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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

THERMAL-HYDRAULIC PHENOMENA SUBCOMMITTEE

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THURSDAY

AUGUST 19, 2003

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Graham B. Wallis, Chairman, presiding.

COMMITTEE MEMBERS:

GRAHAM B. WALLIS, Chairman

F. PETER FORD, Member

THOMAS S. KRESS, Member

GRAHAM M. LEITCH, Member

DANA A. POWERS, Member

VICTOR H. RANSOM, Member

JOHN D. SIEBER, Member

ACRS STAFF PRESENT:

RALPH CARUSO, ACRS Staff, Designated Government Official

NRC STAFF PRESENT:

ZENA ABDULLAHI, NRR/SRXB

FRANCIS AKSTULEWICZ, NRR/DSSA/SRXB

MARTHA C. BARILLAS, NRR/SRXB

KEVIN COYNE, NRR/DIPM/ IEPB

RICHARD ECKENRODE, NRR

BARRY ELLIOT, NRR/DSSA/SRXB

HUKAM GARZ, NRR/DE/EEIB

DONALD HARRISON, NRR/DSSA/SPSB

PATRICIAN HENRY, NRR/SRXB

Y. GENE HSII, NRR/DSSA/SRXB

STEVEN JONES, NRR/DSSA/SPLB

EDWARD KENDRICK, NRR/DSSA/SRXB

MARK KIRK, RES/DES/MEB

RALPH LANDRY, NRR/DSSA/SRXB

RICHARD LOBEL, NRR

SHAULAI LU, NRR/SRXB

KAMAL MANOLY, NRR

CAROL MOYER, RES/DET/MEB

DUC NGUYEN, NRR/DE/EEIB

ALLEN NOTAFRANCSIU, RES/DSARE/SMSAB

K. PARCZEWSKI, NRR/DE/EMCB

NRC STAFF PRESENT: (cont.)

SEAN PETERS, NRR

ROBERT PETTIS, NRR

L. RAGHAVEN, NRR/DLPM/LPDIII

DEVENDER K. REDDY, NRR/DSSA/SPLB

MARK RUBIN, NRR/DSSA/SRSB

WILLIAM H. RULAND, NRR/DLPM/LPDIII

THOMAS SCARBROUGH, NRR/DE/EMEB

PATRICK SEKERAK, NRR/DE/EMEB

MOHAMMED SHUAIBI, NRR

ANGELO STUBBS, NRR/DSSA/SPLB

EDMUND SULLIVAN, NRR/DE/EMCB

JAMES TATUM, NRR/DE/EMEB

DAVID TERAO, NRR/DE/EMEB

JENNIFER UHLE, NRR

CHENGE-IH (JOHN) WU, NRR/DE/EMEB

ALSO PRESENT:

WILLIAM H. SLAGLE, Westinghouse Electric

SUSAN G. STERRETT, Duke University

GEORGE STRAMBACK, GE NE

I-N-D-E-X

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

8:32 a.m.

CHAIRMAN WALLIS: The meeting will now come to order. This is a meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Thermohydraulic Phenomena.

I am Graham Wallis, the Chairman of the Subcommittee. The Subcommittee members in attendance are Thomas Kress, Victor Ransom, Jack Sieber, Graham Leitch, Peter Ford and Steven Rosen.

The purpose of the meeting today is to review the review standard for extended power uprates that has been prepared by the NRC staff.

Tomorrow, the Subcommittee will review the Draft Regulatory Guide, DG-1107, also known as Regulatory Guide 1.82, Version 3, Water Sources for Long Term Recirculation Cooling Following a Loss of Coolant Accident.

The Subcommittee will hold discussions with representatives of the NRC staff regarding these matters.

The Subcommittee will gather information, analyze relevant issues and facts and formulate proposed positions and actions, as appropriate for deliberation by the full Committee.

Ralph Caruso 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 previous published in the Federal Register on August 7, 2003.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice.

It is requested that speakers first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

We have received no requests from any member of the public for time to make an oral presentation. For the discussions today, Dr. Victor Ransom will take the lead responsibility for coordinating the presentations and the conduct of the meeting and reporting the results of the meeting back to the Full Committee. So I will now turn the meeting over to Dr. Ransom.

MEMBER RANSOM: Thank you, Dr. Wallis. During its review of the power uprate applications that have been processed by the staff over the past several years, the ACRS frequently encouraged the staff to better define its process for performing the

technical reviews.

During the meeting with the Commission on December 5, 2001, the Committee recommended that the staff develop a standard review plan for power uprates. In the staff requirements memorandum dated December 20, 2001, the Commission directed the staff to review this recommendation and inform the Commission of the results of the review.

The staff described its plan for power uprate reviews in SECY 02-106 issued to the Commission on June 14, 2002. This document committed to the preparation of a review standard that would include three things: a clear definition of the review scope, (2) references to existing review criteria and (3) a template for safety evaluations.

In July 2002, the staff discussed an outline of the document structure with the Committee and presented the draft review standard to the Committee at a meeting in December 2002. The Committee encouraged the staff to issue the draft review standard to the public for comment and report on the resolution of those comments to the Committee. The staff did issue the standard for comments and subsequently prepared a new version that addresses the comments that have been received which was recently

provided to the Members, RS-001, in draft form.

The Committee understands that a limited number of comments were submitted, all from industry. And we look forward to hearing from the staff how it has taken those comments into consideration.

I know in my looking over the standard one question that came to mind to me that I will kind of be looking for the answer here and I guess the initiation of this pre-dates my sitting on the Committee, what I'd like to hear about why the standard is so detailed in comparison with say some of the review, standard review plans for different components of things that would be addressed and to me, it would seem like it's putting a lot of words in the reviewers' mouth that you'd like to hear from the root source, I guess. And so that's just an issue I guess that I noted and I'd like to hear what the comments are about that.

Now we'll proceed with the meeting and I call upon Mr. Bill Ruland, of the NRC staff to begin.

MR. RULAND: Thank you, Dr. Ransom, Chairman Wallis and other Members of the Committee. Good morning.

My name is Bill Ruland. I'm the Director of the Project Directorate 3 in the Division of

Licensing Project Management in the Office of NRR. I'm also the manager in NRR who has overall responsibility for the power uprate program.

The purpose of our briefing today is to present to the Subcommittee --

CHAIRMAN WALLIS: Bill, can I ask? I haven't heard of this champion designation before. Are there now many champions in NRR?

MR. RULAND: Hopefully, there are a lot of champions. It's a designation that we use for certain processes or programs that we have in NRR and power uprates is one. Reducing unnecessary regulatory burden, license amendments --

CHAIRMAN WALLIS: You get to be the champion before you've run the race?

MR. RULAND: Apparently, yes. Anyway, you're designated the champion.

Where was I? The purpose of our briefing today is to present to the Subcommittee the draft review standard that we developed for extended power uprates.

As Dr. Ransom has stated, we transmitted this review standard to you by memo August 1st. We are seeking the Committee's endorsement of the review standard so we can proceed to issue it in final form.

We previously held two ACRS briefings in the development of this review standard. We briefed the Committee in July and again in December of 2002. In the December meeting, at our request, the Committee agreed to defer its formal review of the standard until after the public comment period had ended which it has done and we've incorporated those comments.

The review standard was issued on December 31st for interim use as previously described. The public comment period closed on March 31st. We received three different sets of comments, one from NEI, Framatome and the STARS Alliance which is a group of utilities in the western part of our country.

We evaluated the comments that we've received and revised the standard as appropriate. We also made changes based on recent experience which include the dryer failure of Quad Cities which I'm sure the Committee will be interested in and recent changes to our organizational structure.

Now as we have stated before, we undertook this standard both with your encouragement and also to help in developing these standards to aid the retention of institutional knowledge. I think that touches a little bit on the level of detail that's included in these standards and that retention of

institutional knowledge before that knowledge is lost or degraded due to retirements or transfers of senior staff. In addition, the purpose of the standard has somewhat standardized our reviews so we make ourselves predictable in a general sense.

CHAIRMAN WALLIS: Although it's a big document, the fact that it exists may, in fact, expedite these reviews and they may be quicker and more efficient.

MR. RULAND: And that's our hope. As an aside, we don't think a particular reviewer is going to be using the entire standard. He would just be using a portion of the standard that's applicable to them. So for -- it's not nearly as daunting a document for that particular individual.

MEMBER SIEBER: I think the bigger advantage of using a standard the way this is written is it's unlikely that you'll miss anything because all the systems are covered and all the important issues that are there. Otherwise, if you're doing it off the top of your head, you will probably analyze and question the things with which you're most familiar which is sometimes not thorough. So I think that's one of the advantages of having a review standard like this.

MR. RULAND: The initial focus of our activity, of course, has been placed on -- the activity being the review standards in general, has been focused on the extended power uprates which is the review standard we're here to discuss today and early site permits.

Now work in these areas, of course, is going to be a pilot for determining the proper approach to be applied in developing the review standards for other areas.

Now let me now turn to the specific standard that we have before us. As you may already know, the --

MEMBER LEITCH: Bill, could you just say a word about where the review standard fits in the hierarchy of documents? This is the first review standard and the one for extended power uprate is a likely second. But in the hierarchy of documents, where does this fit? How does this fit into the picture?

MR. RULAND: The review standard essentially is not the review criteria itself although in some cases it does add that component, but primarily it's a roadmap to get to those other documents that the staff uses to conduct their

reviews. It either has the generic letters, the applicable standard review plans and tries to encompass essentially roughly the universe of issues that a particular reviewer needs to be familiar with.

It's kind of an over-arching document and the particular technical guidance is referenced. That also helps if one of the SRP sections are revised. It doesn't mean that we necessarily have to review the review standard because it already references the standard review plan.

MEMBER LEITCH: So rather than being something completely new, one might think of this as a compilation of existing documents and references?

MR. RULAND: Right, to a large extent. There are some -- for this particular application, there are some cases where we thought the guidance for power uprates wasn't quite complete enough and we added that guidance in here and that's -- as a matter of fact, that's going to be one of the focus -- that's going to be part of the focus of our presentation today is to talk about some of those things we really have to develop to round out and complete our review criteria for power uprates.

CHAIRMAN WALLIS: If I could follow on Graham's question, you mentioned earlier on there's a

problem of age distribution. You have young staff coming on who might well be given the task of doing a power uprate such as BWR. They've got no experience. What you just said, if I understand, they would open this document and look up the materials and chemistry items and go and look at all the listed relevant reg. guides, bulletins, etcetera, etcetera and they'd go away and read those.

Where would they get the information about new knowledge that is being -- especially not the area of materials and chemistry aspects which are not in these historical documents, where would they get that information?

MR. RULAND: We're not pretending that this particular document and maybe I misspoke by using the word "universe" before. This review standard gets you started. It lays out a roadmap. It's not going to address all of those issues. There are going to be some things that -- particularly experienced or knowledgeable staff will have that may or may not be included in the review standard. But our general thinking is as we learn those new issues, as we understand what those are, we can update the review standard to continue to incorporate that knowledge, but there's no substitute for experience and

expertise. Ultimately, that's what we're trying to grow here and I think this is a good starting point. It gets you in, frankly, the ballpark or even within the base path, but it doesn't necessarily get you, if I can continue the metaphor, to home plate.

You do need people's expertise. You do need that as a critical component when we do a review.

MR. SHUAIBI: Just to add to that, this is not a substitute for training. This is not a substitute for involvement in work that's on-going these days. Our engineering staff is out, involved in committees, ASME committees and other committees. They're involved in all of that work. They're up to speed and those members bring that back to the staff and they have that experience and that involvement in what's going on today instead of just what guidance we have from the past.

We may learn things from their involvement in code committees and other stuff. That's where we can come back and look at our guidance and see if it needs to be updated or if we need to provide more, but this is not a substitute for training or the involvement in code committees or anything like that.

MEMBER FORD: Also, just following up, some of my colleagues have commented on how complete

this is, but honestly, I was left a bit flat because apart from some boiler plate and conclusions and introduction, the most important part, the technical evaluation, it was just left blank. And that is, to me, the most important thing that we're doing and yet when we look through this, there's a lot more information in this document that we have discussed than I have found in here. Now is that information that's in here, in fact, buried in here and I can't find it?

MR. SHUAIBI: This other document, you mean?

MEMBER FORD: The one we're talking about today?

MR. SHUAIBI: The slides?

MEMBER FORD: Yes.

MR. SHUAIBI: To address that, the review standard is a roadmap. We purposefully did not include all of the technical information, all of the technical guidance that would be used for power uprates. I think I was here before when this issue of developing a review standard came up and if I were to have included all of the technical guidance, if we were to have gone back and pulled all of the SOP sections, all of the Reg. Guides, all of the generic

communications that's needed to do a power uprate review and pulled it in here, it would be redundant to what we have today, but it would also be a document that's yea high.

So what we did here was we established a procedure for how to do the review. We gave the review as a road map for what information to go out and get in order to do a review, in other words, we told them go get that SRP section and use it. Go get that generic letter and use it. We didn't include that generic letter in here. And that's why it may be missing some of that.

The other point about the technical evaluation and why that's missing. That's going to be a plant specific evaluation. A plant can come in and say I have not changed water levels in my tanks in which case we wouldn't write a whole lot. We would say that. We would confirm it and say that.

A plant could come in and say we changed water levels and we needed to do a flood analysis. In that technical evaluation, the technical evaluation would be different, based on the plant-specific application whereas the regulatory evaluation and a conclusion would be the same, that is, we're looking at it for this reason, for flooding protection and

that's why the regulatory evaluation is included.

The conclusion, assuming that we find it acceptable, would be the same. It's protected against flooding, but the technical evaluation will be different, depending on what the applicant needed to do in order to achieve the power uprate and that's why it's purposefully left out and actually one of the comments from the Committee previously is that we needed to better document our technical evaluations and this took the burden away from the staff having to write regulatory evaluations and conclusions when they find things acceptable and now they could focus in on that technical evaluation that the Committee wanted to see and we're hoping that this is where this is going to take us.

MEMBER SIEBER: Well, part of all this came about because staff reviewed some generic documents from General Electric like the constant pressure power uprate and so when you review that and understand it and approve it, a licensee can reference it and invoke it and say I'm using this technical analysis which the staff has already reviewed for my uprate. When we got to Arkansas Nuclear, that was a PWR. Of course, the constant pressure power uprate didn't apply because it was a different kind of a

plant and so they struggled around with the -- hunting for their own review standard and found bits and pieces of combustion engineering in Westinghouse standards which they put together and the staff reviewed as the basis for their power uprate of about six percent. The difficulty there was there was no formal staff document to guide the review as to what all the things were that they would have to review to arrive at the conclusion. Now the answer, Victor's comment, if I were a reviewer and I picked up this review standard and you have a blank section in there that discusses the details of the review and then this specifies that conclusion, if I can reach that conclusion, then I would not write it down. It's not like I have to write those words. I have to write what the outcome of professional engineers' analysis is and so having written down a summary that's acceptable or a conclusion that's acceptable, tells the reviewers what it is he has to review and what conclusions he has to make in order to come up with an acceptable finding. And so I don't find that difficult when it's understood in that context.

MR. SHUAIBI: And to add to that, we actually do have specific instructions for the reviewers to review those regulatory evaluations and

review those conclusions and make sure that they're consistent with what they're finding in their review.

MEMBER SIEBER: Right.

MR. SHUAIBI: Modify them as appropriate. In other words, if we said something was acceptable in this document and the reviewer finds it unacceptable, there's instructions in here to say modify that.

MR. SHUAIBI: Right.

MEMBER RANSOM: I guess what I'd worry about though is the press of time, oftentimes one might adopt something, even though there is some gray area or something that might fall between the cracks. In a way, I'd rather hear first hand, you know, what the person's conclusions might have be. It makes them think a little more.

MR. RULAND: It ultimately resides on the professionalism and integrity of the staff member that's doing the review, ultimately, whether we provide guidance on one way to word the conclusion. The staff member is going to have to sign up for their conclusion and take ownership for that and so I would argue it's incumbent upon management to kind of reinforce those values and if we have those values in the staff, I don't think -- I wouldn't be concerned with the conclusions we reach.

CHAIRMAN WALLIS: Thank you for bringing in the word "management". I think it's not just the matter of the staff's integrity. If the management isn't supportive enough, it doesn't allow them enough time, it doesn't encourage them to probe deeply enough, then the staff member perhaps will not do it.

MR. RULAND: There's a tricky balance here between providing a standard for review, yet on one hand, and on the other hand, making sure that the technical safety issues are addressed, regardless of if the issues aren't raised in the standard. It's that balance that licensees have to make those balancing -- that kind of judgment all the time also. So there's no easy answer, I don't think, to that question.

MR. SHUAIBI: The other thing I'd like to add to that, in our current standard review plan, the format of that already includes wording about what conclusion you have to reach. This is not different in that sense and it may be specific to power uprates, but it's no different than the current standard review plan.

The other point I'd like to make is we have available to us previous safety evaluations that we wrote. So regardless of whether you have this

document or not, you could always pull an old safety evaluation and if we had that concern which I do not believe we have, I don't believe it's an issue, but if we had that concern, if our reviewer just wanted to copy something, it's available. But I don't believe we have that issue.

MR. RULAND: Let's see, where I left off was discussing the particular timing of the standard. As you may know our semi-annual surveys of licensees obtain information related to how many power uprates we expect. As a result of the last survey which was conducted in June of this year, indicate that applications for 15 extended power uprates should be expected over the next five years.

We hope that our timely development of this standard will help ensure that these reviews are conducted in an effective and an efficient manner.

MEMBER LEITCH: When we say extended power uprates, I guess I'd like to talk a little bit about the definition of the word "extended." There's a stretch uprate, well, first of all, there's a flow measurement uprate which is 1, 1.5 percent. There's a stretch uprate and then an extended uprate.

Does the term extended uprate, it seemed to be tied in the text here to a percentage power

uprate in the neighborhood of 7 percent, but does it also -- might one also use this standard for values less than 7 percent if there are some circumstances, perhaps where a new approach was being taken, a new justification was being employed?

MR. RULAND: Generally, it's around 5 percent, but ultimately it's based upon the capacity of the plant. If the licensee is coming in and making major modifications to the plant in order to avail themselves of a power uprate. Typically, those are the ones who are classifying these as extended power uprates.

MEMBER LEITCH: So extended then means in addition to a general neighborhood of what the percentage is, it also means -- implies major modifications rather than just a reanalysis so to speak.

MR. RULAND: Correct.

MEMBER LEITCH: Physical changes to the equipment.

MR. RULAND: Right.

CHAIRMAN WALLIS: It's interesting that most of those major changes are not nuclear. They're steam generators and turbines.

MR. RULAND: Reheaters.

CHAIRMAN WALLIS: Right. But those are not nuclear. I think where you'd really be concerned would be if there was some change in the nuclear part of the system, approaching some margin or something like that.

MR. SHUAIBI: Yes, a lot of the changes that we've seen today even on the 20 percent uprates have been on the balance of plant size.

CHAIRMAN WALLIS: That's right.

MR. SHUAIBI: We are including those in terms of major modifications. We are calling those extended power uprates. Those could have an impact on the way the plant may respond or the way that the plant, I mean it's not that the protection systems are being changed, but the rest of the plant has an impact on the way the plant is going to respond to an event or how the event is going to take place.

MEMBER RANSOM: Well, the initiating event frequency might change.

MR. SHUAIBI: That's one area.

CHAIRMAN WALLIS: In something like loss of coolant accident, you've got more decay heat. There's nuclear stuff going on.

MR. SHUAIBI: That's right.

CHAIRMAN WALLIS: Presumably from the

point of view of safety, it's likely to be more important.

MEMBER SIEBER: There is an additional effect that if you're trying to get additional heat out of the same core, you may end up with a new fuel design from the standpoint of spatial arrangement of the fuel or the mechanical, thermohydraulic design of the fuel element itself. So that's where a lot of this is reflected and strangely enough it seems to me that the reload analyses that go along with a power uprate, is covered separately from the power uprate itself.

MEMBER KRESS: Strange.

MEMBER SIEBER: So that's, to me, kind of a head scratcher because you approve the fuel separately from the rest of the plant.

MEMBER KRESS: Given that the equipment can take it such as the steam generators and the pumps can stand the power uprate, the regulatory system, appears to me would only mimic the power uprates if they couldn't beat the Appendix Ks or they couldn't beat the containment, 10 CFR 100.

That seems to be the only two things that are show stoppers.

MR. SHUAIBI: From a deterministic

standpoint, our job is to review the application and make sure that it meets the limits, so you're right, what margin exists today, that margin is different for the different plants that are out there. One plant could have PTC 1600 degrees and another one could have a PTC of 1900 degrees and they're both acceptable.

MEMBER KRESS: Yes, the margin belongs to the licensee, I presume. So they can take it to the limit and you guys would be happy. I don't know.

MR. SHUAIBI: I think what you would see if they're right up against the limit or as they're getting closer to the limit the reviewer is going to probably more than if it's -- ultimately, yes, if it's below the limit and we're convinced that they did the analyses right, those are the limits. That's our basis for finding --

MEMBER RANSOM: Below the limit, including uncertainty.

MR. SHUAIBI: Including uncertainty from a deterministic analysis. We also do a review of the risk evaluation, what we'll be talking about later today and if we were to find that even though the licensee's application meets those limits, if we were to find vulnerabilities that would suggest to us that we have an adequate protection issue, then we could

pursue that as well.

MEMBER KRESS: But the trouble with that is, it seems like the only risk implications end up being response times for the operators, that's about it. Those are some of the weakest parts of the PRA. The increased fission product in the core doesn't seem to make much difference.

Increased stored heat doesn't seem to make much difference in PRA space.

MEMBER SIEBER: One could say that if you operate a piece of equipment closer to its final design that the margin for operability is reduced, but that's not modeled in the PRA, so I think there are things out there that change the risk that PRAs just don't capture right now.

MEMBER KRESS: Like initiating event trees. You don't have that because you have to have a database.

MEMBER SIEBER: That's right.

MR. SHUAIBI: What I'd like to do is, you're getting into an area that's beyond my expertise and Bill's expertise. We do have a presentation on risk evaluations.

MEMBER SIEBER: Why don't you just stick with your plan.

(Laughter.)

CHAIRMAN WALLIS: Those are the interesting ones.

MEMBER RANSOM: Maybe I can one other introductory comment. As I understand it, there were three things that the ACRS originally had raised as issues to support the preparation of a review standard and they were one synergistic effects and I'm not sure whether they meant adding to or detracting from safety, but I imagine the context of it was fear that you may reduce safety margin. The second one was the effect on safety margin. It would be interesting to know where these issues are addressed in the review standard. And the third one was thoroughness, which of course, I understand. The document certainly does address that.

But these first two, it might be interesting to point out where in the review standard these are addressed.

MEMBER FORD: One of the synergistic effects which was brought up was the tying together of power uprate and license renewal and whether one comes before the other. Where in this document is the question of license renewal and the synergistic effect associated with that?

MR. SHUAIBI: This document does not address the common issue of license renewal and power uprates or power uprates and some other change that the licensee is going to make. There are a lot of changes that licensees could make after a power uprate, prior to the power uprate.

I think that comes up in the materials therein in terms of neutron effluence and what impact does that have on the vessel and what if you uprate and then go for 60 years is that vessel going to be brittle earlier than what you had anticipated and I could talk about that now, I could save it for later, but when you look at the power uprates, we look at the uprated power level. When we look at license renewal, we look at the ability of the plant to go for 60 years. When we go back to the tech specs and the limits on the plant in terms of how they operate and what they're limited by, they do these evaluations every time they pull a capsule. They look at whether their vessel is good or not good for the life of the plant, but sometimes they could be limited to less than 40 years or less than 60 years and I think we've seen an example in the past that may have had to shut down earlier than its licensed life because of that program that's in place. So I believe they're

captured.

I've had discussions with the license renewal folks in terms of how this gets done and I believe it's captured.

This review standard does not talk about synergism in that area. But we can maybe come back to that later in the day if you don't hear enough and I can try to answer it again.

MEMBER RANSOM: You have a nice list at the end of what the ACRS comments, some of which we've just gone over and highlighted, but not all. So what I'm expecting, and correct me if I'm wrong, is that when you get done with all of this you'll kind of run over these and say okay, we talked about this and that. You'll recall that and if there are any further questions in the areas. My particular emphasis is integral testing and there's a whole section on that.

MR. RULAND: That's correct. We're prepared to talk about that.

MEMBER RANSOM: I will either know I still have an issue or I'll be satisfied with your response.

MR. RULAND: Okay. Just as an aside, licensees have had this version that was issued for public use for interim use and licensees who are preparing their applications tell us that they're

using that in making their -- in preparing their application.

If you could go to the slide?

(Slide change.)

MR. RULAND: This is our agenda for this morning. We've selected these topics, specifically because of the Committee's interest during past reviews and during discussions with the review standard. So this is our morning's agenda and next slide, please?

(Slide change.)

MR. RULAND: This is the afternoon's agenda and as you can see we're going to address the ACRS and public comments.

MEMBER RANSOM: Yes, you'll give us a summary?

MR. RULAND: Yes.

MEMBER RANSOM: Of our stuff and also how you covered them. That's important and very useful. I appreciate you doing that.

MR. RULAND: Unless you have any additional questions for me, I'd like Mohammed Shuaibi to give the background on the project now and discuss specifically how this review standard was updated.

MR. SHUAIBI: I guess I should have

introduced myself when I started talking earlier. My name is Mohammed Shuaibi. I'm the lead project manager for power uprates at NRR.

MEMBER SIEBER: You would be the assistant champion?

MR. SHUAIBI: I'm the one that didn't make it to the finish line.

(Laughter.)

MEMBER RANSOM: You were second.

CHAIRMAN WALLIS: You were so tired from all the running.

MR. SHUAIBI: This slide gives an overview of my presentation today. I'm going to cover a little bit of a background in terms of where the idea of review guidance originated for power uprates. I'll give you the purpose a review standard in general terms, a review standard. I'll talk about how we developed the extended power uprate review standard and also cover the contents of the extended power uprate review standard.

I'm sure the Committee is aware back in 1995 the Agency received an allegation that Maine Yankee had performed inadequate analyses for small break loss of coolant accident to support of a power uprate. The staff was concerned at the time that we

had approved the power uprate and we didn't identify this as part of our review. We formed a task group to look into that and they developed a Maine Yankee Lessons Learned Report. One of their recommendations was to develop a review procedure for power uprate reviews.

But shortly after that experience, or while that was going on, we had two applications in-house and they were reviewing for power uprates. One was the Monticello 6.3 power uprate. Another one was a Farley five percent power uprate. And while all this was going on at the same, those two applications received a lot of scrutiny from the staff, from management. They were not very comfortable with the safety evaluations that were issued. So to address the Maine Yankee lessons learned recommendation to establish a review procedure for reviewing power uprates, what we did is we established those two safety evaluations as our model safety evaluations for how we would do reviews, whether they were complete enough to do that.

MEMBER LEITCH: As I understand how we're using the time extended power uprate, Maine Yankee would not gave fit that category, would it have?

MR. SHUAIBI: That was a look back at our

power uprate reviews in general. Not specific to extended power uprates. Actually, the first extended power uprate was Monticello with 6.3 percent after Maine Yankee.

MEMBER LEITCH: But what I'm saying is if a plant came in today to do the Maine Yankee type of uprate, we would not fall into this review standard.

MR. SHUAIBI: Well, we could use this but it is not really designed for a stretch power uprate or the smaller power uprates. When we looked at the power uprate program, we did a review of the power uprate program to see where we wanted to focus our efforts. We looked at what we're expecting to get in terms of power uprates in the future, where we wanted to prioritize our efforts to develop guidance and put something out for industry for us to use in terms of reviewing them.

In doing surveys what we found was we were probably going to get three stretch power uprates over the next five years. But we're getting a lot of these extended power uprates, the big power uprates, the big power uprates, and that's why we focused on developing guidance for extended power uprates. We have on our website full power uprates, kept the model safety evaluations. We've actually put up model safety

evaluations for reviewing stretch power uprates. But since we only here three that will be coming in, at the time it was three. I have the numbers here, I can dig them up for you later. We didn't believe that there was a need to go through this kind of effort to develop guidance.

MEMBER LEITCH: But other than our institutional memory, how do we know these stretch power uprates fall into the same problem that Maine Yankee fell into?

MR. SHUAIBI: When we looked at the Maine Yankee lessons, we were going through the Farley and Monticello reviews, we believe that those were adequate. In fact, I was going to cover this in the next bullet. Back in SECY-01-0124, we came back and said that those were adequate. But what we said was power uprates are going through changes. Plants are now submitting different types of power uprates. So going up in the 10 to 20 percent range.

So we wanted to come back and revisit whether those template safety evaluations or model safety evaluations would be adequate. And that's where we are today, is this guidance, this work for extended power uprates. We're believe that the model safety evaluations would be adequate for the stretch

power uprates.

