequence representation of the fact that the operator now needs to manually operate the turbine driven emergency feedwater pump.

MS. HENDRICKSON: So looking at some other conditions that are addressed within the flow chart. That first bullet then was for kind of diagnostic complexity, and you also have execution complexity which within the scoping approach is only assessed at a higher or lower level, and it's meant to consider are there multiple steps that need to be done or are there multiple crew members that are going to be involved, and do they have to communicate while they're doing this action? How many locations must be visited? Is there a lot of coordination and communication between the crew members if they have to visit different locations?

So given this assessment, then it's either a high execution or a low one.

The third bullet there, time and a cue for the action relative to expected fire suppression. Eventually what we're getting at here is that is the fire ongoing or not, and we've put a rule of 60 minutes there. That comes from guidance given at 6850, so if the fire, if the action has to occur within the first 60 minutes of the fire and the assumption is made that the fire effects are ongoing, with that then comes other considerations such as if they're traveling to an X control location they need to still consider then is the -- is the area accessible because the area may be in the fire location. Will they have to travel through smoke. Would they still then need to be wearing SCBAs, considerations such as that.

MEMBER STETKAR: If -- and I forget this from the 6850. Do they assume that fire barriers are smoke barriers?

MS. HENDRICKSON: Oh, I don't know.

MEMBER STETKAR: Because if they do you might find out that's not a really good assumption.

MS. HENDRICKSON: Yes, I don't know.

DR. COOPER: I don't know that's within our task.

MEMBER BLEY: You're being fed whether it's smoke or not.

DR. COOPER: And as a matter of fact, to the extent that we can we're talking, we're discussing when we get information from other fire PRA tasks, like fire modeling, you know. You need cable -- you need information at this point in time if you want to do this, for an example.

MEMBER STETKAR: I may not say as much as you do.

MS. HENDRICKSON: Fair enough. That having been said, you know, we could -- there probably more that we could do, but we have tried to the extent we can talk about when or what kind of information we might be able to get from the larger fire PRA team and the modeling that's being done.

MR. NAJAFI: This is Bijan Najafi. I guess -- a quick answer, no 6850 does not make that assumption necessarily. And the information comes from the fire analysis and is fed into that.

MEMBER STETKAR: So it does allow smoke to go through --

MR. NAJAFI: Oh, yes.

MS. HENDRICKSON: So the last thing I would say on this was that last, that sub bullet special cases, so we've identified four special cases: the fire, the turbine generator, outdoor transformers, high energy arching faults and flammable gas fires.

For these special cases no matter when the actions occurs, we assume fire effects are on going, so these don't meet that 60-minute rule. Otherwise, if the action is after 60 minutes then there is different questions in the scope of the flow chart and what you can assume then is the fire facts have been -- the fire is out or has been contained.

Just a couple of more conditions within the flow chart. The action time window to look at do they have a long time to take action or a short time? So the way the time window is measured is from the occurrence of the cue until the action is no longer beneficial. This includes time of diagnosis, time of execution.

If it's only 30 minutes within this time window, then it's a short time window event. The issue here is that it's a short time window -- excuse me, if it's a short event such as it's only 30 minutes or less available, then distractions that arise could cause more of an issue for these actions than if you had more time.

MEMBER BLEY: You assume the operator knows if there's a short time available.

MR. FORESTER: No, it's just a matter of -- it's RES another time available if the action doesn't --

We just say if it's in this time window, we think distractions could have a bigger impact; therefore --

MEMBER BLEY: But you also have a PSF on time, and you know there are a lot of places -- there may not be a lot of time available. Maybe the operator doesn't know that, in fact.

MR. GROBBELAAR: Well, it's really an analytical concept. There are some cases where the operators do work against the clock in a time critical actions, but they've been trained on where they know they have a specific time, but generally not. They don't work against the clock.

MEMBER STETKAR: Why is this an absolute criterion when they're doing an analysis to show what is the time margin available? In other words, I don't -- I don't care if I have 30 minutes available or 12 hours available if the feasibility evaluation shows that if I have 12 hours available but for whatever reason I will consume 11 hours and 48 minutes of that 12 hours, that to me still sounds like a short time margin.

MS. HENDRICKSON: Right. Now on top of this -- on top of this we'll still ask a time margin question, so there's two different assessments. There is one above a time window, but then there's also one about time margin, so it could occur that you have a really long time -- long time window and then you'll have a 15 percent time margin.

MEMBER STETKAR: So right underneath this is a separate criterion?

MS. HENDRICKSON: So part of the issues they're saying that even for -- this came from some of the peer reviewed comments as well -- but even for these actions that -- let's say your time window is less than 30 minutes, if it's 15 minutes.

Even if your execution diagnosis can be done within the first 10 minutes it distraction occurs, whether it be a crew member being taken off the fire brigade or any other kind of distraction that might occur, that when you only have 15 minutes that distraction has a larger impact for those actions than if you have a longer time window to deal with -- since you can kind of step back, deal with a distraction and then come back to your action.

MEMBER STETKAR: How about all the guidance in 1852 and that seems to say that you should account for that when you do your feasibility assessment?

DR. COOPER: This is a little bit different than 1852 because we're doing, we're heading toward quantification.

MS. HENDRICKSON: But yes it was a peer review comment that we add in addition to the time margin that we considered absolute time.

MR. FORESTER: It's a fairly simple concept really in the sense that if you have 10 minutes available for the total minutes available and the action takes 10 minutes, well then if things go wrong. You have a 100 percent time margin there, but if little things go wrong it can eat up that time margin, whereas if you have one that's -- you have four hours available and it takes two hours, you still have a 100 percent time margin, yet there's a lot of minor things that could be absorbed by that.

MEMBER STETKAR: Just concerned about perpetuating the myth of an absolute 30-minute criteria --

MS. HENDRICKSON: But struggled with that number --

MEMBER STETKAR: It's a magical number that means anything.

MR. FORESTER: You're right. You're absolutely right. But again we wanted to get it down to a level where, okay, within this we think it's an issue. As you move beyond that it becomes less of an issue, but you're right it's a -- yes, you're right.

MR. NAJAFI: Somewhat -- Bijan Najafi. But the one -- I know that still 30 minutes is somewhat arbitrary, but it does have some fire effects into it, too, because some of -- you can look at the event and see that the majority of the fire by far and the effect are sort of come to an end within that time frame -- a lot of things.

Yes, there are few fires that range up to eight, 12, 16 hours, but the fire effects sort of become stable well at that time.

MS. HENDRICKSON: Okay, so the next one is level of smoke or other hazardous elements, there's toxic gas as such in the action area or in the travel path to the area. So let's address here -- it's not only smoke level that may interfere with visibility as well as breathing, but also the need for special equipment such as the need to wear SCBAs.

And finally that last bullet is accessibility so can actually get to the action of the area, meaning that the path to the action as well as the area itself.

MEMBER BLEY: Do we have any idea of how many operators in our power plants have actually worn SCBAs in a smoke environment and had any training in that? And do we have any idea of what that impact is on people who have never done it before?

MR. FORESTER: We tried to address this part of that in the demonstration. As they demonstrate the ability to do the action, demonstrate the feasibility, if it's going to require SCBAs then they'd have to use it.

MR. FORESTER: It's only anecdotal that if somebody's had a little of that training I think it's very different to be in smoke for the first time and to --

MEMBER STETKAR: I have no doubt you're correct, which is, again, we try to use the time margin to account for uncertainty of that, but whether it's adequate or not --

DR. COOPER: But I don't think we have any information from nuclear power plants. We did make an attempt to try to get some broader fire information, but we had -- we'll try to look at it during the public comment period, but we did have NIST do some work for us, but we have not incorporated that into the document.

MEMBER BLEY: I would think some fire training things that -- talking to those people could give you some guidance that might help.

DR. COOPER: The first look made it look like it would not substantially change what's provided in 6850, but we can --

MEMBER BLEY: I think eventually your document -- but you can find it. Go ahead. You're moving into a bunch of slides that have flow charts on them, and I know you can't talk us through all of those, so you're going to have to pick on those.

MS. HENDRICKSON: I am. Now the scoping That's right. That's right, exactly.

MEMBER BLEY: And you've got about 20 minutes.

MS. HENDRICKSON: Okay. So at the end what are we actually trying to accomplish here --

quantification so the HEP values.

The lowest HEP value and the base HEP value for the scope and approach is one e minus three, and this actually represents the best possible case, which is that the procedures are available, and they match the cues, means the diagnostic complexity is low, that execution complexity is low, that fire effects are not on-going, so this would mean that at 60 minutes after the fire; that the time window is greater than 30 minutes, so they have a long time and that they have at least 100 percent time margin available to complete the action.

It's still a conservative value, and we based it on these other methods SPAR-H and ASEP, THERP, as well as ATHENA to come up with that one e minus three.

MEMBER BLEY: John just made an argument about why, you know, absolute time excess might be much more important than having a hundred percent, and now you've flipped back to the 100 percent. I'm curious about how what John said matches up with the assumption built into the model.

DR. COOPER: We have both.

MS. HENDRICKSON: And actually I would said it's a combination still, that they do have the longer time, so it's still a longer time window event, meaning they have more than 30 minutes --

MEMBER BLEY: Oh, okay.

MS. HENDRICKSON: -- as well as at least a hundred percent time margin.

MEMBER STETKAR: On top of the longer time?

MS. HENDRICKSON: Exactly.

MR. FORESTER: And for those short time from events we require a larger time margin, so we do use both in that sense.

MS. HENDRICKSON: Then when you move across the conditions within a flow chart or when you move across the flow charts, the way we adjust this HEP is based on multipliers that represent the PSFs or conditions.

So let's jump then to the flow charts themselves then.

The first flow chart that's presented is a search scheme that is meant to help the analyst determine which of the four, the in-control action, ex-control action, main control abandonment, or air due to spurious rotation, which of the four flow charts they'd have to use.

The red band there is just that I'm going to enlarge that piece so it's easier to see, and so you can see then they automatically start getting asked some questions to help them either direct to other flow charts or to be booted out and to get an HEP of 1.0 and understand anytime they get the HEP then there's option to do the detail analysis as well.

That first feasibility action has been demonstrated, yes. Is the main control abandonment criteria met? If it is then we're going to assume that the control room is abandoned. They go to that flow chart. If not, the next question is control within the main control room an issue? I mean, are they going to have to use means for alternative shutdown, in which case they'd opt to go to main control and abandonment flow chart.

And then finally primary cues or instruments spuriously affected by the fire. What this is getting at is that could there be an error of commission or an error of omission due to spuriously affected instruments. We could send them to the spurious instrument flow chart.

MEMBER ABDEL-KHALIK: When you think of an operating plant today, do you think we know all the cable routing records to a level of accuracy or specificity that would allow one to answer this last diamond?

DR. COOPER: Bijan, would you like to answer that one? It's a good question. It came up during plant testing.

MR. NAJAFI: Bijan Najafi. I would say the specificity at this point, you're going to know as much as you're going to know in the analysis. And if there is -- what I mean is that you don't -- you may not choose to trace every cable in the plant, and if you don't you assume the worst kind of information for that piece of equipment.

So if you choose to identify and locate 50 percent of your complements that it's in -- involved, whether it's instrument or complement, the other 50 percent is the worst case failure. So you know with specificity the cable and the failure note and the functional states of the instruments that affect these actions. This is what I'm saying.

Let's say if you find these actions and you find that there are a hundred instruments that could impact these actions, you may if you choose to credit those instruments then you have to trace the cable for all those alarms and instruments. You have to trace them and identify them. But if you choose to do only 50 of them, then the other 50 become I have to do the worst assumption that instrument is going to get a false instrument, for example.

If it's the third type of actions of whatever, the spurious action you didn't like, then I have to assume it's going to get the false information.

MS. HENDRICKSON: Okay, let me move on to the next -- the bottom portion of the search scheme, which is going to direct me to the in-control room or ex-control actions.

The first question, do the procedures match the scenario? Again, that's getting into that diagnostic complexity. If you say that the procedures do not match the scenario, in other words the cues are receiving do not match the procedures they're using, then it's at this point too diagnostically complex to use the scoping approach to find an HEP of 1.0. Otherwise, then you move on and one of the final questions is is the action actually to be completed in the control room or is the action an ex-control room action?

To direct them either in-control room or tech's control room. The final question's asked before they get to ex-control room is a question that's asked if it's either they've got procedures for the execution of the action or that the action is skill of the craft.

Now the other flow chart that hopefully I'll have time to walk through most of it is the in-control room, so now you can see how some of those key conditions or PSFs are directly asked within a flow chart. So it's in this top portion first.

Have 60 minutes elapsed since the start of the fire? Now within the document that's explained more as the business getting at are the fire effects on going? And it has that footnote of the special cases, that if it's a special case fire you have to assume the fire effects are still on going.

MEMBER BLEY: I should know this but I've forgotten. Is there an assumption built into the PRA about how long after the start of the fire it would be observed?

MS. HENDRICKSON: Halfway --

MEMBER BLEY: After you've recognized the fire, this is after the start of the fire itself.

DR. COOPER: Somebody check me, but I think 6850 assumes something like 10 minutes.

MS. HENDRICKSON: They assume about 10 minutes for detection.

DR. COOPER: Yes.

MS. HENDRICKSON: And so then six minutes from the start until it's suppressed. That there is an error factor there, I believe it's 50 to 70 minutes, which could include that 10 minutes of detection.

MR. FORESTER: Yes, that's the issue when suppression occurs, does 6850 include that 10-minute detection time. That's still being worked out.

MS. HENDRICKSON: And there's still some argument on that as well. It hasn't been --

MEMBER BLEY: So given that you have these -- this variability that's built into the model, does that mean that you assume some fraction of the time that you're over 60 minutes and some fraction of the time that you're under, or do you handle that somewhere in the analysis, or is this the point estimate time of 60 minutes?

MS. HENDRICKSON: Yes, this is kind of the point estimate time that we don't --

MR. FORESTER: Oh, it's sort of like 90 -- I think that some 98 percent of the fires are going to be out by then, but most of them are out long before that. So I would argue that we're being conservative by assuming that the fire is ongoing after 60 minutes, whereas 99 percent of them they're actually out within 10 or 20 minutes, so --

MEMBER BLEY: Of course, 10 percent of the cases might make up all of the risks.

MS. HENDRICKSON: Right.

MEMBER BLEY: Go ahead.

DR. COOPER: I think that you're right, but I think that probably needs to go back to the fire PRA.

MR. FORESTER: The worst the case it's assuming for anything that happens in the first hour in terms of the on-going fire effects.

MEMBER BLEY: Go ahead. I'll have to think about that.

MS. HENDRICKSON: Well, in the top portion then all of these questions is from the 60 minutes has elapsed, so what we're saying in this portion is that fire effects are not on going, so the fire has been suppressed at this point. Is action time window greater than 30 minutes? No or yes.

So if we have more than 30 minutes in which to do the action this execution is going to be high, no or yes. Same then if we had less than 30 minutes, is the execution low or high? No or yes.

Now at this point we direct them to an HEP look up table, either A,B,C,or D. So when they go to the look up table -- actually I'll go to it next. When you go to the look up table now is when you're asked what is the time margin for the event for the event. So putting these on the flow chart just got a little too cumbersome, so we broke them out into table in that now based on which look up table you come to, what is the time margin for the action, and now you're assigned the HEP.

I want to go back just a moment to the flow chart and show you the base HEP or that optimal case where that shows up.

CHAIRMAN APOSTOLAKIS: Let's go back to the table.

MS. HENDRICKSON: I am. So I want to show them that optimal HEP or where that base case comes from. Sixty minutes from the start of the fire, yes. The fire is out. Is action time window greater than 30 minutes, yes, you've got a long time.

CHAIRMAN APOSTOLAKIS: There's no report.

MS. HENDRICKSON: Is the execution complexity high? No, it's not. So this HEP look up table C, it's going to be the optimal case, so if we go down here to C and we see a greater than or at least a hundred percent time margin there's our one e minus three. That's that optimal HEP or the base case. Then the other --

CHAIRMAN APOSTOLAKIS: These numbers came from extra judgment, somebody's judgment?

MS. HENDRICKSON: Well, the base HEP wasn't based on some of the other methods.

CHAIRMAN APOSTOLAKIS: Yes, but what about C?

MS. HENDRICKSON: Then the other HEPs from the other time margins were based primarily on expert judgment and then experience with other HRA methods.

We also did look at some of these with the plant testing to see how they compared. Primarily with that one we were using EPRI calculator to see how they compared and how they looked compared to like internal events. They should be slightly higher and a little more conservative than that because now they're in the fire context.

CHAIRMAN APOSTOLAKIS: So people can --

MR. FORESTER: You can trace the HEPs in the sense of there's -- there's multipliers for a particular kind of condition. You just assume multiplier five. If you add another kind of condition on it you might have a different multiplier. So each of the standard values are traceable by beginning with one e minus three --

CHAIRMAN APOSTOLAKIS: So there is something behind these?

MR. FORESTER: Yes. They're not just simply judgment, no. There's actually -- it's an additive model.

MS. HENDRICKSON: Exactly. We want to stay consistent.

MR. FORESTER: Well, it means that if you have -- if you have -- if you're going through the tree and you start with one e minus three, but then you come to, well, no this is a short term action, and it's highly complex and the fire -- there's smoke in the way. For each of those factors you're going to get an additional multiplier. So as things get worse, as the conditions gets worse, the HEPs go higher.

MEMBER SHACK: Because the judgment went into the choice of the multipliers?

MR. FORESTER: Yes.

MS. HENDRICKSON: That's correct.

MS. HENDRICKSON: And then after that we also check to make sure they're reasonable, so there's a double check then to make sure they're consistent and reasonable.

DR. COOPER: There's an entire appendix

that Sandia has developed to address this particular aspect of -- of underlying the numbers.

CHAIRMAN APOSTOLAKIS: So this is the absolute HEP?

MR. FORESTER: Yes.

MS. HENDRICKSON: Yes.

MEMBER STETKAR: Did the peer reviewer say anything about this, Susan?

DR. COOPER: That they had not had this table in this format. When they reviewed it the numbers were on the trees, as opposed to a look up table.

MS. HENDRICKSON: Yes, they didn't have the tables and, in fact, they didn't have the appendix, and so they had a lot of questions.

DR. COOPER: That's one of the reasons why we have it.

MEMBER STETKAR: Okay.

CHAIRMAN APOSTOLAKIS: So why don't we have the results detailing this stuff the next time we meet?

MS. HENDRICKSON: Yes.

DR. COOPER: Okay.

MEMBER STETKAR: Let me ask my question now about the types of dependencies that Jan addressed earlier. Suppose I have a fire induced scenario that disables main feed wire and disables automatic starts of everything in the plant, everything in the plant.

And the operator action, 1-HFE, is to manually start -- let's just for simplicity, let's call it manually start -- from the control room the turbine driven auxiliary feedwater pump, if I can do that somehow.

And if I succeed in doing that, I win. And if I don't succeed in doing that my -- my little event tree then progresses and says, well, I can initiate -- which is feasible. And I do this analysis and I decide that everything is simple and everything is 30 minutes, and I assign a ten to the minus three for manually starting the turbine driven auxiliary feedwater pump, and I assign a ten to the minus three for manually initiating the bleed and feed cooling, because that's always manually initiated.

And now the product of those two errors in my cutset is ten to the minus six multiplied by the frequency of this fire, and that cutset disappears.

How have I accounted for the fact that the operators in the control room for manually starting the emergency feedwater and initiating bleed and feed indeed are operating within a scenario that has a defined time limit and operating under common confusion performance shaping factors by the fact that all of these things are affected by the fire. Was the backstop in these numbers against that type of dependency? That's now my --

MS. HENDRICKSON: Right.

MEMBER STETKAR: Because I can never look at that cutset. That cutset might have an absolute frequency with a ten to the minus six in there. It might be ten to the minus 12. It might not even be above my truncation frequency when I solve the model putting in these numbers.

MR. GROBBELAAR: Well that is not addressed differently from the internal events. When you do the analysis, you start off by saying, like in these two, one point zero. You load the truncation limits so you get 95 percent, then you look at those combinations to see how risk significant they are, and if they are then you -- if you had used the screening ITP or if you had used the scoping ITP and you found that there's a potential dependency issue there, then you need to go back and do some more analysis.

MEMBER STETKAR: I'm asking you how you find that dependency issue.

MEMBER SIEBER: You set the ITPs to one,

regenerate the cutset, and retruncate them, so you normally would use a truncation limit with the ITPs of normal value so that the dependency analysis you set them all to one, you lower your truncation limit and follow the guidance in ASME by doing successive truncations until your mixed truncations doesn't give you more than five percent which you already had. So that is roughly --

MEMBER STETKAR: And this guidance is peered that that process should be applied --

MR. GROBBELAAR: Right.

MEMBER STETKAR: -- at this --

MR. GROBBELAAR: There's no difference in the dependency analysis process for internal events and for this. It's exactly the same.

MEMBER BLEY: I think that should work. We're really getting toward the end of the time. Do you need to walk us through the rest of the trees or what do you --

MS. HENDRICKSON: Okay, so at this point we can -- I can end it here or if you all would like to see more of the trees.

MEMBER BLEY: Are there some concepts out of the remaining trees you can just summarize for us that if there's anything really different going on?

MS. HENDRICKSON: There's not really that much different going on in the other trees. They ask similar questions as to the -- these are the kind of the big questions that are asked in all of the trees. They only additional one -- just a moment, let me go forward and I'll tell you which slide I'm on.

Slide 23, slide 23, that's the X control room, X control room scoping flow chart, and I apologize because it's harder to read because I haven't blown these up.

MEMBER STETKAR: Okay, we've got them.

MS. HENDRICKSON: So the additional questions that are asked for the X control room actions are the questions such as is the SPBA required, and follow up if it's required is the smoke or other effect, such as toxic gas, so bad it will actually impair visibility or functionality so that they go to an HEP of 1.0. That question is not asked in the control room.

But otherwise all of the flow charts follow those questions of diagnostic complexity, execution of complexity, the time windows, the time margin, and so on.

MR. FORESTER: But of course the spurious trees are going to look -- the cases where you have spurious actuations.

MS. HENDRICKSON: Not spurious --

MR. FORESTER: Spurious indications, pardon me.

MEMBER BLEY: Well, the time's just about right. Anything from the committee or Stacey?

MEMBER RAY: Well, let me just offer in connection with the prior discussion, I think the use of word feasibility is the right one here which is used in slide five. Something that's feasible won't necessarily happen, but the time periods and the HEPs associated with margins less than 50 percent I think addresses what I was concerned about, which was how much certainty do we assume merely because something is feasible that it will happen.

And these seem like appropriately conservative, just at first glance, HEP assumptions here as a function of the four different decision points.

MEMBER BLEY: Okay, thank you. And I guess my take away is we haven't seen any meat until today, and now it's just kind of sketchy, so when get in -- I think those issues that were raised you're going to hear again the next time you come back, so I hope you can give them a little more -- a little more thought.

I think it's time to go on to -- is it Jan and Susan?

CHAIRMAN APOSTOLAKIS: Filed out and left.

MEMBER BLEY: Okay, and do you each have enough slides to do a half hour, but together you're going to do a half hour, so I don't know how you've worked that out, but --

MR. FORESTER: Wasn't Bill up next?

MEMBER BLEY: Bill's last according to this, unless you'd rather switch that around.

MS. HENDRICKSON: No, Bill's last.

MEMBER BLEY: Yes, George.

CHAIRMAN APOSTOLAKIS: I'm really worried. I am really worried. The SRM does not say there will be an EPRI and then of zero. Now you guys are going down a path of disaster. EPRI approach, then the NRC approach. What am I going to tell the commission, that there is an EPRI approach and an NRC approach?

MR. FORESTER: I don't think we've decided yet on what any approach is going to be from the SRM --

CHAIRMAN APOSTOLAKIS: What are you going to do with the two approaches? Are you planning to merge them? Are you planning to look at the best attributes and come up with something new? I think the probability of that is pretty low, but maybe I'm wrong.