MEMBER LEITCH: To go back to another Maine Yankee issue, as I understand it, without getting back into all that discussion, the requirements for review, the application of the codes to the small break loss of coolant accident was optional. Maybe that's not quite the right word, but it was at the discretion of the NRC, I believe. I guess what I'm saying is is there still discretion in this or is that kind of review required?

MR. SHUAIBI: I think, I believe if I flip to the matrix, and if you don't mind when I try to defer this to a little bit to where we get to the active systems area of review.

MEMBER LEITCH: Okay.

MR. SHUAIBI: There is a footnote in that table that talks about not just for LOCA, but for transient analyses in general. We're looking to make sure that the licensees not using the code beyond the way that it is approved. But they're using the code in a way that would be consistent with what it is approved for. But I'd like to -- when we're up for reactor systems, I could pull that out and I could point toward and show you what I mean but that.

But after Maine Yankee internally, other

than this review standard, before this review standard came about, internally there was guidance sent out to all the reactor systems review. Now these are the reviewers that looked up the LOCA analysis. That they had been looking for the way that the plant applied that code and as part of the review they would ensure that the plant did not use it outside of the way that it is limited. Because when we review codes, we actually put limitations on those codes that they use. The reviewers actually go back and make sure they're used within their limitations.

MEMBER LEITCH: Is there a requirement that if when doing the power uprate review, the code predicts a peak cladding temperature increase of some number like 50 degrees that the licensee must flag that to the attention of the NRC? Is there still such a requirement or is that documented in here?

MR. SHUAIBI: We don't have a requirement that says they must flag the delta per se, but they do give us the numbers and we compare that to the limit. Now in doing the review, I could go back and check to see whether that increase was 50 degrees or 100 degrees or what it is. I don't believe, but I think we'll have more people here later to talk about that. I don't believe that the guidance says that if you go

over by X degrees, you've got to tell us you've gone over by X degrees for this application or for this power uprate.

MEMBER SIEBER: But you weren't going to get a specific number for power uprate because each core is different. And when you analyze it for every reload there's a different PCT.

MR. SHUAIBI: For the application that's going to be coming in, the licensee is going to have to justify that they're under the limits. And for that application at that time, the licensee will have to give us information to show that they're under those limits. Now going forward after that, they would go back to their normal process of they do their reload analysis, whatever limit would be submitting reports to us showing that there's a procedure for that reload analysis and they would be submitting the information that's required by that.

MEMBER SIEBER: Typically what they give you at the EPU stage is a projection of a equalization cycle, core, which generally don't cover the transition cycles and to me that seems pretty reasonable. You're regulating based on every cycle where specific core parameters can change the degree to which you approach the limit.

MR. SHUAIBI: What's important here though is that when the reviewer makes a determination that it is acceptable, they're making a determination that going for this application the licensee has demonstrated that they meet the limit. Now what that means is if the licensee wants to come and do it ahead of when they do their limited analyses, they may have to take penalties to show that it's bounding. And we look for that. And there's been some recent communication on misunderstandings in terms of what that means.

MEMBER SIEBER: But there are cases where it turns out that it isn't bounding where a specific analysis then has to be performed.

MR. SHUAIBI: Then we would ask for that analysis.

MEMBER SIEBER: That's right.

MR. SHUAIBI: There have been cases during our reviews when we identified plants that have come in and said we have limiting analyses in these areas, or analysis for one unit that bounds both. And we've identified during our review that they, in fact, were not bounding and eventually have gone back to the licensee and said you need to reperform this analysis.

MEMBER KRESS: Will the redefinition of

the large break LOCA size permit sizable solid uprates.

MR. SHUAIBI: I'm not sure. I guess I'd have to wait that comes about and we'll have to see what impact it has. It could, if a plant is large LOCA limited and a lot of their limits are based on that. That's where their margins are the least and possibly it can. But it's plant specific. I think it would be plant specific depending on where they're limited. But I'm not sure. You know, I can't say for sure yes or no. And I could see where it would be. I could see where it logically make sense that it would allow to uprates, maybe larger uprates. But without going back and looking at it to see okay what else is impacted, maybe it is environmental quality.

MEMBER KRESS: Somebody else might --

MR. SHUAIBI: It might be.

MEMBER SIEBER: If you'd like Mark, safety director, might help you with break size. But if you have plenty of margin there, I'm not sure it would make a difference.

MR. SHUAIBI: Right, but sometimes it's these large LOCAs that are also driving other things like containment response and EQ envelopes and things like that. So once you look at everything, once you

take everything into account, you may conclude that will lead to higher power uprates. But before doing that, I can't say for sure whether it would or wouldn't.

MEMBER SIEBER: Right.

MR. SHUAIBI: Okay, the third bullet on this slide in SECY-01-0124, we concluded or stated that we believe that those model safety evaluations that we were using were adequate, but we wanted to reevaluate the need for guidance at a later date based on the fact that the power uprate process was changing with higher power uprates coming in. The ACRS met with the Commission in December of 2001 and the ACRS recommended to the Commission that guidance was needed and SRP was needed for power uprates.

Also in several ACRS letters, as Dr. Ransom said earlier, you've encouraged us to develop a procedure for reviewing power uprates. We were tasked by the Commission to review your recommendation for developing an SRP, and we concluded that a review standard would help make the power uprate reviews more effective.

We have had two ACRS meetings on the status of the development of the review standard. And in the last meeting we requested that the Committee

defer its review until after public comments. The Committee agreed during that meeting. We issued a review standard for public comment on December 31. The comment period expired on March 31. We received three comment letters, as Bill indicated earlier. We evaluated those comments. We've made changes as appropriate to the review standard. We also made other changes, as Bill mentioned earlier, due to organizational changes within NRR.

Due to recent experience with driver failure at Quad Cities and we're here to brief you today on the review standard, now that it's close to final.

CHAIRMAN WALLIS: Now the public comments related directly to this purpose that you're going to get to on the next slide? I think the three --

MR. SHUAIBI: Public comment.

CHAIRMAN WALLIS: Would the three I noted -- what's the relationship to the licensing basis and to the topical reports and the Back-Fit Rule.

MR. SHUAIBI: That's correct.

CHAIRMAN WALLIS: Those are three questions. And I think they're addressed in the purpose in the document.

MR. SHUAIBI: That's correct. Actually --

CHAIRMAN WALLIS: On the brief list. Maybe you could do that when you go to the next slide and talk about the purpose, you could tell us how this relates to the licensing basis the topical report on the Back-Fit Rule?

MR. SHUAIBI: I can do that. I have a separate presentation late in the afternoon to address that. But in short, what I'd like to say is the review standard that was issued for public comment did not address this item in the way that this one does. We were, I believe, silent on licensing basis, although our intent was that we would review a plant against its licensing basis.

And we've clarified that in this version of the review standard to ensure that when we review a power uprate, that if we find when we review against this licensing basis. But at the same time, if we find areas were Back-Fits would be appropriate, we would follow our Back-Fit process. The purpose of a review standard, again, this is general purpose of any review standard that may be developed. It provides comprehensive guidance for the staff in doing its review. Provides a mechanism for retention of institutional knowledge. It provides technical guidance as well as process guidance, and I'll get to

that in a little bit.

It also provides an opportunity for us to update existing guidance where it may be lacking. And I think you'll see that in the review standard discussions later on today when the different presenters will be up here talking about their areas.

Continuing on the next slide, I would believe it will increase the effectiveness and efficiency of our reviews. We have a work planning center.

CHAIRMAN WALLIS: There's a generic question I have. You talk about procedural guidance and I noted in reading the rest of the guide here that there's a question about when should the staff do independent analysis. Sometimes, it is stated that they don't do them. In mechanical engineering, they're taboo. But in plant systems, they're not. I don't understand that. It seems to me that the staff should always have the option of making independent calculations. There shouldn't be a guide that says you do them for plant systems but you don't do them for mechanical and electrical engineering.

MR. SHUAIBI: The purpose here is not to say to the staff that you cannot do independent calculations. In doing a normal power uprate, we

don't expect to have to do calculations for mechanical, electrical instrumentation and controls. That's why those were listed.

CHAIRMAN WALLIS: When you get to reactor systems, you have a very good description with criteria for performing independent calculations which I think would be universal and would apply right across the whole guide, not just through reactor systems, but to everything else.

MR. SHUAIBI: Well, when we developed a review standard, we went back and we actually thought about where we would need to emphasize and duly understanding calculations.

CHAIRMAN WALLIS: It seems to me right upfront if you could touch some criteria, when do you do independent analysis. That applies to everything rather than having a separate description in every section about in this section you don't do it, but another one says in very great detail that you should do independent analysis. When you get to -- why is that? Why isn't this universal criteria for when and when not to do these analyses?

MR. SHUAIBI: We tried to proceduralize and include in this document what we would normally expect to see. And what we normally expect to see and

what we normally expect to do is in some areas we will do independent calculations for certain technical areas we're interested in. We also do those, and we said we would always do those. In other areas, it is based on criteria that we put in this review standard. In other areas, we don't see the need to do independent calculations based on normal practice.

CHAIRMAN WALLIS: Well, you don't at the moment but there could always come an uprate where it would be a very advisable thing to do.

MR. SHUAIBI: The intention for this review standard is again it's not to tell the reviewers that you cannot do independent calculations. This is what we would normally expect would happen, but in a case where this review standard says that you're not doing independent calculations if the reviewer decides it is appropriate to do independent calculations, the reviewer would move forward and recommend doing that.

CHAIRMAN WALLIS: To get back to this, when we look at individual sections. But I was very surprised that you had different words about independent analysis for every section when it seemed to me there was some universal criterion, a set of criterion, that should apply right across the board.

MR. SHUAIBI: We tried to be specific, I guess. Okay.

CHAIRMAN WALLIS: It is almost as if different people wrote different sections and really hadn't thought it out.

MR. RULAND: You know, one of the things I think we did in the standard is try to write down what the common practice was in the individual work groups. So I think that's why you're seeing this variation. So in those areas were calculations are not called out, typically we don't do those calculations.

MEMBER RANSOM: In other words, it is not a standard.

MR. SHUAIBI: It's not a standard. In the areas --

MEMBER RANSOM: This writes down common practice. Well, anyway I just second Dr. Wallis' point.

MR. SHUAIBI: We tried to be specific and this goes back to if you want to make it a standard you want to be specific in the way that you write it. So if I write general criteria that say do independent calculations when we believe they're necessary, we didn't believe it was appropriate to just leave it at

that. In areas where we knew that, in general, we would not be doing independent calculations, we said that. We think it's cooler this way. The reviewer could look at that and know what's expected.

But there's specific guidance in the review standard that says that if the reviewer, based on the review of the review standard, determines that there's something missing, this is not just independent calculations. This is independent calculations for any of these technical areas that they're asked to review. If the reviewer, based on their review of the Applicant's application, based on looking at this review standard and trying to use it, finds that there's something that was not considered that does not prevent them from going and reviewing that or doing any independent calculation that they believe is necessary.

We did want to standardize it. We did ask for a little bit more management control in that area when you deviate from the review standard in order to standardize it. But it says in here that you would seek management approval and you would upon approval do that.

MEMBER FORD: Well, as I understand that, in some circumstances, you do not have all the

information from the licensee in order to do these independent calculations. Is that true?

MR. SHUAIBI: You could run into situations where you need more information to do independent calculations. You could run into situations where the amount of information that you would need is hard to get.

MEMBER FORD: Not because it's proprietary in nature?

MR. SHUAIBI: No, proprietary doesn't get in the way of us getting information. That just gets in the way of making it publicly available. Actually, a lot of these power uprates have a lot of proprietary information submitted with them, so when we -- if we needed information that was proprietary, we would ask for it and submit it before we would request that we would withhold it from the public. And then we would do a review of that to determine if it's appropriate to do that or not.

MEMBER FORD: So in other words, you can get all the information you require from the licensee in order to do the independent --

MR. SHUAIBI: We can get the information that we need to find it acceptable. I guess, the question of how much information do we need and how

much information can we get and is it realistic to expect that we can get all the information that's needed for every one of the analyses that is done in support of a power uprate, that's where you get into maybe a little bit of a problem. Some analyses are -- there are a few numbers. And you could run the calc and you'll find it's okay and other analyses are databases of information and just a lot of information that you would need to get in order to do that independent analyses.

And then that's a difference. But we can get that information if we needed it, I think.

MEMBER FORD: I'm sorry to keep on on this, but if I look at mechanical soil engineering, there aren't page numbers in this thing, so I want to find out why. It's called attachment 1 to matrix 2. It says "independent calculations are not performed in the area of mechanical engineering." It simply says don't do it. When you get to containment review, it says use the following guidelines and they look very good. It says the licensees' performance analysis has changed substantially, has performed analyses using methods which have not been previously used. Sounds good. And yet, it categorically says that some of these sections, independently calculations are not

performed. And that seemed to me to give the wrong message.

MR. RULAND: We'll take another look at

CHAIRMAN WALLIS: This is a general question, rather than the section as it goes through the whole thing. You can flip the different matrices and you find different statements about these independent calculations.

MR. SHUAIBI: That's correct. And they were provided based on the types of independent calculations that are performed. That group, what they do and how they do them, what's needed --

CHAIRMAN WALLIS: They're very restricted. Human performance. The only thing they're supposed to do is perform independent calculations of operational and available response time. So the only thing that affects what humans do is their response time.

MR. SHUAIBI: Again, I'd like to defer that to later because when we get into that discussion, I think what you're going to hear is what we found in power uprate reviews is that is the area that is normally.

CHAIRMAN WALLIS: We'll come back to that.

MR. SHUAIBI: We can talk about a little more, but that's why the focus is there.

MEMBER RANSOM: The nature of my question in that area is that response time is one of the aeroforcing contexts out of a list of a dozen of the different aeroforcing contexts. So has there been a review of all of the aeroforcing contexts and concluding that only response time has changed? That's the issue.

MR. SHUAIBI: And I'm looking around the room and I think may be we'll -- once we get to human factors, maybe we can talk --

MEMBER RANSOM: We can talk about it. We can talk sensibly about the issue.

MR. SHUAIBI: On this slide, we believe that the incident review standard will increase the effectiveness and efficiency of our reviews by implementing NRR's vision for Centralized Work Planning. By that, I mean that the review standard should provide a means for our work planning center to quickly identify the areas that should be reviewed for a given application and distribute the work accordingly.

In addition, we expect the review standard to include the focus, the consistency, the completeness and the thoroughness of the review. And lastly, we expect the review standard to result in

improved documentation of our review which has been a comment on several of the power uprates from the Committee.

We went through this the last time I was up here. I'd like to do this kind of quickly today in the interest of time, but I'd be more than happy to answer any questions that you have. It's going to be a challenge with the mic.

The way we developed the review standard is we looked at our existing values today. We looked at the standard review plan which was the box up here in the diagram. We also looked at a lot of other documentation including regulatory guides and generic safety issues that have come up since the last update to the standard review plan. We looked at our past experience, past experience, we looked at many different things including the model safety evaluations that I talked about earlier that would establish that for Maine Yankee. We looked at our most recent safety evaluations in case there were things that have come up since Maine Yankee that we thought would be appropriate to put in this review standard.

We looked at the topical reports that you mentioned earlier, the ELTR 1 topical reports for

water reactors. We also looked at the Maine Yankee Lessons Learned Reports and documents.

We looked at generic communications, including generic letters, information notices and documents of that sort. And we looked at internal and external stakeholder feedback including public comments during the lessons learned workshop, ACRS feedback and other feedback.

MEMBER RANSOM: Before you get off of that, that this far left hand corner block. What does that refer to?

What are you showing by coming in and clipping a corner off of current experience and heading into --

MR. SHUAIBI: You mean the large transient testing?

MEMBER RANSOM: Yes. What does that block imply?

MR. SHUAIBI: What we were doing here is we were looking at the standard review plan to make sure that it covered all the areas that we needed to cover for power uprate. So what that means is knowing the issues that we had with large transient testing, knowing that we had to review it and we struggled with it. We had a lot of information in doing that, we

wanted to look at the standard review plan, look at large transient testing documentation and experience and make sure that our final document addressed large transient testing, regardless of whether the SRP did or not.

This was a check on the SRP to see if there was any additional guidance that we needed to provide in order to make this review standard complete.

Does that make sense?

MEMBER RANSOM: I'm reading that you took that on as a separate project within the whole thing?

MR. SHUAIBI: It's a separate project, but it had to be incorporated into this review standard to make the review of the power uprate complete.

It was a separate project. It was a project that was offered in the new standard review plan section which we'll be talking about later, but we'll have to bring it into this review standard in order to make this review standard complete, because had they done a separate project and not linked to this review standard, we'd have a separate SRP that's not mentioned in here. And the purpose of this link was to make sure that that experience that's referenced in this review standard is something that

had to be done as part of a power uprate review.

MEMBER RANSOM: And you're talking about 14.2.1?

MR. SHUAIBI: That's correct. And there's a section in the review standard that addresses testing and power accession and large transient together.

MEMBER RANSOM: Okay. good.

MEMBER SIEBER: One question that occurred to me. I guess your standard review plan box, you mean as NUREG 0800?

MR. SHUAIBI: NUREG 0800.

MEMBER SIEBER: Well, this standard review plan for extended power uprates become a part of that?

MR. SHUAIBI: No, what you see here is a roadmap to all the guidance that exists out there. This document, this review standard for extended power uprate draws on a lot of different things, including the standard review plan, generic communications, separate office structures that there for process, but handle, for example, proprietary information or the application, how we process it. So this is kind of a roadmap to all the guidance that exists out there. This is not a section and you give it a number. This is a review standard and we purposefully went away

from the SRP because the SRP has been historically formatted in a way that contained information that was limited to technical guidance. This contains more than that.

MEMBER RANSOM: This SRS is something new, right?

MR. SHUAIBI: That's correct.

MEMBER RANSOM: This is the first one?

MR. SHUAIBI: This is the first one. Another one that was issued along the same time was for early site permit and I believe they briefed the Committee on that one.

So then we looked at the standard review plan. We identified anywhere where we had weaknesses in the standard review plan or areas we were missing, for example, large transient testing and from that, from our look at the standard review plan and all these documents, all these other things that we looked at, we came up with a matrices in the review standard. And you'll see in the matrices they identified the areas that are within the scope of the power uprate review. They reference the guidance that used to be used for a power uprate review and in cases where we found that the guidance was supposed to be supplemented, we provided supplemental guidance,

whether we noted the tables, we included references to generic communications or we drafted new guidance. You'll see some areas where we actually drafted new guidance in support of this review standard. That's all contained in the review standard, as a result of that effort.

So this is the technical review criteria portion of the review standard. On the other side, we went through a similar effort for processing guidance and by that I mean how we handle certain information, how we deal with proprietary information which was mentioned earlier, what type of review we do and how we do that and similar effort, going through that on the other side for process guidance. And what we end up with is a review standard that includes both technical guidance and process guidance and that's what we have here.

One of the blocks on top which I mentioned at the last meeting is inspection guidance. The last section of the review standard references an inspection procedure that was written specifically for power uprates or extended power uprates. We also have a section in our documentation portion of the review standard that says that if you identify things that are important as part of this power uprate that you

want to share with the inspectors so that they can use that to sample -- in terms of the sample for the inspections, there's a section here that identified that for the inspectors.

Our last check on the review standard was to go through past RAIs. We've done several power uprate reviews here recently and what we wanted to do after we did all this work is go back and see if we missed anything. So we looked at all the questions that were asked in past power uprate reviews and we did a consistency check to make sure that we were okay and it turned out pretty good, actually, and that's why that's dashed as a consistency check.

So the contents of the review standard, first thing that it covered is the technical review criteria. First thing I'd like to do is I'd like to talk about the procedural guidance first. And the way I'd like to do that is if you turned, hoping everybody has a copy of the review standard, if you turn to the large figure in your review standard, it's a flow chart. Looks like this. It's behind one of the purple tab.s

CHAIRMAN WALLIS: The only thing that's in this section is these big charts.

MR. SHUAIBI: That's it, this is process

guidance. But this chart actually contains a lot and that's why I wanted to go to this chart. What you see here is the process that you follow for doing a power uprate review. The top path is the technical review path. If you need one I can give mine up. I can talk without it.

MEMBER SIEBER: This 1.1?

MR. SHUAIBI: That's correct. The top path is the technical review path and that starts with the application coming in and doing an acceptance review, going through the technical review. The ACRS is part of that and then you reach a conclusion at the end.

The purpose of this flow chart isn't just to show that we have a path for everyone of these activities. If you look under every box, every step that we do for a power uprate, we've identified the guidance that's used for that step. A lot of times they have, for example, Link 101. That's an office instruction that we have in NRR that says here's how you do amendment reviews. So it looks like a simple flow chart. It contains a lot of information. This is similar to the matrices that we have for the technical review in that it provides a reference to the documents that you should be using when you're

doing these types of review.

We've got a flow path that's for technical review. Below that we have the proprietary review. We have the environmental review and we also have the noticing and making sure that the public is aware of what we're doing.

MEMBER LEITCH: As you look at that flow chart, the second block says PM, issue work request to TS. Is that the same as what is called elsewhere in the document initial screening?

MR. SHUAIBI: That is getting the information out to the technical branches so that they can start looking at the document.

MEMBER LEITCH: But I mean elsewhere in the document, it uses phraseology like acceptance review and this third block is called acceptance review and it says detailed technical, detailed review and that's referenced here. I guess I was a little confused when I would try to compare the verbiage with this chart. It's that second block was called initial screening elsewhere in the document?

MR. SHUAIBI: I'd have to go back -- when the PM gets the application, they do an initial screening to make sure that the type of information that is needed to do an amendment review is provide by

the licensee. That would be an initial screening. The acceptance review is done by everybody, the PM and the tech staff. It's something this big. The tech staff would be providing feedback to the project manager as to whether they have enough information to continue with the review.

MEMBER LEITCH: I understand that. All I'm pointing out is that the verbiage on the chart is different than the verbiage that describes the process and it might be a little confusing is all.

It would seem to me it would be better to either change the chart to say in the second block, initial screening or to change the verbiage elsewhere in the text to make it clear this is the block we're talking about.

MR. SHUAIBI: I'll take that back and look at it.

MEMBER SIEBER: It seems like the initial screening block is missing.

MR. SHUAIBI: That may be the case too. It's a bit of a mismatch in words and in the picture too.

MEMBER SIEBER: It sort of jumps right into the official reviews, the PM assigns the work and the review starts, whereas somebody has to look at the

application, the PM initially and decide whether there's enough substance there to even start the review.

MR. RULAND: I believe that initial screening is located in Link 101, is it, Mohammed?

MR. SHUAIBI: Yes, I believe it is.

MR. RULAND: So the initial screening does get done, but it's kind of a sub-bullet on that and you're right, the diagram doesn't make that clear.

MEMBER LEITCH: It's just the way it's portrayed. I'm not questioning whether -- it seems to me it's done properly. It's just a little confusion in that portrayal.

MEMBER RANSOM: One thing I found a little confusing was the tie back to the standard review plan or is there any?

MR. SHUAIBI: Well, the process, okay, let me -- I've lost my chart. Well, I think I can talk without it.

Under the technical review box, you should, and you can check me on this because I don't have it in front of me, you should have a reference back to the review standard.

If you look under the tech staff performs detailed review, the second arrow under that refers

you to RS-001 section 2. That's an internal reference to section 2 of the review standard which says don't use that section of the review standard to be a technical review. So I guess I passed that test.

MEMBER RANSOM: But it's not tied back to the SRP, I guess.

MR. SHUAIBI: It's a pointer to section 2 and section 2 provides the references to the many SRPs that would be used for doing the reviews in the different areas. This is a process chart. It's a higher level, if you will. This is that when you do a technical review as a reviewer, regardless of what area you're in, go to section 2. You go to section 2 and you find the area that you're reviewing, and that section tells you which SRP to use.

MEMBER RANSOM: If you were to bring it up, you would think that this would be the criterion for whether or not what you've done is satisfactory.

MR. SHUAIBI: It is. From a technical standpoint, from the technical review standpoint, the SRP is being used in a lot of these places, in many of -- in most of these places. The SRP is being used. In terms of process, what we're telling people is and what we're telling the reviewers is if you want to find the technical guidance, go to section 2 of the

review standard. When I, as a technical reviewer, go to section 2, that tells me which SRP to use. It's not just the SRP, it's generic communications. It's supplemental guidance in section 2. So if I just list SRP that would be missing a lot of other information that is important to Section 2.

MR. RULAND: I think it's more a problem for somebody like myself who is not working with this, you know, and you're only looking at it from the overview, you know. Where is the basic criteria that you're using.

MEMBER RANSOM: If a licensee would want to use this diagram to do some planning as to what he was going to run into as he proposed an EPU, are all the documents that are referenced here available to a licensee?

MR. SHUAIBI: They are publicly available. They would have to look in other places, but they're publicly available.

MEMBER RANSOM: Like Office Letter 701.

MR. SHUAIBI: I believe all of that is publicly available.

There are a couple of documents in here that are not publicly available. They're proprietary. They're copyrighted. And --

MEMBER RANSOM: By NRC?

MR. SHUAIBI: They're not NRC documents.

MEMBER SIEBER: That would be things like topical reports?

MR. SHUAIBI: The one that comes to mind is the EPRI document on accelerated corrosion. There's not something -- it's not something that they wanted us to make publicly available. We cannot make that publicly available. It's a reference in here for the staff to go back. We have copies. We can't make them publicly available. You can use them in our review. We have to control have how they're used and who has them. And if licensees wanted the EPRI document they would have to go to EPRI and get it. They could propose alternatives. I'm not saying they have to do it.

MEMBER SIEBER: If a member of the public felt that was crucial to their --

MR. SHUAIBI: We talked to EPRI and if a question comes up where the public wanted to see that document, they would allow us to put it in the PDR, but the public can come and take notes and read it, but they cannot copy it.

MR. RULAND: But that wouldn't be a problem for the staff, the staff has --

MR. SHUAIBI: That's correct. They're actually -- proprietary is the wrong word. They're not proprietary, they're copyrighted and that's how we're able to put them in the PDR if we needed to. And by the way we did put them in the PDR for the public comment period so that if somebody wanted to come in and read them and comment on them, as part of the comment period for the review standard, they had the opportunity to do that. We did put them in the PDR.

MEMBER SIEBER: It might help if you could tell us the difference between the review standard and the standard review plan? They're two different things.

MR. SHUAIBI: They're two different things. The standard review plan is focused on the technical guidance.

MEMBER SIEBER: That's right.

MR. SHUAIBI: It provides technical acceptance criteria in terms of how you find a LOCA analysis acceptable. The review standard provides more than that. If you were to take -- it's a roadmap to that technical guidance. It's a roadmap to more than technical guidance. It provides a roadmap to other guidance that we would use in processing or

handling an amendment request or a power uprate, but provides inspection guidance in terms of where to go to find the inspection guidance that you need. So it's a -- in my mind, it's a higher level document that tells you where to find all the information that you need from start to end in doing this power uprate.

MEMBER SIEBER: The absence of the technical requirements for a review standard is due to the fact that in referencing other documents, like standard review plans where that technical guidance is specified.

MR. SHUAIBI: That's correct.

MEMBER SIEBER: Which was one of our early questions. So maybe helps our overall understanding.

It could use the term it's incorporated by reference.

MEMBER RANSOM: Well, it's a little surprising to me that there aren't review standards for licensing applications to start out with. I guess this is past history.

MEMBER SIEBER: Well, there is a -- for initial licensing there is a standard review plan for that.

MR. SHUAIBI: Yes, it's regulatory guide.

MEMBER SIEBER: It was there long before

the whole concept of review standards was --

MEMBER RANSOM: I assume that the licensing follows something like the standard review plan.

MEMBER SIEBER: Well, yes.

MEMBER RANSOM: That's the guidance.

MEMBER SIEBER: And in these things here, like the standard power uprate and life extension and so forth, you're picking pieces out of other standard review plans to apply to that specific application.

MR. SHUAIBI: That's exactly it. If you look at the standard review plan, it covers I want to say all. That's really the trick here. It covers a lot of things, if not all things that are needed for a plant. when you get license amendment, some of them are focused in on maybe one or two sections and other things like the power uprate accept most of those SRPs. So to put a review standard together for every one of those actions, maybe you'll pick out five SRP sections for one type of action. Three SRP sections for another type of action, 150 SRP sections maybe for a bigger action. But that's -- this review standard pulls all those together for extended power uprates.

MEMBER RANSOM: I understand that.

MEMBER SIEBER: If this were a game, it

would not be fun to play.

MR. SHUAIBI: Section 2 of the review standard covers the technical guidance and I think we covered that in a lot of detail. In terms of how it's included in this review standard, if you want me to go through it I could. In the interest of time, I propose that we move on.

MEMBER LEITCH: I have just one question about that. The purpose, as a paragraph it says that licensees are encouraged to provide with this EPU application markups of the matrices in Section 2.1 of this review standard. And to identify any differences between the information in the review standard and the licensing basis of the plant.

I flip to the table that's referred to, section 2.1. There's a table there that's seems to be completely filled out. I guess I'm not really sure of what we're expecting the licensee to do.