DR. COOPER: Our original thoughts but we haven't sorted out because we need to do some additional testing is to actually provide assignments to the two detailed approaches. So there wouldn't necessarily -- although they -- I mean we can't say you will. I mean, we'll just recommend that the strengths of a particular approach are best suited to something versus the other method, that sort of thing, although we have not yet -- I mean, we've focused our testing at this point in time on the scoping trees, so we need to spend -- you know, we're hoping and anticipating to get some feedback and experience in testing the two detailed approaches in order to develop some thoughts on that. But we don't have that at this point in time. We had some thoughts about it initially, but we decided we needed to get some actual experience under out belt with those two methods before making anything that looked like a recommendation.

MEMBER BLEY: How far in that future will that be before you get the results of application trials back that will let you start looking for a synthesis or, you know, maybe something works better for one kind of problem, something for another. Say of some idea of where you're headed.

DR. COOPER: Well, I guess with respect to the EPRI approach they are, as I understand, applying it now, so I'm not sure exactly when we're going to be -- I mean, I think we can already get some feedback. The harder thing is to get a venue for ATHEANA, a demonstration, and we're talking about that now, with the hope of trying to get something accomplished before the -- before we have to, you know, finish up our comments to the public -- public comments.

CHAIRMAN APOSTOLAKIS: The reason why I'm so negative is that I really want to express my concern early, so I don't surprise you a year from now.

You have to have in mind the SRM, not just the fire HRA.

DR. COOPER: Well, we do.

CHAIRMAN APOSTOLAKIS: And repeating what was done, I believe it was 1852 that looked at the various models --

DR. COOPER: Forty-two, 1842.

CHAIRMAN APOSTOLAKIS: -- and saying, you know, the EPRI approach has these good things and these bad things. The NRC has -- that's not good enough. I mean, we did that some time ago.

One way that might help here is to implement this active listening thing that expert judgment people are saying. Can you, Susan and your team, take the EPRI approach and apply it and have them use the ATHEANA approach and apply it, and then both teams will be in a better position to actually judge the goodness of each approach, rather than reading about.

I'd like Jan to come back here and say, yes, we used ATHEANA and this is what we learned, and then I think you're going to see that maybe you're approaching some sort of concerns, because already we have limited ourselves to two approaches. Suspicion is raised, is it because those two guys are corroborating. Did they really pay attention to anybody else's approach, right? I mean, I hate to say these things, but that's what's going to happen.

And then second, if you end up just saying this is good, this is bad for each approach that does not meet the spirit of the SRM, so I really want to make sure that we all understand this. I would really love to see, you know, the two teams using the other guys' approach and try to do it, maybe not in everything but at least in one or two cases and see what happens.

DR. COOPER: We'll see what we can do in a limited time, but that's -- we're always getting pushed on the schedule, but that is an interesting idea.

CHAIRMAN APOSTOLAKIS: We don't have to settle it now.

DR. COOPER: At the same time, I mean, there is an SRM project, a response to the SRM. There is an actual project, not actually this project. There's some overlap --

CHAIRMAN APOSTOLAKIS: I understand.

DR. COOPER: -- in the --

CHAIRMAN APOSTOLAKIS: Yes, but we can't go to the commission and say whatever problem with the SRM, but this is another project. The whole point was to have an approach that could --

MEMBER BLEY: It's a combination of approaches.

CHAIRMAN APOSTOLAKIS: Susan, you understand a 100 percent of what I'm saying. I know that, so let's not settle anything now.

DR. COOPER: Okay, all right.

CHAIRMAN APOSTOLAKIS: All I wanted to do was note my concern at this point.

MEMBER BLEY: Okay, it's on the table.

CHAIRMAN APOSTOLAKIS: It's on the table.

MEMBER BLEY: Jan, you've got about 15 minute as I see it to do yours, and then Susan has about 15 minutes, or 14.

CHAIRMAN APOSTOLAKIS: Can you do it in 15 minutes?

DR. COOPER: I can do mine shorter.

MR. GROBBELAAR: All right. Basically, our approach has been to take the existing methods that are used by most utilities in the U.S. industry and to see how suitable are they to analyze fires, essentially taking what's there and providing guidance on how do you modify that.

EPRI methods are the cause-based decision tree method which consists of two high level failure modes that are analyzed in more detail in various decision trees, so the analyst simply works with the decision trees to obtain the HEP, asking different questions. For example, for internal events instrumentation will always be available in the control, which has negligible impact for fire. If it's not available it's one point zero. If it's available but impacted and/or there is procedural guidance, you'll get a different HEP. So it's different decision trees that you evaluate.

THERP is commonly used for the execution of actions one diagnoses as successful, and the HCR/ORE correlation is used for time critical actions. That's basically -- it's like a time reliability correlation, but it's not a function of absolute time. It's a function of normalized time.

So we provided guidance on how to use these methods to address fire impacts. This is a basic framework used by EPRI for analysis. You have a cognitive error that can lead to failure. If you have successful cognition and if you do not respond in a timely manner you can lead to failure. If cognition is successful and you respond in a timely manner, execution can succeed or fail.

This was the earlier representation of the EPRI framework. These two terms are commonly combined into cognition. The cognitive response in a timely manner is also described as cognition. So we've adapted this for analyzing a fire context using these methods.

I'm not going to go through each and every

--

MEMBER BLEY: Jan?

MR. GROBBELAAR: Yes.

MEMBER BLEY: Is that parsing of CBDTM, HRC/ORE and THERP built into the calculator? Has that been recommended by EPRI for other things than fire?

MR. GROBBELAAR: Yes.

CHAIRMAN APOSTOLAKIS: Yes, it's their traditional one.

MEMBER BLEY: This is their traditional one, okay.

MR. GROBBELAAR: Yes, either the cognition dominates or this dominates for time critical actions, and time critical is simply where time available and time required gets very close together. That's where you get time critical actions. If you have a lot of time available --

MEMBER BLEY: I didn't mean to slow you down. Go ahead.

MR. GROBBELAAR: Okay. I'm not going to go through all the decision trees or the various factors that are in there, but suffice to say that if we re-evaluate the factors that are considered in these decision trees to see what is the impact.

Okay, so this is an example. This is

talking about timing which may or may not be called the performance -- I know your preference is not to, but --

You have a system time which is probably not going to be impacted by the fire that much. The fire impacts are really here in diagnosis time or response time, manipulation time or time when the fire actually occurred. So for fire you might have this internal event. For fire these values would change. You would take longer to respond. You may take longer to manipulate. So you do this up front to see if your action is even feasible anymore. You know, if some of this exceeds your time available, it's not feasible anymore.

Now if time available is time required, ITP is 1.0. If the key is an indication it's not impacted, and it's a time critical type action we increase the upper bound of the signal that's used in the actual ORE correlation.

CHAIRMAN APOSTOLAKIS: Now these HCR/ORE correlations, these are the normal curves that you guys proposed ages ago.

MR. GROBBELAAR: Yes.

CHAIRMAN APOSTOLAKIS: And so there is evidence that this is the ratio -- what is it the time divided by the median?

MR. GROBBELAAR: Yes, it's time available over the response time.

CHAIRMAN APOSTOLAKIS: And it has been confirmed that this follows the log normal distribution?

MR. GROBBELAAR: I believe so. Looking at the data I collected there have been approximately 100 simulator runs or so back in the nineties, and they found that the operator response times were log normal distributed.

CHAIRMAN APOSTOLAKIS: Wasn't there an issue once, Bill -- do you remember Bill Hannaman? There was an issue about the experiment confirming this --

MR. HANNAMAN: This is Bill Hannaman. I think the issue there was that there was some convenience in using the log normal because it fit better with the PRA models --

CHAIRMAN APOSTOLAKIS: Right.

MR. HANNAMAN: -- and the difference between a, say, a different kind of distribution like a Weibull distribution and the log normal is kind of in the noise, because both you just -- let's see, a Weibull you use three fitting parameters, but with a log normal you can use two, and it simplified the process to use two.

CHAIRMAN APOSTOLAKIS: But I thought there was a problem also for longer times.

MR. HANNAMAN: No, the longer times -- I think if you look at the diagram that Jan put up there with the P2 and the P3 and 1 are included, those are separate items, and I don't think that was ever exactly clarified that the HCR/ORE model did not encompass those other kinds of failure modes directly. It was a time to response. It was the success to response time.

MR. GROBBELAAR: Right.

CHAIRMAN APOSTOLAKIS: Will you tell me what P3 is again?

MEMBER STETKAR: They added -- George, they added P3 as essentially -- The way it works in practice is it's a lower bound. The HCR/ORE model becomes very, very unstable very, very fast for longer times.

CHAIRMAN APOSTOLAKIS: So the table turns around, as I remember it.

MR. GROBBELAAR: No, this P1 is essentially a - a P1 is essentially a forerunner of the ITP value. So the HCR will predict a rapid decrease in HEP if you have time available, but this is putting a floor on it.

MEMBER STETKAR: And you're generating it from a different model?

CHAIRMAN APOSTOLAKIS: P1 or P3?

MEMBER STETKAR: P3, I think it is.

MEMBER BLEY: No, P1.

MR. GROBBELAAR: This is generally using the cause based decision tree. And this was also derived from the inside guide from these operator liability experiments, I believe.

MEMBER STETKAR: Following up on George's concern and this -- have part of the benchmarks for these, more recent benchmark studies looked at HCR/ORE, that type of time reliability correlation with the other factors compared to other time reliability correlations like those in THERP? You can call it ASAP, but it's basically the same THERP time reliability correlation, or similar problems to see --

MR. GROBBELAAR: Well, it is the same --

MEMBER STETKAR: Because the same basic -- it's just the algorithim.

MEMBER BLEY: Yes, I think -- we can't really spend a lot of time talking about these issues. I think we need to do that somewhere else. We want to see how we're using it all, so I'm going to ask Jan to go ahead.

MR. GROBBELAAR: I was just saying that comparisons between ICP and THERP are made in the EPRI documents for the method that I showed. THERP is usually more conservative.

All right, if time available reduces, then we recalculated what we did in the CBD-10. Fire response HEPs, now recall these are new HEPs that are identified based on fire procedure, biased actions. You can analyze them using the same framework, CBDT, THERP, HCR/ORE.

Of course, when you evaluate the fire response actions you have to keep in mind that the fire procedures are not standardized like the AOPs or they're not of the same quality.

MEMBER STETKAR: You're doggone right. That's exactly what I was trying to say.

MR. GROBBELAAR: I mean, the fire procedures may range from -- it looks like a computerized printout of the cable routing database to procedures that are like the EOPs. But they are very similar where the new fire procedures have prior authorization in there based on risk insights. But most of the fire procedures are -- well, it's not standardized, and operators may have less confidence in them compared to what they have in the AOPs, to the extent that they've told us at some plants that they will they will use the EOPs and AOPs as far as they can because they can validate it and they trust them.

MEMBER BLEY: I think that's the fair thing. The regular EOP/AOPs have been thoroughly validated for many years.

MEMBER RAY: You made some mistakes. You corrected them. Now they're okay.

MR. GROBBELAAR: Right.

MEMBER RAY: But until you've made the mistakes in the procedures you rarely use you don't know what mistakes are there.

MR. GROBBELAAR: Correct.

MEMBER RAY: And somebody looking at them isn't going to tell you or even trying them on the simulator won't. All you can do is establish feasibility. That's about it.

MR. GROBBELAAR: And of course if it's a fire response action and for some reason if you glean from the operator interviews that they're not going to use the procedure in time to get to the success path you're after, then of course you won't credit the action.

Local actions may be more complex. This is a new action. There's no base case that they just got modified, so it's a new analysis that they developed from scratch.

Main control abandonment, we've talked about this before. It's a subset of the fire response actions. Control room abandonment be completely abandoned due to uninhabitability. The initial results show that it's of a relatively low frequency. It cannot be a big concern.

CHAIRMAN APOSTOLAKIS: How low is low?

MR. GROBBELAAR: Bijan could maybe help, but it was like control room uninhabitability frequency e to the seven, e to the eighth when due to fire is e to the four, e to the five. So there's several order of magnitude below the sequences that are contributing most to the risks. That's my understanding anyway. I think it was the result of the pilots, too. But the exact numbers I cannot tell you.

MR. NAJAFI: The number could be as low as six -- ten to the minus six or seven, even before you get to the X control room actions, just the ignition and the habitability. In a large part, the reason is normally that all these have the PERCH system that was designed for those kinds of things. There are some plants, even newer ones, at least a couple of them that if the PERCH system works according to design you'll never reach those temperatures and smoke levels, even to fires as much as one megawatt. You may never get there, if those systems worked properly. But the smaller control rooms, they have the tendency. The large control room, newer ones you may never get to that level of a smoke or heat.

Reasonable size fire, of course. If you put a 10 megawatt in it. You don't have oil and stuff. It's all electrical fires that they tend to be small to medium sized.

MR. GROBBELAAR: Thank you. And of course the main control room could be abandoned due to loss of control. In that case the loss of control could be progressive. You would have operators going outside. They may use attachments to the fire procedure or whatever they need to go and locally operate equipment.

And I suppose that they would get to the point where they're doing everything outside the control room, except the command is still in the control room if it's habitable.

Now the plants we're dealing with are just getting to this point where they're starting to do more detail analyses of control room loss of control issues.

MEMBER BLEY: Is there anything unique to, you know, the method, the EPRI method dealing with this. I mean, you're bringing up issues you need to consider, but this really isn't particularly a surprise anyway you do this.

MR. GROBBELAAR: No, it's not unique. Yes, the caveats are if you're dealing with a local action in the proximity of the fire you're not going to credit it. You know, it's not substantially -- it's not qualitatively different from doing a station black out local action, provided you're not in that area where the fire is.

MEMBER ABDEL-KHALIK: Perhaps it would be very helpful then to focus on the differences between the two approaches in your presentation. If there are no differences.

MR. GROBBELAAR: Well, up to this point there are no real differences, I think. I mean, the qualitative aspects of these are the same. The identification definition part is really the same for both approaches if you want to call it. It's just on the quantification where it's different. And the reason we went this way is because the utilities currently using these methods, and it's -- but of course we went through the whole process to see can these methods be used to reflect fire impacts, and we concluded that they can up to this point.

You know, we haven't -- if we have to model -- if the utilities come to us and say we have situations where we moved the command from the control room to somewhere else, that will preserve a new look. You know, we'll have to go and look at it and see what other fire methods do we need to account for for this distributive kind of command and control issues like that. But right now there's not a strong need for it.

MR. NAJAFI: This is Bijan Najafi. Another reason we picked this method for the EPRIs, it's also important to remain consistent with your internal event PRA. Eventually if you try -- and that's why we did a survey who's using what method and this was the first winner, and you said okay for that objective that your internal event and fire should have the same base -- bases. So it's better to stay with the same method, the consistent method.

MR. GROBBELAAR: Right.

CHAIRMAN APOSTOLAKIS: It may be a cyclical argument here because the utilities are using and because EPRI came in. That's not -- come on, the utilities are users. These are rare events, ten to the minus plus, plus, plus. I don't see a utility coming back and saying, hey, we scrutinized this model and we don't think it's right. Hey, they're users. They get it from EPRI and they use it, so, you know, to keep saying that the utilities are using it is not an argument really, in my mind anyway.

MEMBER RAY: We're out of time, George.

CHAIRMAN APOSTOLAKIS: This is not a model that would result in something that is inconsistent with our experience so they will complain. Like the fire that was mentioned earlier, well, gee -- this morning.

If this was right we should be seeing five fires a week, and we don't see them. This is all in the netherland. You know, they get a model from EPRI. EPRI's EPRI and they do it. To say now that they are doing it therefore it's right, it seems to me it's a little bit cyclical.

MEMBER RAY: EPRI wishes that were true.

MR. GROBBELAAR: Well, it's not -- but I completely agree with you because the users are finally starting to evaluate the decision trees in a different way that they haven't considered before.

CHAIRMAN APOSTOLAKIS: If not I agree, because they deal with sequences and actions. I agree. There they couldn't. But when it comes to quantification.

MEMBER BLEY: You've made that one. Go ahead, Jan.

MR. GROBBELAAR: We were talking about undesired operator responses. If we identify them in the previous take to 1.0, and if you can live with that impact in the model you go and see if you can find a success path and then identify, define and quantify the recovery action for the undesired operator response.

Okay, ATHEANA's next.

DR. COOPER: I have 10 minutes.

MEMBER BLEY: Right. Go ahead, Susan. You get 15, too.

DR. COOPER: Okay, I'll be talking about detailed fire reg, HRA, using ATHEANA, and I'm going to try to get through these quickly because I know a number of your are familiar already with some aspects of ATHEANA.

First of all, I just want to remind you

that ATHEANA is documented in more than one place, NREG 1624, rev 1, as well as the more recent user's guide, 1880. And the reason why I want to point this out is because the only place that documents what we would call the knowledge base, in other words the basis for how you analyze things, the perspective that you use, guidance on what kinds of error mechanisms and so forth you worry about, comes from the knowledge base. And the knowledge base is documented in 1624, rev 1, and as it's documented it says that it's principally for at power, post-initiator HFEs. But a developer has always intended that you could develop and use, or just use, a different knowledge base for different environments, and, in fact, that has been done.

So the principal thing that needs to be done for application of AHTEANA, which is mostly a lot of engines -- engines versus a process for doing HRA, an engine for identifying events, and also then the quantification is really to change the knowledge base and how you apply it.

So I wanted to just real quickly then sort of illustrate this by sort of showing the differences or what additional things are needed to apply ATHEANA for quantification versus what's already described elsewhere in the joint guidelines. And I'm not going to go through this in detail. For the most part, you know, the blue words indicates whether it's additional things; otherwise, the additional guidance that's already in the report, the common guidance either for qualitative analysis or for identification, definition already applies to ATHEANA, so those steps that are in the ATHEANA process don't need to be repeated.

It's principally in some of the qualitative analysis, which is described in ATHEANA's steps three and five, for describing the scenario and assessing human performance that more additional work was needed, and then, of course, its approach for actual quantification which includes recovery and treatment of dependency and uncertainty. That is different, as well.

And this is the picture of all the steps. I'm not going to go through those.

So just sort of the philosophy here of ATHEANA qualitative analysis and where we're going to be doing things differently. The purpose is to try to identify what possible courses of operator action there might be for a given scenario, and then why operators might choose them.

And so although it's not -- that's sort of the focus of what we've written with respect to ATHEANA for fire HRA is to focus on those things where operators might have a variety of choices that they might make and then use the ATHEANA approach to try to determine what -- which of those choices are more likely or how those lay out.

One thing that we've benefitted from the empirical study or the benchmarking story is this term operational story, and that is in fact what we tried to develop after examining the different courses of action and why they might choose different ones and lay out what those different possibilities are and why they might choose them. And that is the operational story or stories that you want to try to identify.

CHAIRMAN APOSTOLAKIS: Would you say, Susan, that this is a feature of ATHEANA that is unique to ATHEANA?

DR. COOPER: I think ATHEANA may be the first one to actually identify that that's what we do. I'm not sure there's any reason why another method couldn't think that way.

CHAIRMAN APOSTOLAKIS: No, Susan, but are they? I'm sure they could. But I believe Merimause, the French thing, when they came here we asked this question.

DR. COOPER: Yes, Merimause would be -- yes, yes, that's the way they would think, also.

CHAIRMAN APOSTOLAKIS: Well, this is the kind of thing I have in mind. I mean, this is a good feature. It should be used universally. I mean, maybe -- they can do. There's no question that they can do, but if they're not doing it maybe they should make it part of their explicit, you know, the box kind of thing, because this is a good, a very good feature. Yes, I think you are the first one at least to make it explicit.

When you guys developed your trees in EPRI, you probably go through something like this, but not as explicit or as systematic way perhaps, if I can use those words.

MR. SHUKLA: I think Halden is using this method.

CHAIRMAN APOSTOLAKIS: Halden? Halden doesn't have a model. Halden is just running simulators, right?

DR. COOPER: Yes.

MR. SHUKLA: They are using wire to choose a different course. They are analyzing --

CHAIRMAN APOSTOLAKIS: After they analyze -- yes, sure, sure.

MR. GROBBELAAR: I mean, we basically do this by working through the entries and the procedures, in conjunction with the success criteria.

CHAIRMAN APOSTOLAKIS: I think it goes beyond though. That really asks the operators to --

DR. COOPER: I think that the distinctions have to do with how the procedures are used, and I have a slide coming up here where the kinds of things that they might be thinking of here where there may be important decision points or branching that you might want to think about, and if you want to refer to the Halden studies or the empirical study that Erasmia is the project manager for, some of the work that we've done there have been places in the scenarios where there are different choices so far as maybe making a transition in procedure, from one procedure to another. And when ATHEANA did the analysis we were able to identify what those different options were and even think about why they might do that, what the rationale was, and then actually evaluate it.

Now, you know, the match up with what actually happened wasn't exact, but we were able to at least qualitatively identify those choices and what the reasoning might be.

Trade off are another thing, and that might be something that you want to think about in fire, you know, because you might have some tough choices with respect to resources or whatever. Also, the main control room abandonment might be an issue, places where they don't understand the plant condition. So basically some of the very difficult decision making and cognitive analysis is where we went. Where we used that information, and the ideal situation or the way ATHEANA is intended to be used is to use the resources of the operation staff, plant specific operation staff here in the U.S. The trainers are the best repositories of the kind of information that we want to have about what crews might be doing at this plant.

So in quantification then we want to ask our experts, because we use an expert for those -- facilitation approach. We ask basically two questions: first of all, does the operational story make sense, and do we have to make some adjustments to it. And that may be identifying sub-scenarios, you know, checking it against plant specific operations and what they know about the operators.

And then of course the next question is what is the likelihood that the operators will fail, as described in the operational story. And I'm not going to go through the specifics of the quantification because we've discussed that elsewhere. And I'll just note that 1880, NUREG 1880, does provide further information or how to do that facilitation of the expert elicitation process.

So really that's the end because ATHEANA really just takes the information and then uses the expert elicitation process. So what is in the guidelines, you know, the appendix is to describe what kinds of additional qualitative analysis you might need to collect, how you might use that, and what kinds of problems might best be addressed with that kind of information.

So ATHEANA's --

CHAIRMAN APOSTOLAKIS: Do you guys differ that much?

DR. COOPER: I'm sorry.

CHAIRMAN APOSTOLAKIS: I do not believe that the EPRI in Europe are that different. If we resolve the issue of quantification --

MEMBER SHACK: That's not of interest, really.

CHAIRMAN APOSTOLAKIS: Yes, that's the only difference, and maybe if you dig deeper you may find some of the elements even there.

MEMBER BLEY: I liked your idea of --

CHAIRMAN APOSTOLAKIS: Yes, if you tried that.

MEMBER BLEY: I think that would be really interesting.

CHAIRMAN APOSTOLAKIS: That would really be very useful.

MEMBER BLEY: Yes, John?

MEMBER STETKAR: Can I ask -- keep the slide there. It says fire HRA, and I've heard ATHEANA and I've heard EPRI HCR/ORE. I haven't heard either of you say anything that is unique to fire. The only thing that I've heard this afternoon is the intermediate scoping step as a different table look up that has anything to do with something that might be unique to fire. And I'm curious about why this is not --

DR. COOPER: Two things: one, we have an awful lot that we described in the qualitative analysis that we haven't been able to cover today that does address things are real specific to fire. We have developed the scoping trees specifically to address the fire.

MEMBER STETKAR: But that's not ATHEANA

and that' not --

DR. COOPER: But the other thing is that although we haven't had a full exercise of things we really do have the intention of trying to capture most of quantification there. That is our hope, that the need for going to the detailed HRA will be limited, as it's always been, you know, but you want to try to keep it limited, but that is the intention.

Now, again, we haven't been able to get into the specifics but we do have -- I mean, the objectives of the two appendices that we have in the fire HRA guidelines is to try to talk about how you would apply these methods differently for fire.

And so, for example, the ATHEANA appendix is extremely short because we say, well, we don't want to duplicate everything that is in 1880 and 1624 because everything you already talked about is in the qualitative analysis.

MEMBER STETKAR: Hang on just a second. I'm trying to think of why there's anything -- what has been done to these methodologies that was necessary to change that methodology simply because I'm thinking about fires? And except for the scoping trees --

DR. COOPER: You know, all those same

issues have to be addressed in the detail analyses, too. They do.

MEMBER BLEY: I think your point's on record. I think I agree, and thank you, Susan. We're about to move to Bill Hannaman. Before we do, Bill, gee, if I had been setting this up you'd a had a couple of hours. It always sticks under my skin that somehow dependency and uncertainty are tacked on in 15 minutes at the end. It ought to be all the way through this thing from start to finish, so do what you can in 15 minutes, but I think it's a -- I'm afraid it's a reflection of what I'll find in the report when I read it, and that would make me disappointed.

MR. HANNAMAN: Hello, I'm Bill Hannaman, and I'm already late, but we put these all in one grouping because this area deals more with the interaction of the HRA with the PRA model where a lot of the elements dealt with quantifying and describing the particular action. So it made it a convenient way to put these all in one -- one grouping.

Am I in the right --

DR. COOPER: Push it again. You didn't push it hard enough. Here, just do this.

MR. HANNAMAN: Okay. Our objectives here

were really to use the existing methods to the greatest degree possible and then determine how fire would impact and adapt the methods as necessary to address fire issues. And we started just kind of a brain warmup here. Let's look at what the ASME code requires for recovery. For example, under recovery here it's the ASME permits modeling of recovery actions that have cues, provided the operators know what to do through procedure training and skill and are feasible. That's kind of the basic statement.

For dependency the ASME code requires for multiple human actions in an accident sequence or cutset can be identified, degree of dependency assessed and a joint HEP calculated. Very straightforward.

MEMBER BLEY: Before you do that one, that last phrase is really important. That gets to all those issues we've talked about.

MR. HANNAMAN: Yes, that addresses a lot of the things that were covered.

MEMBER BLEY: And if that's the way you're doing things, I think there's a lot of happy people around this place. Go ahead.

MR. HANNAMAN: Well, this is what -- I've summarized what it says in the ASME standard. Now for uncertainty analysis the ASME standard supports development of a representation of competence in the state of knowledge about a parameter of values and models used in constructing the PRA.

Now that has an impact on the HRA. For example, we use -- we have to give the PRA mean values for an HEP. It may be easier to determine a median value from limited data when you're doing tests or something, so there needs to be a conversion there. That would be one example.

There's other examples. Let's see. The sources of model uncertainty and assumptions that go in also need to be kind of characterized so you'll know how things are going to fit together and where the issues are. So that's an important issue of uncertainty analysis.

But I want to get through these quickly, so let's see if I can look at --

Let's start with recovery. We're using basically the same steps as have already been described, but we're just now -- this is a case where we've done screening analysis. Now you come back with your PRA study, and John's point about, hey, did you lose a cutset somewhere. This is what we're trying to address.

Jan already pointed out that we -- for fires where we've looked at all these dependencies and the sort of realistic case, we now shove them all back up to one and then re-examine all the cutsets to see if -- well not all billion but a group set of them to really look at the ones where there is multiple human actions in the same cutset.

So we may -- there's several ways that a recovery action can be defined for this in-state. Let's say that there's a risk sequence that's sticking way up and the question would come back to an HRA analyst, hey, is there something that you could do about that? Is there a recovery action that's legitimate, that's feasible and everything that should be put into the model, and then that would be where this would kick in.

In a sense, this part is essentially, as I said, the same as the other stuff that Jan and Susan went through. So from the fire viewpoint there's a few areas where we would like to look at, you know, what are the difference just from the fire side, and this, I think, goes back and addresses a little bit about what John said. We have to identify the requirements that should be met before re-creating new recovery actions, and we have to review them and then from the procedures or talk through with operators or training personnel, identify new or potentially previously unidentified recovery actions that apply. And these would be ones -- if they were introduced by a procedure, for example, there's cases where you have, let's say to avoid a spurious action some people have put into their procedures prevention of that by de-energizing a bus, for example. And then later on after things have settled down they may go back and re-energize that bus.

Well, that seems simple but it may have a big impact on the PRA and how those are incorporated. So that has to be looked at very carefully. But we need to do that to get a realistic version of the PRA model, screening, and then later as we start doing a quantification. And then I think there's a final quantification that tweaks everything. This is where the recovery would come in.

So we would do -- feasibility would have to be assessed, and then, most importantly, for fires you have this -- you have to hook up all of the PSFs so they can match in a -- that you have covered them across actions and so forth, because the various fire PSFs interact in a way that would be independent of a rev one analysis.

And then as has been pointed out then you'd use a screening rules or scoping or detailed application.

Okay, let's try dependency analysis. The steps for fire HRA dependency analysis is to go back and identify the combinations of multiple operator actions in the fire scenario, and then evaluate the dependencies within a scenario considering the PSFs. This assumes, of course, that we've already done the -- set it to one, either, I guess you know, manually setting the one or could use risk importance measures to help understand that.

And then we incorporate the dependency evaluation of the fire model, so for a -- and then the next, the final thing is the joint calculations of the HEP.

The final, as I mentioned, Task 11, Task 14 is the final version where you would finally say, okay, enough is enough. This is time to publish your report.

I guess some of the key issues that come up -- and you may have asked questions about this, but first of all select cutsets where two or more fire HFEs have been modeled and then both the HEPs and the non recoveries might be multiplied in the cutset, and this is where John was worried about losing an event. But we've already gone back and checked that by making sure we put in ones to start with.

Then we consider the influence of the fire, and this follows a requirement in the standard to include appropriate PSFs. We verify that the time can be completed given the fire, consider the factors that could lead to dependence, and these are -- especially with fire we get common instrumentation problems because the fire can affect actually redundant and sometimes diverse instrumentation.

There may be common procedures and, of course, the increased stress when many things are happening at the same time.

We verified these factors by looking at our detailed analysis of some of the fire events. And then we must verify that the resources are available and that crew members, plant, personnel, things like equipment that may or may not have been included in the internal study because you didn't have to put on the scubas or those kinds of things.

And then finally we get down to this qualitative process of assigning dependency level bin, and the typical ones are like complete dependence between human actions in the same cutset -- high, medium, low, or zero, and this has been -- we were not trying to invent anything new. And then I think Susan pointed out that this would be done by an expert judgment process where the assignment and THERP is usually done by the analyst in agreement with the PRA team that they're working with and operator review.

So then for the quantitative analysis you quantify that we were proposing the standard dependency formulas in Table 10.2 of THERP and then we used -- or if it's ATHEANA we used the documented expert judgment method. And then finally these go back and get incorporated in the PRA model, and there are some option people have. They maybe would have combined the -- all of the human actions in a certain cutset into one global one that would then be used to represent the fire case.

We do end up with a very interesting issue that we probably created because we said you could use screening, scoping, or detailed HFE, and they would have kind of a different basis. Screening would be highly conservative, scoping a little conservative, and detailed would be an attempt to get a central estimate. But it would seem if you were using a point one for screening that -- and you could show that you had complete dependence that it would be a good idea to go back and relook at the screening or the scoping or a detailed analysis, if that was a risk-important issue because it would be probably too high on a number.

For scoping we are kind of proposing to use the HEPs in there as best estimate HEPs, and I know Susan used that term. That was -- we've had quite a discussion in our team about the meaning between the median and the mean for the scoping trees. Where's John? Yes. And we've kind of decided that that would be up to the user if they were not going to do a detailed uncertainty assessment, then they probably -- it wouldn't make too much difference which one they used, if they were going to go ahead with like a full-blown uncertainty analysis with Monte Carlo methods or something, then they might want to be more precise, and they probably should make an adjustment for the -- changing this from a median value to a mean value, starting out with the numbers in the table as being -- I guess it would be a median value. And then all human actions must be viable when the adequate time margin and so forth. And that would be our dependency method.

And just bear with me. This probably about the last slide, except that we were completed.

So on the uncertainty our objective was to follow the best guidance that we could find, adapt that guidance into what we would say would be -- what we would recommend it was strictly to use for fires. And we can say that most studies, however they're addressing uncertainties, we're recommending that they would use the same method.

For fire the key assumption's probably include timing, which are addressed -- we've had plenty of timing discussion from the scoping and detail analysis -- selections of performance shaping factors and control and abandonment decisions. These are the kind that would be very difficult and probably -- oops, let me go back here. These would introduce kind of an uncertainty, like when do you want to leave the control room? Are you going to leave there as a partial, because remain in the control room or try to go out and do everything externally. It probably gets even more complicated if you have dual plants and those kind of things, so this leads to increased uncertainty.

Now the reference we used include the EPRI report on guidelines for treatment and the NUREG 1855, so plus we paid attention to what Swain did and other -- other guidance and things like that. So that was our plan for the uncertainty analysis. I'm glad you guys all like this. It's late in the day, and I didn't get any questions and we're complete.

MEMBER BLEY: Thank you very much. We have one more topic we wanted to get to and that was the SRN, but I think we had a half-hour discussion, but we've had a lot of discussion along the way. I think I'm going to ask real quickly and run around our table and see if there are any comments and questions from the subcommittee, except for SRN issues, because Erasmi is coming up and we'll talk SRN.

Anything you'd like to put --

MEMBER RAY: Well, I just -- I find this all very interesting. It looks like it's very thorough and systematic, and I couldn't offer anything other than to say I think we tend to develop over confidence by attributing to things we don't do very often the level of certainty that we associate with things that we do very often, and that's the main thing that I'm looking for here, and I mention that in the cases where there's time available, the margin was short, I thought they had been penalized with a fairly conservative factors. But other than that I am very much a believer that you -- that you achieve a high degree of confidence in things by actually doing them.

And interviewing people and so on can only go so far. It's something you have to do, but I don't think it really gives you a high level of confidence. But, nevertheless, that's all I would offer at this point.

MEMBER BLEY: Okay, thanks.

MEMBER ABDEL-KHALIK: I really have nothing to add except to say that George's idea of having the two teams do the -- use the opposite modeling is a great idea that may lead to conversions.

MEMBER BLEY: Yes, I think that's good, too. George?

CHAIRMAN APOSTOLAKIS: If you want me to address the SRM --

MEMBER BLEY: Not yet.

MEMBER BLEY: Will?

MEMBER SHACK: No comments.

MEMBER BLEY: John?

MEMBER STETKAR: The only thing I have not SRN related would be that from everything I've heard this afternoon regarding issues that relate to fire in particular, I think -- and you mentioned this earlier -- not to reiterate it, but how that scoping process is applied in practice to me is very interesting, because that intermediate scoping process is the only thing that I heard that's unique. So given the reliability analysis within the context of fire, so I'm hoping that the next opportunity we have to -- to meet with you folks we see some not just high level or process oriented but how it really is done in practice.

MEMBER BLEY: And I just have a couple of things. We've talked about a meeting in October. The only thing that we saw today when we had no substance coming in until we got here, I had trouble seeing how we could get through whatever we're going to talk about in October in less than a couple of days. I don't -- it seems to me we're going to need a two-day meeting, and we'd really like to see some examples.

MR. BLEY: Yes, I think that's probably, and I wonder -- just think about it now. We'll have the July document, but you will have been getting comments and other things are going on. If there's any way, you know, before our meeting to give us maybe a short paper on your lessons learned and planned improvements before we have the meeting, I think that would be really helpful to filling that gap in time from July until then and see what you've had going on there.

DR. COOPER: Okay.

MR. BLEY: Now I didn't say anything

about -- I don't want to talk about it now, but it just struck me that Table 10.2 on dependencies, I don't think there's any reason to say that works well for clues in the heat of action, which I thought you were saying was what was going to be done. I think that was aimed at pre-initiator kinds of events, and it was the real seat of the pants novel at the time.

MR. HANNAMAN: I think that's a quantification process, and the way that you get the heat of the battle in there is through the qualitative assessment beforehand when you assign the high dependence. It's that transition from the qualitative to that assignment, and the numbers are reasonable for the dependency factors.

MEMBER BLEY: That's when we see some real stuff. We'll probably have real questions --

CHAIRMAN APOSTOLAKIS: I think we should have enough time to review this stuff, because this is going to be overwhelming, so maybe getting it at least a month.

MEMBER BLEY: Well, we'll have the report in July.

CHAIRMAN APOSTOLAKIS: Okay, so that's good.

DR. COOPER: That's right. And I think

it's a good idea that we'll try to provide you a summary of major modifications.

MEMBER BLEY: And maybe you can touch base with our staff and see if there might be a reason to get together before that October time frame if you have something to talk about.

DR. COOPER: Okay.

MEMBER BLEY: After we've had a month or two to digest that report.

DR. COOPER: Do you only want two days in October, or just whenever the next meeting is, you want two days, just to clarify, because that does make a difference.

MEMBER BLEY: I think we can work that out as we get closer. I think --

CHAIRMAN APOSTOLAKIS: What do you mean whenever the next meeting is?

MEMBER BLEY: If we get together before October, if they come back for another meeting before October.

Okay, Erasmia, you're on for some unrelated things, and then George will have lots of comments.

MS. ERASMIA: So this is only -- oh. This is only three slides.

MEMBER BLEY: If you can, make them big.

CHAIRMAN APOSTOLAKIS: Yes, go down and make it big. Okay. This is a big issue, so we decided in order to address the SRM we had to focus it, and we are focusing right now to address full power PRA and indeed detailed analysis, because you have screening barriers and scoping version. Yes?

MEMBER STETKAR: Why?

MS. ERASMIA: Because --

MEMBER STETKAR: You enough about low power and shut down modes to know except for the fact that a lot of things are manual and the time windows are longer, they're largely the same.

MS. ERASMIA: I'm not saying that we're not going to address shut down. As a matter of fact, we initiated right now work to think about shut down HRA because no method has been developed a priori with the idea of shut down activities and needs; however, to address the SRM, the SRM is saying tell us do we need all of this different models. Can't we marriage in one model and -- and if we keep more than one tell us why. So we would like to address this issue of going through systematically. Let's resolve the full power internal event PRA first, and then we'll expand from there.

I'm not saying it's not within the future, but the immediate scope is full power internal elements because we feel that's all we can buy right now, and I'll walk you through. Yes?

MEMBER STETKAR: We're all risk analysts. That's why we're in this subcommittee and this meeting. What is the risk if you approach -- except for Bill, sorry.

What is the risk if you do that, if you focus the scope on full power right now, what is the risk that when you then think about extending your thought process to low power and shut down modes that you might discover that, oh, these methods don't apply very well then and we need now another different method. What is the risk of that? You know, what's your confidence level that you'll conclude that -- that the results of your evaluation within the context of full power PRA, the conclusion when you extend that to shut down PRA will be that yes indeed these methods apply quite well to shut down PRA. What's your confidence of that? Are you 90 percent confident? Are you 10 percent?

MS. ERASMIA: Let me tell you what my answer is. I don't believe any of the existing methods THERP, ASEP, SPAR-H, ATHEANA, have been developed with the concept of shut down. I agree with you there have been used, they have been applied; however, the core -- the underlying assumptions and these methods have been developed to internal analysis, control room emergency procedures been in use. Those are the core -- that's what they're addressing, and then EPRI has been expounding CBDD in shut down and we're going to talk with EPRI and see how they do it and why.

But the HRA model difference is the study has to do a lot with ad power internal events, and we would like to address this issue, for instance, then as we go and look at the shut down, HRA needs. We have that in mind. We know that the SRM commission doesn't want us to give out new tools different tools unless there is a need, and we continue like that. It's a progression. It's a stage approach. We cannot.

I mean, right now shut down for a -- we haven't developed, the NRC has not developed in a method for HRA for shut down and have not reviewed any method that has been applied for shut down.

We have -- analysts are using it, but no method has been developed or reviewed, officially.

CHAIRMAN APOSTOLAKIS: Do you brief the

commission periodically on progress in this SRM or have they forgotten about it?

MS. ERASMIA: As far as we know, we understand is this is the ACRS task to brief the commission, because the SRM has been addressed to the SRS, so what we do here --

CHAIRMAN APOSTOLAKIS: That's highly unusual because we don't really do work.

MS. ERASMIA: So what we do we support the ACRS for addressing the SRM.

CHAIRMAN APOSTOLAKIS: So the commission has no idea what has been going on this?

MS. ERASMIA: No.

MEMBER RAY: They trust us, George.

CHAIRMAN APOSTOLAKIS: It has to be remedied. Huh?

MEMBER RAY: They trust us.

MS. ERASMIA: You have written -- a year ago you have written a letter to the commission indicating that we are going to work with -- the staff is going to work with EPRI to address the issue, and we have a plan. And we gave you the plan last night.

CHAIRMAN APOSTOLAKIS: The question that came to my mind is -- let's say 2010 when you send your SECY or whatever it is to the commission and they look at this, I don't want them to be surprised. I want them to know in advance that this is what's coming to them.

So I don't know. Shall we do it on Thursday, Bill? Take a few minutes -- I mean we have to talk to them at some point and say what's going on. If it's up to us and the staff feels that it's not their business or their job, somehow we have to make sure we inform the commission, you know, what's going on.

I would hate to surprise them at the end, but that's not a good idea in general to surprise anybody. But Thursday's too soon.

MEMBER RAY: I think you're right, George, that Thursday's too soon.

MEMBER SHACK: You can propose it for the agenda and they can decide whether they want to hear about it.

CHAIRMAN APOSTOLAKIS: Well, they definitely should agree. But we have never really proposed it. That's what I'm saying. We never really said in the agenda this is something that we believe that should be done, so maybe next time we should do that, yes.

You know, you will know all the

assumptions. It seems to me that the work we discussed this afternoon with Susan and her colleagues will be of tremendous value, especially if they do this thing of swapping models, because then, you know, you will know all the assumptions and, you know --

MS. ERASMIA: The empirical studies on this we were using a lot, the results from the Holden study. Actually, the memos and CREAM and NARA or all of the European methods are participating, so we have the capability. We have to understand what the methods are and also to identify the desirable features of the methods. So in a way this hybrid has been benefitting tremendously from the empirical study.

CHAIRMAN APOSTOLAKIS: So somebody's working on this already, the hybrid?

MS. ERASMIA: That's why you see Will here. We have a meeting tomorrow. We have two and a half day meetings to go forward with -- with --

CHAIRMAN APOSTOLAKIS: I am looking forward to the day when Vinh will be sitting there.

MS. ERASMIA: However, we went around the table and we asked people whether -- wouldn't you like to have a tool box or one method, and everybody said I would like to have a tool box in the sense that I would like to have my method address the specific needs of my application.

CHAIRMAN APOSTOLAKIS: Yes, but then again, I don't think they know what they're talking about. If you explain -- I mean, what if you look at those methods and you decide that the fundamental structure is the same, that the assumptions are the same, and there are differences in a few minor points. Those guys are not qualified to say that. You will say that. Vinh will say that.

So that's really -- I hear words of today, you know, a lot of people are using this. This is not a democracy, guys. This is science? Maybe it is. Technical -- I mean, we really have to decide. I mean, the experts will have spent a long time studying these things and applying them. They have to come up to sort of consensus.

We aren't going to go out and say, you know, I have to find a tool box. I don't know what that means. So I don't pay much attention to those kinds of things. I like the conclusion of the workshop though.

MS. ERASMIA: Okay.

MEMBER BLEY: Pick what you want to pay attention to.

CHAIRMAN APOSTOLAKIS: You know what I want.

MS. ERASMIA: So what we are doing right now, we are identifying the critical elements of a sufficient qualitative and quantitative analysis. We are taking into consideration the human factors, literature, and models being built so far, and evaluating existing methods with respect to these desirable characteristics and begin the process, and all of that is going to happen from tomorrow on, of method selection -- or parts of methods.

CHAIRMAN APOSTOLAKIS: I really think it's Vinh or whoever from you group --

MS. ERASMIA: John, Susan --

CHAIRMAN APOSTOLAKIS: Okay, Susan and John are involved, then that's fine. I just wanted to -- my point was that these guys were doing this should be intimately familiar with what is going on in the fire area because a lot of the stuff that has been done there is relevant to this.

MS. ERASMIA: Exactly.

CHAIRMAN APOSTOLAKIS: Well, I feel better now.

MEMBER BLEY: You can read the G graphs for us.

MS. ERASMIA: I will put my name on it and keep it with --

CHAIRMAN APOSTOLAKIS: Very good. So that's it?

MS. ERASMIA: That's it.

CHAIRMAN APOSTOLAKIS: Okay, Mr. Chairman.

MEMBER BLEY: Thank you very much. Any more discussion? I'd like to thank everybody for the really nice presentations and good participation today. It gives us a lot to think about. Not much in our hands yet except graphs, so we're looking forward to getting something substantive to look at, and with that --

MR. SALLEY: Question?

MEMBER BLEY: Yes, sir.

MR. SALLEY: Yes, let me just get a question here. Back at the SRM I'm a little confused. Who has the action? Does ACRS have that or does the staff have the action on that?

MEMBER BLEY: It says we do, but I'd want to look at it again. I haven't looked at it for a while

CHAIRMAN APOSTOLAKIS: The SRM is addressed to us, the ACRS and says working with the staff to do this.

MEMBER BLEY: Okay.

CHAIRMAN APOSTOLAKIS: We don't do work. WE don't produce anything.

MR. SALLEY: This one's a little different. Yes, so we just need to check on that.

MS. ERASMIA: We're supporting the ACRS. We're doing all the work; however --

CHAIRMAN APOSTOLAKIS: However what?

MS. ERASMIA: It's SRM. We feel that the SRM is addressed to us, the ACRS.

MR. SALLEY: And the second question I guess is kind of a question comment, and you all talked about it a little bit before. I'm not an HRA expert, so I don't understand the one model versus the different models. I'm trying to draw correlations to the fire models and what we do with the fire models, and that's probably a bad correlation because we specifically said we will not do one fire model. We did five so the people would have a choice on the level of detail, so for me this is a little different departure from what we did in fire modeling.

But keep in mind that what you had mentioned earlier that, you know, half the plants in the country are transitioning to 805, and they need a method out there now to get their stuff done, so Susan and her group, they're under pressure because people are wanting to do this and they need a method, and I don't want to get into a debate which is the --

To me I guess a tool box approach or a fire HRA model, I was for that, but I don't know the details of HRA, so I can't speak to that. But what I'm saying is the people have a need out there right now, and we're trying to fulfill that need, so we're pushing Susan here quite a bit. So keep that in mind.

CHAIRMAN APOSTOLAKIS: But they are in an excellent position to create a hybrid model. They are the ones who are doing that. I mean, especially if they swap positions and models. Because it was clear today, for example, the qualitative analysis is almost the same. I mean, the words are different.

So the quantification, okay, we'll have to look into it and reconcile, but it's not a big deal.

MR. SALLEY: Yes, I mean, I'm perfectly fine with the fire piece being a trial balloon and trying to pave the way and do that. I'm all for that. Just keep in mind that there's 50 plants out there, and like I said the first ones are done, and how good it's going to be, well, the staff hasn't reviewed it yet, so there may be a lot of questions in how they did that HRA. We need to -- the other forty-some units that are coming in, the sooner we get them a good method, you know, something they can work with, the better off we'll all be. So please keep that in mind.

CHAIRMAN APOSTOLAKIS: The problem, Mark, is that the SRM we've been talking about is not just on a specific issue. It has broader implications, so you can't go to the commission and say, yes, we decided in response to the SRM, but this is hybrid, and then next week you go there with Susan and say for fires now you have two HRA models. You can't do that.

I'm sure one of the commissioners at least will notice it, so it's kind of a unique situation, but one SRM there has much broader implications than just address this issue.

MEMBER BLEY: The SRM on the other hand doesn't, as I recall it, doesn't say come up with absolutely a single method to use everywhere.

CHAIRMAN APOSTOLAKIS: That's right.

MEMBER BLEY: It allows that there might be different needs.

CHAIRMAN APOSTOLAKIS: There must be a reason. There must be a reason. Anyway, I'm done.

MEMBER BLEY: Again, thanks to everyone.

We appreciate it. We look forward to the next meeting.

(Whereupon, the foregoing matter concluded at 5:48 p.m.)