MR. SHUAIBI: If we have identified a regulatory guide or if we had identified an SRP. If we had identified the general design criteria that doesn't apply to that plant. We want them to mark that up and tell us this doesn't apply, but this other thing does. Some plants are not GDC plants and we're not using this power uprate process to make them GDC

plants. So for us to be able to do an efficient review we've asked licensees in your application, provide a markup of this matrix to tell us that you're not a GDC plant. Cross out those GDCs and put in the criteria that you're licensed to. This is a reference to where those are. That way you can do a review of your licensing basis. And this way you're not -- this is the way that we review and cannot make a non-GDC plant a GDC plant or backfit the GDCs on a plant that's not a GDC plant. If we needed a backfit, if we needed to go through the backfit process and we felt it was appropriate we could still do that, but this is to identify those differences so that we don't inadvertently go down the path of making a non-GDC plant a GDC plant.

MEMBER SIEBER: There aren't very many of the non-GDC plants. How many are there?

MR. SHUAIBI: I don't have a number on that.

MEMBER SIEBER: Small number.

MR. SHUAIBI: Again, the challenge here is to develop guidance that's generic and knowing that the plants are not all designed the same way, you need that kind of guidance that says tell us where the differences are. To develop this for all the plants

that are out there, you'd have a different document for every plant.

MEMBER LEITCH: The GDC is just one example.

MR. SHUAIBI: That's correct. The GDC is just one example. It's an easy one for me. That's why I referred to it.

CHAIRMAN WALLIS: This section has matrices in it.

MR. SHUAIBI: That's correct.

CHAIRMAN WALLIS: And I commented earlier about the difference between the matrices and independent calculations. The details seem to differ in the matrices. For interest, in the plant systems, we've had a lot of discussion about transport coolant.

MR. SHUAIBI: That's correct. And the reason for --

CHAIRMAN WALLIS: Someone has decided and we need a long description of spent fuel. We don't need it on anything else.

MR. SHUAIBI: Right, the reason for that is when we looked at the guidance that currently exists in the SRPs, when the plant system reviewers looked at the guidance that currently exists in the SRPs, they found the SRPs to be adequate, except for

a couple of areas. Spent fuel pool cooling and fire protection. And to make that adequate, they had to supplement it and that's why that that extensive write up --

CHAIRMAN WALLIS: This might be supplemented again the same way in some other areas.

MR. SHUAIBI: That's why the information that's in here may be used to update the existing guidance in which case this information may go away. We could just reference it in the SRP section and all the supplementary guidance could go away. It could be used in both ways.

Going on to Section 3 of the review standard, Section 3 is documentation. Again, we talked about that earlier. These are boilerplate safety evaluations where we told the reviewers this is how you would document your area of the review and the last section of the review standard is inspection. Again, here, two things. One is we've developed an inspection procedures specifically for extended power uprates. We reference that. The other thing is in doing the review we wanted the reviewers that are performing the review to communicate with the inspectors on what information they felt the inspector should go out and look at. And that would be for the

inspector to consider that as part of their sampling in the plant in terms of what they want to look at for implementing the power uprate.

If you have no other questions on my presentation, I'd like to turn it over now to Rich Lobel who is going to talk about containment systems.

MEMBER LEITCH: Mohammed, I have just a general question. When a licensee submits an application for extended power uprate does he list that application also, submits to providing certain modifications in the plant or is that separate? In other words, are we embarrassed by the fact that we have plants that we have licensed for a rating greater than they can attain?

MR. SHUAIBI: It's always embarrassing when you find something that you didn't know after the fact.

MEMBER LEITCH: No, but I mean before the fact like I'm thinking, for example, that the case of Brunswick. There were two reviewing cycles that they were going to take before they were able to obtain the rating that they're presently licensed for. In fact, even at the moment, Brunswick came out and they quote what we call 100 percent of their license capability. I mean is there a commitment that they're going to

install these modifications? Suppose, for example, they say well, we're not going to install these modifications. We're only going to provide 96 percent power from now on. Does that present us some kind of a problem?

MR. SHUAIBI: The licensee, when they make their application, they actually describe how they're going to do this. They do tell us that we're going up in two steps. We're going up in one step. We're going up in three steps. But they will tell us that in their application.

MEMBER LEITCH: That's a force of a commitment?

MR. SHUAIBI: I'd have to go back and look at that, whether it's a commitment or something else. I have to go back and look at that.

I want to say yes, but I need to go back and look into that and get back to you on that.

MEMBER SIEBER: On the other hand, you're licensing the plant to the uprated power. The balance of the plant isn't capable of producing it and therefore you're limited by your tech specs and your operating enveloped, so you only get 95 percent of power. I don't see a regulatory problem with that, nor do I see the need for a commitment to install

additional equipment to improve your plant output, unless it's an economic matter for the licensee. Analysis is good, regardless, what power level you have.

MR. SHUAIBI: Right, they're not modifying the safety systems. We do have different levels of control on the things that we approve. In some examples, some previous power uprates, we felt it was necessary to not only get a commitment from the licensee, but to impose a license condition on the plant, and certain modifications that they committed to do and they've done that.

MEMBER SIEBER: Involving safety.

MR. SHUAIBI: Involving safety systems, involving, yes.

MEMBER SIEBER: Nonsafety systems? Unless they somehow had a safety implication, I'm not sure why --

MR. SHUAIBI: We usually treat those, depending on how we use that in our evaluation. If it's something that's needed for us to conclude, that it's acceptable, we've met the threshold of the license condition. If it's something that the licensee wants to make, but we don't believe it's necessary for us to control in the way that we'd have

to review the difference or a deviation from that, it could be a license commitment. And then there are other things that the licensee could say we're doing, but we don't really consider. That's just good information for us to have. So there are different levels of control. I don't have the answer on Brunswick. I'll have to come back.

MEMBER LEITCH: For example, at Brunswick, I know they committed to some change to get the details in the standby liquid control systems.

MR. SHUAIBI: I believe that made it into a licensed condition, not just a commitment which is a much tighter control. They'd actually have to come to us for review and approval if they wanted to change that. Then we have to submit a license amendment that says we want to change this and we'd have to review it and approve it.

So that, I believe, ended up being a licensed condition which is more tightly controlled, just like any increased power level above their licensed power level.

MEMBER SIEBER: And a change of that nature could affect the way the ultimate power that you would license the plant too. If they decided not to modify the safety system necessary to justify the

greater output.

MR. SHUAIBI: Maybe we can talk about this later. I believe that was driven by the risk review.

MR. HARRISON: If I could interrupt. This is Donnie Harrison. I'm from the PRA branch. On the specific example you're giving, it eventually became a licensed condition from the deterministic side, but on the risk side we evaluated both the installation of the modification as well as not bringing the modification in because it was still under management review by the licensee. So there was the option at that point in time during the risk review that they might not do it, if it was determined not to be necessary for the power uprate. And so we evaluated both the benefit of doing it and then also what would be the risk if they didn't do it. We evaluated both conditions to satisfy our review.

MR. SHUAIBI: So then Donnie, to summarize what you're saying is we ended up moving it from a deterministic standpoint and therefore it became a license condition.

MR. HARRISON: Right.

MR. SHUAIBI: So I stand corrected. I said something that was a little different a little wile ago.

MR. HARRISON: I understand. Thank you.

MEMBER RANSOM: I've got one proposal, I'm wondering if maybe we should jump to the ACRS public comments, ACRS and public comments which I think is one of the main purposes of this meeting and they're now delayed so late in the day.

MR. CARUSO: Do you have a problem with that?

MR. SHUAIBI: I do not -- I may get into areas where I would need additional support. I may have to defer that to a little bit later, if that's okay. But I could try to cover as many as I can and I do have support here to talk about certain areas.

MEMBER RANSOM: Anybody else feel strongly about that?

MR. RULAND: Mohammed, could we do that first thing in the afternoon, right after lunch. Maybe that would work.

MEMBER RANSOM: Why don't we do it right after lunch?

MR. SHUAIBI: We can do that as well. We'll have the staff here to answer any questions on that.

MEMBER SIEBER: Now might be a good time for a break.

MEMBER RANSOM: Well, they scheduled 10:20. I don't know if we can get through the next one or not. It's 30 minutes. Does everybody want a break? Why don't we break now for 15 minutes. Come back a quarter after.

(Whereupon, the foregoing matter went off the record at 10:03 a.m. and went back on the record at 10:18 a.m.)

CHAIRMAN WALLIS: It's all yours, Vic.

MEMBER RANSOM: Richard, go ahead.

MR. LOBEL: Good morning. My name is Richard Lobel. I am a reviewer in the Containment and Accident Dose Assessment Section in the Probablistic Safety Assessment Branch. I'd like to talk about the containment aspect -- the containment review aspect of the extended power uprate review. The scope of the review generally covers all or some of nine items: Peak containment, pressure and temperature analysis for LOCA, main steam line break, the containment response to that, subcompartment analyses. Subcompartment is a confined space in the containment and a high energy line break in this confined space could result in an increase in pressure faster than the containment pressure would increase. And this is of a concern for structural analysis, making sure that

the pressure different across walls and structures doesn't exceed whatever the structure is designed for.

Combustible gas control is another aspect that's usually minor in power uprate reviews. Containment heat removal systems that spray in the fan coolers are usually only looked at from their capabilities that are confirmed by the analysis. In general, there's no changes to the design of these systems associated with power uprate. Minimum containment pressure is calculated for input into LOCA analysis and this analysis has a completely different set of assumptions. Instead of trying to be conservative and maximizing the containment pressure, this analysis attempts to underestimate the containment pressure since that results in a higher peak clad temperature for the LOCA analysis.

Net positive suction head of the ECCS in the containment spray pumps is looked at. The flows usually don't change, but the sump water temperature or the suppression pool temperature can be hotter. Environmental qualification envelope for equipment important to safety and containment, this usually doesn't change but it's possible that it could. And BWR suppression pool hydrodynamic loads and BWR drywell bypass. Drywell bypass is a term that's used,

it's really more a suppression pool bypass where there's some leakage from the drywell directly into the containment bypassing the suppression pool. So there's the possibility of increasing the containment pressure. So there might possibly be some changes to that analysis as part of a power uprate.

MEMBER LEITCH: Some plants are allowed credit for containment pressure in calculating the net positive suction head and some are not, right? Is that correct?

MR. LOBEL: Well, some don't need it, most don't need it. Some of the older plants, especially some of the older boiling water reactors need some credit for containment pressure, and when that's the case they do an analysis similar to what I was describing for the peak clad temperature for the PWRs. They do an analysis that minimizes the containment pressure so that when they say they need a certain amount of pressure to get adequate NPSH, we're still assured that there's at least that much pressure available. We usually try to limit the amount of credit we give to no more than what's required, and typically that's not a very high pressure.

MEMBER SIEBER: That's done by exemption, though, right?

MR. LOBEL: No. No, they don't need an exemption for that, because that's not specifically in the regulations.

MEMBER LEITCH: My question is basically if a plant does not presently require credit for containment pressure but with the power uprate would require credit, is that change possible?

MR. LOBEL: It's possible. I think typically it's for more than a plant that already has some credit for it and may need a little bit more. I don't think there's been a case, I can't think of one offhand, where a plant that didn't have credit needed credit.

MEMBER LEITCH: I see.

MR. LOBEL: But I'm not positive about that, but I don't think so. So typically it's at a plant that already has credit getting a little bit more because their suppression pool temperature is a little higher.

MEMBER LEITCH: Okay.

MEMBER SIEBER: It seems to me that some plants take credit for fan coolers, for containment coolers and other plants don't. That's correct, right? And they rely on containment spray.

MR. LOBEL: Yes. Typically, they do both,

but I believe you're right, there is some that don't.

MEMBER SIEBER: Well, the question becomes if you pressurize containment, you change the load on the fan motor, and a lot of the fan motors can't take the extra load and they'll trip.

MR. LOBEL: I know in the Arkansas II power uprate they made modifications to their fan coolers because of that. I don't know of any --

MEMBER SIEBER: That's like Beaver Valley, that the fan coolers trip off when you get an ACIB signal and they stay off, and they rely totally on sprays.

MR. LOBEL: Yes. Well, they're a subatmospheric containment, at least for now, and they --

MEMBER SIEBER: There's a bunch of them out there.

MR. LOBEL: Yes. They have a lot of spray. Next slide, please.

The analytical methods for the BWRs that are typically used include the Mark I containment load definition report. These are plant-specific reports of calculations that were done to support hydrodynamic load evaluations. There's a GE pressure suppression containment analytical model that goes back to the

early '70s that's based on the Bodega Bay testing, early BWR suppression pool testing. GE Mark III report, analytical model that's used for short-term blowdown analyses, and the Super HEX code that's typically used by licensees for long-term containment and suppression pool analyses. This would typically be the code that would calculate the suppression pool temperature and pressure for NPSH calculations.

MEMBER FORD: Could I ask a question about these very old reports? In many of the technologies that we're interested in, this one included, but other materials, because a report has been approved back in the '70s or whatever, the presumption is that it's still all right 20 years later. Is there any questioning of that assumption?

MR. LOBEL: When Duane Arnold came in -- yes. And when Duane Arnold came in for power uprate, they were a large increase in power, we asked ourselves that question, and also one of our criteria here about change in margin. You designed your plant for one power level, now you're going to a 20 percent higher power level. Where's the margin to do that? So we performed some independent calculations, audit calculations for Duane Arnold, and we did the same thing for Clinton, which was the first Mark III, and

in general we got good agreement with the GE calculations.

Now, you have to understand that when we do these calculations, so far what we've done is the containment part of the calculation. We haven't done an independent calculation of the mass and energy input into the containment. But from doing these reviews it appears that those methods are -- the older methods are actually more conservative, and in some cases General Electric uses more modern methods that have been approved by the staff because they need the margin and the older methods are too conservative. So we have looked at that as part of the reviews, and the conclusion so far is the older methods are conservative and unacceptable. We haven't done detailed reviews of the models, which is another reason we did the audit calculations with our own computer code that we understand to make sure that we could get agreement and there weren't any areas that we couldn't explain. But, in general, we had the same trends in the analysis and pretty much the same values for both the Mark I and the Mark III calculations that we did.

MEMBER FORD: Now, when you said, "we," did we institute or instigate a reevaluation of this

old report? Maybe that's more of a general question to you, Mohammed. Who specifically instigates that? Is it the engineer in charge of a specific section and his gut feeling tells him that maybe he should go back and review that old report in light of the current data?

MR. LOBEL: In this case it was me.

MEMBER FORD: Okay. So it was you because of your experience.

MR. LOBEL: And I questioned that, pretty much your question and the question of margin.

MEMBER FORD: And what about a young engineer coming on?

MR. LOBEL: Well --

MEMBER FORD: Who would advise him, "Hey, you'd better -- there's data coming out from such-and-such a plant in Japan which may question this scientific procedure"?

MR. SHUAIBI: I think the idea here is if we were to get new information that would suggest, for example, that now or sometime in the future that something is wrong with the method that we're using, the idea is to update this guidance to provide that for the new reviewer or even the experienced reviewer that may not know that. But in terms of who actually

questions the applicability, the reviewers would.

In the case of containment systems, because of the way that the reviews are done, Rich talked about the fact that we haven't reviewed the detailed models in some of these because they rely heavily on independent calculations to confirm the codes that licensees are using are predicting things in the same way that we expect them to or that we would, and we use a different code to do that. In other areas where we review codes in detail, there are instructions for the reviewers, new or old, experienced or new hires, to go back and make sure that the codes are used within their limitations. And I will do that -- as Rich is continuing, I will try to pull that statement from one of the matrices for the other sections.

MR. LOBEL: I don't think that this is -- speaking from my knowledge, and I used to be a Section Chief for quite a while, I don't think this is the kind of review that you would give to a new person to do. This takes a fair amount of knowledge in a lot of different areas. I went through kind of a scope of a review and a person doing this review would have to have a pretty good knowledge of what was in the standard review plans for these different sections and

hopefully some experience in doing these reviews before he got assigned -- he/she got assigned to do a power uprate review. So this isn't typically the kind of thing that a new person would get unless that new person had an awful lot of experience in some other way.

MR. SHUAIBI: The way we've handled that is in our effectiveness and efficiency plan for power uprates, a Commission paper, a paper that we wrote to the Commission. We told that we would strive to assign the more experienced reviewers on power uprates. In cases where we don't, we will make sure that they're either tagged with someone with more experience so that there's a transfer of that knowledge, if you will, and that they can do the review, or they can receive sufficient training ahead of time.

So we are -- we do have people that are not as experienced as Rich that do get involved in these reviews, but they're usually tagged with someone that has done these reviews in the past and that has been around long enough, like Rich has, to make sure that they're doing the right thing. In the containment systems, really, I don't believe we've gone into that. I think we've had Rich almost on

every one of these, and we've had some others involved in doing independent calculations. In other areas, we do get new reviewers.

MEMBER RANSOM: This as well --

MR. SHUAIBI: Again, this goes to -- I'm sorry.

MEMBER RANSOM: This as well as other areas, I would think, would -- like Rich stated originally, its purpose is to retain experience, that to the degree possible it would be very good to put down what are the criteria that say the experienced person looks for to decide whether we should do independent calculations or not.

MR. SHUAIBI: Right. And in a containment area, because of the way that the reviews are done, we've got to -- we have the guidance listed in Attachment 1. Again, because of the way that the reviews are done in the containment area, they usually do not get into the detailed models, and, Rich, correct me if I'm wrong, within the codes that are used. So they do independent calculations, make sure that these codes and the results of these analyses match up, and I'm talking about the licensee's analyses versus our own independent analyses, that we have confidence that they're tracking correctly.

Now, going back to the comment earlier, in the reactor systems area, which is different than containment systems where they actually do detailed reviews, we have a note in here that applies to a lot of the things in Matrix 8, if you would go to Matrix 8. And we have a note in here that reminds the reviewer, the review also confirms the licensee use NRC approved codes and methods for the plant-specific application and the licensee's use of the codes and methods complies with any limitations, restrictions and conditions specified in the approving safety evaluation. So we're telling them, "Go look. Make sure that you go back to that topical in the way that it was approved in that method and the way it was approved and make sure that you look at those limitations and make sure that the licensee's use of those methods is consistent with those limitations."

MEMBER RANSOM: Just one other thing. Richard mentioned doing independent calculations. What code do you use to do that?

MR. LOBEL: We have been using the CONTAIN II code, which is the NRC code, NRC-developed code.

CHAIRMAN WALLIS: It's for PWR?

MR. LOBEL: It's for both, and we've used it for both. Both Duane Arnold and Clinton were both

done with contained. An earlier analysis for Arkansas was done with MELCORE. That was done at Los Alamos, and it was their choice. That was the code that they thought they could use most effectively. But since then we've been trying to use contained for all the analysis.

MEMBER LEITCH: Is there an analytical method for Mark IIs? I don't see a reference to Mark II on here.

MR. LOBEL: It pretty much uses these other methods. They're not that specific, and the models for the containment are pretty much included in these. Super HEX certainly does all three designs.

MEMBER LEITCH: Okay.

MR. LOBEL: And the others do too. In some cases, other codes could be used also, but this is typically what's used by General Electric and the licensees.

MEMBER RANSOM: Is Super HEX a GE code?

MR. LOBEL: Yes. Okay. The next slide is a similar list for PWRs. COPATTA is an old Bechtel code; COCO is an old Westinghouse code; LOTIC is a Westinghouse code that's used for ice condensers; TMD is a Westinghouse code that's used for subcompartment analysis, LOCTIC is a Stone & Webster code that's used

for subatmospheric analyses, and CONTRANS is a CE code. And all these codes are typically used for containment analysis by licensees.

The GOTHIC code is a little different than these other codes. It's developed by EPRI, and it's developed by Numerical Applications, Incorporated for EPRI. GOTHIC stands for generation of thermal hydraulic information for containment, but it's always called GOTHIC. It's an industry-wide code. There's a large user's group that provides feedback to the developers. It's covered by Appendix B. It's had extensive validation and has state-of-the-art models. And the staff has approved GOTHIC analyses for AP 600. The WGOTHIC code that Westinghouse used is based on an earlier version of GOTHIC, and an earlier topical-owned Quani reload methods used an earlier version of GOTHIC, GOTHIC 6. GOTHIC is up to 7.1 now.

And we have GOTHIC in-house and have GOTHIC ourselves, although, like I said, we typically use CONTAIN for our independent analysis. But in some cases, we have done sensitivity studies. When a licensee uses GOTHIC, we've used the same code with the same input and done sensitivity -- look at different questions we had.

MEMBER SIEBER: What happens when somebody

like Westinghouse uses GOTHIC to develop WGOTHIC, and their modifications to the code are based on some version number?

MR. LOBEL: Right.

MEMBER SIEBER: So now you've got two paths going. You have the WGOTHIC path and the EPRI GOTHIC, which now continues to accumulate modifications in new version numbers. Does the WGOTHIC track that or do they freeze it in time and --

MR. LOBEL: Right. Typically, what's done is --

MEMBER SIEBER: -- say, "I'm going to add my own stuff"?

MR. LOBEL: -- we use -- we started with GOTHIC, I think it was 4, Version 4 that they used to develop WGOTHIC. So now that code is WGOTHIC and it's not GOTHIC anymore. And WGOTHIC is the code that's maintained by Westinghouse. And any changes they make to that would be covered by 5059. Typically, if they were making some change to improve the numerics to make it run more efficiently, we probably wouldn't get involved in that at all. If they were making some change to a condensation model or the way they were noting the containment, we probably would be involved with that. So your latter choices is what happens.

And the same thing with Quani. They used GOTHIC 6 as their version for the reload applications, and now they're in for a review again because they want to use another version of GOTHIC, so they have come back to us to review the newer version. So that would be their evaluation model and that's what they'll use from now on for their containment analysis till they want to change.

MEMBER SIEBER: Well, my question is it seems to me I recall that in an appendix case base every year there was some kind of review and report that was submitted that says, "We found this little minor error and it causes the results to go for PCT ten degrees higher. On the other hand, we found this other little thing modified which causes a PCT to go 15 degrees lower, so everything is just fine."

MR. LOBEL: Yes.

MEMBER SIEBER: Does that happen in the GOTHIC space too?

MR. LOBEL: No, because that's not covered under a regulation. It does -- well, what happens is --

MEMBER SIEBER: It is to the extent that the Agency is the regulating authority and the containment is a pressure vessel.

MR. LOBEL: What happens in the case of GOTHIC is that there's a user's group that's always providing input back to the developers. If they find a problem in using the code, they'll tell the developer about that in e-mails or at meetings that they have or whatever forum they use. We're not involved in that, they don't want us involved in that, because they're afraid that that will limit the usefulness of the feedback they get if everything is reported to us. But on the other hand, the licensee has an obligation if they're using an analytical method and they --

MEMBER SIEBER: Is this under Part 21?

MR. LOBEL: Under Part 21 or operating outside their licensing basis. If they find a problem with a code that they feel has an impact on the calculations they've done, their licensing calculations, then they have an obligation to come to us and tell us about that. So it's not covered by a regulation but --

MEMBER SIEBER: It's sort of the reverse of Maine Yankee, the Maine Yankee situation?

MR. LOBEL: I'm not that familiar with Maine Yankee. I won't comment on that. I wasn't involved.

MEMBER SIEBER: Well, it's an analogy but probably not a good one so I'll drop it.

MR. LOBEL: So, okay. I guess --

MR. SHUAIBI: Where they come and tell us about it instead of not tell us about it.

MEMBER SIEBER: Well, sort of curious as to how that system works, and I would imagine from the staff's standpoint the bookkeeping as to who's using what version of what and where it came from is difficult.

MR. LOBEL: We don't keep records of that. We don't have --

MEMBER SIEBER: So it's easy then. It's not difficult if you don't keep the records.

MR. LOBEL: Well, yes. It comes down to a licensee's responsibility, and I have seen 5072 reports and LERs where licensees have reported that they've discovered problems in a calculation and they're taking appropriate administrative steps until they fix the problem and redo the calculation. There was a case with a couple of two-loop PWRs where they recently in the last couple years found a new single failure that they hadn't analyzed before, and when they went back and reanalyzed they got results that were over their containment design pressure. So they

took appropriate steps until they could redo the analysis and make sure that their analysis of record was predicted pressures under the design pressure.

MEMBER SIEBER: Does the staff review and approve containment codes the way they do Appendix K codes?

MR. LOBEL: No. We don't do that, and we typically have not done that in the containment area.

MEMBER SIEBER: So Appendix K is unique with regard to --

MR. LOBEL: It's more the exception than the rule.

MEMBER SIEBER: Okay.

MR. LOBEL: I don't want to speak for other technical areas, but I think RSB is more the exception than the rule in that they review in detail the codes.

MEMBER SIEBER: And that's because there is a specified rule that says, "If you're going to make this calculation this way, then you've got to meet these criteria."

MR. LOBEL: Well, we have that, but what's happening now, GOTHIC is a good example and there are others, is the codes have gotten so big and have so many models that it's hard to do a code review. And

there are other problems too, problems with fees and if you have a code like GOTHIC who's going to answer the questions -- who's going to answer the staff's questions. So the method that we use now for doing containment reviews has a couple different steps, and basically it's -- you look at the type of analysis that's being done and you make a judgment of what are the most important models that impact that particular analysis. You look carefully at those models as opposed to looking at the whole code, and you do an audit calculation if that's called for.

MEMBER SIEBER: Okay. So this would be sort of in terms of independent verification?

MR. LOBEL: Right.

MEMBER SIEBER: And you would do that using GOTHIC?

MR. LOBEL: We would do that using CONTAIN, typically.

MEMBER SIEBER: CONTAIN, okay.

MR. LOBEL: Yes. Yes.

MEMBER SIEBER: And so once you do the independent calculation, you don't really need to worry so much about the details of whatever code the licensee used --

MR. LOBEL: Right.

MEMBER SIEBER: -- as long as you get the same answer.

MR. LOBEL: Right. And my last slide I was going to go through a calculation and show kind of what the reasoning is when we have a discrepancy, but typically that's how we do the reviews.

MEMBER SIEBER: Okay. I appreciate that. That clears up a lot for me.

MR. LOBEL: Okay. Part of what's happening now with containment analysis is that the standard review plan in this area is getting outdated and licensees are typically coming in with calculations that are using new models, partly to accommodate the increase in power level. The new models that are used typically emphasize physical phenomena rather than the older empirical correlations. If you're familiar with it, there's the Tugami and the Uchita correlations which are very conservative heat transfer correlations that were developed a long time ago. The Uchita paper I think is dated 1965 but have been used by the staff because they're so conservative.

But now with the newer codes that are being used, GOTHIC and to some extent MAP and CONTAIN, newer models are being used. There's a heat mass

transfer analogy that's used for the condensation heat transfer that CONTAIN uses and GOTHIC uses where physical models of condensation and the presence of air is used rather than use empirical correlations. There's modeling of aerosols that's been proposed, the breakflow consisting of droplets and the behavior of the droplets and multi-node calculations. Instead of the containment being one node, it's multi-node. And those kinds of things are new. They're real effects and we're still evaluating although they're real, are they adequately quantified and how much conservatism needs to be left when you're giving credit for realistic models? So those are issues we're dealing with now.

MEMBER RANSOM: How do you deal with -- has this reduced the margin compared to what previously was available?

MR. LOBEL: It does reduce the margin, yes.

MEMBER RANSOM: How do you handle that, I guess, in terms of safety implications?

MR. LOBEL: Well, we're trying to decide that now, but usually -- well, the way we would handle is we'd look and see what conservatism remained and satisfy ourselves that the conservatism that was left

is still sufficient. These models don't cover the mass and energy release. Those calculations are typically very conservative. They don't consider the input that's used for the calculations. The volume of the containment is adjusted depending whether you want a minimum or a maximum pressure. The input for the beginning temperatures and pressures and humidities and those kinds of things, all those kinds of things are still done in a conservative way. And so there's still conservatism remaining in the code even though some is being taken out in these containment models.

MEMBER RANSOM: As you reduce that, there is uncertainty associated with even the new models, of course.

MR. LOBEL: Right.

MEMBER RANSOM: So how do you, I guess, quantitatively evaluate what that means in terms of risk?

MR. LOBEL: Well, in terms of risk, there's always the fact that the design pressure can be exceeded to some extent. We don't give credit for this but the design pressure can be exceeded to some extent without increasing leakage. But like I'm saying in the slide, that's something that we're dealing with now. A lot of these things are still

under review, and we haven't reached conclusions on what to do. The analyses that have been approved so far for power uprate haven't used these new models to a large extent and still contained a lot of conservatism.

MEMBER SIEBER: Well, there's actually two issues. One is as you increase the pressure, because you have more energy to the containment, two things happen. One of them is the margin to catastrophic failure to containment is reduced, and the second thing that happens is the leakage -- the propensity for leakage increases.

MR. LOBEL: Right.

MEMBER SIEBER: So you actually have to evaluate both, and there is a lot of margin in the ASME code for between design pressure and ultimate strength. It's like a factor of two or three compared the code max allowable, which is what you're calculating here. So there is plenty of margin for that. Where the uncertainty I think becomes important is in knowing the extent to which you approach Part 100 on a leakage basis.