Joint EPRI / NRC Fire Human Reliability Analysis Guidelines

Susan Cooper & Erasmia Lois, USNRC
Jan Grobbelaar, EPRI/Scientech

Presented to ACRS Subcommittee on Reliability and PRA
June 1, 2009
Rockville, MD

Presentation Outline

- Project coordination with SRM response
- Project Overview & Status
- Technical Summary

Staff Requirements Memo on HRA

- **SRM to ACRS, November 8, 2006**
  - Work with staff and other stakeholders to address the issue of HRA model differences and determine whether we can have a single model for the Agency to use or more than one with well-defined guidance on their use
- **The issues**
  - Need to address issues related to the quality, traceability, and reproducibility of HRA results

Addressing SRM in the Fire HRA Project

- This project sought from the beginning to address the SRM concerns recognizing that existing HRA methods have been developed mainly for control room human actions for internal **non-spatial** initiating events
  - **“well-defined guidance on their use”** implies that the method/tool should address the needs of the domain for which is been applied

Addressing SRM in the Fire HRA Project

- The Fire HRA method developed by this project
  - Ensures that domain-specific human performance issues are appropriately reflected/modeled
    - Initial conditions & accident progression
    - Operator actions outside the control room
    - Potential for environmental influences (e.g., smoke)
  - Ensures transparency and traceability of the method
    - Important for the NRC reviewer
  - Addresses user needs for simplified model
  - To a great extent, addresses the issue of reproducibility from analyst-to-analyst

Addressing SRM in the Fire HRA Project

- SRM allows for multiple methods with **well defined recommended applications**
  - "well defined guidance" is provided as part of this project

Overview: Joint EPRI/NRC Fire HRA Guidelines

- The issue….
- Development approach
- Project status

The Issue

- NUREG/CR-6850 addresses
  - Identifying human failure events (HFEs)
  - Assigning conservative screening human error probabilities (HEPs)
  - Provided Performance Shaping Factor (PSF) information
- Approximately 50% of US plants transitioning to NFPA-805 to date

Overall Project Objective

- Through joint NRC and industry efforts, address the need for HRA guidance, especially for best-estimate quantification, for use in fire PRAs
  - Address methodology
  - Address guidance for implementing the methodology
- Develop a joint EPRI/NRC report (similar to NUREG/CR-6850)

Fire HRA Team

EPRI | **NRC**

Doug Hance (Bob Kassawara)
EPRI Project Manager

Susan Cooper & Kendra Hill
NRC-RES Project Manager

EPRI

Jeff Julius & Bijan Najafi

Jan Grobbelaar & Kaydee Kohlhepp

G. William Hannaman & Erin Collins

RES

Susan Cooper

John Forester

Stacey Hendrickson

Independent Review Team

NRC Reps

Utility HRA Reps

Development Approach

- 3 primary tasks:
  - Fire Data Review
  - Fire HRA Methodology & Guidelines Development
  - Fire HRA Review & Test

Task 1 – Fire Data Review

- Made use of existing guidance, such as:
  - NRC's "good practices," NUREG-1792
  - Draft EPRI Fire HRA Guidelines
  - Fire Manual Actions, NUREG-1852
  - PRA Standards (internal events & fire PRA)
- Started with NUREG/CR-6850 considerations of fire effects as basis for quantification
- In order to verify these considerations (and identify any needs for updating):
  - Collected and reviewed recent NPP fire events
  - Collected and reviewed plant data
    - Considered a range of plant responses (fire response strategies).
    - Performed some plant interviews

Task 2 – Fire HRA Development

- Examined HRA process, identified how the process and tasks would change in a fire environment or accident response scenarios in response to a fire
  - Successive screening/quantification
- 3 categories of fire-related actions:
  - Existing post-initiator HFEs
  - Post-initiator fire response HFEs (including Main Control Room abandonment)
  - Undesired response to spurious cues or actuation
- Decided on a progressive approach for fire HRA quantification (reflecting fire PRA development):
  - Rough, quantitative screening per NUREG/CR-6850
  - Scoping fire HRA approach for scoping fire models ***(newly developed)***
  - Detailed fire HRA quantification using EPRI's Cause-Based Decision Tree & HCR/ORE and/or NRC's ATHEANA **<u>(modified for fire effects)</u>**

Task 2 – Fire HRA Development (cont.)

- Decided on a progressive approach for fire HRA quantification (reflecting fire PRA development):
  - Rough, quantitative screening per NUREG/CR-6850
  - Scoping fire HRA approach for scoping fire models ***(newly developed)***
  - Detailed fire HRA quantification using EPRI's Cause-Based Decision Tree & HCR/ORE and/or NRC's ATHEANA **(modified for fire effects)**

Task 3 - Fire HRA Review & Testing

Peer Review:

- NRC and industry team with 7 reviewers:
  - NRC: Gareth Parry, Erasmia Lois, J.S. Hyslop
  - Industry: Stuart Lewis, Kenneth Kiper, Young Jo, Zouhair Elawar
- In general, was the **right approach** taken and implemented?
  - Is the technical approach sound and reasonable?
  - Are the selected HRA models appropriate for the application?
  - Are the assumptions presented in this methodology reasonable?
  - Does the guidance meet its stated objectives?

Task 3 - Fire HRA Review & Testing (cont.)

Testing

- Plant 1: Conducted in August 2008, tested flowcharts
- Plant 2: Conducted in September 2008, tested flowcharts

Fire HRA Guidelines: Status

- Started March 5, 2007
- First integrated draft May 2008
- *Peer review in June 2008*
- *Testing at 2 plants in Summer/Fall 2008*
- Revised draft in April 2009
- *Quick review by NRR & NRO – April 2009*
- *ACRS sub-committee presentation for information - now*
- Public comment period & return to peer reviewers - Summer 2009
- *Piloting by PWR Owner's Group – Summer 2009*
- *Joint EPRI/NRC-RES Fire PRA Course - (for information only) June/October 2009*
- *ACRS sub-committee presentation – October 2009*
- Publication of final report - early 2010

Fire HRA Technical Overview

- Fire HRA Process:
  - **Identification and Definition - next**
  - Qualitative Analysis
  - Quantification
    - Screening
    - Scoping
    - Detailed
  - Recovery, Dependency, & Uncertainty

- Each element described in subsequent presentations

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IDENTIFICATION AND DEFINITION

Jan Grobbelaar, EPRI/Scientech

Presented to ACRS Subcommittee on Reliability and PRA

June 1, 2009

Rockville, MD

Scope

- Limited to post-initiator operator actions
  - Pre-initiators can use existing, non-fire guidance

Fire detection excluded

  - Many compartments alarmed and/or occupied

Fire suppression Human Failure Events generally excluded

  - Suppression failure probability curves are based on empirical data in NUREG/CR-6850,
    - include detection and actuation
  - If suppression is modeled, existing pre-initiator guidance and/or new post-initiator guidance can be applied

Categories of Fire PRA Operator Actions

- Existing internal events operator actions
  - From current Level1/LERF PRA model
- Fire response operator actions
  - New actions per fire procedures
  - New actions to address recovery of spurious actuation
  - MCR abandonment is a subset of fire response actions
- HFEs Corresponding to Undesired Operator Responses
  - New actions to address undesired operator actions in response to spurious indications per fire PRA standard
    - Fire PRA Methodology Standard ANSI/ANS-58.23

Identification:
Internal Events Operator Actions

- Identify fire-induced initiating events
  - For example, general transients, loss of support systems, LOCAs
  - On a PWR, steam generator tube rupture not considered as SGTR not directly caused by fire
  - ATWS not considered in NUREG/CR-6850 based on low frequency arguments
- Identify operator actions modeled in fault and event trees delineating the plant response to fire-induced initiating events

Identification:
Fire Response Operator Actions

- Required in response to a fire, as directed by the fire procedure/s e.g.
  - Mitigate or prevent fire damage to equipment
  - Recover existing internal events operator actions
  - Mitigate the effects of spurious indications or actuations
  - Abandon main control room and perform safe shutdown outside the main control room
- Identification process can be
  - Iterative as required in fire PRA
  - Comprehensive based on fire procedure/s

Identification:
Fire Response - MCR Abandonment Actions

- MCR abandonment actions are a sub-set of fire response actions
- Operators will abandon if control room becomes **uninhabitable**, or due to **loss of all required control**
- Identification process can be:
  - Iterative as required in fire PRA
  - Comprehensive based on review of the MCR abandonment procedure
- The FPRA can credit scenarios in which operators remain in the control room but perform local actions because of lack of control from control room
  - In this case the fire specific scenario is to be identified and defined by the FPRA analyst
  - HRA analysts task is to identify procedure guidance operators will follow for partial abandonment case

Identification: HFEs Corresponding To Undesired Operator Responses

- An undesired operator action is a well intentioned operator taking action that unintentionally aggravates the plant response
  – Operators are generally trained to (1) believe their instrumentation and (2) to follow their procedures
- Identified within the context of the accident progression
  – Review emergency operating procedures
  – Review annunciator response procedures
- Defined in terms of their impact on the function, system, train or component. Although these actions are well intended and not operator errors as such, the undesired consequences have the same impact as an error and are therefore to be modeled as HFEs

Identification Criteria for HFEs Corresponding to Undesired Operator Responses

- Cue parameter/s
  - Single or multiple
- Cue (procedural) hierarchy
  - Continuously monitored or procedurally checked only
- Cue verification
  - Required or immediate actions
- Degree of redundancy for a given parameter
  - Redundant channels mitigate single spurious

Human Failure Event (HFE) Definition

- Review/update of the definition of existing internal events HFEs to be revised for fire impact
- New fire response HFEs are to be defined
- Definitions should address:
  - Fire impact on instrumentation & indications credited for detection and diagnosis
  - Fire impact on timing of (1) cues, (2) response, (3) execution, and (4) time available
  - Fire impact on success criteria
  - Fire impact on manpower resources, which affect recovery
  - Fire impact on local actions, e.g., accessibility, atmosphere, lighting

Preliminary Assessment of Feasibility

- Purpose: To initially reduce the total number of HFEs required for further analysis based on easily identifiable criteria
- Feasibility Evaluation – if any one of the following is true, set HEP to 1.0
  - Insufficient time available to complete action
  - Insufficient manpower
  - Fire is in same location as required actions
  - Inaccessible tools and equipment
- After the preliminary results have been incorporated into the model, additional resources can be used to reassess actions

Fire HRA Technical Overview

- Fire HRA Process:
  - **Identification and Definition - complete**
  - **Qualitative Analysis - next**
  - Quantification
  - Recovery, Dependency, & Uncertainty

- Each element described in subsequent presentations

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Examples of Potential HFEs Corresponding to Undesired Operator Responses based on ARP Review

Spurious Annunciator	Undesired Action	Consequence
ESW PUMP MOTOR INSTANT TRIP	Place the affected pump's control switch in LOCKOUT.	One train of service water stopped reducing ESW prob. of success in CCDP calculation. Can be restarted.
CCW PUMP MOTOR INSTANT TRIP	Place the affected pump's control switch in LOCKOUT.	Stopping one CCW pump increases operating temp. on many components in CCDP calculation. Can be restarted.
EAST RHR PUMP SUCTION VALVES NOT FULL OPEN	Immediately open 1-IMO-310, East RHR Pump Suction, or 1-ICM-305.	Depending on scenario (size of LOCA or not) could lead to cavitation of the pump. Loss of pump in Recirc. mode
RHR PUMPS MOTOR INSTANT TRIP	Place pump control switch in LOCK-OUT.	Delay start of RHR if not on or halts RHR if on. Impacts CCDP. Can be manually started.

Fire Response Action Examples

- Identify protected instrumentation channels (to mitigate spurious indications)
- Defeat solid state protection system (to prevent spurious safety injection)
- Control auxiliary feedwater locally by throttling valves manually and starting / stopping pumps
- Place remote shutdown location back-up indication panels in service
- Obtain steam generator level locally
- De-energize all ADS valves
- Close HPCI steam supply valve locally
- Align 4 kV bus by locally operating breakers

QUALITATIVE ANALYSIS

and

INTRODUCTION TO QUANTIFICATION

John Forester, SNL

Presented to ACRS Subcommittee on Reliability and PRA
June 1, 2009
Rockville, MD

Introduction

- Regardless of which HRA method is used for quantification, all PSFs addressed in ASME standard (HR-F, HR-G) and NUREG-1792 need to be considered, but may or may not be <u>explicitly</u> addressed in quantification approaches (screening, scoping, detailed)

- Qualitative analysis includes:
  – Developing fire specific context
  – Performance shaping factors
  – Review of historical experience
  – Review of plant operations

Definition and Fire Specific Context

- Per ASME requirement HLR-HR-F the HFE definition should include:
  - Accident sequence
  - Timing
  - Accident progression
  - Availability of cues and other indications
  - Preceding successes and failures in sequence
  - Success criteria
- Fire PRA Context
  - Task 7a – Screening HEPs could be appropriate
  - Task 12 – Scoping HRA
  - Task 14 – For risk significant HFEs perform Detailed HRA

Performance Shaping Factors

- Includes addressing fire related impacts associated with these PSFs:
  – Cues and Indications
  – Timing
  – Procedures and Training
  – Complexity
  – Workload, stress, pressure
  – Human-Machine Interface
  – Environment
  – Special Equipment
  – Crew Communication, Staffing and Dynamics

Cues and Indications

- Need to evaluate availability of cues and indications given the fire impact
  - Verify (by cable tracing if necessary) that either

    (1) instrumentation is not affected by fire, or

    (2) it is known that required instrumentation is sufficiently protected and can be identified (e.g. procedurally) as such
  - If primary cues or indications impacted, identify diverse cues and indications that could be credited

Timing

- Obtain the following timing for each HFE considering fire effects
  - Total time available (thermal-hydraulic data)
  - Time at which cue occurs relative to the initiating event. (thermal-hydraulic data)
  - Time it takes operators to diagnose and formulate a response (operator interviews, or observations/demonstrations)
  - Time it takes to execute response including time required to travel to local area if necessary (operator interviews, or observation)
- Consider impacts of fire conditions on time required
    - Additional travel time due to presence of fire
    - Delayed diagnosis due to fire related distractions)
- The different quantification approaches address timing issues in different ways and with different levels of detail

Procedures and Training

- Identify how operators implement fire procedures
  - Implemented in parallel or after completion of EOPs
  - Unlike EOPs, fire procedures are not standardized and their use can be discretionary
- Identify critical procedures steps for both cognition and execution
- Identify if and how often operators are trained on both fire procedures and EOPs

Environment

- Consider effects of smoke, heat and toxic gas for main control room abandonment
  - Follow guidance in NUREG/CR-6850 Section 11.5 for impact of smoke
- For control room actions, even if fire is not in the control room, environmental conditions outside the control room may impact on operator performance inside the control room (e.g., smoke effects)
- For local actions, there is the potential that the fire could impact ideal travel path to locations (smoke, water, fire brigade) or require use of SCBAs.
  - Additional routes and travel times need to be considered
  - Longer response time due to donning and wearing SCBAs
- For main control room abandonment, actions may need to consider operators' use of SCBAs

Review of Plant Operations

- Prior to quantification, HRA analysts should confirm with operational personnel:
  - Staffing during fire
  - Fire procedural usage during fire
  - How control room staff will interact with fire brigade
  - Expected staff response after detection of fire
  - Review plant specific fire histories for insights
- After preliminary quantification, analysts should conduct operator interviews and specifically address risk significant HFEs
  - Operator interviews should confirm:
    - Specific procedural usage for each HFE
    - Scenario and plant specific timing information
    - Expected operator response for specific scenario
  - Operators interviews could also include walkdowns and simulator observation

Introduction to Quantification

Three Approaches to Quantification:

- Screening: Slightly modified from NUREG/CR-6850 to cover long-term events
- New Scoping fire HRA quantification approach
  - Less conservative than screening, but designed to be slightly more conservative than detailed approaches
  - Some actions may not be able to meet some of the criteria (result in an HEP of 1.0)
- Two Detailed HRA quantification approaches modified for application in fire scenarios
  - EPRI Cause-Based Decision Tree (CBDT) HRA Calculator
  - ATHEANA (A Technique for Human Event Analysis)

Screening

- A given HFE must be matched to a set of fire related criteria to obtain screening value (per NUREG/CR-6850)
- Conservative HEP may not be acceptable as a final HEP for a given HFE (i.e., a more realistic HEP may be needed)
  - Aid in simplifying and refining the Fire PRA model to focus analysis resources
- Screening approach assigns a screening value of 1.0 for main control room abandonment or alternative shutdown actions
  - But NUREG/CR-6850 allows assignment of a single overall failure probability value (e.g., 0.1) to represent the failure of reaching safe shutdown using alternate means
  - Certain minimum criteria must be met

Scoping

- Flowchart approach that provides less conservative HEPs for HFEs surviving screening
  - Straightforward approach without requiring detailed analysis
- Intent is to provide HEPs that are more realistic, and therefore, some detailed analysis of PSFs is required
  - Require simple judgments about PSFs to support consistency
- Relies on demonstrated feasibility of actions and a time margin to account for many of the uncertainties associated with fire scenarios (e.g., per NUREG-1852)
  - Strives for demonstrated crew familiarity and understanding of fire scenario actions

Scoping (Continued)

- Designed to address limited set of PSFs and plant conditions explicitly
  - If factors outside the set are thought to be important for a scenario, then detailed HRA should be performed

Detailed

- When scoping criteria cannot be met or a more detailed and possibly less conservative analysis is needed
  - EPRI HRA Calculator – Guidance modified to account for fire conditions
  - ATHEANA HRA method (NUREG-1880)
    - Requires appropriate consideration of the fire context as described in Chapter 4 of Fire HRA Guidelines (Qualitative Analysis)
- Guidance on method selection (given the fire context) planned for later
  - At present time, method selection based on considerations such as:
    - Plant-specific scenario information
    - Fire context/impact
    - General suitability (for non-fire conditions)

Fire HRA Technical Overview

- Fire HRA Process:
  - **Identification and Definition - complete**
  - **Qualitative Analysis - complete**
  - **Quantification**
    - **Screening – complete**
    - **Scoping – next**
    - Detailed
  - Recovery, Dependency, & Uncertainty

- Each element described in subsequent presentations

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Back-up slides

Complexity

- For local and MCR abandonment actions, the crew may be required to visit various locations
  - As the number of locations increases, the complexity of the situation is increased
  - Multiple actions may require coordination among crew which may increase complexity
  - The number and complexity of the actions and the availability of needed communication devices should be addressed

Workload, Pressure and Stress

- For HRA methods that categorize stress into different levels, such as low, moderate and high, a new highest level of stress may want to be considered for fire HRA
  - This is because of the potential for more combinations of negative PSFs that could occur during a fire and increase the stress above what is considered high stress for internal events HRA
  - Example - the scenario may be unfamiliar, the procedures and training for the fire scenario are only considered adequate, and the time available to complete the action has been shortened due to fire
- Presence of fire, interacting with fire brigade, one crew member assigned to Fire Procedures may increase workload

Human Machine Interface

- For control room abandonment actions, the adequacy of the remote shutdown and local panels need to be verified
  - Shutdown panels are plant specific and design reviews and improvements have not always been completed
  - Additionally, the operators may not be as familiar with the panel layout as they are in control room scenarios
- Local actions that require the use of equipment that has been damaged such that manipulation could be difficult or unlikely to succeed should not be credited in the PRA
  - For example, a hot short on a control cable has caused a valve to close and drive beyond its seat, possibly making it impossible to open manually

Special Equipment

- Due to varying environmental conditions during a fire, the crew may require the use of special equipment such as:
  - Keys
  - Ladders
  - Hoses
  - Flash lights
  - Clothing to enter contaminated areas
- Tools need to be checked to ensure they can be located and accessible during a fire
- The call for abandoning the MCR might also require use of protective gear or self contained breathing apparatus (SCBA). The hindrance of the special clothing on the operators' actions needs to be addressed

Crew Communication, Staffing and Dynamics

- Per NUREG/CR-6850, most plants can be operated from the main control room with two or three operators as the minimum, but a crew may consist of four or five licensed operators
  - thus assigning one to the fire brigade does not diminish the control room capability below what is required
- Crew credited for recovery in internal events may no longer be available in fire scenarios
- For MCR abandonment actions, verify that there are adequate control room members necessary to fulfill the needs of proper shutdown actions from RSP
- MCR abandonment actions as well as some local actions may require the use of SCBA and could impact communications

SCOPING FIRE HRA QUANTIFICATION APPROACH

Stacey Hendrickson, SNL

Presented to ACRS Subcommittee on Reliability and PRA
June 1, 2009
Rockville, MD

Categories of Actions Addressed in Scoping Flowcharts

- New and existing **main control room** (MCR) actions
- New and existing **ex-control room** actions
- **MCR abandonment** or alternate shutdown related actions
- **Recovery** of EOCs or EOOs due to **spurious instrumentation**

Steps for Using Scoping Fire HRA Approach

1. Ensure minimum criteria are met
2. Demonstrate feasibility of operator actions
3. Calculate time margin
4. Assess key conditions and PSFs
5. Use flowcharts to quantify - Search scheme directs to one of the following:
    - INCR – In MCR actions
    - EXCR – ex-CR actions
    - CRAB – MCR abandonment or alternate shutdown
    - SPI – errors due to spurious instrumentation

Minimum Criteria

- Procedures
  - Plant procedures covering each operator action being modeled
  - Support both diagnosis & execution of the action
  - Exceptions:
    - Execution of skill-of-the-craft actions
    - Recovery of EOO or EOC in some cases
- Training – on the procedures and the actions
- Availability and Accessibility of Equipment

Demonstration of Feasibility

- Show that a given action or set of actions for a particular HFE can be diagnosed and performed within the time available

time available > time required

- Walk-through tasks and simulate conditions as realistically as possible
- Considers several factors and PSFs
- If estimates must be made, use a process to ensure that estimates are reasonable and use knowledgeable plant staff

Considerations in Conducting Feasibility Demonstration

- Environment
- Equipment functionality and accessibility
- Available indications and MCR response
- Communications
- Portable equipment
- Personnel protection equipment
- Procedures and training
- Staffing
- Other aspects (e.g., travel path, smoke density)

Time Margin

- Extra time included to account for potential unexpected fire effects and variabilities such as:
  - Uncertainties in the demonstrations and conditions unable to be simulated
  - Potential variability in crew response times and individual differences
  - Variations in fire type and related plant conditions
- Within the scoping approach, time margins are required to be calculated for all actions or set of actions.
- Similar to guidance in NUREG-1852

Assessing Key Conditions & PSFs within the Scoping Flowcharts

- How well the procedures match the scenario
  - The procedures should be relatively easy to follow given the pattern of indications
  - Serves as a proxy for diagnostic complexity
- Response execution complexity
  - Assessed as high or low
  - Considers number of steps involved in the action, number of crew members necessary, how many locations must be visited, coordination and communication, how many functions are involved, the accessibility of the location or of tools, etc.
- Timing of cues for the action relative to expected fire suppression time
  - Need to assess on-going fire effects
  - Special cases: fires of turbine generators, outdoor transformers, high energy arcing faults, and flammable gas fires

Assessing Key Conditions & PSFs within the Scoping Flowcharts

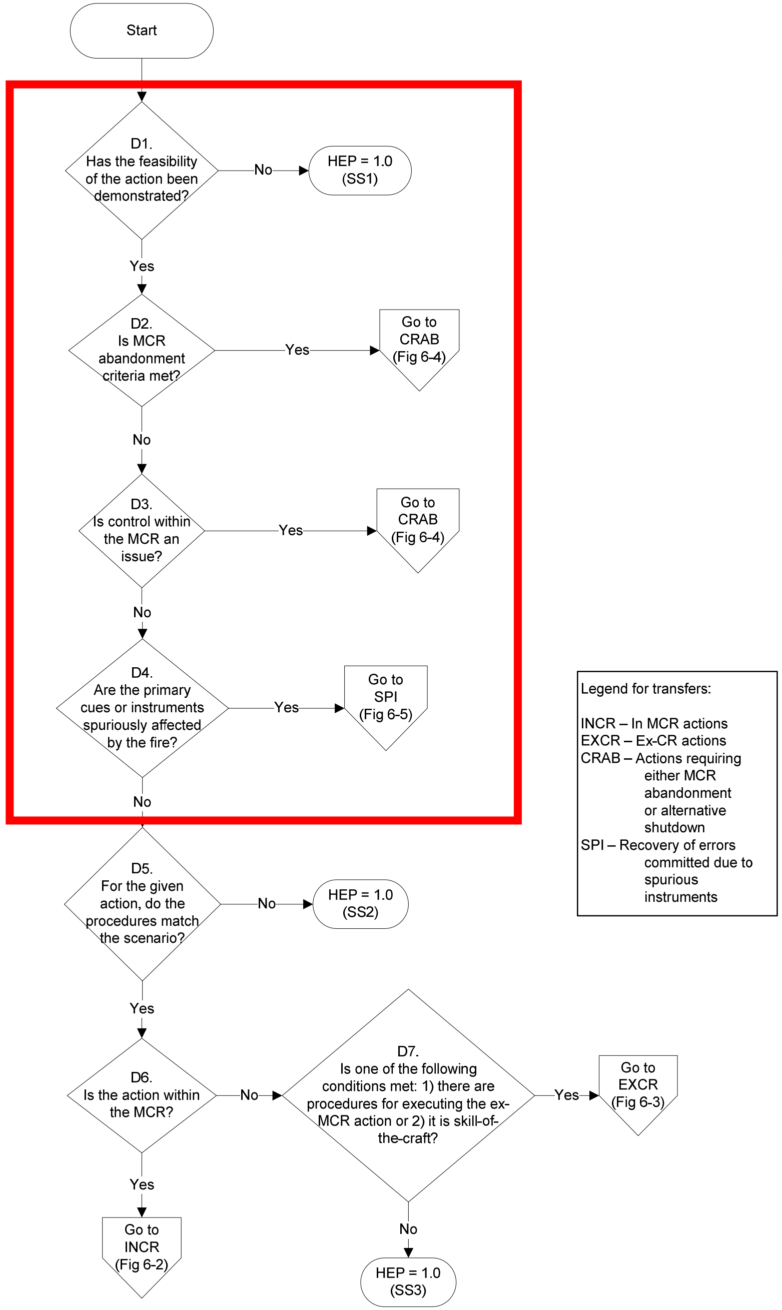
- Action time window
  - Time from the occurrence of the cues for action until the action is no longer beneficial
  - Short time window = 30 minutes or less
  - Long time window = greater than 30 minutes
- Level of smoke and other hazardous elements in the action areas
  - Need for special equipment (e.g., SCBA)
  - Impairment of vision or prevention of the execution of the action
- Accessibility
  - Location of action
  - Travel path