MR. LOBEL: Yes. But as part of the Appendix J, Option B work that we did, we did some risk type calculations where we looked at how much the

containment leakage would have to increase before it started to have an effect -- now, these are risk calculations, not Part 100 calculations, and it was an increase in leakage of several of orders of magnitude before you started to see any increase in risk due to containment leakage.

MEMBER SIEBER: You mean radiological risk?

MR. LOBEL: Right. Right. So there was some -- there is some margin in leakage too. And, again, we don't give credit for that, but that's there as something that we're aware of.

MR. SHUAIBI: I also want to emphasize that there are margins to cover uncertainties in a lot of different things that we assume when we do these analyses. There are input assumptions that Rich talked about, the way that things are modeled. There's nothing that says that a plant can't go out and develop a realistic method.

MEMBER SIEBER: Right. But then uncertainty becomes extremely important.

MR. SHUAIBI: That's right. Then we would be looking for them to show us what the uncertainty is, and we would go through an uncertainty review to make sure that it's captured and that we're not losing

the conservatism. Methods have to be conservative, they have to account for the uncertainties.

MEMBER SIEBER: Now all the codes you listed there, which is GOTHIC and WGOTHIC and LOCTIC and CONTAIN, those are all -- none of those are realistic codes, those are all bounding codes; is that not the case?

MR. LOBEL: Well, GOTHIC and CONTAIN are more realistic codes, but it depends --

MEMBER SIEBER: But you still don't need to know the uncertainty.

MR. LOBEL: It depends on how you use them, and they're used in a conservative way. Our Office of Research has put out a series of guidance documents that we've been using for these audits that look at how to use CONTAIN to do calculations that are similar to the calculations that were done with the older, more conservative CONTEMP codes the staff used previously. And those kinds of -- and that guidance was used, by the way, for these audit calculations for power uprate for the BWRs.

MEMBER SIEBER: There's actually two kinds of uncertainty, one of them the user generates by the degree to which they realistically or in a bounding sense put the input into the code. And then the code

itself generates some uncertainty because of assumptions made in the numeric methods and the algorithms of the user. Well, we're probably getting too deep into this, but it's interesting to me.

MR. LOBEL: I'd better move on. I'm probably taking too long. Why don't we -- can we skip the independent calculations. That's just a list of criteria --

MEMBER SIEBER: Well, I think we've talked about those.

CHAIRMAN WALLIS: This is where I said, "This looks great. Why don't we have these criteria for every area, not just for containment systems." In materials, the only thing you're supposed to look at is -- well, why don't you look at everything else where there might have been a first-of-a-kind method or questionable results or something?

MR. LOBEL: Let me go to the last slide. I put this in as just an example of the process we go through a little. This is a curve of a PWR large break LOCA. The sump temperature is a function of time, so this is the water temperature in the sump. And the solid line is our CONTAIN calculation of the sump temperature. The dotted line, the black dots, is a GOTHIC calculation of the same thing using basically

the same input. And you can see that there's a pretty large difference between the two calculations.

CHAIRMAN WALLIS: This isn't so bad because your code is predicting less. But if your code predicted more, then you'd have --

MEMBER SIEBER: That would discredit all the other calculations.

MR. LOBEL: Right.

CHAIRMAN WALLIS: Is this because one code's bad or because --

MR. LOBEL: No.

CHAIRMAN WALLIS: -- it makes different assumptions?

MR. LOBEL: The dot-dash curve answers that question somewhat, but, no, we tell licensees -- we ask licensees for their input so that we can do these calculations. Just as an aside, getting back to an earlier question, someone asked we've never had a problem with licensees providing information we need to do these calculations. We always tell licensees that there is no right and wrong. The codes have different models, and what we're looking for is to be able to explain the differences, and then we can use our judgment once we know what the difference is to say that's acceptable or not acceptable. So there's

the CONTAIN calculation which gives a lower temperature, the GOTHIC calculation that gives a higher temperature, and we tried to reconcile it by doing another CONTAIN calculation.

The reason we did the CONTAIN calculation, let me back up, you have to think in terms of the energy that's going into the containment atmosphere and the energy that's going into the sump. The CONTAIN calculations uses what's called a temperature flash model where the energy that goes into the containment equilibrates with the containment atmosphere before the fluid goes to the sump.

MEMBER SIEBER: So it's a vapor.

MR. LOBEL: So in the case of CONTAIN, a lot of the energy has been given up to the atmosphere, so the water temperature is going to be less. A lot of the energy is remaining in the atmosphere, which for a peak pressure calculation is conservative. It's going to give the highest peak pressure.

Okay. The GOTHIC calculation actually breaks up the break flow into droplets and looks at the behavior of the droplets and the heat transfer from the droplets and the fallout of the droplets to the sump. So in the case of GOTHIC, less energy is given up to the containment atmosphere, so more energy

is going to go to the water in the sump.

MEMBER SIEBER: Through the droplets.

MR. LOBEL: Through the droplets dropping into the sump.

MEMBER SIEBER: And the droplets are hotter than the general atmosphere.

MR. LOBEL: Right. Right. And so more energy goes to the sump, less energy went to the containment atmosphere, so the GOTHIC sump temperature is higher than the containment atmosphere. So what we tried to do was a calculation where we assumed -- took the CONTAIN code and assumed that five percent of the break flow is aerosol that stays in the atmosphere and the rest drops out to the sump.

MEMBER KRESS: Why did you choose five percent?

MEMBER SIEBER: Yes. What's the basis of that?

MEMBER KRESS: Is that because that's what's in GOTHIC?

MR. LOBEL: It was no special reason. It's kind of a typical value.

CHAIRMAN WALLIS: What if you made it ten percent? Would the temperature be that much higher?

MR. LOBEL: I don't think so. I think

five -- one of the reason for five percent is from other sensitivities, that five percent seems to be about an asymptotic value.

CHAIRMAN WALLIS: Okay.

MR. LOBEL: So in the case of CONTAIN now, only five percent of the break flow is remaining in the atmosphere, the rest is going to the sump. So therefore the sump temperature is going to be higher than the other CONTAIN calculation, and it's going to be closer to the GOTHIC calculation. So what this tells us is we could pretty well explain the difference between the original CONTAIN calculation and the GOTHIC calculation in terms of the modeling of drops in break flow.

MEMBER SIEBER: I think that is backwards from what you said. Ninety-five percent of the energy goes into the atmosphere, five percent goes directly to the sump, right, as opposed to what you said which was the other way around.

MR. LOBEL: No, I think it's this way. It's this way. Five percent stays in the atmosphere. The aerosols stay in the atmosphere. They don't drop out very easily.

CHAIRMAN WALLIS: Most of it's fallen out.

MR. LOBEL: Yes. And the rest of it falls

out carrying the break energy to the sump.

MEMBER SIEBER: Okay.

CHAIRMAN WALLIS: What's a realistic calculation besides all these assumptions?

MR. LOBEL: Realistic is probably closer to the GOTHIC calculation.

CHAIRMAN WALLIS: Because there's an experimental basis for that?

MR. LOBEL: Well, yes. The drop size is picked based on some experiments that were done, and the GOTHIC drop sizes is in the range of this experimental data.

MR. CARUSO: I'm sorry, did you say GOTHIC is the realistic one?

MR. LOBEL: Yes.

MR. CARUSO: Well, then you're saying CONTAIN is --

MR. LOBEL: Well, it's hard to say. CONTAIN is realistic in some ways, but we use -- in this calculation, we used an unrealistic, very conservative of putting the energy into the containment atmosphere, this T-flash method.

CHAIRMAN WALLIS: In the point of view of net positive suction head and --

MR. LOBEL: Well, yes. In the point -- if

we were looking at net positive suction head, GOTHIC would be conservative. But in terms of pressure, peak pressure calculations, GOTHIC would give a lesser pressure than CONTAIN.

MEMBER SIEBER: That's right. For each of these curves, there is a corresponding plot of containment pressure versus time for each rod --

MR. LOBEL: Right. Containment pressure and temperature.

MEMBER SIEBER: -- which gives you the opposite conclusion as far as margin is concerned --

MR. LOBEL: Right.

MEMBER SIEBER: -- depending on which code you use.

MR. LOBEL: So this would -- if we were looking at containment pressure, this would say that GOTHIC is non-conservative for containment pressure, or at least without getting into right or wrong, it's not as conservative as CONTAIN, because remember the CONTAIN calculation is using the most conservative assumption that leaves the most energy in the atmosphere.

MEMBER KRESS: Why isn't the difference between those two, CONTAIN, about five percent?

MR. LOBEL: Between CONTAIN and GOTHIC?

MEMBER KRESS: No, between CONTAIN and --

MR. LOBEL: CONTAIN five percent.

CHAIRMAN WALLIS: Because it's a 95 percent difference.

MEMBER SIEBER: Yes.

CHAIRMAN WALLIS: The amount that goes into the sump. Isn't that what's true?

MR. LOBEL: Between the solid line and GOTHIC or between the dot-dash line and GOTHIC?

MEMBER SIEBER: Dot-dash.

MR. LOBEL: Oh, why is there a difference there?

MEMBER KRESS: Why isn't it five percent?

CHAIRMAN WALLIS: Five percent is --

MEMBER SIEBER: It's 95 percent.

CHAIRMAN WALLIS: Ninety-five.

MEMBER SIEBER: It's the other way around.

MEMBER KRESS: We've got a CONTAIN and a CONTAIN with five percent water aerosol.

CHAIRMAN WALLIS: CONTAIN has 100 percent aerosol, doesn't it?

MR. LOBEL: Well, there's other models too. I don't think you can assume that it's going to be a linear calculation. There's other effects going on too at the same time, and this is five percent

aerosol, not five percent energy.

CHAIRMAN WALLIS: The base has a lot more water suspended in the containment than five percent. Isn't that the reason? That's why it doesn't fall down. That's why the temperature is so low here, that you haven't got that water into the pool.

MR. LOBEL: Right. The water is in the --

CHAIRMAN WALLIS: The containers have a lot more water aerosol than five percent.

MR. LOBEL: The water is in the containment atmosphere. The T-flash model assumes the water is in the containment atmosphere until it equilibrates, until it's given up its energy. And then it goes to the sump. The other cases the droplets are carrying a lot of energy from the break to the sump. In the bottom CONTAIN curve, you've given up all the energy before you go to the sump.

MEMBER RANSOM: That's the base CONTAIN?

MR. LOBEL: Yes. The base CONTAIN, the T-flash model. What you assume is that the energy coming out with the break equilibrates with the containment atmosphere, gives up its energy to the containment atmosphere, and then the droplets fall to the sump.

MEMBER RANSOM: So I guess the question

would be what is this temperature, is that temperature of the atmosphere or temperature of the sump?

MR. LOBEL: No. This is the water, this is the sump water temperature. So the reverse, like you were saying, the containment atmosphere, would have a higher pressure and a higher temperature. This is the sump water temperature.

CHAIRMAN WALLIS: This is an example of how you do independent calculations and you look at parameters and you figure out what's going on.

MR. LOBEL: Yes. That's all I have.

MR. SHUAIBI: Next up we have the Mechanical Engineering Branch with a presentation. I would like to go back and look at the agenda. We're running behind schedule.

CHAIRMAN WALLIS: Well, maybe we don't need to go into so many details.

MEMBER SIEBER: I think we're forcing them.

MR. SHUAIBI: I think what I'd like to do is if the Committee has an interest in a certain area that they would like us to cover in detail and other areas where maybe they do not want us to cover and would be willing to take those off, the slides are available or you have the slides, but I'll leave that

up to the Committee, but we are behind schedule.

MR. MANOLY: Good morning. I'm Kamal Manoly, the Section Chief in the Mechanical Branch, and just the cast of players here. I have Dr. Wu. He's the lead reviewer of the power uprates and he was involved in the audit with Pat Sekerak from the Mechanical Branch of the Quad Cities steam dryer failure. And also Dave Terao, the other Section Chief in the Mechanical Branch, and Tom Scarbrough are working for the plan for the NRC action following the Quad Cities failure. So on specific questions I'm going to be referring to either John Wu or Dave depending on the type of question you have.

I'd like to maybe head on with the question that you had previously with other individuals here on the need for independent calculations, and it seemed like an issue that --

CHAIRMAN WALLIS: Could we perhaps look at -- rather than looking at everything, look at those areas where power uprates actually triggered some extra work? Flow-induced vibration, for instance, is important for power uprate.

MR. MANOLY: Correct.

CHAIRMAN WALLIS: Some of these other things didn't really change with the power uprate.

It's the same pressure, the same vessel and so on. So if you could move on to the things where you really had to think about this issue with respect to power uprate.

MEMBER SIEBER: It might be worth talking about Quad Cities particularly, because to me that's one that we reviewed and concurred with the staff's opinion, then you turn around and the Plant has a failure, which seems to -- I think Dresden also had one, right, cracked, all sorts of -- to me something went awry there and maybe there's a lesson learned that may or may not be factored into your review standard from those issues.

MR. SHUAIBI: Would you like us to do Slides 26 through 29 or would you like us to go through just the Quad Cities dryer failure?

MEMBER SIEBER: I think we could suffice this whole section by doing that in detail and --

MR. SHUAIBI: The Quad Cities dryer failure?

MEMBER SIEBER: Right.

MR. SHUAIBI: Okay. So that's Slides 28 --

CHAIRMAN WALLIS: Wasn't that what we were into now?

MEMBER ROSEN: We're going to just talk about Quad Cities?

MEMBER SIEBER: I think that's way too narrow.

CHAIRMAN WALLIS: Isn't Quad Cities is an example of what you're on now?

MEMBER SIEBER: That's right. It's an example of the failure of the --

MEMBER ROSEN: Well, certainly we want to hear about that, but that's not all I want to hear about.

MEMBER SIEBER: All right. Well, then --

MEMBER ROSEN: I can tell you I'm interested in safety-related valves and their ability to handle the increased steam flows and the ability to handle vibration.

MR. MANOLY: Okay. I think if you look at the areas that we typically look at on Page 24 and 25, that gives you the spectrum of what we look at. In terms of functionality and the impact of the APO on the previous responses to communications, that's one of the things we look at, how they address the bulletin that gives -- 88-11, that's the bulletin, 88-11, for the surge line stratification. We looked at the responses -- the change of responses to 89-10,

which is the MOV Program, and the 95-07, pressure locking and thermal binding, and 96-06 for the pressurization of isolated sections of piping that was -- so we do look at all the previous responses and how they change after the power uprates.

Also look at the impact on the pipe break locations because the change of either fatigue numbers or the stresses, the threshold of stresses. And also look at the effect on the structures in terms of the qualifications, dynamic qualification, the structure, especially when you combine the dynamic loads with the seismic loads in combinations. And electrical equipment qualifications as well.

So that covers the scope of the things that we look at in the review. Slide 26 gets into the flow-induced vibration, and that's one of the areas that obviously attracted more attention after the Quad Cities issue. I think Dr. Ford has been asking questions in that area, and we feel that previous maybe power uprate submittals did not address the issue maybe in the level of detail that he felt comfortable with, but the issue was always that the steam dryers were non-safety conformance, and that's where the utilities felt that we don't have to go into the level of detail that we expect them to go to on

other --

CHAIRMAN WALLIS: How about the analysis here? What I've seen looked very, very crude, sort of Rho v squared or something for forces, but there's a lot of things like residences and behavior, structure interaction which isn't very well understood. And you've sort of approached this by doing experiments and operating the power slowly and seeing if things begin to shape. You can't predict all these things very well, can you?

MR. MANOLY: Well, I don't -- yes. The responsible structure based on the CFD analysis and then taking that, applying it to a finite element computer model is not usually very well representative. I think on Quad they worked the problem backwards from the failure that they had and tried to develop the force or the lows that can give you that kind of failure.

CHAIRMAN WALLIS: So they had to sort of hypothesize that there were shed from something or other, which perhaps wasn't in the CFD at all.

MR. MANOLY: That's very likely. Maybe John or Dave can add to that.

MR. SHUAIBI: I'd like to interrupt a little bit. There's some things about the dryer

failure and the way it was analyzed that are proprietary, and we can certainly cover this in a closed session at some point. There are other things that we can talk about in terms of the fact that historically dryers have been analyzed, like Dr. Wallis said, in a crude way, and now they're being analyzed a lot more rigorously as a result of the experience at Quad Cities. But in terms of how the analysis was done, how either GE or the licensee -- how they performed the analysis, what type of analysis they did, we can get into proprietary information, which would have to be deferred to a closed session if that's what you want to do.

MEMBER SIEBER: On the other hand, since the dryer is non-safety, then once you assure yourself that it doesn't generate a loose part or damage the fuel or restrict the flow, would that become a candidate for elimination from your uprate review?

MR. SHUAIBI: I think right now the way that -- what we've done in the review standard is we've added a footnote to the table in Mechanical Engineering that says that we want more detail on how this dryer is going to behave following the power uprate. We are still dealing internally, we don't have an answer in terms of what exactly it is that we

want to do going forward. We're still looking at our options in terms of do we want to get into -- do we do an analysis -- like you said, do we ask for an analysis, like you just suggested, and determine we don't need to go into that area or do we pursue it because it's an internal component to the vessel? So we're still working on how would we deal with the dryer failure?

MEMBER SIEBER: But if it's non-safety, doesn't that answer the question and tell you where to go?

MEMBER ROSEN: No, I don't think it does. I think with non-safety tells you that as long as it performs appropriately, that is it doesn't do anything unexpected, then it's okay not to go into a lot of detail. The minute you have operating experience that says that it's surprising you, then you're in a different environment. Then you can ask and should ask a lot of the kinds of questions that Jack raised and it's fair game. It's inside the vessel and the vessel includes things that we very much do care about.

MR. SHUAIBI: I do want to emphasize that these questions were asked when the dryer failure did happen. We sent a team out to the Plant to

investigate what happened, how the Plant is dealing with this, what they've learned. We've looked at the analyses that were performed by GE in support of this failure. We're asking a lot of these questions. What we don't have right now is an answer on how we're going to be moving forward. But we've asked all these questions, we'll continue to ask ourselves questions. We're looking broader than the dryer failure, we're looking broader than the dryer itself, we're looking broader than boilers. We don't know whether this problem exists anywhere else or not, but we're considering all of that. But right now we don't have an answer in terms of what specific information is it that we want plants to submit.

MEMBER ROSEN: Well, I've just enunciated my doctrine for what you should do. You obviously don't have to do what I say, you only have to listen. The doctrine I espouse is that as long as it's a non-safety related component and it performs roughly as anticipated, then you don't need to go any deeper. The minute it deviates from that and operates from experience, then you have free reign to ask any questions and the licensee, the applicant, should in fact commit to giving you the answers before you take licensing action.

MR. MANOLY: We certainly agree with you on that, and I think the new plants coming in for power uprate, I think it was Vermont --

MR. RULAND: Vermont Yankee.

MR. MANOLY: -- Vermont Yankee, we talked to them before even they submit the application, and they got a sense of what we're looking for, the type of things we're looking for to support their flow-induced evaluation. And they have a good feel that we're looking for a lot more than we looked for at Dresden Quad, for example.

MEMBER FORD: When we visited, and that's the ACRS, when we visited GE in San Jose, when the Quad Cities II system came up we were assured that repair and mitigation of that problem was undergoing. Yet the very next cycle we get another tracking failure. Was there any review by the NRC of their mitigation strategy?

MR. MANOLY: Not to my -- I mean I can't say from my knowledge that there was one. It could have been one but I'm maybe not aware of it.

MEMBER FORD: Would that not be required before you could start up again?

MR. SHUAIBI: When you say mitigation strategy, you mean?

MEMBER FORD: Well, they were going to -- I think they were going to review their calculations and put in whatever they were going to do.

MR. SHUAIBI: We had a commitment from the licensee? They obviously came down to repair the dryer and we had a lot of dialogue with the licensee and a commitment from them on how they're going to proceed in coming back up. They did hold power until they came in and presented to us their root cause evaluation and what they did and all the modifications they made to the dryer. And after that point, we were satisfied with the Plant. There were no reasons for us to keep it down any longer.

MEMBER FORD: The reason why I'm asking this specific question, Mohammed, relates to what you were saying, that we talked to people at Vermont Yankee and they had a feeling as to what you wanted them to cover.

MR. MANOLY: Because we have the experience now.

MEMBER FORD: Going to another thing, I think the designation of a non-safety related item rises out of the 06 report, I think it's 06. And yet when you read that report the justification for it not being safety-related is not there. I mean there is no

analysis at all of the frequency and consequence of the failure of the steam dryer and the loose parts analysis, et cetera. There's none, there just isn't. It is not a safety-related item.

In light of the current experience that we have, has there been any review of that designation?

MR. MANOLY: I think they addressed that point in the Quad Cities failure itself, regardless of what the VIP said. And they --

MEMBER FORD: They being NRC?

MR. MANOLY: No, I mean the licensee when they discussed with us. And their assertion that it is not a safety-related component and the consequences of failure appears to impact more economical operation rather than a safety -- highly safety significant issue. We consider this at the moment as a medium safety issue.

MEMBER FORD: And could you now have a loose parts problem thing going around, being trained into the jet pumps?

MR. SHUAIBI: Yes. I want to say one thing and then I see I think Dave is at the table, and he may want to add something here. What I want to say is the dryer has a safety function to maintain the structural integrity. When you look at the dryer for

loose parts, just like you said, if this thing does not maintain the structural integrity, what effect will loose parts have on other safety systems, downstream, upstream? It's very important for us, and we looked at that. Like I said, we sent a team out to Quad Cities and we looked at that. We looked at the licensee's evaluation in terms of how that works, so we do look at that. Let me ask if Dave could add anything more on that.

MR. TERAO: Yes. Actually, I'd like to just add a little overall perspective and maybe that can help us out on where we are with this issue with respect to the review standard and generically. As you're aware, Quad Cities had two failures. The first one was last summer and they just recently had one this summer. When they had the failure last summer the root cause was attributed to a combination of vortex shedding, coincidence with an acoustic loading, and it was very localized on the cover plate. It was a cover plate that failed. So at that time, the staff believed it was very plant specific and not a generic issue. So we didn't delve into the details too much at that time.

So based on that failure, what we did is at that time we were putting together the review

standard, so based on that plant-specific failure we provided some additional guidance on the steam dryer for EPU reviews. But since then Quad Cities had a second failure and now we've looked at it a lot more deeper. We've concluded that there's a lot more information, a lot more that we need to understand ourselves, that we don't understand ourselves, so we have yet to embark on discussions with the industry, with GE, as well as the BWR Owner's Group on how they intend to address this issue and how it's going to impact future EPUs. We haven't done that yet.

We're waiting on two pieces of information or two things need to happen first. One is that GE's going to issue a second SIL, service information letter, and we understand that's going to come out on August 26 or there abouts. And the second thing is today, I guess, August 19, the BWR Owner's Group is meeting to discuss how to address this issue. So after the BWR Owner's Group meets today and after GE issues its SIL, the staff plans to meet with GE and the BWR Owner's Group sometime in September time frame to discuss this issue more generically, and at that time what we want to discuss is what are the susceptible plants, what action does the Owner's Group plan to take, and that time we will assess if the

actions are adequate. If they're not, then we will take further regulatory action.

But all of this is not reflected currently in the review standard, so if we need to revise the review standard at that time, we will do that. But right now I'm just trying to point out that this review standard up until now is just based on the first cover plate failure. So maybe that puts this a little bit more in perspective.

MEMBER FORD: And let's assume that this is not a plant-specific GE design problem but it is more generic. Would that --

MR. TERAO: We're seeing --

MEMBER FORD: -- therefore lead to reassessing to whether it's a safety-related component or not?

MR. TERAO: It probably will not. I mean we are still looking at the impact of this flow-induced vibration on the steam dryer. We still believe it is a non-safety component.

MEMBER ROSEN: But wait a minute, let me interrupt there. What we heard just a minute ago is that it has a safety function which is to retain its structural integrity. So aren't components that have safety functions safety related?

MR. TERAO: No. This is more like a two over one issue. This is a failure of a non-safety related component as it could affect safety-related components inside the vessel.

MR. RULAND: The dryer doesn't mitigate the consequences of an accident.

MEMBER ROSEN: No, but it could cause one.

MR. MANOLY: If it inhibited -- I mean just hypothetically, you have to look at the scenario that can lead to a reactor failure, but itself it doesn't cause that.

MEMBER ROSEN: I'm not sure why it matters. Can you help me understand why it matters, whether it's a component akin to a two over one component or a safety-related component or a non-safety-related component? If it's failure could result in damage to safety-related equipment, it sounds like you're taking the right steps in any event, and the debate as to whether it's safety related or not safety related or a safety component with a safety function is I wouldn't say irrelevant but nearly so, isn't it?

MR. MANOLY: If it has an impact on safety-related components, it gets special treatment, but other than if it totally has no impact on a

safety-related component. If it's a failure strictly at an economic cost to the licensee but there is no safety implications there, then --

MEMBER ROSEN: Yes, I understand that, but in terms of what we're trying to do -- it's like the action matrix, we're trying to figure out what you do with the information. What do you do differently --

MR. MANOLY: I understand what you're saying.

MEMBER ROSEN: I understand if you're designing a new plant, you do a lot of things differently, but now you're in operating space and you have a non-safety-related component that could damage safety-related components.

MR. MANOLY: Absolutely.

MEMBER ROSEN: You have evidence that it has failed in ways that we didn't predict, and now you do the things you need to do to protect the safety-related components.

MR. SHUAIBI: That's absolutely right. I think you've summarize that. We have a non-safety-related component that has a safety function, regardless of how you classify it, and we're looking at the impacts of this, of this experience that we had on the safety of the plant. We're looking at,

regardless of whether you call it a two over one, a safety-related component or non-safety-related component. If we find that the failure of this component is going to make operation of the plant unsafe, we will take action to make sure that that doesn't happen, make sure that it's modified or whatever appropriate action we need to take.

MEMBER ROSEN: And arguments by licensees or applicants or vendors or stuff that it's not safety related, so thank you very much for your opinion.

MR. SHUAIBI: In the past, we have gotten those arguments. I don't think anybody's arguing with us right now that, "We need more information to understand this." Everybody's coming forward and saying, "We're going to support this, we're going to provide the information that you need." We still need to decide internally, like Dave said, in terms of is the Owner's Group going to do enough, are we satisfied with what they're going to do, are we going to take separate action to make sure that we're satisfied about the safety of these plants? That's something that we're still working on, but right now nobody's coming to us and saying, "This is non-safety related, we're not going to answer your questions."

MR. MANOLY: I think that's captured in

the two bullets on Page 29 that we are interacting with the BWR Owner Group to finally understand what they come up with and based on that we will take whatever action we deem necessary.

MEMBER LEITCH: Can I fall back to the situation in Brunswick where we have a BWR that's about the same vintage as Quad Cities, where we've approved an extended power uprate and Brunswick thus far has only operated up to about 94 percent of that new licensed level, and I believe in the next refueling outage they're going to put in some modifications that will allow them to go to 100 percent of that new level. Are there some analyses that we should be doing or asking them to do to give us confidence that that new power level, which we approved a year ago but has not yet been attained, still makes sense, technically?

MR. MANOLY: It could imply the need for a backfit. If we determine based on whatever action we take that plants were approved in the past, if we have to go through on some backfit evaluation to determine whether we need to take additional action, we'll definitely do that.

MEMBER LEITCH: I think most utilities if they really were fully aware of this situation would

probably not go up to the full rating until this problem with the dryer was fully understood. In other words, presumably during this next refueling outage they could do some kind of an inspection or whatnot, and I just wonder what's the sequence of events there?

MR. MANOLY: I think I understand your point, and the point becomes how safety significant the issue is in terms of the big picture. The need to take an action and develop a plan and deal with the industry on what we're planning to do and whether we need to backfit all the applications we approved in the past, that will take place, but whether to require them to go back to the pre-power uprate level it's really a decision based on the significance of the issue.

MEMBER LEITCH: But they're running at 95 percent of the new power level or 94 percent, whatever it is, without apparent difficulties, but would it be reasonable to ask them to go up to -- or allow them to go up to 100 percent until we fully understand this issue?

MEMBER ROSEN: Graham, I'm not so sure you're right about that. That's a little bit different tact I want take on this. That is we now have evidence that at 110 percent of the design basis

or something like that, we have steam dryer failures. How do we know we're not having those kinds of problems at full power for plants that have not done an EPU?

MR. SHUAIBI: Yes. Let me ask Dave to respond to some of these questions.

MEMBER ROSEN: Are we certain of that, that we're okay, that we haven't seen these effects at nominal license power levels?

MR. MANOLY: I think Dr. Ford alluded to that when we were doing the power up, because this stuff is not sitting in LERs.

MEMBER FORD: A telling comment.

MR. SHUAIBI: David?

MR. TERAO: If I could answer Dr. Rosen's question here. I think that's a very good question. I think that's a very good question because what we have found from discussions with GE is that there have been steam dryer failures in plants without EPU. Susquehana came up.

MR. TERAO: Two failures there. There are even failures in two foreign plants in Japan without EPUs. So the question isn't so much is EPU -- does EPU cause the steam dryer failure, what we believe is happening, and this is just our preliminary views at

this time, is that when you change the power level significantly so that you have now a significantly different flow through your steam lines, through your vessel, that you may find a component that now is in residence that was not previously in residence. And if it is in residence, then it will fail and relatively quickly, we're starting to find, from three months to maybe a year.

The reason why it didn't happen before, why we haven't seen these type of failures before is because when plants start up initially there is a -- we have a regulatory guide, Reg. Guide 120, which has guidance on instrumenting your internals, there's a predictive analysis that's required. When they start up the predictive analysis is compared with the measured vibrations, and if the measured vibrations are lower than the predictive displacements, then it can be assured that the stresses are below the endurance limit, the fatigue endurance limit. So the plant can run indefinitely, theoretically, for an infinite number of cycles.

But when you change your flow through your pipe now, when you change your steam, we at this time have not required reinstrumenting the internals. Now, this is one thing that we are considering and we may

discuss with the BWR Owner's Group with future EPUs whether there may be a need for some limited measurement of the steam dryer or other areas that may be susceptible to failure. Currently, we do have EPUs instrument their main steam line so that was one area that we did foresee, but we never thought of instrumenting, for example, the steam dryer. But these are areas that we are considering at this time.

MEMBER ROSEN: Well, yes, that's an interesting answer, but it's not -- it started out being an answer to the question that I posed but it kind of got off that. Come back to the question I posed which is do these failures in EPU plants reveal an issue in non-EPU plants? I think you said yes by telling me about experience at Susquehana and some foreign plants.

MR. TERAO: Yes.

MEMBER ROSEN: Now my question is what about those? What is your thinking about non-EPU plants?

MR. SHUAIBI: I think we're struggling to answer some of these questions because these are issues that we're struggling with internally, whether we are here in front of you or not in front of you. We're asking ourselves those questions. What do we

want to do for going forward in EPU? What do we want to do going back on EPUs that have received their power uprates? What do we want to do absent the EPU? We're actually asking those questions internally. We haven't come up with the answer in terms of what we're going to do, whether we want to issue generic communications, whether we want to go through the backfit, whether we want to -- we haven't answered those questions internally, and that's why we're struggling in front of you. This is a new experience that we're dealing with and we've got a plan, I believe, that we're developing on how to deal with this, we're looking at industry to see what they're going to do, we're going to evaluate that and see if that's sufficient or not, but we don't have an answer right now.

MEMBER ROSEN: You needn't be too apologetic. I think we're working with you on this, trying to give you some benefit of insights that we have. I think that's okay.

MR. SHUAIBI: Okay.

MEMBER RANSOM: Well, the concern here I think is with how do you update the standard and factor that kind of new information into it? We're not going to solve that problem.

MR. MANOLY: Ultimately, it will be addressed in the standard.

CHAIRMAN WALLIS: I'd like to follow up on that. What we're doing here is we're talking about the review standard for EPU, and there are always going to be things that happen that you have to respond to. That really doesn't change the standard, does it?

MR. SHUAIBI: It could.

CHAIRMAN WALLIS: You add something to it --

MR. SHUAIBI: Yes.

CHAIRMAN WALLIS: -- but the framework is still the same.

MR. SHUAIBI: The framework is the same. We make them up with new guidance based on the dryer failure that would need to be added to this review standard.

MR. MANOLY: I would expect that would happen in that section, specifically.

MR. SHUAIBI: We are expecting that to happen. I mean it would supplement the review standard. But at this point with what we don't have an answer.

CHAIRMAN WALLIS: But we're not -- today,

we're not trying to solve the steam dryer failure problem, we're trying to review a review standard.

MEMBER SIEBER: Well, maybe I could ask a question in procedure. You have the review standard, the review standard really specifically does not address the dryer issue which you are pondering at the time. My question is if a licensee comes in and wants an upgrade for another boiling water reactor plant and you haven't made up your mind what you're going to do on a generic basis across the industry, would you approve that application minus this insight that you have where you haven't decided what to do yet or would you put some kind of condition in the license amendment that would say, "Before you do this, we're going to have to resolve this issue"?

MR. MANOLY: That's precisely the reason I brought up the issue of Vermont because Vermont has not submitted their application yet, but we had a conference call with them and we gave them a lot of our thinking and where we feel uncomfortable, and we want them to factor that into their application and the kind of commitments they're going to have to make. And that was at least a first step on our side to let them know that we're looking for a lot more than your old standard application to address that.

MEMBER SIEBER: Now, in that case, that's not a backfit when you say, "If you really want an upgrade, you've got to tell us this stuff." On the other hand, if you determine that there is a class of plants out there that are susceptible, you can ask them to volunteer to provide information or fix it or you can force a backfit.

MR. SHUAIBI: That's right.

MR. MANOLY: If it's deemed necessary.

MEMBER SIEBER: And so the question becomes where do you end up with with the whole class of plants to which this issue applies?

MR. SHUAIBI: Well, I think we have different options, like was mentioned earlier, and some of those are conservative options, ones that we may be comfortable with, and that's what we're discussing with the different potential applicants for a power uprate. But that's where we are today.

MEMBER SIEBER: I think from at least my personal viewpoint, I would prefer not to have a power uprate issued going forward until you know and have decided what to do about that issue.

MR. RULAND: Specifically associated with where we have a hatch power uprate in-house, I believe it's -- Mohammed, it's an MUR uprate, correct?

MR. SHUAIBI: It's a measurement of uncertainty.

MR. RULAND: So it's not an extended power uprate, but we basically held that back and I don't know if we issued it at this stage but we wanted to make sure that the issues raised by Quad Cities weren't going to affect the hatch uprate also. So we are thinking along those lines.

MEMBER SIEBER: Okay. In my opinion, that's the right way for you to be going.

MR. MANOLY: A couple of things I'd just like to add that came up during the discussion with the previous individuals. The question was about when the licensee identifies the need for modifications and that did happen and they made a commitment to complete the mods before the power ascension. So in some cases that happens and we do write that in the safety evaluation that they have to complete the modifications and upgrade before the ascension of power.

On the issue of the need for confirmatory calculations and whether it's power uprate or other aspects that licensing actions we do, we don't have a policy that prohibits a reviewer from doing independent assessments or calculations. That does

not exist in our branch. I'd like to make that pretty clear. We have very experienced reviewers, many of them work many years in industry, including myself, and obviously one of the things we look at primarily is the methodologies used, the assumptions in analysis, the codes that they used. If you're comfortable with all that, with the model, then what's left really is number crunching, and we know that that's -- if that's all acceptable, then we don't need to go through the crunching process.

And I call on -- and Catawba-McGuire when they replaced the steam generators they proposed to use a new computer code that combined the RCS system with the main structure, and that was not part of the original licensing of the plant and we felt that there's something to be looked at there. We used the National Lab at Brookhaven to look at the calculations and the code, and we found the code was underestimating the response. So on a case basis we do look at stuff that we feel that we need to underscore, that sometimes we do audits, we audit the calculations when the need exists, but there is no blanket statement that we have to do confirmatory analysis on everything we look at.

CHAIRMAN WALLIS: A statement that you

don't do it.

MR. MANOLY: Now, I was talking to Mohammed during the break and really maybe this statement and the standard doesn't quite represent the reality.

MR. SHUAIBI: And we've already agreed we're going to look at that.

CHAIRMAN WALLIS: You're going to change it.

MR. MANOLY: Yes. Because I mean it's just maybe the words are not quite precise there.

CHAIRMAN WALLIS: I could look at it too but I don't like what I see.

MEMBER SIEBER: I sort of take it that it was a matter of how you interpret the words. You're not requiring a confirmatory calculation but you're not forbidding one to be performed.

MR. RULAND: Essentially, the issue is have we communicated -- has management, essentially, communicated our expectations about how these reviews are being conducted effectively with this document? And what I'm hearing from the Committee is maybe that's not the case. So we don't want to -- I mean clearly we don't want to communicate the expectations that independent calculations are prohibited or

discouraged in any way, and that's something --

MEMBER SIEBER: You'll fix.

MR. RULAND: -- we're going to fix, we're going to fix that.

MR. MANOLY: Any other questions? Thank you.

MR. SHUAIBI: Next up we have Plant Systems Branch, then we're scheduled to talk about risk evaluation in the morning, but I think we're behind schedule. Jim Tatum from Plant Systems Branch. And I think the focus of this discussion is going to be on the supplemental guidance, so hopefully we can go through this one quicker.

MR. TATUM: Yes, it's still morning. Good morning. Again, my name is Jim Tatum, I'm from the Plant Systems Branch. We have essentially two sections that we cover reviews for in the Branch. One is balance of plant systems, which when you thumb through the slides you'll see there are several pages of areas that we look at, we're responsible for reviewing. Again, as Mohammed had mentioned earlier in the presentation, we touch on bits and pieces of these things, but for the most part we don't get into a complete review of each and every section. It really depends on how the power uprate affects the

systems involved for a particular plant.

And, typically, each plant is different. No plants are the same when it comes to the balance of plant part of the review. We're looking at the steam systems, the service water, cooling water systems and what not and thrown in along with that, of course we have all of the peripheral type things that no one else wanted to claim ownership for. We have flood protection, some of the pipe break effects analysis and that sort of thing. And our intent really is to stick with the guidance in the standard review plan and use that as we go through these different systems when we're doing the review for the power uprate.

And to the extent that we determine areas that are impacted and what not, we will look at the standard review plan and apply the guidance that applies to the specific situation. And if the guidance suggests that we should do some sort of calculation, our intent is to go ahead and do that calculation to the extent that it's needed. Typically, that involves, more often than not, a look at the methodologies that are used, the assumptions and that sort of thing. And if we're comfortable with that, it's a reviewer's prerogative if he wants to do more detailed analysis or not. We don't discourage

that in Plant Systems Branch.

The other section that we have is primarily fire protection, and they're very busy these days on different issues and what not. And that would comprise the two different groups within Plant Systems Branch.

Just going through the different -- the list of systems and what not, you can see we have a number of other things associated with balance of plant, but also flooding analysis, we take a look at that, and that's one of the things that may very well affected just depending on what the existing licensing basis is compared to how they've got a modified systems and what not to be able to accommodate the power uprate, flow rates and that sort of thing. If they have to accommodate increased volumes in tanks and that sort of stuff, we'll be looking at whether that impacts those sort of analyses, just as an example.

As we go on through this --

MEMBER LEITCH: Jim, I'm just curious, what are the kind of things that would necessitate looking at the circulating water system or the turbine generator?

MR. TATUM: Well, the circulating water

system, I would suspect that would be one of the systems that would probably be impacted to some extent just because of the extent of the power uprate. If you're talking about a 20 percent power uprate, the original plant design may not have been designed with that kind of margin in the circulating water system and so the plant obviously from an economic perspective they're going to have to be able to accommodate the need. Otherwise they're not going to be able to produce the power. That's one end. But as far as the plant --

MEMBER LEITCH: But why do you care about that?

MR. TATUM: Well, as far as the Plant Systems analysis goes, one of the impacts of circulating water system, a major impact is the flooding analysis. Usually, the circulating water system for the turbine building area is the controlling system for the flooding analysis, and that's what we look at to see what's the impact on flooding and what not. And depending on plant design I mean the systems can be very different. If it's a system that requires a pump versus a gravity drain type system, you can get into different issues and that sort of thing, but the actual design of the

system, I mean what we would be looking at is how they're changing that design and how that's going to impact the analysis that we had done previously. And the standard review plan pretty much focuses our attention on the areas that we need to look at. Like I say, for circulating water system, primarily it's going to be a flooding analysis.

MEMBER LEITCH: Okay.

MEMBER SIEBER: But that would only occur if there is a delta in the system, for example, you would replace pump propellers.

MR. TATUM: Exactly.

MEMBER SIEBER: Right.

MR. TATUM: We're going to be looking to change --

MEMBER SIEBER: It's the same system even by their --

MR. TATUM: If the licensee determines that they've got plenty of margin in the system and they're not changing anything and it can accommodate the power uprate, then we wouldn't be reviewing that system because there ,is no change from that perspective. But then again the licensee would be taking a hit if they guess wrong because they're not going to be able to get the power output that they

need, they can't maintain condenser vacuum, for example, they're going to have to derate, to some extent, in order to operate the plant. They won't be able to get the full benefit of the uprate.

MEMBER SIEBER: Now, you have a list of systems that goes on through Slide 36.

MR. TATUM: Yes. The --

MEMBER SIEBER: One that's in your standard that I don't see in this list was the turbine gland steam system, which I presume is the auxiliary steam injection point to the gland and the gland steam condenser which is -- again, and I can understand. The reason stated was because you're trying to control radioactive releases.

MR. TATUM: Correct.

MEMBER SIEBER: And I could see that in a BWR for normal operation because the glands if they malfunction would put radioactive steam into the turbine. But in a PWR that's a pretty unlikely situation, is it not?

MR. TATUM: Yes.

MEMBER SIEBER: But I also found it in the PWR section.

MR. TATUM: Correct. That's less likely in a PWR, and some of the things that we get into

these days that causes us still to take a look at that are the submittals licensees are making for alternate source term and crediting played out in the steam system and what not. And then you have to look at, well, how about the leakage through the gland seals and what not. But I mean for power uprate we don't expect that we're going to get involved with that, typically.

MEMBER SIEBER: In a PWR, you might have a greater likelihood of a steam generator tube rupture because the flows are higher and depending on how you do it, you may have a higher tube temperature in there, which has an impact on greater corrosion. On the other hand, the gland steam system is the least of my problems if I have a steam generator tube rupture.

MR. TATUM: Correct.

MEMBER SIEBER: I mean you've got atmospheric dumps and stuff going out all over the place. So I was curious as to why so much detail on that where it seemed to me to be a very small impact.

MR. TATUM: Well, the idea with the standard was really to include everything that we thought might be affected by the power uprate, and because of the nature of the systems we look at, we really couldn't dismiss it out of hand because it

depend on changes, but I would agree that the impact of the gland sealing system would be negligible in most respects, I believe.

MEMBER SIEBER: Compared to everything else.

MR. TATUM: Correct.

MEMBER SIEBER: That brings a larger observation to me. I read -- since I've been through and reviewed the constant pressure power uprate in a lot of the topicals that came out, I felt that I was pretty familiar with what they were doing, and I was curious to see what you did with PWRs, but then I started comparing PWR to BWR and other than changing the system name they were remarkably similar. And I was curious as to why that happened to be because the phenomenon for an upgrade is very different between a BWR and a PWR. In BWRs, you just keep pumping water into it. The more water you can pump as long as you don't exceed fuel, you get the power. PWRs, to control the temperatures and the pressures, you've got to change the heat exchange surface which is a whole new phenomenon. And to me I was struck by the similarity between all these inserts and matrices between PWRs and BWRs.

MR. SHUAIBI: We'll try a little bit to

address that. The review standard covers a lot of different areas --

MEMBER SIEBER: Yes, it does.

MR. SHUAIBI: -- like Jim mentioned. We do expect if you were to apply, for example, a previous topical report, that you will find a lot of these areas may have been generically dispositioned to say that they're not really significant.

MEMBER SIEBER: Right.

MR. SHUAIBI: And plants can do that. They can come in and say, "This is part of the review standard but we have provided you the justification that this is not significant," in which case the write-up for that section in our safety evaluation could go away and it will turn into maybe one sentence that says, "See that topical. It says it's not significant."

MEMBER SIEBER: Right.

MR. SHUAIBI: Okay? But we did want it to be comprehensive, we didn't want to miss things that could be affected by the power uprate. Plants without topicals could come in and say, "We've looked at the system and the change is insignificant," and if we agree with them, again, we could do that kind of write up, but we did want to provide a review standard that

was comprehensive and covered anything that we could potentially --

MEMBER SIEBER: So you want to be comprehensive and at the same time you don't want to block out some future innovative way to do an uprate that isn't covered by today's thinking, I presume is the reason why it's a very open standard that allows licensees to submit a variety of different techniques to achieve the uprates.

MR. SHUAIBI: That's right.

MEMBER SIEBER: So I presume that's the reason why it's written that way.

MR. SHUAIBI: Yes. I can't predict today what changes a plant's going to have to make in order to achieve a power uprate, so we put in things that we thought could be affected by a power uprate.

MEMBER SIEBER: Well, that's clearer to me. Thanks.

MEMBER RANSOM: So I guess it's understood that in the review that you're looking for the effect on safety-related equipment and you're not -- and if it has no effect, why then it's not really a factor.

MR. TATUM: Right. The standard is focused that way. If you look at the standard review plan, the focus of the review is on safety impacts and

safety considerations. The non-safety function and what not we don't really focus on that, and that is really driven by economical considerations. I mean the affiliates have plenty of incentive to look at those aspects.

If there aren't any more questions on the specific systems and what not, I wanted to go ahead and turn to the supplemental guidance. There were a few areas where we felt it was necessary to supplement the standard review plan guidance. The first area, on Page 37, we talk about the Fire Protection Program, and in that case we felt it was necessary just to remind or to ask licensees to confirm that their programmatic elements are not affected by the extended power uprate. We would not expect them to be, but we want to make sure that we get an explicit statement to that effect from the different utilities and what not.

The other part of the fire protection, the next two bullets on 37 and following on 38, have to do really with the increased decay heat load. And if existing systems are were not originally designed as safety mitigating systems and what not but they're being relied on for fire protection purposes, then those systems probably need to be looked at and reviewed to make sure that they can handle the uprate.

If, on the other hand, they're systems that are typically relied upon for accident mitigation purposes, we would expect that they would do the purpose also for fire protection. So we wanted to make a distinction there and focus utilities' attention on those systems that aren't credited for accident mitigations if they do credit for fire protection so that they don't fall through the cracks and that they adequately address those. And the same thing was true then for their emergency procedures for addressing fire protection.

MEMBER ROSEN: I don't understand the bullet on your previous slide, the last bullet. Can you help me with that? When less than full capability systems are relied on.

MR. TATUM: Yes. Basically, that was what I was trying to explain is that those are systems that other than the ones that are relied on classically for accident mitigation purposes. And so in the fire protection arena, we have allowed licensees to credit other systems to the extent they can show they would be available to help mitigate a fire in a particular fire area. However, those systems are not necessarily systems that are relied upon for accident mitigating purposes, and so the licensee really needs to take a

look at those systems that were credited specifically for fire protection and make sure that they still can do the job with the extended power uprate.

MEMBER ROSEN: Can you give me an example to help me understand that?

MR. TATUM: Yes, I have an example here listed. We have -- when less than full capability are relied upon specifically for fire events and not other analysis, so what we're looking at is the -- like I say, it's just the situation where you're relying on a non-accident mitigating or preventing system that was allowed by Appendix R, not necessarily safety related in fact, but that is outside of the fire area that can be relied upon for mitigating the event. It could be a non-safety service water type system that they're using but it's not impacted by the fire area, but it doesn't have full capability that you would expect for accident mitigation and it was only reviewed for its capability to mitigate the fire event.

Now, when you have the increased decay heat load and what not on the plant and you're taking another look at those systems that were relied upon and credited that are less than full capability, you have to take a look and see, well, do they have

capabilities for this increased decay heat load situation? And can operators -- likewise, do they have time within the assumptions of the analysis to still take the actions or do they have to take another look at the time available, given the higher decay heat load?

MEMBER SIEBER: It seemed to me that Appendix R says that you have to get the plant to cold shut down in a certain amount of time.

MR. TATUM: That's correct.

MEMBER SIEBER: With a higher decay heat load, it may take you more time; in fact, you may not meet Appendix R time limits --

MR. TATUM: Right.

MEMBER SIEBER: -- with a higher decay heat load. So if you did that calculation and you said, "Oh, I can't do it in the time allowed," does that mean you would have to, in addition, request an exemption from that provision of Appendix R, maybe if you takes you three hours longer than allowed under the generic -- is that the way that would be handled?

MR. TATUM: Well, yes, that would be the way a licensee might choose to try to handle that. I don't know that we would be receptive, though, to giving an exemption.

MEMBER SIEBER: Well, that would be the first --

MR. TATUM: Correct.

MEMBER SIEBER: So there have been exemptions issued on that.

MEMBER ROSEN: There have been a few exemptions to Appendix R.

MEMBER SIEBER: Yes.

MR. TATUM: Yes.

MEMBER SIEBER: Not for that particular thing.

MEMBER ROSEN: Well, not for EPU but for other --

MEMBER SIEBER: No, but not meeting the time.

MR. SHUAIBI: I think the case here that we're talking about is when a system is not capable and then they modify the system to make it capable to get to shutdown, cold shutdown in 72 hours. Or at least we want them to look to make sure that the system has the capability, and if it needs to be modified, it needs to be modified.

MEMBER SIEBER: Okay.

MR. TATUM: I'm just looking at the Attachment 2 to Matrix 5, and the example that I was

looking for there that it gives is partial automatic depressurization system capability for reduced capability makeup pump. That was just something that was put into the matrix as the additional guidance. I mean that's the one it listed as an example, but there are others that typically utilities would use that aren't safety systems per se but that they credited for Appendix R analysis.

MEMBER SIEBER: Okay. Thank you.

MR. TATUM: The next area where we supplemented the guidance, if you look on Page 39, has to do with spent fuel pool cooling, and in that particular area we felt it necessary to supplement the guidance to incorporate resolution of GSI-173A spent fuel storage pool for operating facilities. In essence, the standard review plan is quite out of date with respect to resolution of the GSI, and we wanted to make sure we had the criteria captured for the review of the extended power uprate, and that was the purpose of supplementing the guidance there.

And, finally, with respect to station service water and reactor auxiliary cooling water systems, we wanted to make reference to a couple of generic letters that are important for licensees to maintain their capabilities. One was a Generic Letter

89-13, which has to do with capability of service water systems and what not, licensees maintaining the ability of those systems to perform their function, including the maintenance and upkeep, but in particular the performance of the heat exchangers. They have programs where they monitor heat exchanger performance and the capability of those heat exchangers, and they need to take a look based on their data and determine whether or not the heat exchangers can in fact perform as they need to for the extended power uprate condition. We want them to take a look at that and address that in the submittals.

The other item that we -- generic letter that we wanted to refer to here was Generic Letter 96-06, which has to do with the waterhammer and two-phase flow impact that could occur on containment fan coolers that are relied upon for helping to remove heat from containment following an event if you have a loss of power condition concurrent with a LOCA or main steam line break, and that was a concern that we've been reviewing recently with the utilities, and we want to make sure that those that come in for extended power uprate they take a look at their resolution and either confirm that it's still valid or they go through and address the issue again.

CHAIRMAN WALLIS: Did you ever resolve that issue?

MR. TATUM: Well, as a matter of fact, we're still working on about a dozen utilities. The EPRI initiative, in fact, the utilities, while they were grateful to be able to use it, it really didn't buy them a whole lot in terms of analysis base, maybe up to maybe ten percent. And they, for the most part, have completed their analysis, but we continue to challenge some of the methodology that they use and what not, and we've been iterating as to what's acceptable and what's not, and I think we're getting at the final stages here on these remaining plants to make sure that they've done an adequate job. But it's been a challenge.

CHAIRMAN WALLIS: Several years ago when you presented this stuff to us --

MR. TATUM: Yes.

CHAIRMAN WALLIS: -- we said, "Go away and work it out."

MR. TATUM: Exactly. And we're working it out. And that concludes the Plant Systems part of the presentation.

MEMBER RANSOM: Well, thank you. That puts us about 40 minutes behind, I guess, overall, but

why don't we break for lunch, come back at one o'clock, and we'll start out with the ACRS and public comments, okay?

(Whereupon, the foregoing matter went off the record at 12:06 p.m. and went back on the record at 1:02 p.m.)

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

(1:02 p.m.)

CHAIRMAN WALLIS: We will come back in session, and Dr. Ransom will lead us.

MEMBER RANSOM: I think we have come up with a plan for some provision in the schedule.

MR. SHUAIBI: We have -- I was talking to Dr. Ransom right after we went to lunch. The proposal I guess -- is there anything on the agenda in the afternoon that the committee would like us to not cover in order to recover some time?

We really tried to put together an agenda of areas that you are interested in, and that's why all those items are on the agenda. If you want us to cover them all, that's okay, and we will cover them all. But if there is anything that you want us to delete, then we would of course be more than happy to do that.

CHAIRMAN WALLIS: I think we can catch up if we just don't go into too much detail with some of these matters.

MR. SHUAIBI: Okay.

MEMBER RANSOM: Well, I think you were going to also cover the public comments, and ACRS comments first.

MR. SHUAIBI: Right. We are going to start with --

MEMBER RANSOM: And maybe the risk evaluation, and to combine it with one of the other -- well, with that, I guess.

MR. SHUAIBI: Right. We will cover the public comments first, and then I will cover ACRS comments. I will defer ACRS comments on the risk evaluation for the risk presentation, the risk evaluation presentation. And that will be at the end of Donnie Harrison's presentation on risk, if that is okay with the committee.

So I will cover most of ACRS comments, but not all of them, during my discussion, and then Donnie Harrison will cover the rest.

MEMBER RANSOM: That sounds fine to me. Okay. Proceed.

MR. SHUAIBI: Again, we issued the draft review standard on December 31st of 2002, and the public comment period closed on March 31st of 2002. We received three letters; one from NEI, one from the STARS Alliance Plant, and one from Framatome, and I think that Bill covered those this morning a little bit.

To summarize the comments, we got quite a

few comments on backfit implementations of the review standard. We referenced the standard review plan sections. We referenced general design criteria, and those are not things that all licensees have committed to on a licensing basis.

And the concern was are you going to be imposing those during power uprate reviews, and in response to that, our intent was that we would be reviewing a plant to its licensing basis, but where we see the need for a backfit, we would pursue it through the backfit process.

So we modified the risk under the purpose section -- I'm sorry, the review standard in the purpose section to be more clearer on that in terms of us reviewing a plant to its licensing basis.

The next comment was the burden of completing the matrices. Commenters thought that it would be too much burden on licensees applying for a power uprate to complete the matrices in the way that we had asked for. We believe that could significantly improve the effectiveness and efficiency of our review, instead of us having to go and find every one of those references, that they could do that up front in their work. And we continue to believe that they should do that.

CHAIRMAN WALLIS: While we are on burden, one of the longest attachments that you have is to Matrix 13. You have a long section on risk and it asks for good PRAs, and it talks about what needs to be in the PRA, and so on, and so on.

I would think that someone, the industry folks, would regard this as imposing an extra burden on an application which is not risk-informed anyway.

MR. SHUAIBI: Historically, we have conducted risk evaluations for these types of power uprates. Risk information was included in the topical reports for large power uprates, and I believe also when we came to the committee with the first extended power uprate that the committee thought it was appropriate to consider.

CHAIRMAN WALLIS: We considered it appropriate, but then you got criticisms from the committee, and that it is not really considered, and it is not risk informed, and therefore they get away with a not very good PRA, and this is not a good precedent, and so on.

So this is sort of a halfway measure to have it considered, but it doesn't have to be -- well, not enforced or something, and really I think we ought to move to the point where everybody has a good PRA.

Maybe the results then are taken seriously, but we are still halfway there now, and so I would think that some industry would complain that you are imposing this burden on them to have this really hotshot PRA when it is not needed.

MR. SHUAIBI: Well, when we do risk evaluations for power uprates, we actually do a very thorough review. I mean, I know from comments in the past from the committee that there was an impression that we don't really do a good review in that area, and I don't believe that is the case.

And a little bit later, right after my discussion of the comments, Donnie is going to address that, and will probably cover some of that, and then right after his presentation, we will go back to the comment of PRA quality.

That is one of those that I said I would not cover as part of my comments, a discussion of the comments, and I would leave it up to be covered in that presentation.

CHAIRMAN WALLIS: Anyway, these three commenters didn't complain about the PRA part.

MR. SHUAIBI: I'm sorry?

CHAIRMAN WALLIS: These three commenters --

MR. SHUAIBI: No, they did not.

CHAIRMAN WALLIS: -- didn't say anything about a PRA apparently.

MR. SHUAIBI: No, they did not.

CHAIRMAN WALLIS: And that is a bit surprising to me.

MR. SHUAIBI: I don't believe that I got any comments on the use of PRAs, but I will go through these. For independent calculations, the comments that we got for independent calculations is that it is always the option to do independent calculations and we recognize that.

They said that it was not necessary to include guidance on independent calculations. Some of these may not be worth the effort, and the purpose of this review standard was to provide guidance on how to do the reviews, and we thought that it would be better to provide guidance on when to do these independent calculations than just leave it out for people to use their judgment if you will.

So we thought that it was a good idea to keep the guidance on independent calculations, and we had a comment from this morning's discussion which we need to go back and revisit. But we kept that in there.

Use of precedence. One of the commenters or some of the commenters suggested that we should not leave out precedence, in terms of previous power uprates. We should provide a reference to those at a minimum, and precedence is posted on the power uprate website that the NRC keeps.