HEP Values

- Base HEP = 1E-3
  - Represents best possible case
  - Conservative value
- Comparison to other methods:
  - SPAR-H
  - ASEP
  - THERP
  - ATHEANA
- HEPs are adjusted within and across flowcharts with multipliers to maintain consistency

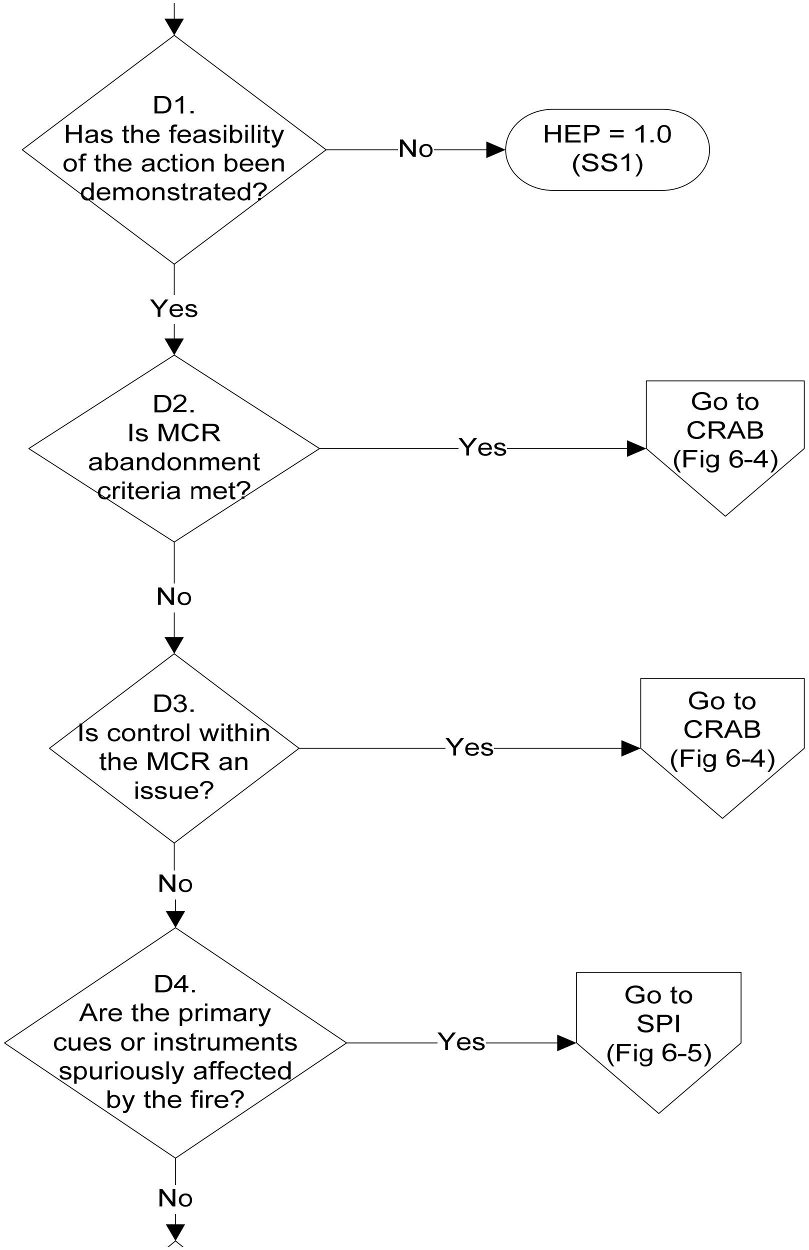
Search Scheme

- Directs analyst to correct quantification flowchart



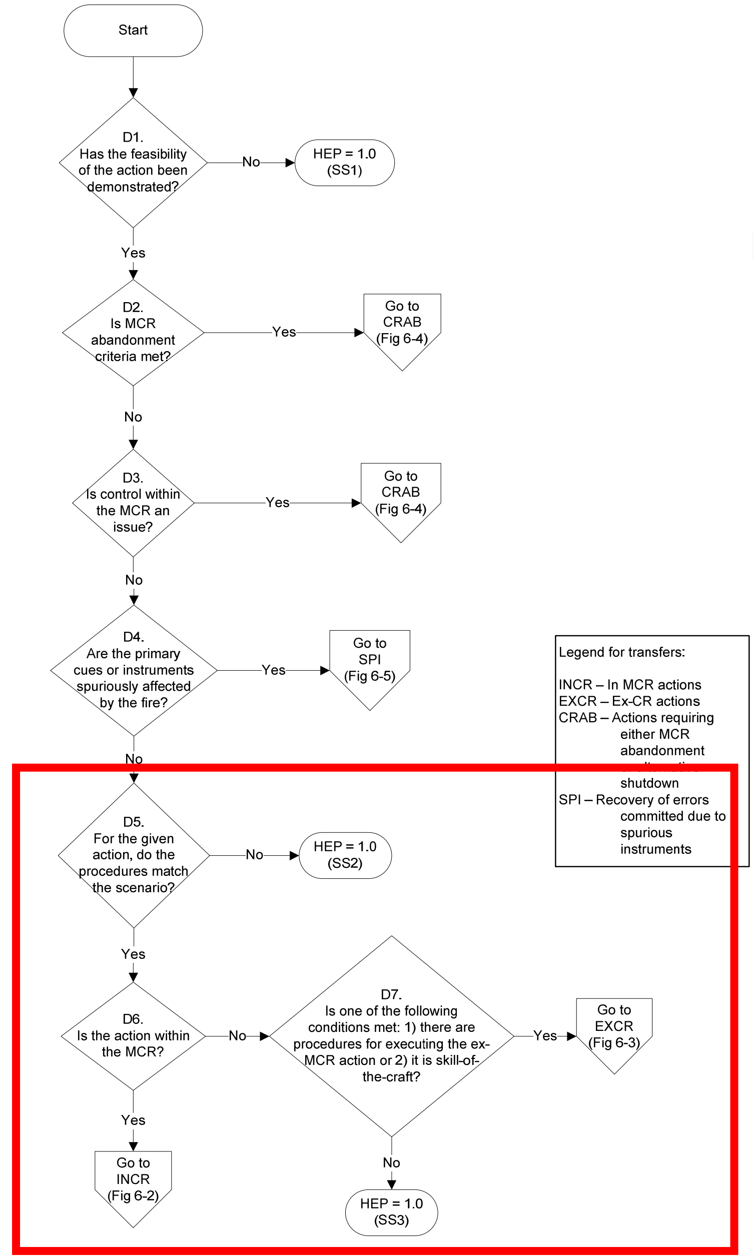
Search Scheme

- **Direct to CRAB or SPI**



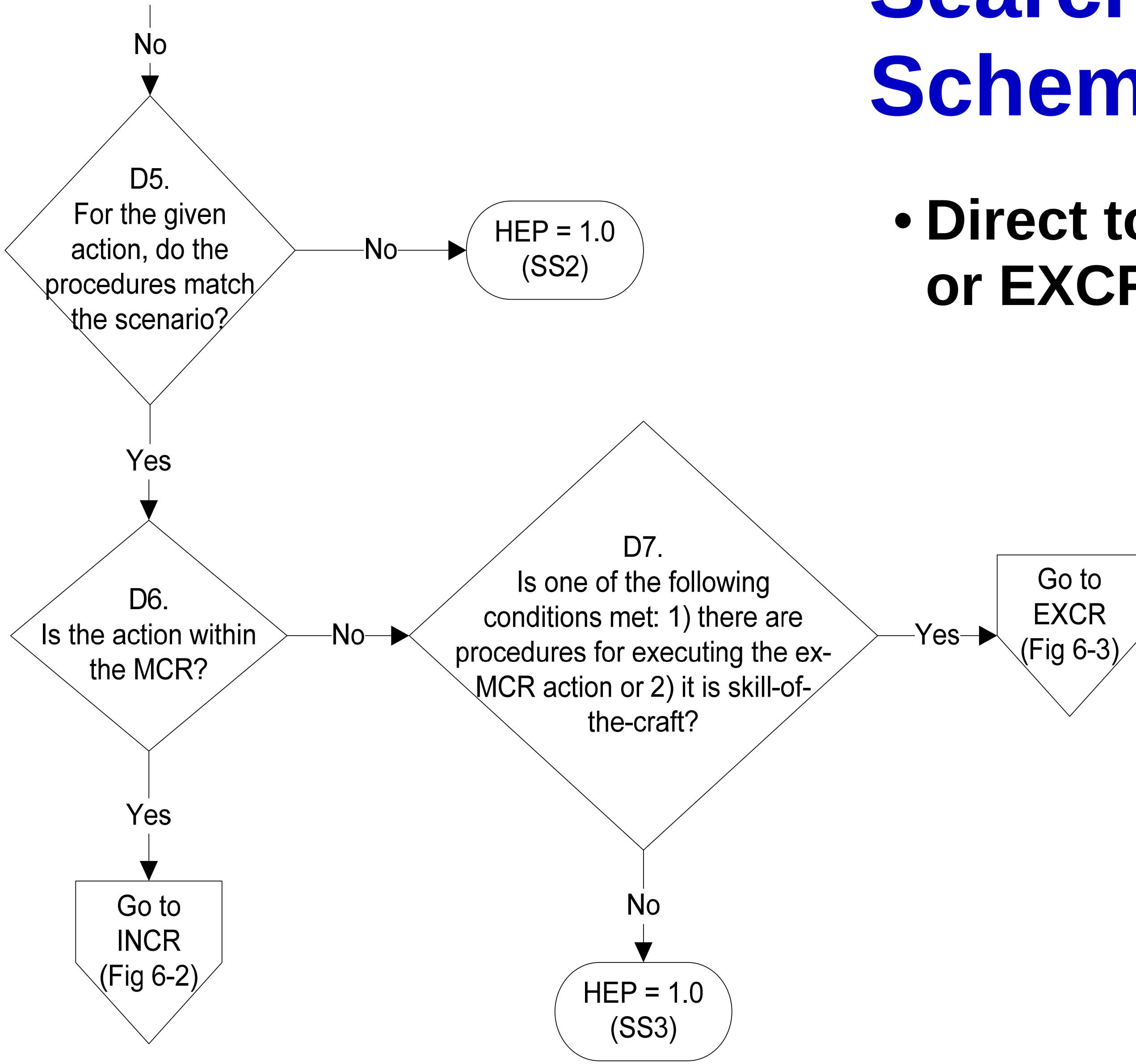
Search Scheme

- **Directs analyst to correct quantification flowchart**



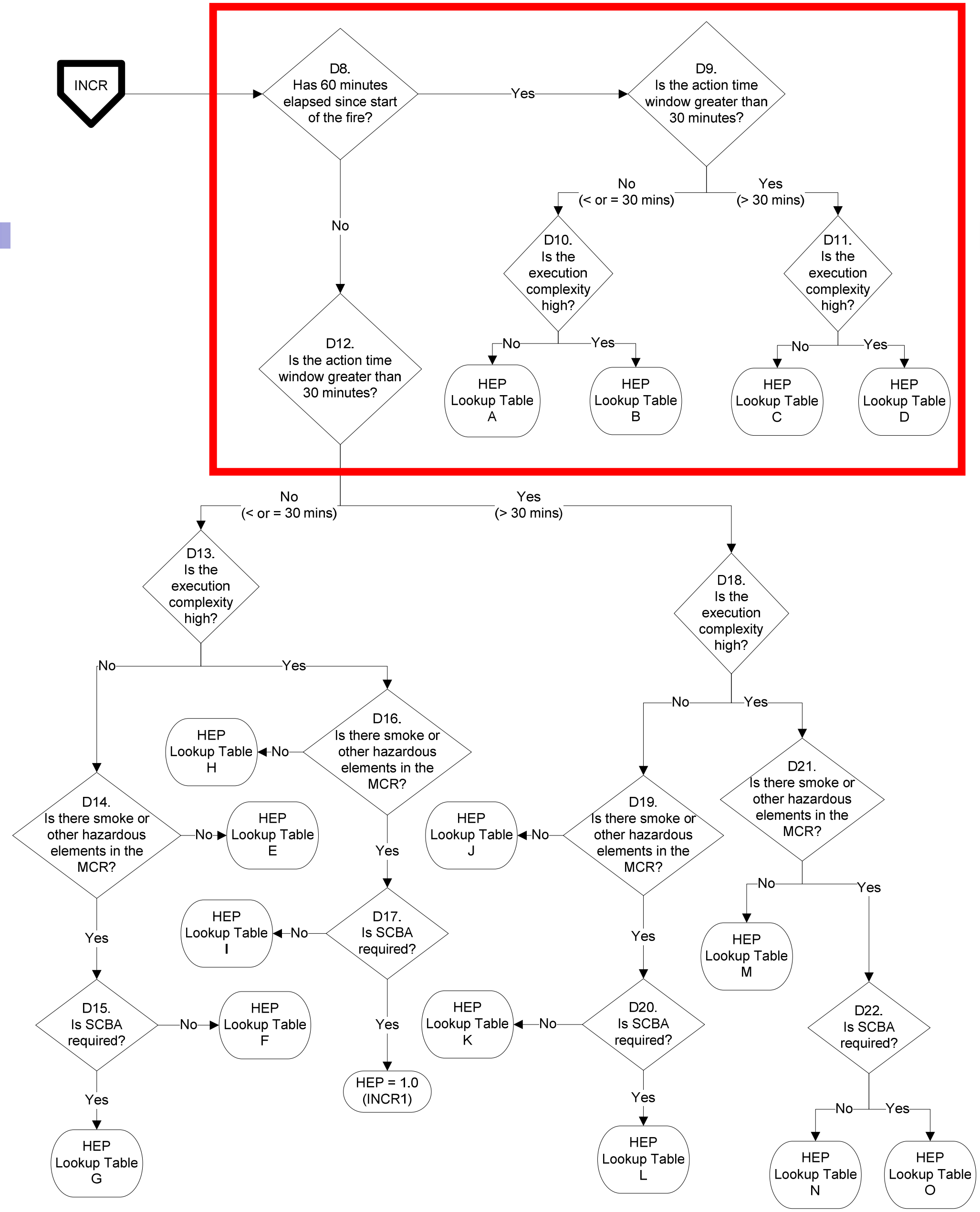
Search Scheme

- **Direct to INCR or EXCR**



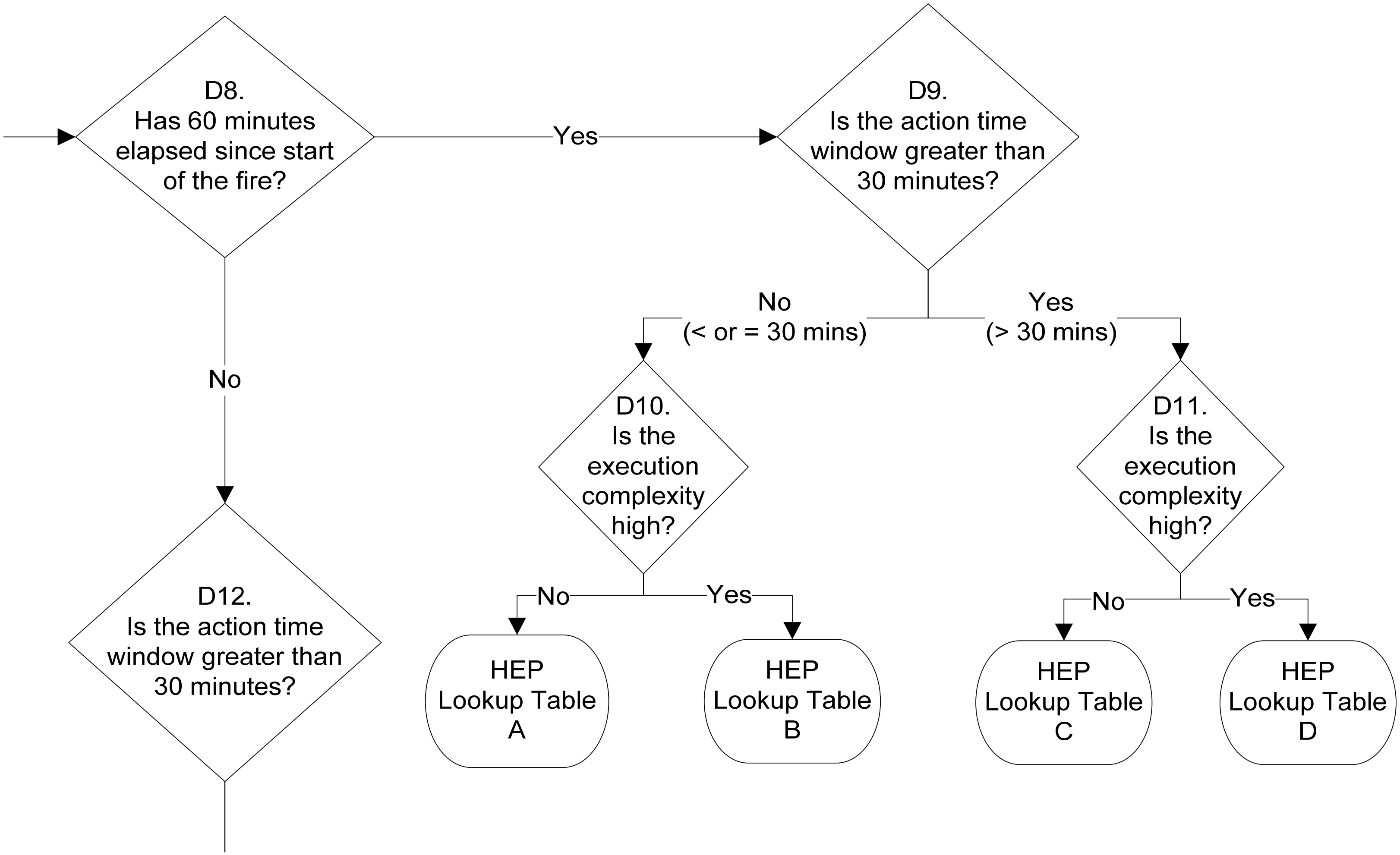
INCR

- Scoping HRA for in MCR Actions



INCR

- 60 minutes since start of fire

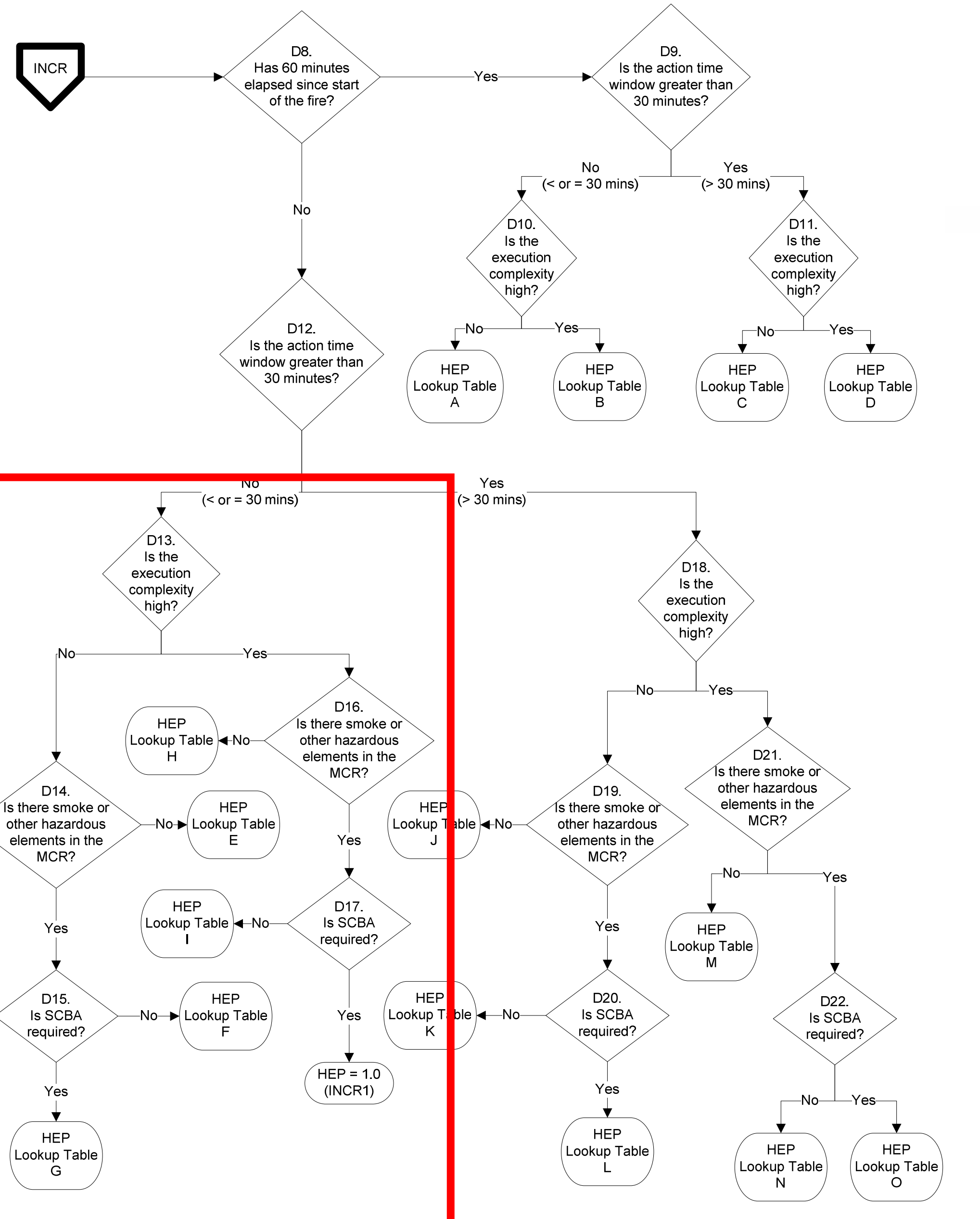


INCR - HEP Lookup Table

HEP Lookup Table	Time Margin	HEP	HEP Label
A	≥ 200%	0.005	INCR2
	100 – 199%	0.025	INCR3
	50 – 99%	0.125	INCR4
	< 50%	1.0	INCR5
B	≥ 200%	0.025	INCR6
	100 – 199%	0.125	INCR7
	50 – 99%	0.625	INCR8
	< 50%	1.0	INCR9
C	≥ 100%	0.001	INCR10
	50 – 99%	0.005	INCR11
	< 50%	1.0	INCR12
D	≥ 200%	0.005	INCR13
	100 – 199%	0.025	INCR14
	50 – 99%	0.125	INCR15
	< 50%	1.0	INCR16