They are publicly available, and what we did in the review standard is to reference that website, and provide a link in the future when we have this as a web-based document, and that will take you right up to the power uprate website, and you can see which power uprates were reviewed, and then which power uprates were reviewed and approved, and what the safety evaluations for those were.

So we did provide that reference. The impact of the NRC approved -- the impact of this review standard on NRC approved topical reports. The concern there was that we already had several topical reports approved for power uprates. Does this mean that those are no longer approved, or this is going to have a big impact on that.

We don't really see a inconsistency between the topical reports and the review standards, and what I mean by that is if a topical report had somehow dispositioned an area as not significant for

a certain type of plant, the applicant could reference that topical report, and show us that that topical report applies to their plant, and they could use that as a way to justify not providing a whole lot of plant specific information. So we don't see that as inconsistent.

Another comment on the control of future changes to the review standard, and this comment suggested that we did a thorough job here, and we went out for public comment. The concern was are you able to make changes to this review standard without providing an opportunity for public comment in the future.

And what we did here is that we committed to develop an office instruction that will establish a threshold that will provide guidance on how to develop and update review standards, and within that, it would establish thresholds for when you would receive public comment, or when you would need to go out for public comment.

We have not developed that office instruction as of yet, but we will be doing that, and that is something that we are committed to do.

Another one of the comments was related to piloting the initial use of this review standard, and

power uprate the first time out, and see what you learn, and see if it needs to be modified.

We think that was a good comment. However, we believe that we will be factoring feedback, or experience back into the review standard as we do reviews. It is not just the initial review that is going forward. Any review that we do, if we learn something, and we feel the need to update the review standard, then we would be doing that.

On the next slide, we got a comment on NRC management oversight of power uprate reviews, and the comment was hinting at more stringent oversight, I guess, from management on the way that we do these reviews.

And what we wanted to say was this review standard is only one way or one mechanism within a bigger effective efficiency plan for how we do power uprates. Management is actually involved at different levels in power uprate reviews, and these extended power uprates are assigned out by our office director, and they are not assigned out by typical licensing actions at the section chief level.

So management is involved. As part of the effectiveness and efficiency plan, we have developed approaches that go to management on what is happening

in these power uprate schedules, and even identify some of the problem areas that we encounter in these power uprates.

This is one part of a larger effectiveness and efficiency plan, this review standard, and so we didn't feel the need to have this review standard address management oversight for power uprate reviews.

There was a comment on acceptance review, and what do you mean by acceptance review. We include the word sufficient detail in the review standard. This has not been an area of concern for us. We have been able to do acceptance reviews. We don't believe that there is need for detailed guidance on how you would do an acceptance review.

The idea is to review the application, and see if the licensee has provide in general information that would support their finding, but not to the level of detail to where you would find it acceptable.

That review is done at the detailed review stage. So the reviewer would be looking for the licensee address on the top that they needed to address, and that they provided -- and does it look like they provided sufficient information to make the call as to whether it is acceptable to continue the review or not.

And then they would continue with a more detailed review later. They didn't believe that there was a need for any additional guidance on that.

There was a comment regarding evaluating the results of this review standard, in terms of costs and RAI savings, and is this going to result in power uprates being performed or completed in less staff hours, and is this going to result in fewer RAIs.

Well, it is our hope that it would result in fewer RAIs. Hopefully with this information out, plants could submit the information that we need to do the review, and it will result in fewer RAIs.

In terms of cost, this review standard is broad as we had talked about earlier. There is not -- we don't know whether this is going to result in a cost savings, in terms of the hours of review, but over time I think we will see that with the experience in this review standard that will be to some appropriate level.

What that means is that if it is more or less than previous reviews, we don't commit to that.

MEMBER SIEBER: Is that an industry or licensee comment?

MR. SHUAIBI: All three comments were from industry. One letter came from NEI, and one from

Framatome, and one from the STARS Alliance.

CHAIRMAN WALLIS: Who paid for your development of this review standard?

MR. SHUAIBI: We did.

CHAIRMAN WALLIS: And it was not billed by industry?

MR. SHUAIBI: It was not billed to any particular licensee, but it would be considered --

CHAIRMAN WALLIS: So it would be billed to all of them?

MR. SHUAIBI: Yes.

MEMBER LEITCH: So eventually industry paid for it?

MR. SHUAIBI: Yes, as with a lot of other things that we do.

MEMBER LEITCH: Yes, most.

MR. SHUAIBI: There is a comment on the need to review training for non-licensed plant staff. They are questioning whether we actually need to do that or not, and we believe that we need to continue to do that.

Power uprate has implications on more areas than just the licensed operators at the plant, and we wanted to make sure that the licensee considered that when they provided information in

their application to show us that they did that.

MEMBER LEITCH: And that is as non-licensed operators?

MR. SHUAIBI: Yes, non-licensed people.

MEMBER LEITCH: And that is maintenance people or --

MR. SHUAIBI: Non-licensed plant staff refers to licensed -- well, it was just in a comment on licensed operators. There was a comment about having a stand alone reference section in this review standard, and initially we thought, sure that would be a simple thing to do, and actually we can do that.

But if I am going to look at the review standard, it is a list of references, and the way the matrices are done, and the way that is everything is done, we didn't see the benefit of doing that. So we decided not to do that.

MEMBER RANSOM: Just one point of clarification. What kind of training for non-licensed personnel is required in the normal license process? Is there a specific requirement?

MR. SHUAIBI: Richard Eckenrode from the Human Factors Branch can talk about that.

MR. ECKENRODE: No, their normal training process is that it would go through. There is nothing

different here. They would have to learn what the differences are for EPU. But their training is basically the same as it has always been.

MEMBER RANSOM: So what the training is, is just basically to do the job that they would normally be expected to do?

MR. ECKENRODE: Yes, correct.

MEMBER LEITCH: There is an IMPO accredited program for non-licensed operators.

MR. ECKENRODE: Yes.

MEMBER LEITCH: And it is based on job and task analysis, and it is dependent upon what jobs the position actually performs, and you have to be able to demonstrate the skills to do that.

MEMBER SIEBER: If you do a design modification that introduces or installs new equipment in the plant, that is automatically part of the design model process. It specifies the training that is required.

MR. SHUAIBI: But all of the licensed operators -- and please correct me if I am wrong, but we do have operators that go out and do manipulation of systems, configurations, and things of that nature.

MEMBER SIEBER: Yes, correct.

MR. SHUAIBI: And auxiliary operators, and

those operators or those staff at the plant have to be familiar with, well, what impact does this have their job, and that is what we are really talking about.

MEMBER SIEBER: True.

MR. ECKENRODE: Correct.

MR. SHUAIBI: There was a comment about establishing a standard application format. That is, a standard format that industry would use or licensees would use in submitting their power uprates, and we are actually in favor of that. I believe that would be a good idea for industry to do, and we believe that this review standard could be used to develop such a thing.

And I would also even comment that some of the topical reports that we have, have done some of that already for the boiling water reactors. There was a comment about NRC fee billing practices, and the comment there was that there is this issue that is out there that talks in a lot more detail about billing and who is charging what hours to our reviews, and the commentor actually said that this is being handled by another organization or another task force.

And we just said, yes, we agree that it is being handled by that task force, and I think that it is actually the right place for that kind of comment

to be handled, or that kind of issue to be handled.

MEMBER LEITCH: It seems to me that I remember one of the commenters had a question and questioned the need for a required audit, basically saying that why are we specifying the requirements for an audit that the NRC has the prerogative to do that anyway. I don't see that addressed here.

MR. SHUAIBI: Actually, I think that was on a previous slide.

MEMBER LEITCH: Is it under that need for independent calculations?

MR. SHUAIBI: Yes.

MEMBER LEITCH: Okay. Then it is addressed there. Okay. Thank you.

MR. SHUAIBI: Again, I am going to address some of the ACRS comments today, the comments that we received in previous letters on previous extended power uprates. The ones on risk are going to be addressed later on in the presentation on the risk evaluation.

Historically, the ACRS has reviewed power uprates greater than 5 percent, and more recently the reviews that the ACRS has conducted were on the Duane Arnold power uprate, Resident Quad-Cities power uprates, Clinton power uprate, ANO-2 power uprate.

I also reviewed the GE CPPU Topical report and the Brunswick power uprate, and they were done in that order. And we received letters from you on these power uprates, and reviewed these power uprates. And what we are capturing are the comments that we received on these letters.

And I just wanted to clarify that to let you know what the source of those comments are. I said earlier that historically we have reviewed power uprates greater than 5 percent. We have a power uprate in-house right now that is at 6 percent, and we are in the process of sending a letter over to you explaining the kinds of modifications that the plant is going to make to achieve that power uprate, and requesting from the committee a response in terms of whether you need to review it or not.

I don't have that letter here with me, and the intent is not to go into detail about that letter right now since I don't have it, and it has not been issued yet. But that is why I say historical threshold on this slide.

CHAIRMAN WALLIS: I think I discussed with you about whether or not you needed a review standard and whether it goes back to before to Duane Arnold, and Monticello, and looking at any of these things,

any of the possibilities of power uprates. So I think we raised the question as to that.

MR. SHUAIBI: The need for a review standard? Yes, actually that came out -- as I said earlier this morning, that came out of the Maine Yankee lessons learned, and this goes back to the 1995-1996 time frame.

MEMBER SIEBER: And we reiterated our desire in the GE CPPU topical letter.

MR. SHUAIBI: For an SRP?

MEMBER SIEBER: Yes.

MR. SHUAIBI: In several of the letters actually.

MEMBER SIEBER: Yes.

MR. SHUAIBI: Yes.

MEMBER SIEBER: And also Duane Arnold, or Arkansas, excuse me.

MR. SHUAIBI: Arkansas, and Duane Arnold, that recommendation was in several, and before, and it was also before that, and you are absolutely right. To summarize the comments, we received quite a few comments on documentation.

The comments, for example, in the Duane Arnold review was that it seems like you have done a good review, but from reading your safety evaluation

it is not apparent to us what you did, and that's why we drafted the template safety evaluations, again taking away the burden of having to write regulatory evaluations and conclusions, and leaving that technical evaluation portion, and actually trying to up front identify why it is that we are doing the reviews, and that is why that regulatory evaluation is in there.

And why it is that we are doing these reviews, and what is the concern, and what are the criteria that we are going to be using to evaluate every year in the template SE. There was a comment regarding communication with inspection staff, and that comment -- I believe it related to flow accelerated corrosion.

There was an application where there was significant corrosion of certain piping and the comment was, well, are you telling the inspectors to go out and look. And as I said earlier, we have two places where we are communicating with the inspection staff.

One is that we have developed an inspection procedure that addresses that. The other is that we had in our template safety evaluations, we have a section that is specifically for that.

So that if a reviewer identifies an area that they believe is important, it should be shared with the inspection staff so that they can go out and do inspections, and they can highlight it in that portion of the safety evaluation.

There were comments regarding establishing criteria for independent calculations, and I think that we discussed that at length today, and we have a take away from that, in terms of revisiting some of the areas where we didn't provide the guidance.

The comments regarding the standard review plan, again, we just talked about this one, and the committee has been recommending a standard review plan for some time now, and we had developed this review standard, and we believe it goes beyond the standard review plan, and that it provides process guidance for us, for the reviewers, and so we believe that we have done that.

And once we issue this review standard, we believe that we have done that. There was a comment regarding integral testing, and we had two comments from the committee on that. We have developed an SRP section specifically for evaluating power ascension and transient testing that covers both, and there will be a discussion later on this afternoon that is more

specific to what is in that SRP section. But we have developed guidance on how we will evaluate those.

MEMBER LEITCH: I have some questions in that area. We are going to recycle back to that?

MR. SHUAIBI: We will be coming back to that. There will be a specific session or presentation on that.

MEMBER LEITCH: Okay.

MR. SHUAIBI: There were comments regarding transition safety analyses, and whether we should review them, and whether we should audit them. The committee encouraged us to continue to do the audits that we are doing, and we will continue doing that, and whether we should review them or not, and I will -- I think we are going to continue auditing these analyses, just as you have encouraged us to do.

In terms of review, we will have reactor systems up here a little bit later. We are not right now saying that we are going to be reviewing them, I believe, but I will defer that to reactor systems, and they will be up here to talk about that.

There is a comment regarding the need for more detailed thermal hydraulic models, and we understand that some of the models that are used out there are dated like we talked about earlier. They go

back to the early '70s.

However, as long as -- and the committee would also like to see newer models, but as long as the models are conservative, and they continue to model things correctly and we can reach the conclusion that it is safe, we don't believe that we need to go out and make people develop new models.

CHAIRMAN WALLIS: Is there any connection with the reload part? In your neutronics, you deal with a pretty sophisticated model of these reloads. They are complicated and are more different kinds of fuels and different places, and different ages, and so on.

The thermal hydraulic model of the core is much simpler than that, and it may be that you ought to catch up with the neutronics because of all of this variability throughout the core, and just averaging things may not be as good as you would like to have.

MR. SHUAIBI: Yes, we would like to have better models, more realistic models, more detailed models. If we were to find a problem with the way that the models are being used today, of course we would go back and say that these are inadequate for the type of analysis that you are doing.

But absent that, we can't go back and say

that you have to have newer models in order to do this.

MS. UHLE: The kinetics --

CHAIRMAN WALLIS: Please identify yourself.

MS. UHLE: Jennifer Uhle, Reactor Systems. The kinetics methodologies are also -- we benefit from benchmarking, in the sense that you have the start up power testing, and so in some cases there is a full-scale test to determine whether or not you are getting the proper behavior from your calculation.

In a thermal hydraulic case that is a little bit harder to do obviously. So I understand that you are implying that we are looking more at the thermal hydraulics, and that we can look at it this way. That during the kinetics methodology reviews, and whether or not a licensee can use that methodology, there is the benefit of benchmarking in the full-scale sense.

MEMBER KRESS: Was this also where we commented that we thought that the regulatory process was a deterrent to improving these codes, and that is why they are so hard and don't get changed, or did we make that in another letter? We made that comment in a letter somewhere.

MEMBER SIEBER: Or did we want to make it and didn't make it?

MEMBER KRESS: We must have done that somewhere else.

MR. SHUAIBI: I think there was a comment related to risk that touched on that. I don't remember --

CHAIRMAN WALLIS: I think we raised it in several places.

MR. SHUAIBI: Okay. On the next slide, I have a summary of the areas that were identified by the committee as important for doing power uprates, and all of these comments, all of these areas, are addressed in the review standard.

The reduction in (inaudible) property action is covered twice in the risk area, and once in the human factors area, and in relation to the stress corrosion cracking of the internals and the flow-accelerated corrosion in the materials area.

Fatigue of feed water piping is covered in the mechanical area. Containment response, and we heard about that earlier today, and that is covered in the containment area. Local power oscillations and ATWS, and ATWS recovery, and those are covered in the reactor systems area. They are all covered in the

review standard.

And I would like to emphasize that although we did get a comment saying that these are important, I don't think that the committee was under the impression that we didn't review these. I believe that you highlighted these areas that you believed are important. We had been doing reviews in these areas all along.

CHAIRMAN WALLIS: The flow-accelerated corrosion is a little bit like the (inaudible) interaction, and that the mechanisms are somewhat obscure, or difficult to pin down, or predict.

And when you change the flow rate, things happen that you can't quite predict in terms of trouble or something, which affects the flow-accelerated corrosion, and in those particular areas which are susceptible to it. So it is a bit like the other one and you have got to watch it.

MR. SHUAIBI: Yes, but I believe --

CHAIRMAN WALLIS: And not to take some simple analysis and dismiss the possibility of it.

MR. SHUAIBI: Yes, but I believe that in the materials presentation today, that they are going to talk to you a little bit on that. I believe that the methods that they used to predict wear rates and

systems are based on empirical data, such as CHECKWORKS.

CHAIRMAN WALLIS: CHECKWORKS, and it is empirical.

MR. SHUAIBI: Yes. It is empirical, and it keeps on being updated and we look to make sure that the licensee has used that and updated their analyses, and they have programs in place. But it is empirical.

MEMBER RANSOM: I am wondering why is the fluid structure interaction left off this list? It seems like an awful lot of questions concerning them, such as steam dryer cracking, et cetera.

MR. SHUAIBI: When we pulled these comments, we went back to the letters that were written, and that is where we got the comments from.

MEMBER RANSOM: That was not mentioned.

MR. SHUAIBI: I do not believe. I mean, I am the one that did the review of these letters, and I do not recall seeing that. If I did, I must have missed it. But I don't believe seeing a discussion in the letters related to that.

MEMBER FORD: You're right.

MR. SHUAIBI: Okay.

MEMBER FORD: That is where the

embarrassment is; that we didn't foresee that that would be a problem.

CHAIRMAN WALLIS: I remember that we talked about it in the meeting, but it didn't make it to the letter.

MEMBER FORD: That's correct, which is often the case.

MR. SHUAIBI: It is embarrassing to us as well.

MEMBER FORD: Again, and it will undoubtedly come up when we talk about materials, but at least two of those, the FAC and the IASCC problems, these are evolving technologies, and the two citations that you give in the matrix for dealing with those are relatively old.

And I would encourage you at least during the presentations to the ACRS that you indicate when you do your audit of how the licensee attacks those problems and others, that you are using the latest knowledge. Not just the old documentation.

For instance, IASCC. TEMCO, as you know, have lost pretty much all of their reactors, PWRs, because of IASCC core in tunnels, and that should be reflected, for instance, in the changes in fast neutron flux during power uprates, as to how likely

are we to increase the danger of cracking for most components. And that knowledge is available. It is not in those documents that you cited.

MR. SHUAIBI: Okay. That is beyond my -- beyond what I know, but I will -- we will --

MEMBER FORD: Well, it is evolving.

MR. SHUAIBI: Well, I will note that down as to an evolving area, but we will have a materials discussion a little bit later, where we will have some people up here that may be able to get into that in a little bit more detail than I can. That is not my area of expertise. So I really can't comment too much on that.

Okay. If there are no additional questions, then I think --

MEMBER SIEBER: Well, let me ask one. I might have -- and since I was not here the whole time, but did you discuss the large transient tests, like steamline isolation valve closure, and a hundred percent power, and reactor trip tests to verify. There were a number of reasons for doing this, and one of them is to be able to put another point on the power flow curve.

The second reason was to make sure that the plant would stay together in the process of

undergoing a major transient. The third one was to evaluate the state of operator training to respond to those.

And there was a contest in one of these applications as to whether or not these large scale tests were to be required of the licensee or not, and I don't know that we wrote a specific opinion, but I do know that we had to add comments on there. Was that addressed?

MEMBER LEITCH: It is addressed in it. We said we would come back to it.

MEMBER SIEBER: So are we going to address this later on?

MR. SHUAIBI: Yes. It is in one of the bullets. I only addressed it to the point that I said that we did write a specific standard review plan section for power ascension and testing programs.

And then I deferred the harder discussion until later when we are up talking about that area. We have a specific presentation on power ascension and testing, but I only addressed it here -- the only thing I said here was that we did develop guidance on that, which was what we were tasked with doing, and we had the guidance referenced in the review standard.

MEMBER SIEBER: And are you going to tell

us what it is?

MR. SHUAIBI: We will try to do that a little bit later, yes. We have people here that are ready.

MEMBER SIEBER: You're lucky. Let me write that down.

CHAIRMAN WALLIS: Did you lose your final --

MEMBER SIEBER: I see that you --

CHAIRMAN WALLIS: Okay. So this is the last time that Mohammed is the chief presenter here?

MR. SHUAIBI: I will be up here to answer any questions.

CHAIRMAN WALLIS: Well, I wanted to commend you on seeing this through from the early days.

MR. SHUAIBI: Thank you.

CHAIRMAN WALLIS: It was about 6 years ago or something that we first started to talk with you about the need for something like this.

MR. SHUAIBI: Thank you.

CHAIRMAN WALLIS: And eventually it has happened, and so I wanted to say something nice. I mean, we do sometimes do that.

MEMBER RANSOM: As much as it pains us.

MR. SHUAIBI: But I do have to say that a lot of the hard work was done by the other people that are here. So, thank you. So, with that, let me turn it over to Donnie Harrison, who is going to cover the risk evaluation portion.

MR. HARRISON: I have been here before. I am Donnie Harrison, and I am with the PRA branch. Ever since the Duane Arnold power uprate came through, I have been the one who has come up here and presented to you.

I will start off with echoing what Dr. Wallis said. I was thinking about this yesterday actually with Mohammed. It shows what can be accomplished if you have a technically savvy person that is also your project manager.

CHAIRMAN WALLIS: And if you have one that is not technically savvy?

MR. HARRISON: Well, what you do is that you get a really good product out of this, because he deals with us. He is always coming in late and always changing at the last minute, and he knows the issues better than we do.

So he is always reminding me of things that I already told him and so that I don't trip over myself. So I appreciate Mohammed's work. I will say

that to start with. We have been doing these risk reviews of the power uprates for the -- well, since the extended power uprates started coming through with Hatch and Monticello, and even though they are not formally designated what is called risk-informed applications, we still do a risk evaluation, which requires us to get risk information.

So if we can live with that oxymoron, we will proceed.

MEMBER KRESS: Well, I was -- I asked that question once, and the answer that I got was that the risk information puts into question the adequate protection.

MEMBER SIEBER: The presumption of adequate protection.

MEMBER KRESS: The presumption of adequate protection, and then you may use it to follow up and do more extensive reviews or something. So it may not --

MEMBER SIEBER: That is the special circumstances.

MR. HARRISON: Correct, Dr. Kress. As a matter of fact, you are a perfect lead-in. So what we have got is a system where the Commission approved a process where if someone designates something as risk-

informed, we have a process for that, and that is Reg. Guide 1.174, and all the applications to the specific reg guides.

As well as if something comes in that falls under the category called special circumstances, where it is not risk informed, but we know that there is an issue, and again the classic example so far has been electrosleeves. I think that is maybe the only one that has been brought up in that sense, and it created the process.

And in that situation, then you may go and do a detailed risk evaluation of the issue, even though it was not risk-informed. What we are doing is that we are actually pre-processing if you will. We are trying to look at the risk information to see if we have the special circumstances to see if we need to get into a deeper risk review.

So, if you will, if you were to look at the process flow diagram, we are in the box before the first box. So we are just getting that information and looking at it, and then we are making a determination if we have the actual basis to question the presumption of the adequate protections map, because the licensees are in compliance with their regulatory requirements.

MEMBER SIEBER: We discussed this before at length.

MR. HARRISON: Right.

MEMBER SIEBER: And there is a presumption of adequate protection provided that the licensee obeys the commission's rules and regulations. And so that is the basis of the authority and the way the agency satisfies the Atomic Energy Act.

Now, the special circumstances that you referred to give rise to a situation where there is about that adequate protection, the presumption of adequate protection exists. Now, the question that always comes to my mind is that it seems to me that is pretty subjective.

And when you talk about the electrosleeve issue, that was way -- pretty far down the road in severe accident space, which is beyond the licensing basis for that particular plant. And it was solved by being able to calculate and thereby conclude that the pressurizer surge line would fail before the electrosleeves would fail, which is not risk informed. That's deterministic.

So I continue to struggle and perhaps I should think about something else, but I continue to struggle on how we derive -- who decides what special

circumstances are, and what is sufficient to say that special circumstances give rise to that.

MR. HARRISON: In the guidance that we have right now, one way to look at it -- and I think that there are two parts to the definition of special circumstances. One was if you knew this existed in a number of plants would you be writing a regulation to control it.

That is one of the ways that you can look at this. That I would actually write a regulation and take care of this problem because if it happened across the fleet, I would want to have that.

The other one is that when you have something that is an unforeseen new hazard, if during this power uprate there is a lot of changes, a lot of modifications to the plant, and if you were to look at it and you were to see a large increase in risk that was unexpected due to if you will some synergistic effects, because you are doing so many modifications, then that would also raise the question that maybe we don't have adequate protection, and we would want to pursue it further.

MEMBER SIEBER: Yes, but that is sort of backwards the way I think of it. In other words, you are saying that the risk information that you get

tells you whether you have a special circumstance or not, the large increase in risk. On the other hand, it is the existence of the special circumstance that allows you to ask for risk information.

MR. HARRISON: There is a Catch-22 in the process.

MEMBER SIEBER: I mean, it is backwards.

MR. HARRISON: Yes, and that's why I said we are not even in the first box. We are in the box before the special circumstances process, asking can we get enough information to make a determination that we clearly don't have special circumstances.

So, if you will, we are doing a negative review. We are finding out do we not have special circumstances, and if we don't, the we can proceed on with the deterministic evaluations and not perform a detailed risk evaluation.

If we were to identify special circumstances at a plant, I would assume at that point that we would be calling Mohammed, and the review would basically go to a halt as we would go up the management chain.

MEMBER SIEBER: I don't think you could do it, because just as though -- just like you could not foresee in standard PRA space the corrosion of

Northwest Ohio plants reactor vessel heads. That was in nobody's PRA. If you don't know about it, it is really not there until it pops up.

MR. HARRISON: Right. An analyst can't analyze something that he doesn't know about. That part is true, but that is an unknown, and again under the premise of a PRA, what you do is you look to make sure that the plant is operated and built as expected, and that is kind of going into an assumption in a PRA. And if a plant has a whole in its reactor vessel head, or nearly has that --

MEMBER SIEBER: Or some other thing.

MR. HARRISON: Then that won't be reflected in the PRA, and that is a known limitation to the method. And again we are only providing the information insight, and we are not making the final decision on whether it is acceptable or not.

MEMBER SIEBER: That limitation is universal, and it is limited in the deterministic world, too. If you don't know it, you can't analyze it.

MR. HARRISON: That's right.

MEMBER KRESS: If you have a failure of the hot leg, a large break LOCA, that is in the PRA, and the failure of the head is not much different from

that. The only question is how we got the right initiating event frequency, and if you put uncertainties in your PRA, you probably have covered that pretty well in the PRA.

MEMBER SIEBER: You have covered the result, because it is a medium break LOCA.

MEMBER KRESS: Well, if you put in uncertainties in your initiating event frequencies, you may have even covered that.

MR. HARRISON: And if I can take a little issue with that. To put in uncertainty bounds, typically what that gets interpreted to mean is that you are doing data uncertainty.

MEMBER SIEBER: Yes.

MR. HARRISON: And what we are discussing here is not a data problem. It is a phenomenology, or --

MEMBER SIEBER: It is a model uncertainty.

MR. HARRISON: Well, yes.

MEMBER KRESS: It is a model uncertainty.

MR. HARRISON: But that would be a different situation, and you really can't handle that directly in the PRA as they are done today, and so that situation -- again, it would be a deterministic issue as well of things that you just don't address or

don't know.

MEMBER LEITCH: ACRS has suggested to the commission in a recent letter that the staff look into ways to deal with model uncertainty.

MR. HARRISON: Granted, if you go back to an old, old, old PRA, you will find an event called the unknown basic event. And then the argument became what is the probability for that unknown event.

MEMBER SIEBER: It is not that high of a probability.

CHAIRMAN WALLIS: Well, that's true; if you don't know about it, you can't analyze. You can start with an analysis and get unexpected conclusions from the analysis itself.

MR. HARRISON: Right. But what we are trying to do at this stage is we are trying to understand what the power uprate is doing, and at least get some type of a risk feel for where the plant is, and what changes are occurring because of that.

If there is something above and beyond that knowledge base, then I don't think you can expect us to find it out, much like the Quad City steam dryer. You know, everyone is saying that they are embarrassed by it. I am not embarrassed by it because we didn't know that would happen.

CHAIRMAN WALLIS: There are always going to be things, unknown things, that happen.

MR. HARRISON: There is always going to be the unknown thing that happens.

MEMBER RANSOM: If you assume that it stays within the same licensing base, is that the same as assuming that the delta-CDF and the delta-LERF are zero?

MR. HARRISON: No.

MEMBER RANSOM: For the EPU?

MR. HARRISON: No, what we do with that -- and I will get to that on the next slide maybe, but we will start through the process and we will get there.

MEMBER SIEBER: Yes, I will suspend further discussion, because this is really a philosophical thing which forms the structure upon which the regulations were established, and it has been carefully written over the years to make sure that there is a conceptual understanding of what the intent was.

So I think that I should just accept it, rather than pick at it. I will try to do that.

MR. HARRISON: Okay. I will hold you to it. Okay. For the scope of the review -- and again even though these are not risk-informed, and

Attachment 2 to Matrix 13, we provide a really neat perspective maybe for this area, because again since we are kind of in a non-process here, we wrote our own guidance and put it in here for how to do this review.

And it is built off of the reviews that we were doing for the prior power uprates. The scope is basically a full or broad scope review of the PRA, PRAish analyses, because they are not all PRAs.

We covered the internal events and we covered four main areas; the initiating events, the component system reliability, the success criteria, and operator actions.

MEMBER KRESS: Now are you looking at the effective power uprate on this?

MR. HARRISON: The effective power uprate is evaluated on each of these areas.

MEMBER KRESS: Okay.

MR. HARRISON: So these are the areas or the topics that we look at.

MEMBER KRESS: So it is another way of saying that this is a kind of a power uprate that might change the initiating event frequency by some -

MR. HARRISON: Right. We are seeing examples on Dresden, where they put in a recirc runback feature on their feed water pumps, because

they were going to use their spare as a regular with that. And then there was the potential for a spurious operation to cause a transient.

So we asked them to evaluate that, and we looked at that delta increase due to that mod. A lot of these -- what will happen is that the plant will say that they have their start-up transformer, a large transformer, and they are going to overload it because of the power uprate, because it was not designed for this load.

That does a couple of different things. One is that they could maybe modify it so they could now handle the load and do some type of mod., like add some cooling to the transformer. We have seen a couple of those such things, or maybe to shorten the life of the transformer.

Instead of maybe getting 30 years out of that transformer, maybe they are only going to get 15 years, or something like that. So we work closely with the other technical branches when those types of issues come up so that we understand what the impact might be.

Again, Dresden, and at least one other utility, came in for their power uprate, and their transformer, we had them evaluate a 10 percent

increase in the frequency of the loss of off-site power due to a transient or transformer overloading.

So that is an example of an initiating event frequency hit. As Dr. Wallace said earlier today, most of the impact that we have seen thus far has been in the operator action or the operator response times.

And that is partly or mainly driven by the fact that at increased decay heat loads that you are analytically seeing the HRA analysis, a slight decrease in the time available for the operators to respond to events.

We have seen some limited component reliability and limited success criteria impacts thus far, but we still plan to review all those areas as part of every power uprate. On the external events area, typically you get seismic events and fires, and usually the high winds, floods, and other events are screened out during the process.

Seismic events is an interesting one, because it is done as a seismic margins analysis typically at the plants. You don't have a PRA, and we provided an attachment, an Attachment 4 to the matrix to give an example of how we can get a ball park figure of what the seismic CDF is based on that

seismic margins analysis.

And then we have issues that arise if the plant took credit for modifications that maybe they have not done yet, and how we have to back that out, or have to consider those types of things as part of the power uprate evaluation. We also look at shutdown operations.

MEMBER KRESS: You have a way to convert it? HCLPF --

MR. HARRISON: Yes.

MEMBER KRESS: -- into a CDF?

MR. HARRISON: Bob Kennedy wrote a paper a few years ago, and basically you take the seismic hazard curve, and use a beta uncertainty factor to take that HCLPF value and increase it to a level, and actually mathematically it works out real simple.

You find out that rule value on the seismic hazard curse, and find its frequency, and divide by two, and that is your estimate of the CDF. So it is a very simplified -- I have computerized it on an Excel spread sheet type of process so that I can put the plant information in and do it.

For shutdown operations, again we provided another example of that, and that is Attachment 3 in the matrix. Again, most people do not have shutdown

PRAs. What they do is usually have a risk management guide that they operate by, and that is a NUMARK -- I forget, but 91-06, I believe is what they follow.

Back I think in '97, we wrote a SECY paper, and that is SECY-97-168, and that by a range of risk values for different interpretations of that guidance.

So we used that to again give a ball park feel for what the risk aspects of a shutdown operation is at the various plants.

MEMBER KRESS: When you are using risk to classify components as to their safety importance, and when you are using the importance measures, when you have a substantial power uprate does anybody go back and check to see if that might have changed what you thought were safety related equipment to do this?

MR. HARRISON: What we have done in some of these submittals is look at the raw values in fussel-vessleys, and a lot of times what will happen for like the operator actions, or for the confirmed reliability, we will recalculate a new raw value, and if it goes over a certain threshold, the licensees have sent that into us to say that is their screening criteria.

MEMBER KRESS: But you do look at that.

That's all I wanted to know.

MR. HARRISON: Yes, and that becomes the licensee's screening criteria, and then a perfect example of this was on the -- we also know what we expect to see safer operator actions in a BWR, and after reviewing a number of these, we have to have our eyes open for certain types of events to show up.

And on the Brunswick submittal, we didn't see them. So we sent back an RAI that said why aren't these here. We expect to see ATWS operator related actions, and it turned out that they had used a conservative bounding approach, and the timing associated was already bounded.

So that's why it didn't show up. But that prompts us to ask questions. On the PRA quality area, again these are not risk informed, and so we are trying to find some risk insights.

But at the same time, at least I hope through the 4 or 5 SCs that you have read, that you see that we do a fairly thorough review, and in a couple of cases we have actually done site audits to validate the information that the licensee is submitting to us.

We will go back and look at the IPE results, the IPEEE results. We will evaluate the peer

review findings that were performed on these plants, and we will come back and ask some questions about how the power uprate impacts just to ensure that the analysis that has been done actually is appropriate for the plant. Okay. Next slide.

Just to summarize the guidance. Again, as I said, the specific guidance for how to do these reviews is actually in the Attachment 2 to Matrix 13. We have some supporting guidance, but the specific guidance for power uprates is actually in that attachment.

And Reg. Guide 1.174 actually establishes a starting point on your question on adequate protection. It gives us the baseline value CDFs that we can look at and focus our review as we go through the process.

There is not a hard line for when you cross the threshold on adequate protection, but we know that as you get higher in the base value, the more attention that we give to it, the more we look.

SRP Chapter 19, and actually the last bullet there, we have the regulatory information summary, the regulatory information summary was incorporated into the SRP Chapter 19 as Appendix D. So now that part of the process is there, and that is

the process that describes how you perform the review once you have found special circumstances.

MEMBER KRESS: Let me ask you a question on Reg. Guide 1.174. This is one of my hobby horses. The LERF value that is built into the guide as a surrogate for practicalities, is that derived based on a mean value of prompt analysis to the population of plants, and that is actually calculated using the level-3.

So you take that mean value, and you back up the LERF, and it represents that. Now, that calculation is based on a given fission product inventory actually, and given fission product release. Now you have got a power uprate, and you are going to change the inventory.

Shouldn't that change the LERF value that is a surrogate from the prompt fatality?

MR. HARRISON: Well, this is why I went ahead and moved to the next slide.

MEMBER KRESS: Oh, okay.

MR. HARRISON: The last slide is the ACRS comments. So this fits right into where your comment was. It is the last bullet actually, which is what I call Reg. Guide 1.174 interpretation issues. That is an ongoing debate on what to do with that.

As it is right now the staff evaluates LERF on a unit specific basis, similar to CDF. There are discussions especially for the advanced reactors, where you have modules, and is it appropriate to model that LERF value on more of a site basis, as opposed to a unit basis.

MEMBER KRESS: And ACRS has come down on the side that it is a site factor.

MR. HARRISON: Right, and we have heard you loud and clear.

MEMBER SIEBER: Well, the matter applies even if it is standard plants, two reactor and three reactor types.

MR. HARRISON: Correct, and it becomes more of an issue when you start having 10 modules at a site.

MEMBER SIEBER: Then it is 10 times as high.

MR. HARRISON: Yes.

MEMBER KRESS: You know, two sites change by a factor of two, which is not very significant. When you start getting to 10, that is a different question.

MR. HARRISON: Right. And again for this part of it, and again this last slide here actually is

dealing with the ACRS, but most of these comments from the ACRS, I would categorize as almost generic from a PRA approach in a risk-informed environment.

The interpretation issues on the LERF is really not a power uprate issue. It is a generic issue, and it is how we do our reviews.

MEMBER SIEBER: Right.

MR. HARRISON: Again, we are going to need a continued dialogue with the ACRS. I can personally see it from both views, and it depends on why you are calculating the LERF value in the first place. And the problem that I personally see with it is most people shortcut the LERF calculation even.

And they take the CDF and they go to the NUREG, and that gives them a factor to use., and they multiply the other factor, and they don't do any level-2 at all.

MEMBER KRESS: That's true.

MR. HARRISON: And in that sense then, you really aren't doing a LERF calculation. You are just taking a generic fudge factor if you will and applying it without knowing what the impact is.

And we have said that is acceptable. We maybe need to think about that.

MEMBER RANSOM: On that issue, where you

stand depends on where you sit.

MEMBER KRESS: I like that.

MR. HARRISON: That's a good observation. But I would note that most of the time at these plants the LERF criteria typically is not the driver, especially for --

MEMBER KRESS: No power uprates seem to be in effect.

MR. HARRISON: Right, especially when you are just looking at the base risk guidance, which is what we focus on. If we were to invoke the delta-risk calculation part of this, it would probably become more of a driver to the decision-making process.

But since we are addressing adequate protection, and that is really a base risk value, the delta-risk just gives us an understanding of what the impact is. The base-risk number is really the key to our review.

MEMBER SIEBER: But it would seem to me, getting back to your earlier point, Dr. Kress, it is incorrect to jury-rig LERF, and taken into account the variability of the source terms and its effect on practicalities.

We have chosen not to use the term prompt fatalities and so I think we are stuck with the

unadulterated LERF as measure, even though we know that it is a surrogate.

MR. HARRISON: Right, and then we are back to the interpretation of visit per site or per unit, and how do you address that.

MEMBER KRESS: There is a school of thought that says that these sort of things go back to a full Level-3, site specific Level-3.

MEMBER SIEBER: I don't see any reason why that is not valid.

MEMBER KRESS: That's right. We don't have any questions about it either, except for the quality of the site and the calculation.

MR. HARRISON: But if I could suggest that if you do that, please do it in a risk-informed submittal, and not on a non-risk informed submittal.

MEMBER SIEBER: That will make it the largest part of the submittal.

MR. HARRISON: Right.

MR. RUBIN: If I could add to this. Mark Rubin from the PRA branch. We have of course been discussing this with our colleagues in research, this issue that Dr. Kress brought up. It has been discussed a number of times.

I think there is confidence that the LERF

surrogate that we are using now is appropriate for the highest power rated plant, namely the plants with the greatest source terms, and a bit more, possibly quite a bit more.

But at some point a power level of plant size may be a more appropriate way to say it, would have a source term where the LERF metric would have to be sort of re-derived.

And, of course, we are well aware of that, and the discussions have gone on. I don't think we are anywhere near there yet. But at some point some sizing would have to be done.

MEMBER KRESS: I'm just glad that you are thinking that.

MR. HARRISON: Yes, we have been. Thank you. Again, I know that this has been a conversation throughout the day about independent calculations and audits. I personally agree with the ACRS.

We could make some generic criteria. Again, if the results are questionable for my PRA review, if we have questions regarding the quality of the PRA. If we do, the first bullet and the last bullet on this chart are somewhat related.

The first bullet says that we potentially -- if we identify a potentially significant impact, we

might want to dig a little on our own, and we might visit the site and look at what they did, especially if they are arguing that they did a conservative calculation.

The last bullet is that after we have done that site audit, and our own count, we determine that we really do have special circumstances, and you can pretty much bet that there is going to be a lot of calculating and auditing going on.

MEMBER SIEBER: Would you ever expect a plant to come in and file an application, and not give you risk information, or not have it to give to you?

MR. HARRISON: I don't expect someone not to purposely not give it to us or not have it. We have had a couple of the early submittals, where they sent us a one-paragraph response that was basically an IOU of we will give it to you before you approve this, to which we responded with no. You will give it to us so that we can review it.

So there has been that. Now, the hope is with this guide that we are giving here, is that we are laying out what information we need to be able to do our risk evaluation.

MEMBER SIEBER: But the guide says that you don't ask for it unless you determine there are

special circumstances.

MR. HARRISON: That is the Appendix D guide.

MEMBER SIEBER: Yes.

MR. HARRISON: And in this --

MEMBER SIEBER: And your guide in Section 13 says the same thing.

MR. HARRISON: Well, no, there is a little nuance there.

MEMBER SIEBER: Well, I have got to read it again, but there is a hook in there somewhere?

MR. HARRISON: Yes, there is a hook. It says in Section 3 that our expectation of the information that we expect to receive so that we can do our review. And in that we basically go through all the areas that I have presented.

MEMBER SIEBER: I read that, but the little lawyer inside me says that you have got to read the whole thing and abide by what favors your case the best.

MEMBER RANSOM: If you are an applicant, you get disabused of that notion early on in the process.

MEMBER SIEBER: Well, disabused is an apt word.

MR. HARRISON: And I would expect that if a licensee chose not to submit the information that during our acceptance review obviously the PRA branch would send that back as not being acceptable.

MEMBER SIEBER: Yeah, you would not approve the application.

MR. HARRISON: Well, we would at least at that point engage the licensee and say that we find this unacceptable, and at that point you can start the dialogue of getting the information that you need to be able to evaluate the submittal.

MEMBER SIEBER: I think that we are fortunate that the licensees are generally cooperative. They are generally reasonable.

MR. HARRISON: Right. And to be honest with you, all the plants have PRAs, at least for their internal events. So they can provide that information to us, and what the results are.

MEMBER SIEBER: Well, when you say that, you mean they all put in an IPE?

MR. HARRISON: They all at least have an IPE.

MEMBER SIEBER: Okay. Well, that isn't necessarily up to date.

MR. HARRISON: Correct, it is not

necessarily up to snuff for our use, but at least they do have it. There is some capability at every plant.

MEMBER SIEBER: That's right.

MR. HARRISON: Where we find more of a struggle is on the external event side, where a plant might do a seismic margins analysis and take credit for a lot of things that they haven't done.

MEMBER SIEBER: Right.

MR. HARRISON: And then put us into the situation where we have to go back and say that there were vulnerabilities at your plant that were identified as part of the IPEEE. Please evaluate those vulnerabilities so we can estimate what the base risk is for seismic.

That is an example of where we can go back and re-engage.

MEMBER SIEBER: Okay.

MR. HARRISON: And I guess the next thing to talk about is again the summary comments from the ACRS. I put these into four categories that I think nearly every power uprate that came through in the last couple of years has gotten some type of a PRA comment written into it by the ACRS as a response.

Most of the difficulties is probably in the first bullet there and then also the last bullet,

which is Dr. Kress' issue on LERF, and other interpretations of the Reg. Guide.

The first one is the fact that licensees use human reliability analysis methods and models that the NRC has never formally approved or reviewed, reviewed or approved, and that is a true statement.

The licensees use these methods, and the staff is aware of these methods and familiar with them. And as a matter of fact on the Arkansas review, we went and looked at it to make sure that the way that they were implementing that method was consistent with the EPRI guidance that they said that they were following.

So even though we may not have formally reviewed and approved these as an agency, the staff is familiar with them, and can go out and audit against those methods.

MEMBER SIEBER: And you are not required to approve then to have a licensee use them and submit the results to you?

MR. HARRISON: There is no regulatory authority that I am aware of that would require us or require a licensee to submit a methodology like this for approval. There are topical reports that will be approved, but there is no requirement for them to do

that.

MEMBER SIEBER: Okay.

MR. HARRISON: The second bullet is a comment that we received that dealt with the question that it sure would be nice if the PRA could deal with all these margin reductions and why aren't we doing that.

And my response to that is that maybe in an indirect way the PRA does deal with margin reductions, and the fact that for success criteria that you are looking at the capacity of the system to handle the increased load.

If there is no change, and even if we go all the way up to a margin to its limit, if there is no change in success criteria, at least from the PRA side, then you are saying that even with that full margin reduction that you are still acceptable, and there is no change at the plant as a result of that.

MEMBER SIEBER: Well, even in a deterministic sense, you are supposedly good, or in other words, safe, and the equipment won't fail if you operate it at any place up to the point where there is no margin.

MR. HARRISON: Right. And what I am adding to that is there is a high margin above that.

MEMBER SIEBER: And if you look at what margin really means, you have to have a database that says my failure rate or my reliability, or availability, changes depending on how much margin I have used, and that database to my knowledge doesn't exist.

MR. HARRISON: Yes, I am aware of that. I mean, I know that in transformer space that they have a little bit of that.

MEMBER SIEBER: Yes, they make them hot enough and they will burn up quicker.

MR. HARRISON: Right, and that is about the only place where you have that kind of damage.

MEMBER SIEBER: And the transmission lines, too, as we probably will find out.

MR. HARRISON: But that is my response to the ACRS on margin reduction, and in one sense the PRA through success criteria does deal with the reductions in margin.

MEMBER SIEBER: Do you think that there would be more of an impact that you had that interface and applied the concept of margin reduction increases failure frequencies than as opposed to that an operator has 3 seconds or less time to turn this switch?

And they are both down in the grasp where you really can't tell what the difference is. Do you know what I mean?

MR. HARRISON: What I would answer with that is, and again I would go back to my premise, but if I have got two prompts, and each prompt can handle 150 percent flow, and my power uprate increases that flow from its hundred percent to 120, each pump is still able to handle that, and at 120 percent --

MEMBER SIEBER: And that is what determines --

MR. HARRISON: -- it is still going to be 150 percent, and you are not going to get a degradation in a pump performance from what the ordinary database would give us. And I don't think that you could really model that the way that you are thinking.

MEMBER SIEBER: But Dr. Ford would tell you that your pump will wear out faster.

MR. HARRISON: It very well may be that you have an increase in maintenance activity on that pump. That is true.

MEMBER SIEBER: Yes, and so it is less reliable.

MR. HARRISON: Well, you will have more

maintenance on that pump, because you can always replace the pump. You may be on a quicker replacement cycle. So you may not actually create an unreliability condition.

MEMBER SIEBER: I accept your point, and you can move on.

MR. HARRISON: Okay.

MEMBER KRESS: Well, going back to your LERF calculation for a moment, does anybody ever take MELCOR, for example, and redo the level-2 calculation for any of these plants to actually see what the effect is?

MR. HARRISON: No.

MEMBER SIEBER: You mean besides you?

MEMBER KRESS: Well, I don't do MELCOR. I don't have MELCOR on my PC. I have got something else, but just to actually see what severe accident effects you might expect from a significant power uprate.

MR. HARRISON: Right, and Liefstadt, I believe, did some of that, and they were looking at the increase in source term,. and they looked at the decrease in time, and they started doing --

MEMBER KRESS: And that also brings up the question of the hydrogen amount, and how much ZERC

goes on down to the core concrete interaction, and how that changes the long term effects of --

MR. HARRISON: I don't believe that their study even went to that level.

MEMBER SIEBER: Well, that is what makes the big change, is the change in all these interactions, because the fuel, before it melts --

MEMBER KRESS: You don't want to get that in a LERF calculation.

MEMBER SIEBER: Yes, you will.

MR. HARRISON: Right.

MEMBER SIEBER: Or, no, you won't.

MEMBER KRESS: That's why I was wondering --

MS. UHLE: This is Jennifer Uhle from reactor systems. I used to be in research in the branch that did severe accidents, and when I was over there a year-and-a-half ago or so, remember the BWR synergy program that was started?

That is still ongoing, and I believe that they were looking at going to a level-3 PRA.

MEMBER KRESS: Oh, wonderful.

MS. UHLE: And running of MELCOR was on the task list. I can't tell you if that is still ongoing or not.

MEMBER KRESS: Okay. All right.

MR. HARRISON: And like I said, I think that Liefstadt, when they did their review -- and again that was a number of years ago -- they looked at the increase in force term, and they did a component effect that you -- I think they ended up with 15 percent sooner, and 15 percent more, for a 15 percent uprate. It was very linear, but that is the only thing on that.

I think that we have already talked about PRA quality, and the point that I think the ACRS was making was to ensure that we were doing a thorough review, and that we weren't just, if you were, rubber stamping the analysis just because it was not risk informed, and I hope that I have convinced you that we don't do that.

I hope that I have convinced the industry that I don't do that. And the last one again is the interpretation issue. I know that there is an upcoming meeting with the ACRS in September to deal with DG-1122 and PRA quality. It is not quite relevant to this, but it touches on the interpretation issues.

And I think that there is a need to keep that going and see where we end up with on how we

reconcile our reviews on all the different interpretations.

One point that I do want to make on that interpretation issue was that we have modifications at a plant that go in parallel with the power uprate, and are being done solely to support the power uprate.

And the example that was coming up in this interpretation issue was the SLC Mod. at Brunswick. It was suggested that you don't -- that you will allow them to do the SLC Mod., but you separate it from the power uprate, and I just want to deal with that because the only reason that Brunswick was proposing to do the SLC Mod. was to achieve the power uprate.

MEMBER SIEBER: Right.

MR. HARRISON: And that closely coupled, you really need to look at them in concert together, and when we did that, it actually showed a risk benefit, because the SLC Mod. improvement was so much of an improvement in their response to ATWS, which was the dominate impact from the power uprate.

And so they were actually showing that by going up in power and doing the SLC modification that the plant would actually be better from a risk perspective than they were today.

And so I just want to make sure that we

understand that when they are that closely linked that we shouldn't decouple the two issues.

MEMBER SIEBER: Well, Reg. Guide 1.194 allows coupling.

MR. HARRISON: It does, and as a matter of fact, one of the perspectives that I have had on that is you can look at the SLC Mod. as being a compensatory measure, which the Reg. Guide 1.174 calls for them to be.

MEMBER SIEBER: It allows, yes. I agree.

MR. HARRISON: Okay. And that's all I had. Thank you.

MEMBER SIEBER: Well done.

MR. SHUAIBI: So I hope that we have convinced you that we do a thorough review in the PRA area.

MEMBER SIEBER: Well, I am convinced that you know what you are talking about.

MR. SHUAIBI: All right. Up next we have the materials engineering branch, and we have Ted Sullivan from the Materials Engineer Branch and other people, Barry Elliott and Chris Parczewski supporting him.

CHAIRMAN WALLIS: Did you want to hear any more about this?

MEMBER FORD: I would love to.

MEMBER SIEBER: We can take a break.

MR. SULLIVAN: Good afternoon. Well, my viewgraphs are pretty straightforward, and so I will see how long this takes. My Edmund Sullivan, and I am from the Materials and Chemical Engineering Branch, and our review guidance is in Matrix-1 of the review standard, and our safety evaluations are behind Insert 1 also.

These first two viewgraphs just lay out the subjects that we have prepared or assembled guidance on. I don't think that we really prepared any guidance, but we have cross-referenced a lot of guidance in the matrix.

And as you can see there are a number of issues there that relate to the reactor vessel, the primary system. At the bottom of that first page is leak-before-break, and then I think from there I would like to go on to the --

CHAIRMAN WALLIS: Well, why is PTS colored differently?

MR. SHUAIBI: That is just an indication that we are going to talk about it a little bit later in more detail.

MEMBER FORD: Oh, so we are not going to

talk about the reactor internals again?

MR. SULLIVAN: Not unless you want to.

MEMBER FORD: I asked this question --

MR. SULLIVAN: Well, let me just lay out a little bit just so you can see where it is going. The second viewgraph just talks about the rest of the items in the matrix, and then we talk about PTS very briefly, and then we talk about FAC very briefly, and independent calculations.

So if you want to talk about other than FAC or PTS, this would probably be a good time.

MEMBER FORD: Well, I would like to just ask a question that I think I asked when you were out of the room, about the reactor internals in the core support materials.

As you know this is an area where we have had in the last 5 years increasing materials degradation problems in that area, and by increasing the flow rate, and increasing the flux, the fast neutron flux, you are going to potentially change the response of the reactor internals across the board to degradation.

You cite in your document Matrix-3 various old reports from VIP, WCAP, and various areas. The first question. Have all of those supporting

documents been approved?

MR. SULLIVAN: Well, the VIP reports, I would have to double-check on this, but I am pretty sure that the VIP reports have been reviewed and approved. The ones that we have cited in here have been reviewed and approved.

MR. ELLIOTT: This is Barry Elliott, also of the Materials and Chemical Engineering Branch. All the documents cited in here have been reviewed by the staff, maybe not always as topical reports, but have been reviewed as part of other evaluations, like license renewal, and that is where they came from. They came from our review process by the staff.

MEMBER FORD: Now, in that particular area in which you are discussing, internals across the board, there is increasing material information being accrued since those documents were made.

When you do your audit of the ICCs claimed, there is no problems. Do you take that into account?

MR. SULLIVAN: We set criteria for when -- well, once you go over the criteria, it is a neutron fluence criteria, and once you go over that neutron fluence criteria, we assume that you are susceptible and you have to have a program.

So if as part of the power uprate, if before the power uprate they were below the criteria, but as a result of the power uprate that they went above the fluence criteria, then they would fall into the category of assuming that they would have a problem, and they would have to at some time generate a program for looking for those aging effects.

MEMBER FORD: Okay. But that does not specifically take into account changes in flow rate and increases in fast neutron flux.

MR. SULLIVAN: The flux itself is a very small increase. We are talking about a 20 percent increase in fluence, and so it is a very small increase in flux. I don't have all the answers about flux effects, but the fluence is hopefully set low enough so that we will pick up any plant that has a problem.

And of course we have a continuous oversight of these internal components through the regular inspection program. And if something should occur that shows that at higher fluxes that we need a new criteria, then we would establish a new criteria.

MEMBER FORD: Okay.

MR. SULLIVAN: But right now this is where our criteria is.

MEMBER FORD: I will tell you why I am so uppity about this. I was embarrassed about Quad Cities. I really was. And when I look at documents coming, for instance, from General Electric saying for core in tunnels, no problem, my antenna immediately go up, because I know that -- well, I doubt that statement.

And I just wonder how much do you examine and question that problem statement?

MR. SULLIVAN: Well, we go over the criteria, and then we examine every component that goes over the criteria, and we decide what the impact of going over the criteria has on a particular aging effect.

Then we see if the program is acceptable for maintaining the integrity of that component. That is how -- this is a component specific evaluation.

MEMBER FORD: A core shot or a core plate.

MR. SULLIVAN: And the upper tie rod.

MEMBER FORD: Okay. And also one last question. The cracking of those components, especially attachment rods, the cracking -- the stress corrosion cracking, or ISCC, can be influenced by the super position of small vibratory loads, which will be increased because of power uprates.

Are those taken into account in your evaluations, because those are not in the current guideline documents that you are talking about.

MR. SULLIVAN: We handle those separately. The laboratory problems are handled separate than the other --

MEMBER FORD: Not fatigue, but just superimposed vibrations.

MR. SULLIVAN: We mostly handle laboratory evaluations through fatigue, yes, or the fatigue program, and looking for problems like the -- well, we just have, like the problems on the separators, and that was a laboratory problem.

And the IGSCC has analyzed it as a separate problem. We don't put them synergistically together.

MEMBER FORD: Okay.

MR. ELLIOTT: Any further questions on these topics?

MEMBER FORD: No.

MR. ELLIOTT: Okay. This next slide, Slide 39, has the remaining list of subjects that are contained in our matrix and that we would review in general for extended power uprates.

And then going to Slide 40, we have just

a little expansion on PTS indicating that for PTS we evaluate the effects of increased fluence on RT-PTS, and ensuring that the calculated values comply with 10 CFR 50.61.

We do look at the methodology that the licensee uses and ensure that it meets the screening criteria of the rule, with the objective of course of ensuring the structural integrity of the pressure boundary.

And then in the area of flux and accelerated corrosion, we evaluate the effects of changes in flow rates and thermal dynamic conditions in carbon steel piping on FAC corrosion rates.

We ask certain questions about modeling, and monitoring programs, and again with the objective of ensuring structural integrity.

MEMBER FORD: Now there you supported their use of CHECKBOX. Is that right? You are going to stand behind them when they do the calculations, and then you do the interpolation between observation and theory, et cetera?

MR. PARCZEWSKI: Yes, they are using CHECKBOX.

MR. ELLIOTT: But we don't actually audit their calculations. We ask them questions about what

sorts of changes they are going to make in their modeling as a result of the extended power uprate, and then we ask them questions about what -- well, it depends on the review, but we may ask them questions about where they expect changes in corrosion rates to occur, by how much, and how they might change their monitoring programs as a result of changes and results from the CHECKWORK program.

We don't actually do an audit. We have not gone out recently to plants to look at how they are implementing CHECKWORKS. We did that much earlier on, but not in the context of power uprate though.

MR. RULAND: Just so you understand our terminology. Audit typically refers to the reviewers going to the site prior to the approval of the amendment, and inspection of course subsequent, and review is typically the stuff that we do in-house.

MEMBER FORD: Okay. The reason why I used the word audit was that I seem to remember when we were doing the hearing about one of the power uprates, and I have forgotten which one, because there were a lot of questions asked about the flow assisted corrosion, but I got the impression that in fact that you went to whichever station it was and watched them do CHECKWORKS and walked the process through with

them. Is that true?

MR. ELLIOTT: Right.

MEMBER FORD: And that is the way that I understood an audit to be.

MR. ELLIOTT: Right.

MEMBER FORD: Okay. Good.

MR. ELLIOTT: And then the last subject that we were going to just touch on briefly was to indicate that we do perform independent calculations in two areas as part of power uprate reviews; the RT-PTS calculations and upper shelf energy calculations.

MR. SHUAIBI: We do have a comment from earlier today that we are going to be going back and looking at all the independent calculations, and attachments to the matrices, to see what changes we need to make to them.

CHAIRMAN WALLIS: So this was independent calculations of RT-PTS. This is just plugging in some numbers in a formal way in that Reg. Guide 1-191? It is very simple, and so you are not looking at the basis for the fluence and all that sort of thing? That is a complicated process.