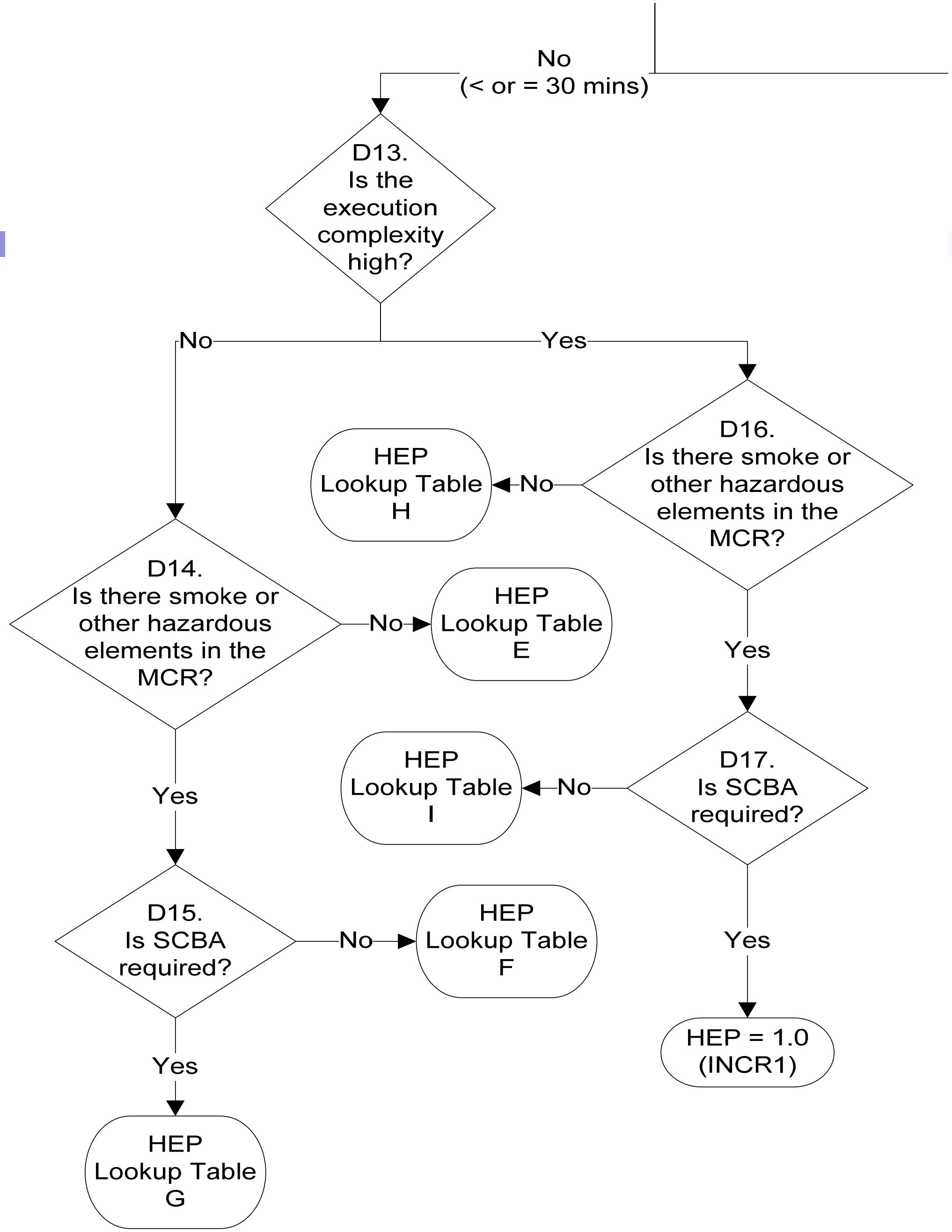
INCR

- Scoping HRA for in MCR Actions



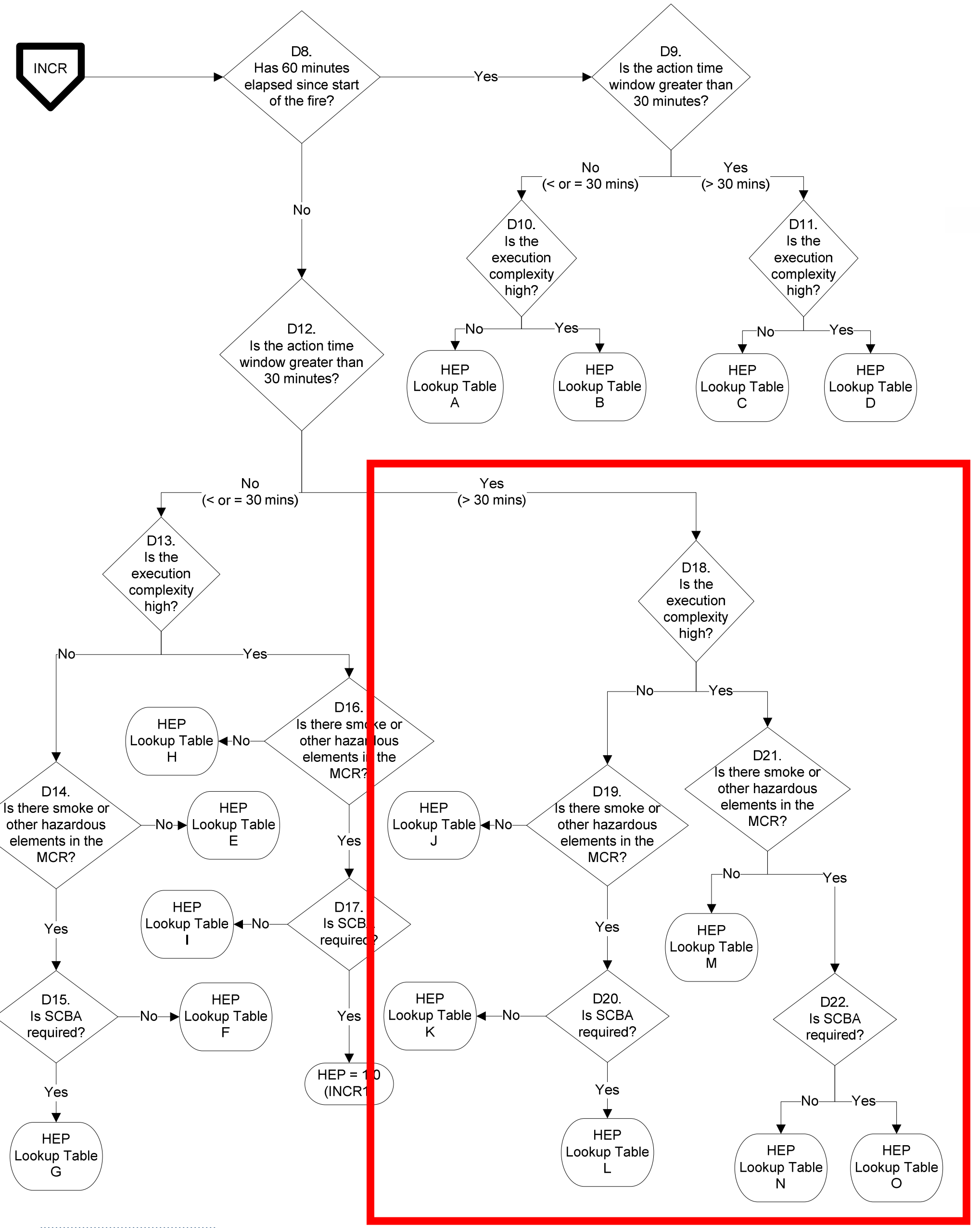
INCR

- Fire on-going
- Short time window



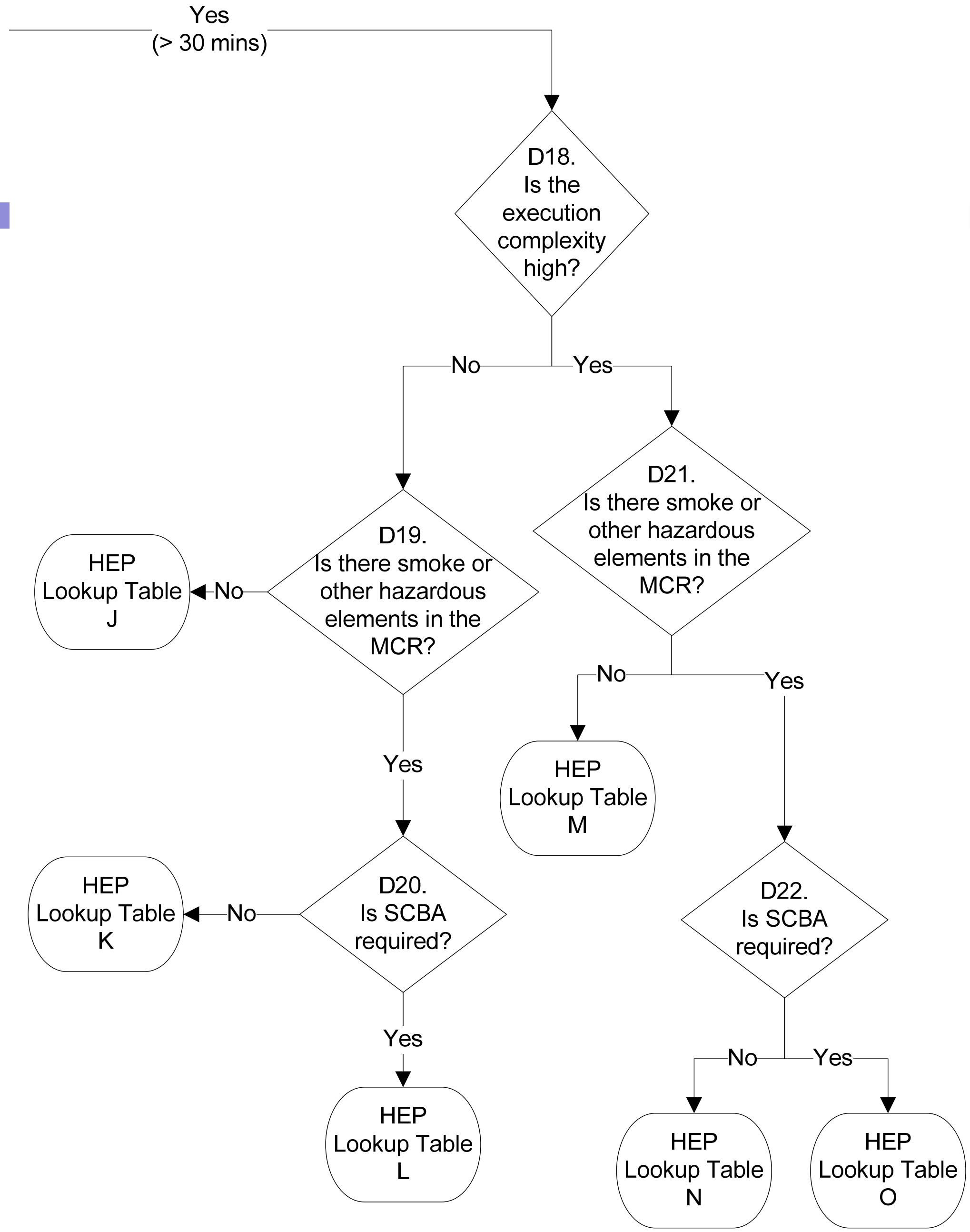
INCR

- Scoping HRA for in MCR Actions



INCR

- Fire on-going
- Long time window



Fire HRA Technical Overview

- **Fire HRA Process:**
  - Identification and Definition - complete
  - Qualitative Analysis - complete
  - Quantification:
    - Screening – complete
    - **Scoping – complete**
    - **Detailed - next**
  - Recovery, Dependency, & Uncertainty

- **Each element described in subsequent presentations**

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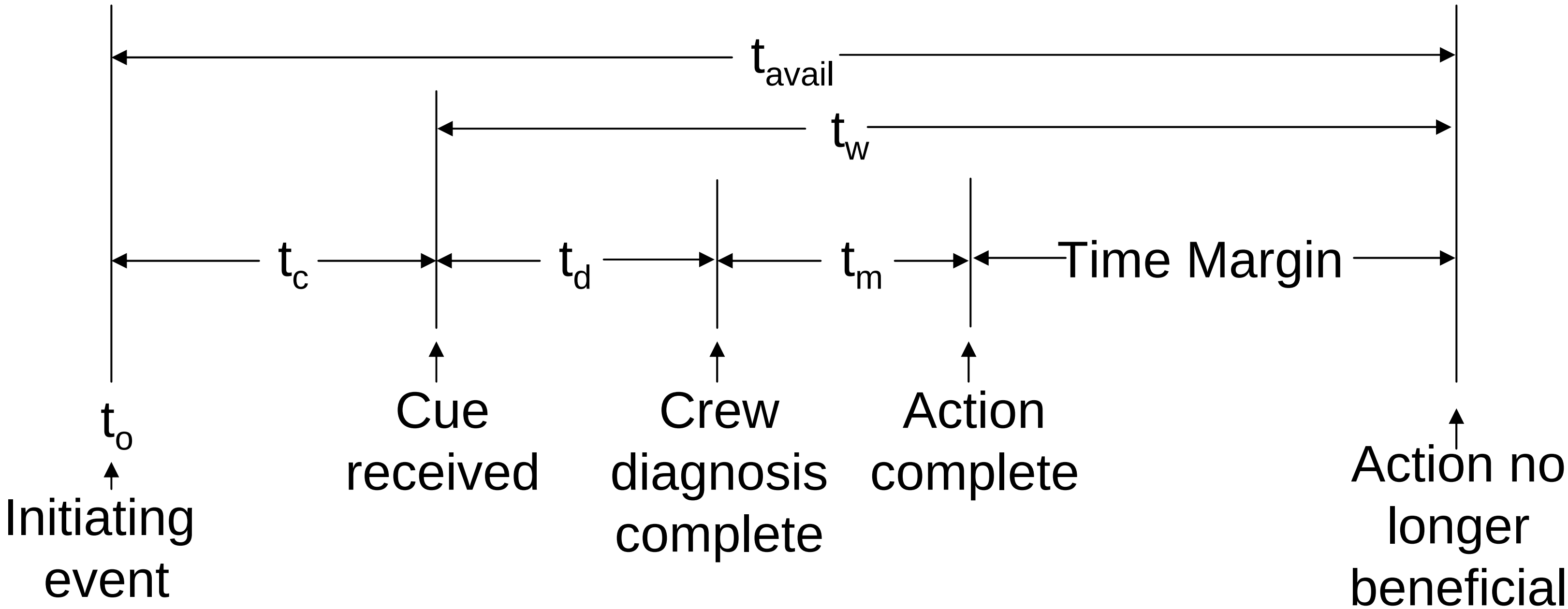
Calculation of Time Margin



$$\text{Time Margin} = \frac{t_w - (t_d + t_m)}{(t_d + t_m)} * 100\%$$

CRAB – MCR Abandonment or Alternative Shutdown

- Application to 2 situations:
  - Uninhabitable environment in MCR
  - Plant monitoring and control extremely difficult from the MCR (unable to control key safe shutdown equipment)
- Additional information needed:
  - Identification of the cues necessary for diagnosis and verification that the instruments supporting these cues are protected from the fire effects
  - Determination of whether the action must take place in the direct vicinity of the fire.
  - Estimated level of smoke in the area

SPI – EOC or EOO Due to Spurious Instrumentation

- Assumes the EOC or EOO has been committed & quantifies the probability that the error would remain uncorrected
- Assume an EOC or EOO if:
  - If the cables are routed through the fire area (Need cable routing information!)
  - If the instrumentation is not required for an Appendix R action, then it can not be assumed to be protected by the electrical raceway fire barrier system
  - A single affected instrument can lead to the action
- Don’t assume an EOC or EOO if:
  - Cables are verified as protected (beyond Appendix R criteria, or verified as protected against direct flame impingement and explosive fires)
  - Operator is suspicious of the equipment or instrument because it may be “suspect” due to location of fire
  - Demonstrated redundancy and diversity

SPI – Recovery of an EOC or EOO

- Recovery prompted by either:
  - Procedural guidance
  - Contextual information or subsequent cues in conjunction with existing procedures
- Recognition for need to recover may be either through:
  - Recognition of an error
  - Recognition of the need for the function
- Recovery possible by:
  - Reversal of the action (EOC)
  - Use of alternative system (EOC)
  - Performance of the necessary action (EOO)

EPRI APPROACH TO QUANTIFICATION FOR FIRE HRA

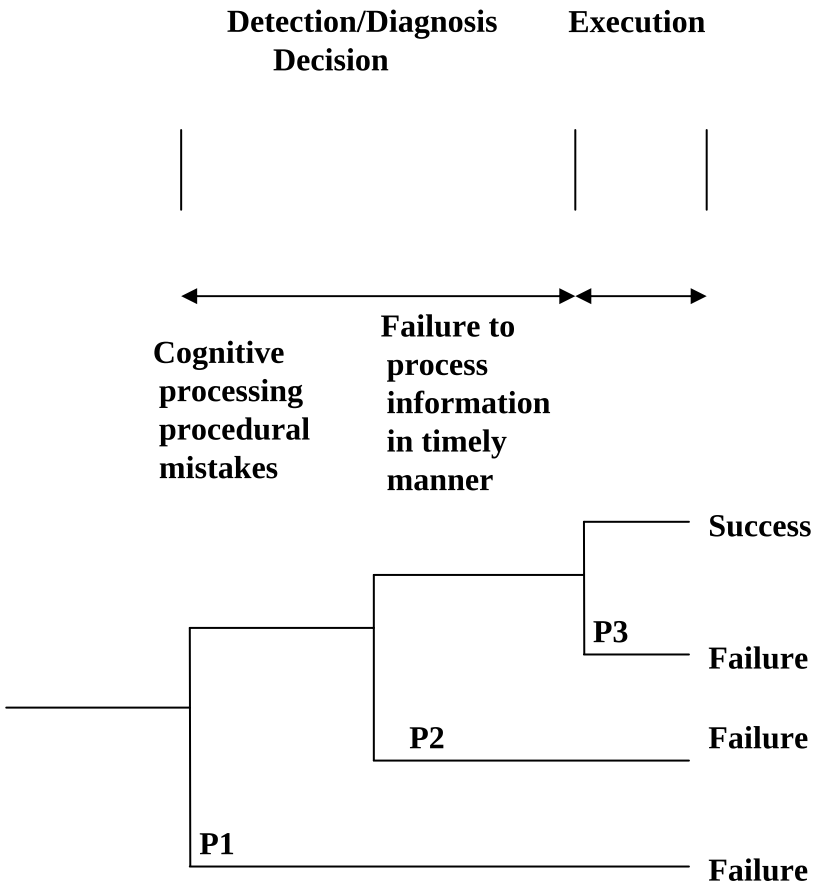
Jan Grobbelaar, EPRI/Scientech

Presented to ACRS Subcommittee on Reliability and PRA
June 1, 2009
Rockville, MD

EPRI Quantification Methods

- **CBDTM (Cause Based Decision Tree Method) –** For cognition
  - Analytical approach based on failure mechanisms & compensating factors
  - Applicable to rule-based behavior, as when procedures are used
  - Two high-level failure modes:
    - Plant information-operator interface failure
    - Operator-procedure interface failure
  - Each failure mode is decomposed into contributions from several distinct failure mechanisms
    - Eight decision trees based on insights from ORE
- **THERP (NUREG/CR-1278) –** For execution
- **HCR/ORE Correlation (Human Cognitive Reliability / Operator Reliability Experiment) –** For time-critical actions
  - Normalized time reliability correlation (function of $\mathbf{T_{available} / T_{required}}$)
  - Empirical method
  - Fitted to successful response times
- Above methods are implemented in EPRI *HRA Calculator*® software

General EPRI Approach to Quantification



P1 is quantified using CBDTM

P2 is quantified using HCR/ORE

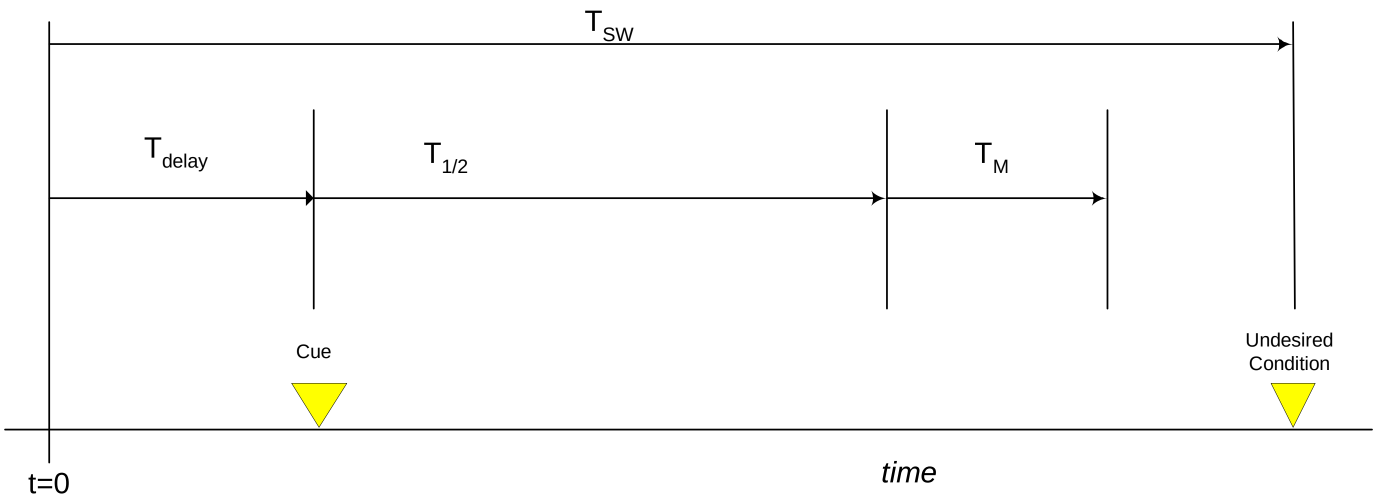
P3 is quantified using THERP

Total HEP = P(P1)+P(P2)+P(P3)

Quantification: Starts with Qualitative Analysis for Internal Events HEPs

- If HFE has been quantified using EPRI HRA approach for internal events, quantification for fire requires re-evaluation in the following areas:
  - Timing
  - Cue and indications
  - Increase in stress
  - Increase in workload
  - Use of multiple procedures
  - Execution performance shaping factors
  - For local actions, consider alternate routes if fire impacts ideal travel path

Fire Impacts on Timing



T_{SW} = System time window (to reach undesirable end state)

T_{delay} = Time when cue is reached may be delayed

$T_{1/2}$ = Response time (for diagnosis) is typically increased

T_m = Manipulation time (for execution) is typically increased

Result is less time available than for internal events cases

Fire Impacts on Timing

- If (time available) < (time required), HEP = 1.0
- If cues and indications are impacted, then variability in crew diagnosis response time is increased to upper bound (95% value) in the HCR/ORE
- If time available for recovery is reduced due to fire impacts, then recovery credit within CBDTM is reduced

Fire Response HFEs

- Same considerations as internal events cases – qualitative analysis then quantification
- Following additional considerations
  - Fire procedures are not standardized like EOPs.
  - Local actions may be more complex or performed in a harsher environment
  - No base case from which to build the analysis, so entire analysis must be developed
- Detailed quantification is conducted using
  - EPRI CBDT & THERP (for all actions)
  - EPRI HCR/ORE & THERP (for time-critical actions)

Fire Response HFEs – MCR Abandonment

- No separate guidance for MCR abandonment
  - MCR could be completely abandoned due to **uninhabitability**; initial results show that frequency is low enough to not be a concern
    - If required, additional decision trees may be developed to model locus of control moving outside the control room
  - MCR could also be abandoned due to **loss of control**
    - Ex control room actions due to loss of control are not substantially different from other local actions (e.g. during SBO)

Quantification of Undesired Operator Responses

- Actions not screened from consideration are initially to be set to 1.0

- EPRI approach is to assume the Undesired Operator Response has occurred, then
  - Identify, define & quantify a recovery action

Fire HRA Technical Overview

- Fire HRA Process:
  - Identification and Definition
  - Qualitative Analysis - complete
  - Quantification:
    - Screening – complete
    - Scoping – complete
    - Detailed:
      - **EPRI - complete**
      - **ATHEANA - next**
  - Recovery, Dependency, & Uncertainty

- Each element described in subsequent presentations

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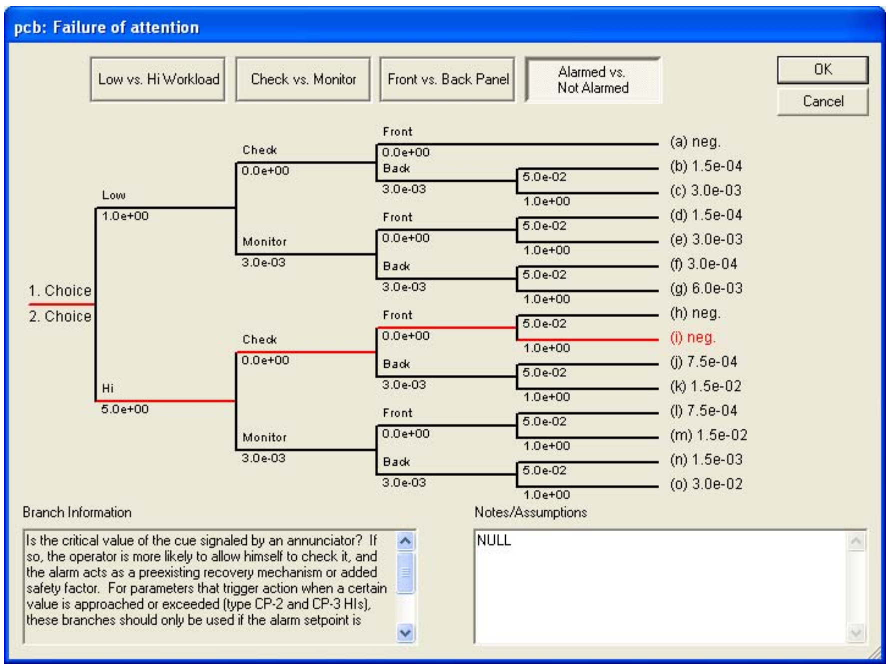
Fire Impacts on Procedure Usage

- If EOPs are implemented in parallel to fire procedures, then multiple procedures are used
- If EOPs are suspended while fire procedures are being used, then only one procedure may be in use and the time delay for performing EOPs is accounted for by adjusting the timeline



Undesired Response to Spurious Indication or Actuation

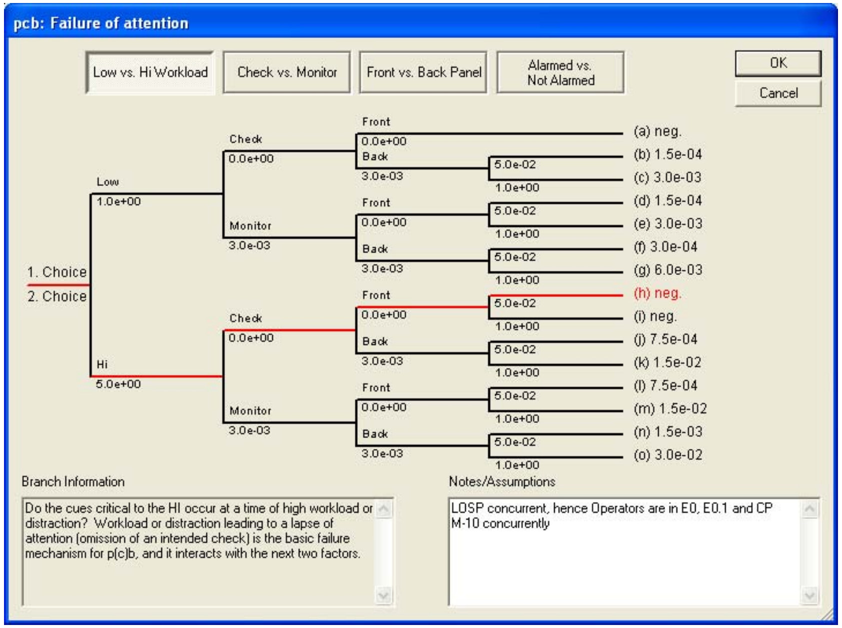
- The following can be screened from consideration during identification:
  - Actions that require multiple spurious indications on different parameters
  - Actions that require multiple spurious indications on redundant channels
  - Actions that have a proceduralized verification step, if verification will be effective given the fire scenario

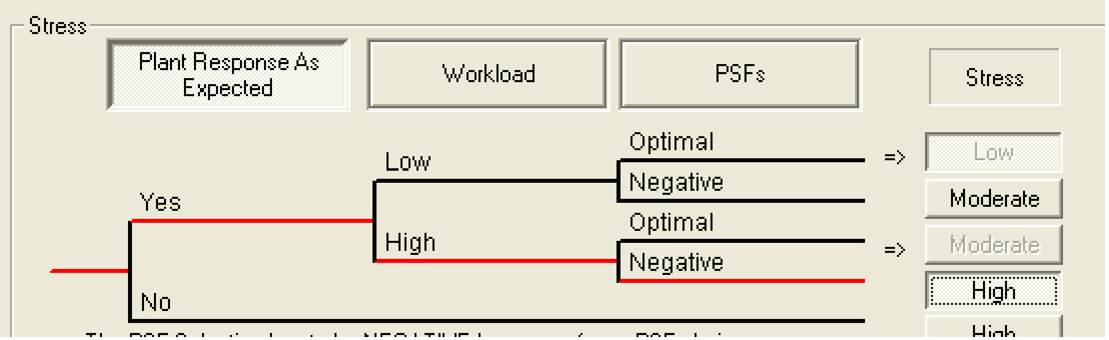
Fire Impacts on Execution

- Stress is increased to high (× 5 multiplier) for internal events cases
  - Except for control room actions when operator actions occurring more than 65 minutes after the fire started, because (1) the average fire is extinguished in 13 minutes and (2) 99% of fires are extinguished within 65 minutes per Appendix P of NUREG/CR-6850
- For local actions, additional factor of 2 (× 10 multiplier) can be applied to account for smoke, communication impacts, or additional equipment required by fire such as SCBA, ladders, keys, etc.
- For control room actions that involve smoke in the control room (requiring SCBA, reduced visibility, heat) an additional factor of 2 (× 10 multiplier) is applied

Fire Impacts on Workload

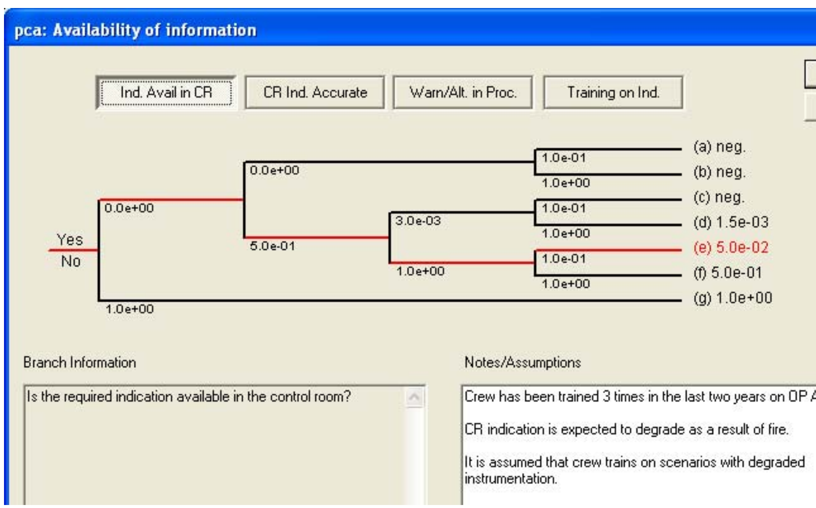
- Increase in workload is
  - modeled explicitly in decision tree Pcb by selecting high workload during diagnosis phase
  - also considered in determining the stress level for execution

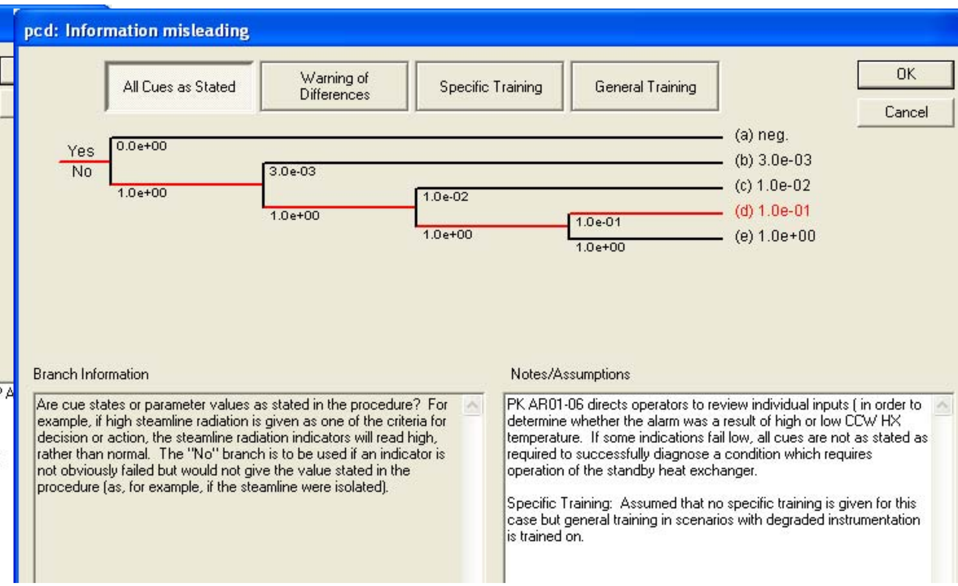




Fire Impacts on Instrumentation

- If all required instrumentation is impacted and there are no diverse cues for diagnosis then HEP =1.0
- Partial instrumentation impacted is modeled in decision tree Pca and Pcd (HEP range 1E-2 – 1.0)





DETAILED FIRE HRA USING ATHEANA

Susan Cooper, USNRC

Presented to ACRS Subcommittee on Reliability and PRA

June 1, 2009
Rockville, MD

ATHEANA is….

- **NUREG-1624, Rev. 1**
  - A knowledge-base for (mostly) at-power, post-initiator HFEs
    - But, different knowledge bases* can be used, substituted, etc.
  - An approach for event analysis

- **NUREG-1880 & NUREG-1624, Rev. 1**
  - An HRA process
  - A search scheme for HFEs (including errors of commission)
  - A quantification approach

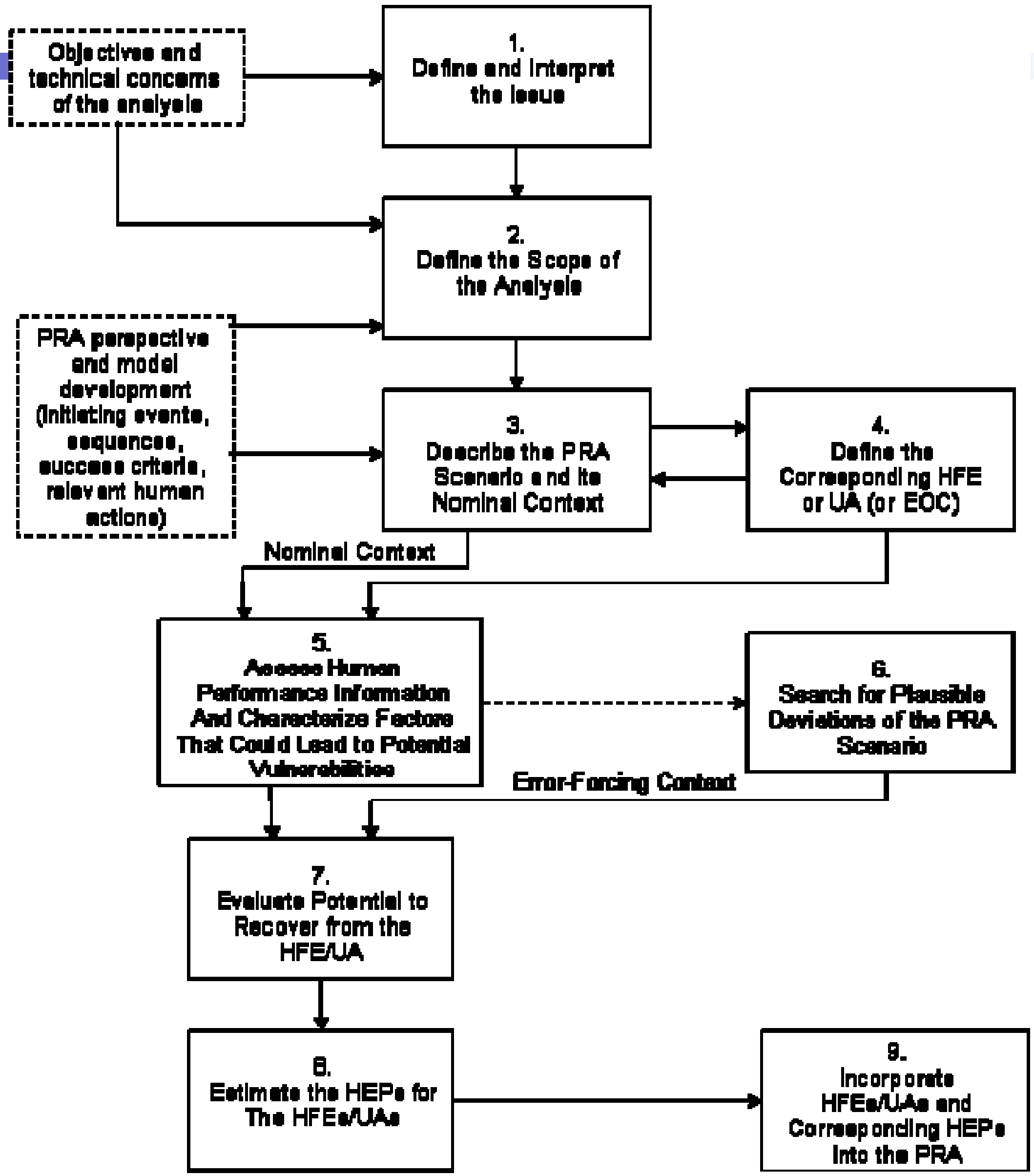
* NUREG/CR-6850 and supporting documents provide needed adjustments for a fire-specific knowledge-base

Mapping ATHEANA process steps to Fire HRA process

<u>ATHEANA Process Step</u>	**<u>Fire HRA Guidelines Process Step</u>**
• Steps 1 & 2: Define issue & scope of analysis	• Defined by fire PRA & its scope of analysis – ***no additional work needed***
• Step 4: Define HFEs and unsafe actions (UAs)	• ***Covered**** by Chapter 3: Identification and Definition
• Steps 3 & 5: Describe PRA scenario & assess human performance information, etc.	• Some additional information needed for detailed HRA; but, ***mostly covered*** by Chapter 4: Qualitative Analysis
• Step 6: Search for deviation scenarios	• ***Not needed***; fire scenarios are already "deviations"
• Step 7: Assess potential for recovery	• Similar to Chapter 6: Recovery
• Step 8: Quantification (explicitly addresses dependencies & develops uncertainty distributions)	• Different approach than scoping trees (Chapter 5) or CBDT (Appendix C); different approach to dependency & uncertainty (Chapters 7 & 8)

* The need for redefining or identifying new HFEs can always come up during qualitative analysis & quantification.

Steps in the ATHEANA Process



Objectives of ATHEANA qualitative analysis

- **(If needed) Determine the possible courses of operator action for a given scenario**
- **Determine "why" operators choose different courses of action for a given scenario**

Result: "Operational story (or stories)" that explain what courses of actions and why operators choose them for a given scenario (that result in "failure," as defined by the PRA)

Examples of Additional Qualitative Analysis to Support ATHEANA

- Identify important decision points or branching, and other possible places in procedures where operators may make different choices
- Identify any tradeoffs (e.g., operators have to make impromptu choices between alternatives) or other difficult decisions that operators may need to make
- Identify potential situations where operators may not understand the actual plant conditions (e.g., spurious indications)

ATHEANA quantification: Ask the experts two questions

1. **Does the operational story make sense?**
   - given the specific PRA scenario or sub-scenario
   - given what is known about operators & operations at this plant

2. **What is the likelihood that operators will fail as described in the operational story?**

ATHEANA uses a very structured, facilitator led, expert opinion elicitation process:

- NUREG-1880 provides guidance on forming the expert team, controlling biases, addressing uncertainty, etc.
- leads to consensus distributions of operator failure probabilities

Fire HRA Technical Overview

- **Fire HRA Process:**
  - Identification and Definition
  - Qualitative Analysis - complete
  - Quantification:
    - Screening – complete
    - Scoping – complete
    - Detailed:
      - EPRI - complete
      - **ATHEANA - complete**
  - **Recovery, Dependency, & Uncertainty - next**

- **Each element described in subsequent presentations**

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RECOVERY, DEPENDENCY AND UNCERTAINTY ANALYSIS

Bill Hannaman, SAIC

Presented to ACRS Subcommittee on Reliability and PRA
June 1, 2009
Rockville, MD

Recovery, Dependency & Uncertainty Analyses

Objectives

- Fire HRA process addresses recovery, dependency and uncertainty analysis
  - Recovery
    - ASME standard permits modeling of recovery actions that have cues, provided operators know what to do through procedure or training/skill, and are feasible.
  - Dependency evaluation
    - ASME standard requires that multiple human actions in an accident sequence or cutset be identified, degree of dependency assessed, and a joint HEP calculated.
  - Uncertainty analysis
    - ASME Standard supports development of a representation of confidence in state of knowledge about parameter values and models used in constructing PRA

Fire HRA - Recovery Analysis

Analysis Process

- Steps:
  - Same fundamental steps
  - Identify and Define recovery of function, system, or component from faulted condition or an error
  - Qualitative analysis of Performance Shaping Factors
  - Quantify
    - Approach changes for Screening, Scoping & Detailed

Fire HRA - Recovery Analysis (cont'd)

Analysis Process

- Identify requirements that should be met before crediting recovery actions in Fire HRA
  - From risk contributing cutset review identify need for additional recovery actions
  - From procedures, talk- through with operators or training personnel identify potential new & previously identified recovery actions that apply
  - Initial HFEs incorporated into the internal events PRA model contain recovery actions
    - New recovery actions needed for a realistic evaluation of overall fire risk in developing Fire PRA model (7b and/or Task 11 of NUREG/CR-6850)
- Assess feasibility of recovery action identified (as part of definition)
- Qualitative analysis of performance shaping factors
- Quantification:
  - Screening rules and criteria from 6850
  - Scoping analysis logic provided in diagrams
  - Detailed applications (EPRI or ATHEANA method for complex situations)

Fire HRA - Dependency Analysis
Evaluation Process

- Steps for fire HRA dependency evaluation within fire scenario
  - Identify combinations of multiple operator actions in fire scenario
  - Evaluate dependencies within scenario considering fire PSFs
  - Incorporate dependency evaluation into Fire PRA model

- Joint HEP calculation for Fire PRA
  - Perform preliminary dependency analysis during detailed fire modeling (Task 11 in NUREG/CR-6850)
  - Finalize dependency during fire risk quantification (Task 14 in NUREG/CR-6850)

Fire HRA – Dependencies

Considerations for assigning dependence level

- Assess degree of dependence between multiple HFEs performed in each fire scenario/sequence
  - Select cutset(s) where two or more fire response HFEs are performed
    - both initial HEPs and non-recoveries are multiplied in cutset
  - Consider influences of fire scenario on success or failure of parallel and subsequent human actions and system performance included in PSF evaluation (ASME Standard, criteria HR-F2 requirement B):
    - Verify time required to complete all actions is within time available
    - Consider factors that could lead to dependence (e.g., common instrumentation, common procedures, and increased stress)
    - Verify availability of resources (e.g., crew members, other plant personnel to support ex-control room actions)
  - Assign a dependency level bin
    - Such as - complete, high, medium, low, zero using THERP
    - Use expert judgment according to ATHEANA.

Fire HRA – Dependencies

Quantitative Analysis

- Quantify Joint HEP dependence for fire HRA
  - Apply appropriate dependency formula in Table 10-2 in THERP
  - Use appropriately documented expert judgment (as described in NUREG-1880) if ATHEANA is being used to quantify actions and HFE dependencies.
- Incorporate human interaction dependency values into PRA model
  - Fire HRA dependency analysis includes Screening HFEs, Scoping HFEs, and Detailed HFEs
  - Treat scoping HEPs, same as best estimate HEPs.
  - All human actions in cutset must be viable with an adequate time margin given dependent fire effects.

Fire HRA – Uncertainty
Analysis

- Fire HRA uncertainties addressed in same manner as internal events HRA.
- In fire HRA, key assumptions may include timing or selections of performance shaping factors, and control room abandonment decisions
- References for internal events HRA uncertainty also apply to fire HRA.

1. EPRI 1009652, "Guideline For Treatment of Uncertainty In Risk-Informed Applications," December 2005.
2. NUREG-1855, "Guidance On Treatment of Uncertainties Associated with PRAs in Risk Informed Decision Making," (DRAFT), November 2007
3. NUREG/CR-1278, "Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications," (THERP) Swain, A.D. and Guttmann, H. E., August 1983.
4. NUREG-1792, "Good Practices for Implementing Human Reliability Analysis (HRA)," Sandia National Laboratories, 2005.
5. ASME PRA-S-2000, "Standard for PRA for Nuclear Power Plant Applications", Rev 14A, May 11, 2001 supplemented by ASME RA-Sa-2003, "Addenda to Standard For Probabilistic Risk Assessment For Nuclear Power Plant Applications", December 5, 2003, supplemented by ASME RA-Sb-2005, "Addenda to Standard For Probabilistic Risk Assessment For Nuclear Power Plant Applications", December 2005, all by American Society of Mechanical Engineers.

Fire HRA Technical Overview

- Fire HRA Process:
  - Identification and Definition
  - Qualitative Analysis - complete
  - Quantification:
    - Screening – complete
    - Scoping – complete
    - Detailed:
      - EPRI - complete
      - ATHEANA - complete
  - **Recovery, Dependency, & Uncertainty - complete**

Fire HRA Guidelines: Status

- Started March 5, 2007
- First integrated draft May 2008
- *Peer review in June 2008*
- *Testing at 2 plants in Summer/Fall 2008*
- Revised draft in April 2009
- *Quick review by NRR & NRO – April 2009*
- *ACRS sub-committee presentation for information - now*
- Public comment period & return to peer reviewers - Summer 2009
- *Piloting by PWR Owner's Group – Summer 2009*
- *Joint EPRI/NRC-RES Fire PRA Course - (for information only) June/October 2009*
- *ACRS sub-committee presentation – October 2009*
- Publication of final report - early 2010

Steven A. Laur, PE

Senior Technical Advisor, Risk-Informed Initiatives

Division of Risk Assessment

Office of Nuclear Reactor Regulation

NFPA 805 SRP and Regulatory Guide

ACRS Subcommittee

June 1, 2009

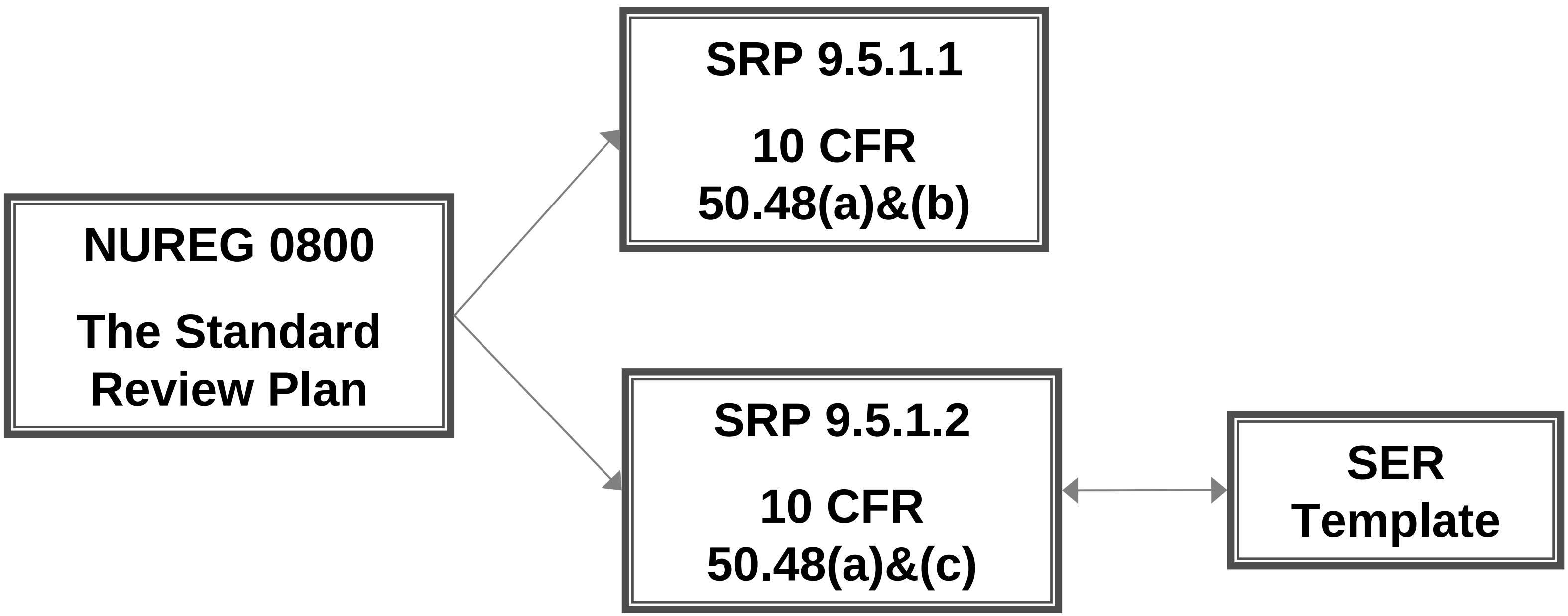
Briefing Objective

- Explain the proposed changes to RG 1.205, “Risk-Informed, Performance-Based Fire Protection For Existing Light-Water Nuclear Power Plants”
- Present new SRP 9.5.1.2 table of contents
- Foster ACRS understanding

Discussion Topics

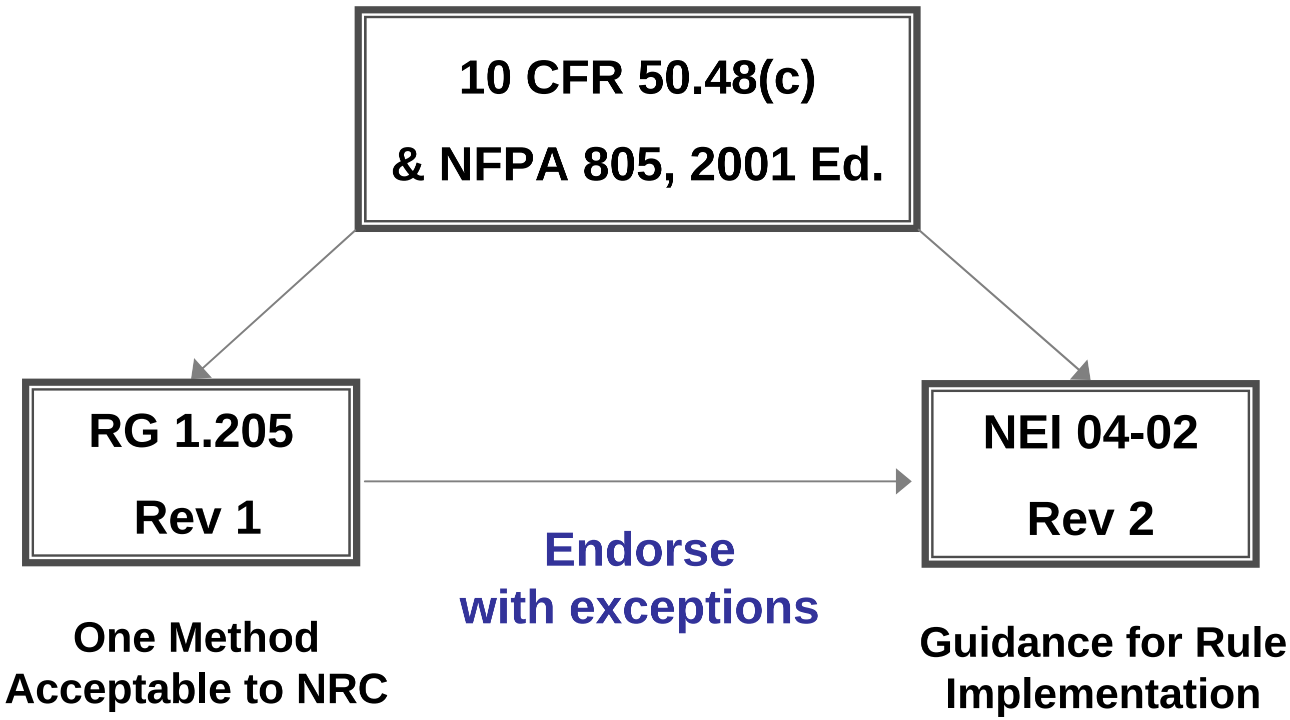
- SRP and RG Framework
- Drivers for revising RG 1.205
- RG 1.205 Table of Contents
- Detailed presentation of key changes to RG 1.205 Section C – Regulatory Position
- SRP 9.5.1.2 – guidance consistent with DG-1218
- Questions

Standard Review Plan Framework



SRP 9.5.1.2: "Risk-informed, Performance-based Fire Protection Program"

RG 1.205 Revision 1 Framework



DG-1218: "Risk-informed, Performance-based Fire Protection Program for Existing Light-water Nuclear Power Plants"

Drivers for Guidance Revisions

- Endorsement of Revision 2 to NEI 04-02
- Integrating the Resolved FAQ Issues
- Integrating Lessons Learned from:
  - Pilot Plant Observation Visits
  - Pilot Plant Fire PRA Reviews
  - Pilot Plant LAR Reviews, including site audits

RG 1.205 Contents

A. INTRODUCTION

B. DISCUSSION

C. REGULATORY POSITION

1. NEI 04-02
2. License Transition Process
3. NFPA 805 Fire Protection Program
4. NFPA 805 Analytical Methods and Tools

D. IMPLEMENTATION

REGULATORY ANALYSIS

BACKFIT ANALYSIS

REFERENCES

GLOSSARY

DG-1218 Key Changes
Section C – Regulatory Position (1)

§	Content	Key Change
1.	Endorsement of NEI 04-02 with exceptions.	Explicitly presents exceptions and clarifications.
2.2	License amendment request content.	Notes that NEI 04-02 guidance may not be complete; moves this to new section 1.2, "exceptions and clarifications."
	Performance-based methods for Chapter 3 requirements – 10 CFR 50.48(c)(2)(vii).	(new section 2.2.2 from original 2.2 and 3.2.2) – Separated the two major rule sections.
	Risk-informed, performance-based alternatives to NFPA 805 – 10 CFR 50.48(c)(4).	(new section 2.2.3 from original 2.2 and 3.2.2) – Separated the two major rule sections.

DG-1218 Key Changes
Section C – Regulatory Position (2)

§	Content	Key Change
2.2	Risk evaluations that should be performed.	Created section 2.2.4 for this information. Revised to address risk assessments required by NFPA 805. Explicitly says that LERF as well as CDF be provided.
-	N/A	Created section 2.2.5, "non-power operational modes."
-	N/A	Created section 2.2.6, "radioactive release transition."

DG-1218 Key Changes
Section C – Regulatory Position (3)

§	Content	Key Change
2.3	Existing Engineering Equivalency Evaluations (EEEEs).	Created section 2.3.1 to discuss previously approved alternatives to NFPA 805 Chapter 3 requirements.
		Created section 2.3.2 for EEEEs; section 2.2.7 of NFPA 805.
		Added that recovery actions must be evaluated using performance-based methods, whether or not previously approved by NRC.
	Operator manual actions and recovery actions.	Created section 2.4 to provide better guidance regarding recovery actions. Added discussion of "primary control station."

DG-1218 Key Changes
Section C – Regulatory Position (4)

§	Content	Key Change
3.1	Standard license condition.	Self-approval allowed only for CDF increases no more than 1E-7 /yr (1E-8 for LERF).
		Methods must be approved by NRC.
		Added performance-based changes to Chapter 3 requirements.
		Will list items required for implementation (modifications; compensatory measures).

RG 1.205 Self-Approval Risk Informed

$\triangle$CDF	April 2006 Version	Proposed Rev. 1	$\triangle$LERF
10^{-6}/yr	Submit summary description of change to the NRC (risk, defense-in-depth, safety margins) Unless NRC objects within 90 days, implement change	Prior NRC review and approval is required	10^{-7}/yr
10^{-7}/yr	Prior NRC review and approval is not required Maintain defense-in-depth and safety margins	Same. Low risk acceptance criteria provides reasonable assurance that cumulative risk is acceptable.	10^{-8}/yr

DG-1218 Key Changes
Section C – Regulatory Position (5)

§	Content	Key Change
3.2.4	NRC approval required for certain fire protection program changes.	(new 3.2.3) Added combined changes where any part would exceed the risk increase allowed in the license condition.
3.2.6	Cumulative risk of changes.	(new 3.2.5) Included both cumulative risk and combined changes, as these are discussed in NFPA 805 2.4.4.1.
4.2	Fire models.	Added ASTM E1355-05a for licensees to use for V&V of fire models.
4.3	Fire PRA.	Use RG 1.200 revision 2. Perform peer review. NUREG/CR-6850 acceptable for fire PRA.

SRP 9.5.1.2

Guidance to NRC staff is consistent with DG-1218

Follows general SRP format:

I. AREAS OF REVIEW

II. ACCEPTANCE CRITERIA

III. REVIEW PROCEDURE

IV. EVALUATION FINDINGS

V. IMPLEMENTATION

VI. REFERENCES

Includes Attachment 1 – RI/PB FPP LAR Acceptance Review Matrix

SRP III. REVIEW PROCEDURE

1. PROGRAMMATIC REVIEW OF LICENSE AMENDMENT REQUEST
2. FUNDAMENTAL FIRE PROTECTION PROGRAM ELEMENTS AND MINIMUM DESIGN REQUIREMENTS
3. NUCLEAR SAFETY PERFORMANCE CRITERIA
4. RADIOACTIVE RELEASE PERFORMANCE CRITERIA
5. RISK ASSESSMENTS AND PLANT CHANGE EVALUATIONS
6. MONITORING PROGRAM
7. PROGRAM DOCUMENTATION, CONFIGURATION CONTROL, AND QUALITY ASSURANCE

Questions?

Margaret Stambaugh
Engineer
PRA Licensing Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

NFPA 805 Guidance Document Feedback

ACRS Subcommittee
June 1, 2009

Briefing Objectives

- Present public feedback on DG-1218 and SRP 9.5.1.2, to date
- Present the schedule for completing the NFPA 805 guidance documents
- Obtain ACRS views

Topical Areas

- Probabilistic Risk Assessment (PRA) Methods
  - For the base PRA
  - For the self-approval process
- Recovery Actions
  - Previous approval
  - Definition and treatment

Preliminary feedback is based on discussions at public meetings on April 21, 22, 23, 29, and May 7, 2009.

Base PRA Methods

Early Feedback

- *Typically, a NRC review of a license amendment request (LAR) that involves a PRA focuses on the application of the base PRA to a proposed plant change. NFPA 805 states that the PRA approach, methods and data shall be acceptable to the AHJ.** ***Will the NRC need to review a licensee's base PRA methods?***

* AHJ: Authority Having Jurisdiction

Base PRA Methods

Early Feedback

- ***In future, would a licensee violate their licensing basis by employing a new method in their base PRA without NRC approval?***

Self-Approval Process

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Early Feedback

- ***What information needs to be in a license amendment request to enable self-approval?***

Self-Approval Process

Early Feedback

- *In the long term, a licensee may wish to make a wide range of low-risk plant changes through the self-approval process. Yet the methods used to evaluate the risk of the plant change must be acceptable to the AHJ.* ***Can flexibility be built into the program to enable self-approval using novel PRA application methods?***

Prior Approvals

Early Feedback

- ***When does a previously approved Appendix R exemption satisfy the requirements of NFPA 805?***
- *Some licensees have approved exemptions to their Appendix R license which involve operator manual actions.* ***How should those previous approvals be transitioned into the NFPA 805 licensing basis?***

Recovery Actions

Early Feedback

- *Section 4.2.4.2 states that evaluating plant risk requires comparing "the risk associated with implementation of the deterministic requirements with the proposed alternative to deterministic requirements."* ***How should a performance-based risk evaluation be performed for plants which are not purely deterministically compliant?***
- ***Should the evaluation be different for the transition process than for post-transition plant changes?***

Recovery Actions

Early Feedback

- *Too broad of a definition of "primary control station" may cause a licensee to classify many operator actions as recovery actions.* ***What guidance is available to treat recovery actions for which a quantitative risk assessment is very challenging or involves a great deal of uncertainty?***

RG and SRP Schedule

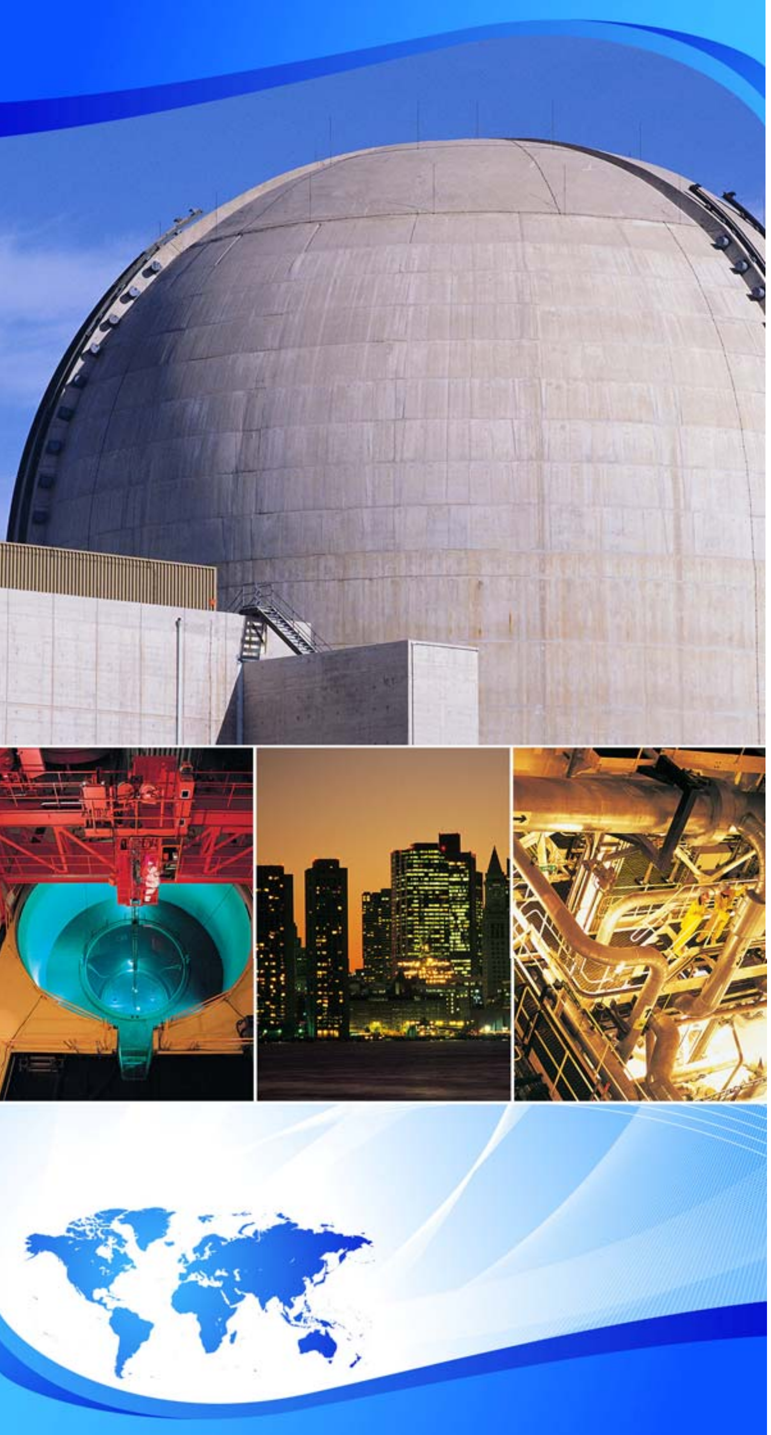
- Out for public comment
  - SRP: February 5, 2009
  - RG: March 25, 2009

Comment Periods Closed:

- SRP & RG: May 22, 2009

- ACRS Subcommittee Briefings in June and July
- ACRS Full Committee tentatively scheduled for September, 2009
- Estimate final SRP and RG by 12/2009

Questions?



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Fire PRA and NFPA 805

ACRS Meeting
June 2009

Ken Canavan
Senior Program Manager
Risk and Safety Management

Fire PRA and NFPA Issues

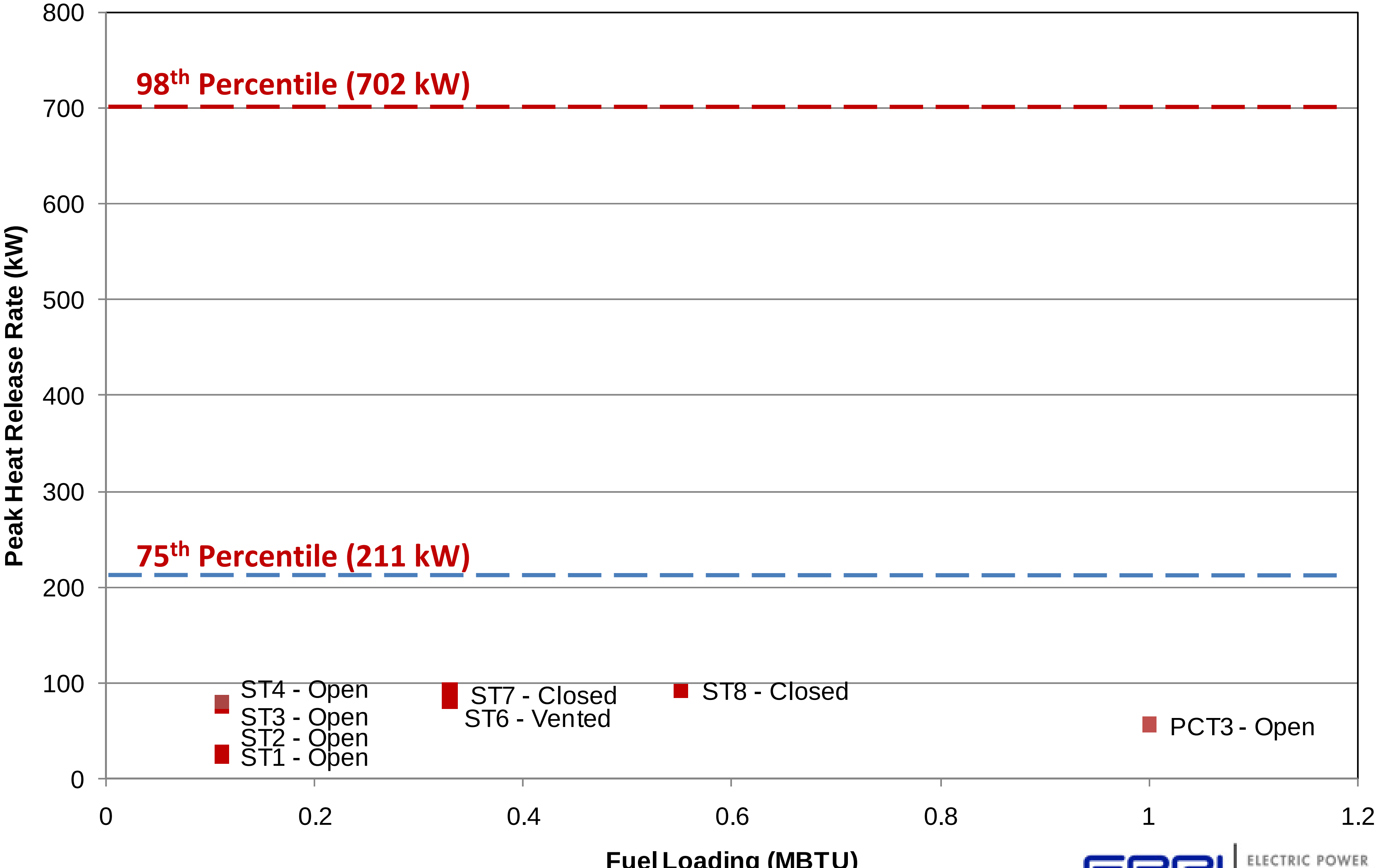
- NUREG/CR-6850 Fire PRA Method Conservatism
  - Recent pilots results do not comport with industry fire experience
  - Method and data enhancements remain conservative or unresolved
- Impact – Gross Overestimation of Fire Risk
  - Mask other risk contributors
  - Model and results un-usable for applications
- Draft RG 1.205 (DG 1218) Prescribes Use of
  - Conservative methods of NUREG/CR-6850
  - Deviations from NUREG/CR-6850 require NRC acceptance

One Example … of many

- Electrical Cabinet Ignition Frequency (6850 Prediction)
  - Generic ignition frequency for electrical cabinets - 4.5E-02/yr
  - Equivalent to ~5 fires per year across industry
  - Grow to peak Heat Release Rate (HRR) in 12 minutes
  - Probability of non-suppression prior to 12 minutes = ~0.8 (assuming 10 minute brigade response)
  - ~4 fully developed electrical cabinet fires are predicted per year
  - ***Does not comport with experience (~ 0 per year fully developed electrical cabinet fires – all are suppressed)***

- Electrical Cabinet Peak HRR Perspective:
  - 75^{th}% = 211 kW (roughly equivalent to 1 sq ft of gasoline)
  - 98^{th}% = 702 kW (roughly equivalent to 2 ft pool of gasoline)

Vertical Cabinet Test Results (NUREG/CR-4527)
(Qualified Cable)



PRA Regulatory Process

- NRC & Industry developed PRA consensus standard
- NRC has developed RG 1.200 to address PRA adequacy
- NRC developing NFPA 805 application guidance (draft RG-1.205)
  - Regulatory Guide 1.200 R2, consensus PRA standards, and peer review are not sufficient for demonstrating PRA base model technical adequacy for NFPA 805
  - Deviations from NUREG/CR-6850 method must be justified and approved

Fire PRA and NUREG/CR-6850

- NUREG/CR-6850 not fully piloted prior to current NFPA 805 use, and lacks detail in some important areas
- Initial NFPA 805 results have revealed conservatisms leading to over prediction of fire CDF
- Current pilot efforts should be used to provide lessons learned and identify improved methods
- Concerns identified in January 23, 2008 (letter to NRR)

Efforts to Date

- EPRI is spending significant portion of available research funding on development of improved methods
- Over 18 months of continuous interactions to discuss methods with NRC staff through EPRI/NRC MOU
  - Deterministic approach
  - "Level of proof" to justify realistic methods is unprecedented for PRA
- NRC continues to default to conservative methods and data contrary to generally accepted and appropriate PRA practices

Broader Concerns

- NRC PRA policy statement calls for realistic methods
- NFPA 805 is charting a new course for PRA in regulatory applications
- Could undermine years of effort in risk-informed regulation and PRA
- Mischaracterizes fire risk and could lead to general as well as public misunderstanding of fire risk

Path Forward

- EPRI is moving to publish the improved methods addressing several critical areas
- These methods comport with traditional regulatory risk informed practices by complying with Reg Guide 1.200 and the joint ASME/ANS PRA standard
- Methods (e.g., data and statistical treatment) are consistent with internal events methods
- Longer term efforts underway to improve methods for data, HRA, and others relative to Fire PRA

Conclusion

- RG 1.200 is appropriate, justified, and consistent with past regulatory practices
- Imposition of prescriptive and conservative methods will lead to many regulatory pitfalls
  - Inability to improve methods
  - Lack of innovation to reduce real fire risk (e.g., incorporate incipient detection)
  - Impacts leading to inappropriate decision-making and resource allocation affecting both safety and operations
- We urge NRC to allow and facilitate the proper use of Fire PRA for NFPA 805

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