MR. ELLIOTT: Barry Elliott. We have a regulatory guide for neutron fluence, and it is Regulatory Guide 1.190, and that contains all the

criteria that we look at, and as long as they satisfy the criteria in that Reg. Guide --

MEMBER FORD: Then you don't do the calculations?

MR. ELLIOTT: -- then they are okay.

MR. SHUAIBI: We don't redo their fluence calculations, at least not --

MR. ELLIOTT: We don't do the actual fluence calculations, but we take the results of their Reg. Guide 1.190 evaluation, and put that in to determine the RT-PTS value.

CHAIRMAN WALLIS: I just wonder why you want an independent calculation of something which is so simple to do.

MR. ELLIOTT: Well, it is not that simple, because some of these plants have surveillance data. It is when you have surveillance data, this becomes a little bit more complicated, and that you have to decide the value of the surveillance data, and how it impacts the PTS evaluation.

MR. SULLIVAN: So it is not just plugging a number into a formula?

MR. ELLIOTT: Right. You have to also look at the surveillance data.

MEMBER SIEBER: Well, actually --

MR. ELLIOTT: You may find that you wind up with just doing the arithmetic, but you still have to look at the surveillance data to see the impact.

MEMBER SIEBER: I think that some of it depends on how well you know the chemistry, and the surveillance data has a tendency to provide good specimens. It has a tendency to bring you back if you are off on your chemistry a little bit, as far as what the weld composition is as you benchmark. Is that correct or not correct?

MR. ELLIOTT: We had a -- there was a chemistry issue that was reviewed as part of Generic Letter 92-01, Supplement 1.

MEMBER SIEBER: Right.

MR. ELLIOTT: And we went through the whole industry of what the chemistry was for each weld in each beltline in all 110 plants. That was reviewed for many, many years, and we finally resolved it, and that's the chemistry for each belt line weld.

MEMBER SIEBER: So when you finished that work, it was by declaration that this is what their chemistry is?

MR. ELLIOTT: That's right. This is all that we have got at this time, and this is all the knowledge that we have, and this is the best estimate

for all the chemistries for each weld.

Again, we are constantly getting -- well, not constantly, but we get surveillance data, and then we have to adjust our -- make our decision based on that, too.

MEMBER SIEBER: Okay.

MEMBER FORD: Can I ask a thought process question? The vast majority of the boiling water reactors in this country are on Noblechem, which is going to supposedly going to mitigate all the cracking problems of the core internals.

If you increase the flow rate, then the whole question of the adherence of this atomic layer of metal on the surface is put in jeopardy and it could be removed. Thereby the mitigation action has been upset.

Does that fact enter into your thinking, because it would just be an availability problem, and it would not be a safety problem? Do you go through that kind of questioning of the system that you are examining?

MR. ELLIOTT: Well, I can only think of -- well, I think it is BWR VIP, and I think it is 75 or 25. I forget the number. But there is a -- we have a piping where we have had a lot of intergranular

stress corrosion cracking.

And if you do a Noblemetal addition, that affects the frequency of your inspection. It does not eliminate it. It just reduces its so that instead of certain frequency if you didn't have it. So if the effect is there, you should see it as part of the inspection.

So we are not eliminating inspection by doing Noblemetal. We are just affecting the frequency of the inspection.

MEMBER FORD: And not so much for the piping, but for the core and tunnels. If you are putting a certain extended inspection frequency --

MR. ELLIOTT: Well, we only give them credit for the piping. For the internals, we don't give them any credit for that. We just still use the screening criteria that we talked about before, and that's it.

MEMBER FORD: So you have thought about it or talked about it?

MR. ELLIOTT: Yes.

MR. SHUAIBI: Okay. With that, we will now go to the Reactor Systems Branch, and I have a lot of people here, and we won't be able to name everybody in the room.

We will have Sean Peters and Zena Abdullahi here at the table, and we will have people from that branch, including both section chiefs, supporting the presentation. There are also a lot of different experts also here supporting the presentation.

MR. PETERS: Good afternoon. I am Sean Peters, and I have coordinated the pressurized water reactor system section portion of the review standard for the Reactor Systems Branch. With me is Zena Abdullahi. She developed a portion of the boiling water reactor portion of the review standard.

Basically in our guidance, we -- and as Mohammed mentioned earlier, and I guess as has been mentioned a lot of times, we used the standard review plan as a basis for our portion of the review standard.

And we provided additional guidance where we thought that it was necessary in the review standard. Next slide, please. As part of our fuel and core performance portion of our review, in the Reactor Systems Branch, we do a fuel system design review.

Part of that is under normal operation and to anticipate operational occurrences, we verify that

they meet specific safety limits. For non-LOCA accidents, we also verify that they meet specific safety limits, and we evaluate the effects of their not meeting the safety limits on projected fuel safety.

CHAIRMAN WALLIS: When you verify that they meet the safety limits, you mean that they calculate a number and that you read it, and say yes, it is less than the number that they claim is less than?

MR. PETERS: Basically in our review, we -- and in fuel system and in other system designs, we look at the methodology that they used.

MR. SULLIVAN: You audit it?

MR. PETERS: We have audit criteria that we developed, and that will be addressed --

MR. SULLIVAN: And do you do calculations?

MR. PETERS: And we have independent criteria, independent calculation criteria, that we also have on our last slide that we will discuss.

CHAIRMAN WALLIS: You may sometimes calculate these yourselves? Somebody in the branch may do it?

MR. SHUAIBI: I just want to add that the independent calculations criteria that you will see

from Reactor Systems are very similar to the ones that you liked in containment.

CHAIRMAN WALLIS: I just wondered if they are ever applied though.

MR. SHUAIBI: I do have an example, and maybe Zena can talk a little bit about this. It is not an uprate review, but it is related to an upcoming uprate review, where the branch is performing independent calculations or actually contracting to do independent calculations in support of that review. Maybe Zena could add a little bit.

MS. ABDULLAHI: Yes. We are going to do some independent calculations, and we have a plan to do so for future power uprates, and we are in the process of contracting it out.

CHAIRMAN WALLIS: What calculations?

MS. ABDULLAHI: MELLA Plus for one, but I think what we are trying to do was -- and I don't know if you would prefer that we start with --

MR. SULLIVAN: I just wondered what kind of things you can calculate, and what --

MS. ABDULLAHI: Oh, you must want to get a general idea?

CHAIRMAN WALLIS: What are they calculations of?

MR. SHUAIBI: Well, let me be a little more specific, because I think I turned it over a little too soon. We have a review currently in-house, I believe, for MELLA Plus. Is that it?

MS. ABDULLAHI: Right.

MR. SHUAIBI: And aren't we doing independent calculations with respect to that?

MS. ABDULLAHI: Yes, we are. Some of the things that we are going to do, and we would cover it later if you wanted it in detail. Right now I think what Sean is trying to do is to go through the process, and tell you things that we have looked at, and then we will try to address how we went about addressing your major concerns, that we should be doing confirmatory analysis, and we will provide you with an example.

And also what we plan to do in the future, if that is okay. That is our plan.

MR. PETERS: Okay. And finally we go through LOCAs, and we have ensured that they meet the 50.46 criteria. Next slide.

CHAIRMAN WALLIS: I always wondered with these sophisticated fuels that are tailor-made and buried all over the place how well they really are on top of what happens, in terms of analysis and

predictability.

MS. ABDULLAHI: I don't think we get the question. What do you mean by --

CHAIRMAN WALLIS: Well, when you have these complicated fuel designs, where you have different enrichments in different places, and there are all kinds of -- well, it is a complicated arrangement, and it is complex in the sense that it takes a lot of information to describe it, let alone calculate it.

I just wondered how well these folks who make these submittals are able to calculate the performance of their fuel.

MS. ABDULLAHI: Well, we have a particular review standard in place, and --

CHAIRMAN WALLIS: Well, I just don't know -- the standard may be there, but I just don't know how good the technical basis is for making the calculations.

MS. ABDULLAHI: Shaulai, do you want to comment on that?

MR. LU: This is Shaulai Lu from NRR/SRXB. I think that they have (inaudible).

CHAIRMAN WALLIS: How do you know how good it is? Is there some verification?

MR. LU: We audited them. We audited the code using the --

CHAIRMAN WALLIS: Well, that is probably what Jennifer said earlier, that you actually have measurements in the reactor.

MR. LU: You mean irradiation measurements?

CHAIRMAN WALLIS: Well, in terms of what the neutrons are doing. But you don't have measurements of the temperatures.

MS. ABDULLAHI: Okay. But what aspect of the fuel performance, because there is the structural performance, and then there is the neutronic performance, and there is the heat transfer, and there is -- I mean, of course, if it is a fuel design looking at the critical heat flux correlation, they of course will have a correlation developed for the particular fuel design. And what aspect of fuel behavior are you referring to exactly?

CHAIRMAN WALLIS: Well, I am ignorant here. I just know that it is a very complicated core.

MEMBER SIEBER: Well, maybe I can help here a little bit. What you are talking about when you talk about zoned fuel, what you are really looking at is what the neutronic performance is, which in my

opinion as I used to do that kind of work, the calculations are pretty good as far as determining what the production, pellet by pellet, of the fuel is.

CHAIRMAN WALLIS: But whether or not you will get DNB somewhere --

MEMBER SIEBER: Well, that is a more complicated thing because the heat transfer, you don't know the flow regime exactly around each fuel pin. You have an idea of what the mixing correlation is, and how much cross-flow there is, and in general you have an idea of what the profile of the heat generation is across the core.

And from that you can calculate your approach to DNB and critical heat flux and so forth, but it is not as accurate as the actual neutronics calculation, where you can tell and basically pin by pin and pellet by pellet, what the power level is.

So the more that you get into the thermal hydraulic aspects, where there is first of all less measurements, and you are relying on correlations developed in some fluent laboratory to describe the W2 and W3 correlations, and so forth, the less accurate they are. But there are also merging there.

CHAIRMAN WALLIS: I guess the reason for bringing this up is that it looks as though they go to

higher and higher uprates, and there may be higher ones in the future.

The core and the fuel are going to probably be one of the really limiting features.

MEMBER SIEBER: Well, that is where you start to get the uprate in a way, because you are fixed with a package of a certain size, and the fuel length is whatever it is -- 12 feet or 14 feet, and the reactor vessel is so big in diameter that you have got to produce more power out of that.

And the way that you do it is to better distribute the power production, which leads to burnable poisons, and zoned fuel, and some dummy rods here and there. They know a lot about it because in the early days they were in flux wires periodically into the core where you could get the flux profile.

You had to run in-core instrumentation in about 50 assemblies basically every month, and so the operating plant people, plus the fuel designer, knows what the flux profiles are as the core burns down based on what the prediction is from the initial design.

On the other hand when you get into accident analysis, where the parameters of the core are beyond those which you experience and measure day

by day, there is more uncertainty, and so I think that is more in the prediction area.

CHAIRMAN WALLIS: Well, I am not looking for an answer today. You said that you are doing --

MS. UHLE: Well, I can fill in a little bit more. I mean, the sense of -- like say thermal hydraulically, if you are talking about having a mix of different fuel types, and so there is correlations developed again for a critical heat flux for the particular fuel design.

Now, if you are going to mix fuel designs, then you are going to get into a situation where we require them to take based on the methodology a DNB penalty in the case of PWRs.

But that is in some ways a conservative approach, where we can't --

MEMBER SIEBER: That is more of a mechanical design, as opposed to neutronic design.

MS. UHLE: No, neutronically, again, a lot of the methodologies, if you want to call it a better estimate methodology, I would call neutronics being more able to handle the physical phenomena from a best estimate standpoint.

They also benchmark against Monte Carlo codes, and MCNP, KENO, and so there is a bit more

certainty with respect to the neutronics calculations. And then of course there is the benchmarking during start-up testing for the power response.

So in the thermal hydraulics arena, I think that we do rely on more conservative approximations for some things that we don't know. The neutronics is perhaps a little, and perhaps less conservative, but then with the fuel there is also the issue of the structural integrity of the fuel, and that is what Shaulai Lu looks at, and looks at the different loads based on the flow rates and what have you.

MS. ABDULLAHI: If I could just add to what your concerns are, Dr. Wallis. Your concern is that the fuel design and the zoning for BWR is quite complex, and how well do the codes manage to model it, so that the neutronic feedback can be captured in the analysis.

Since the margins might be low, and how well the codes do it, some of the codes I think if you were in the future we will definitely try to address. Some of the newer codes might be much better at it than the older ones.

And such a TRAC-G might be a lot better than you generally might have, I suppose. Now, that

is one aspect that the plants have, let's say, reduced margin, and as such they are automatically converting to TRAC-G.

For instance, one of the reasons that they are doing it is that they want to have more margin and have a better neutronic feedback model then. And we have had the staff review the capability of that particular code.

Now, in terms of your concerns, we had a similar concern, and taking a simplistic approach, the staff after listening to your concerns, we tried to be quite responsive and learn from your concerns.

And one of the things that we are doing right now is we actually have GE-14 cross-section generated, and it is as close as possible to a plant that had uprated and it might also be going on an uprate dominant change.

We intend as well to have another fuel type as being (inaudible) cross-section generated.

CHAIRMAN WALLIS: Generated in the form of inputs to a code?

MS. ABDULLAHI: No, it would be done by the lab, and we would give them the bundle designs. We would give them, let's say, 4, or 5, or 6 bundle type designs. They are all GE-14s, but they have

different zoning, and they have a different lattis (phonetic) design.

And what we would do is we would take a core that has been designed and sort of try to fit in a Browns Ferry core, and expand that core, and then take those particular bundles and have a cross-section generated for that particular bundle, and then what we would do is we would have an analysis performed using that neutronic feedback.

Now, we intend and our boss has been very supportive in this, in trying to do the same thing for (inaudible), which is what we would be using, as well as doing the same thing for the Atrium-10, which Browns Ferry at some point intended to do.

So we are listening to your concern, and we are building towards it, and we have some constraints, both financially and time wise, but we are taking it into account. So basically I am giving you two sides of the story, which is that we are building ourselves to get there.

Secondly, licensees are going to convert to TRAC-G, which does a better job for the G.

CHAIRMAN WALLIS: We can drop this now, but we will come back to it when we actually look at individual uprates.

MS. ABDULLAHI: Exactly.

CHAIRMAN WALLIS: Thank you.

MR. PETERS: Next slide. Similarly in the nuclear design, and this is also part of our fuel and core performance portion of our review, also from normal operations and AOOs, we looked for specific fuel and specific limits continued to be met.

For reactivity accidents, we also look for rector coolant pressure boundary failure, and try to ensure that that does not happen. And also we ensure that core coolability is maintained. The next slide.

Also in our scope of review in our fuel and core performance portion, we look at thermal hydraulic design. If you look at the liquid methodologies that are used, make sure that they use improved topicals in matters that are specified, and in matters that are specified by our approving safety evaluation.

We look in the thermal hydraulics stability in these methodologies. We look at the hydraulic loads on the cores, which is what Shaulai Lu does. We also look at the normal operations in AOOs for the margin of safety for fuel damage, the NBR, and CHFR, and CPR.

MEMBER RANSOM: When you say you look at

this along the lines of what we talked about before, the major difference is the flatter profile in these higher energy cores, and you would think that maybe stability in the BWR might be more of an issue since codes have been validated against the old parabolic profile type systems, and not necessarily against these new higher energy profiles.

And so I am wondering how do you judge what they have done as adequate from the standpoint of stability? I agree that neutronics is well calculated, but now the void distribution on everything through the core may not be as well known.

MS. ABDULLAHI: I was hoping that you were talking about the grid instability. You know, the blackouts. Electrical.

CHAIRMAN WALLIS: Do we have insights into that, too?

MS. ABDULLAHI: No. For the instability, it is a problem that we are aware of, and what you are basically asking is how are we addressing or ensuring that core stability is -- impact on core stability is covered, right, in our reviews?

It is a difficult situation to address, because the point that you want to know is what codes do we have available that can adequately impact model

in a time domain, and what instability it would alter and do a very good neutronic feedback and thermal hydraulic feedback, and come back and tell us what is the characteristic of the instability for that particular core, and what would be the consequence.

And what we are trying to do in that arena right now is say that before we relied on the consequence based on mitigation actions. Now what we are questioning is whether the mitigation actions effective.

Are the mitigation actions effective, and would the severe instability increase assuming a certain core design and certain operating conditions. Now we have our own limitations, because of the fact that the code limitations, that the codes may not be able to well model that we have in our arsenal as a confirmatory.

But we are trying to mix GE, and using GE's codes to do some analyses, and at the same time see what else we can do with the codes available to us.

MEMBER RANSOM: Well, I am wondering because -- well, even TRAC-G has been benchmarked against the old cores, you know, where they had incidents of instability, and we are able to now tune

it more or less so that you agree, or can predict the phenomena.

But now going to these new flatter profiles, you would wonder if some of the phenomena that are present in the old cores would carry over, and if they would be as accurate in predicting the onset of instability.

MR. AKSTULEWICZ: This is Frank Akstulewicz from the staff. Especially related to TRAC-G, we have enough along the way to with GE to submit that code and look at the benchmark data to support whether or not that code will actually predict stability correctly. We are going to be starting that review shortly.

So we are kind of premature in answering your question at this moment.

MS. ABDULLAHI: That's true. It is going to be submitted for review.

MR. PETERS: And this is just an overall slide of the systems that we review in reactor systems. Most systems are done by plant systems or other groups, but these are the select few that we do. Next slide.

And also among the areas that we have seen significant changes in plant response because of the

power uprates are Chapter 15 accidents in transients. Of course, on the other slides we showed that we looked at anticipated operational occurrences, non-LOCAs and LOCAs.

But also in this we look at the codes and methodologies. We ensure that they are approved for plant specific application. We look through them to make sure that they comply with the implementations, and conditions, and restrictions, of our safety evaluations.

And we look at the assumptions to make sure that they account for the changes that are caused by the extended power uprate. Next slide.

MEMBER RANSOM: What do you look at in those cases in the LOCAs that change in peak CLAD temperature that they predicted, compared to the normal power?

MR. PETERS: That is one example of what we do. Other things that we do are that for assumptions that may have changed, we look at the initial conditions.

MEMBER RANSOM: How much increase in peak CLAD temperature would you allow? Is there a specification for that?

MR. PETERS: 10 CFR 50.46 addresses the

limits that peak CLAD temperature will allow.

MR. SHUAIBI: I want to emphasize what Sean just said. I think I am kind of left with the impression that maybe you are left with the impression that we are looking at the final number and saying it is under the limits and we are down. That is not the way that we do these.

We will look at the models that the plants are using and the assumptions that the plants are using to how they are designed. We look at the input assumptions that he plant uses, and we ask questions about that.

I will give you an example of what we did in the past when we found something that was different from what the plant proposed. Zena is up here and she can talk about it in detail, because she was one of the people that discovered this.

A plant had submitted an analysis and it was a (inaudible) plant, where they said it was bounding for both units. They wanted to use a single analysis to bound both units, and through our review in looking at the FSAR and the design of the plant, we found that some of their relief capacity -- and I believe it was a steam --

MS. ABDULLAHI: That's a PWSRB.

MR. SHUAIBI: Well, we found that their analysis which they said were bounding for both units were not in fact bounding for both units, and they had to go back and reanalyze. So we are not looking at the final numbers and saying they are acceptable.

We are looking at their FSAR and we are looking at their plant design, and look at their relief capacity, and I don't want to leave the impression that we are looking at the PCT and the oxidation, and these limits, and saying they are under the limit, and therefore it is acceptable.

MEMBER RANSOM: This is getting beyond the mission here. It is really to look for -- you are really looking at the methods and the approaches that they have taken and whether they are acceptable or not.

MR. SHUAIBI: We are also looking at the methods. That's correct. We are also looking at their methods, and there is one case where it sounds like we are doing more work to confirm that those methods are good for the applications.

In many cases we go back to the approvals and see if they are limited, and is there a code that they are using that is a single phase flow, and is it okay in using it if they are not going into two-phase

flow.

And we will look at that kind of thing, and then we end up with questions to justify their use of the codes, and to justify the way that they did their analyses, and in the end we come out with our conclusion as to whether it is acceptable or not.

So it is not just a review of the final number or the final result of the analysis.

MS. ABDULLAHI: If that plant has a large margin, and it has a 500 or a 600 degrees margin to the PCT, or a thousand, there is so many things to review. So you choose where you focus on that particular review, and whether you do confirmatory, or whether you do checking the background.

CHAIRMAN WALLIS: That last bullet is a somewhat dangerous one, in that these codes are full of assumptions, even for the page one.

MS. ABDULLAHI: Right.

CHAIRMAN WALLIS: And you are not going to go back and check all the assumptions in the code. You are making some assumptions at some very high level here or something. You are not going to look at the details of assumptions about flow regimes and things like that.

MS. ABDULLAHI: No.

MS. UHLE: This is Jennifer Uhle from reactor systems. Actually in a case that we have under review currently for a PWR, although it is a lower power uprate, we are asking questions about the applicability of a particular heat transfer.

CHAIRMAN WALLIS: You are? Okay. So you are going to --

MS. UHLE: Yes, and a lot of that comes from doing the code review very thoroughly. If the code review is -- if the methodology is reviewed, and it is clear as to what the perhaps limitations were in some models, we want to document that clearly so that when we do apply this methodology and plant specific application that we have those issues flagged and it helps us go back and ask the questions.

And so I think Mohammed was talking about sometimes perhaps we ask questions that you don't need to. Again, I am getting to the point where we are getting down to questions of the applicability of a phenomenology to a particular plant.

MEMBER SIEBER: As far as flow core correlations are concerned, those are usually submitted to you as topical reports?

MS. ABDULLAHI: Right, but the topical --

MEMBER SIEBER: And you approve them and

then people apply them.

MS. ABDULLAHI: But we can put limitations on approval. For instance, there is a particular heat transfer code that has a potential of non-conservatism. We did a sensitivity or you did a sensitivity study that only went up to this temperature to show that the conservatism did not impact.

So then this particular application would potentially have to resubmit a sensitivity study at the temperatures for which their core was going to get to. Those are questions that we are currently asking, and at power levels that are at less than the 20 percent increase. So the reviews are thorough.

MEMBER SIEBER: Well, that has been your procedure for a long time then as I recall.

MR. SHUAIBI: Yes, it is.

MS. ABDULLAHI: I think we are now more focused on writing the methodology reviews, safety evaluations, in a way that facilitates asking these questions, because in some cases vendors, if we don't have the question flagged under the approval restrictions, then it can be a contentious interaction.

So we have learned from previous reviews

that we need to make these statements very, very clear in the conclusions section.

MEMBER SIEBER: Okay.

MR. PETERS: And then the other areas that we review in reactor systems, we do ATWS reviews, and PWR for instability I believe Zena has already talked a little bit about the instability phenomenon in BWRs.

And pressurized water reactors, we look at particularly at plants without DSS systems, and we also in the case of increase in fuel enrichment, we will look at spent fuel and new fuel storage facilities to see the adequacy to handle the --

CHAIRMAN WALLIS: Well, what is a DSS?

MR. PETERS: It is a diverse scram system. Westinghouse plants are not required to have the diverse scram system.

MS. UHLE: This goes back to the ATWS rule, and the ATWS rule was originally promulgated, it had done sort of a risk -- I want to call it a risk assessment, but looked at the consequence of ATWS or the probability of ATWS, and determined that Westinghouse, based on the way that they were operating in their plant design, had an acceptable response to ATWS, and we did not require them to have a DSS.

Whereas, CE and B&W, have a DSS. So it comes out from the ATWS rule.

MR. PETERS: Okay. And also one of the last things that we look at is that we look at the -- we evaluate the increase in the integrated fluence, and we provide these results to the materials and chemical engineering branch, and they have already spoken how they deal with that on the effects on the reactor vessel. Next slide.

CHAIRMAN WALLIS: So you do spent fuel pools as well as the plant systems people?

MR. PETERS: Yes, we do the neutronics evaluation on the spent fuel pool, and they do the heat generation.

CHAIRMAN WALLIS: Okay.

MEMBER SIEBER: In spent fuel pools though there is more uncertainty in the dimensions of what is going on there, you know, particularly the ones with the absorbers in them. So those calculations are not as accurate as in the core neutronics calculations. That's true, right?

MR. PETERS: Yes, it is.

MEMBER SIEBER: But the rules that you have set up are pretty conservative.

MR. PETERS: Yes, we have a conservative

criteria for, I believe, .95K effective values.

MEMBER SIEBER: And you don't take credit for burn up, right?

MR. AKSTULEWICZ: This is Frank Akstulewicz again. The 50.68, which is the rule that governs this, sets the criteria of .95K effective for unborated water. So it is pure water, and we do give credit for the burn up and the build in of the actiones and other activities like that to remove some of that over conservatism.

MEMBER SIEBER: Okay.

MR. PETERS: And in response to the ACRS comments, we develop preliminary guidance for performing audits and independent calculations. We do this in the case, first, of the kind of methodologies, and we may do it for new applications of the methodology for new plant types, or power levels, or power densities. We also if --

CHAIRMAN WALLIS: What do new applications of the methodology mean?

MR. PETERS: Let's say that you had a methodology that you applied at a Westinghouse plant, and you decided that you wanted to cross that over to a B&W plant or CE plant.

CHAIRMAN WALLIS: Oh, I see.

MR. PETERS: If you are going to try and incorporate that methodology for --

CHAIRMAN WALLIS: So you are using the same old method, but you are applying it again?

MR. PETERS: I guess you can think of it that way. Maybe we should clarify the guidance a little bit on that.

MEMBER SIEBER: But when Westinghouse and combustion engineering became sort of a single entity, that is where you end up with these cross-over kinds of applications.

MR. PETERS: Exactly, and now all the vendors are doing fuel for each other.

MEMBER SIEBER: Right.

MR. PETERS: It is becoming more of a problem.

MS. UHLE: Currently we have one in place that is looking at that exactly, and it is an application of a Westinghouse non-LOCA transient methodology to a CE-designed plant, and we are doing -- we have a two day meeting actually with them starting tomorrow. So if you guys are bored, you can take my place.

MR. PETERS: Okay. If they deviate from our methodology, from our approved methodology, we may

do an audit or independent calculation. If our methodology sets specific limits, and they try to extend its applicability out, we may do that also.

Any questionable assumptions that go into an audit, and go into a methodology, we may do an audit. Questionable results automatically flag our system.

MEMBER RANSOM: How do you judge?

CHAIRMAN WALLIS: The other guys had questionable methods and questionable results as a criterion. That is kind of a catch-all, and you can always say I question the result.

MR. PETERS: Well, questionable results, let's say we have certain staff experience --

CHAIRMAN WALLIS: You just have some feeling that it is not quite right or something?

MR. PETERS: I guess that is where our engineering judgment comes into -- of a reviewer comes into effect. I mean, all-in-all, we all do have to use engineering judgment at times in our reviews.

MS. ABDULLAHI: If the PCT that you have been seeing was 1,500 or ATWS --

CHAIRMAN WALLIS: There must be a typo or something.

MS. ABDULLAHI: Or if the pressure was

very high, and --

CHAIRMAN WALLIS: Something unusual.

MR. PETERS: Exactly.

MS. ABDULLAHI: And then you say how come you are so low now.

CHAIRMAN WALLIS: Well, it is unusual in some sense.

MR. PETERS: Right. And then one of those other things that is along those lines is peak cladding temperatures, and significant reduction in margin. If they closely approach the limits, and say you have a 2,200 peak clad temperature, and they are coming in at 2,199, you may want to go and evaluate their methodology to make sure that they applied it appropriately.

MEMBER RANSOM: That is a reduction in a deterministic sense?

MR. PETERS: Exactly. Exactly.

MEMBER FORD: Could I ask the question to what extent have you approached your Office of Research to look into the question of future problems which you don't current have. I am thinking of, for instance, fuel cladding, and increased fluence and higher flow rates. Is there any theory to suppose that you might have degradation of that fuel cladding

over a period of time? I don't know the answer to that, but if you did, then you would have big problems.

MR. ELLIOTT: One of the things in the fuel arena is that we meet regularly with all the fuel vendors on a semi-annual basis to discuss problems like that, and to look at unique fuel designs, and what experimentation that they are doing, and what data they are developing.

And if we feel that there are potential holes in the support or in the development of that material, we have that opportunity to interact with them at that time.

MEMBER FORD: So has that specific question been asked?

MR. ELLIOTT: What was the specific question again?

MEMBER FORD: The question was higher fluxes, in addition to high flow rates pass the fuel cladding.

MR. ELLIOTT: I know that in the area of flux or fluence, they do look at the effect on the cladding material, and the actual pellet. As far as flammable, I am not in a position to answer that question. I don't know the answer to that.

MEMBER FORD: My guess is that it wouldn't. It is a ceramic that you have got there, but --

MR. ELLIOTT: But for the ceramic, that is inside the cladding, but in terms of the --

MEMBER FORD: Well, zirconium. You have zirconium film on the outside of the cladding.

MR. ELLIOTT: Right. And I just am not sure how they look into the increase in the flows. I am just not prepared to answer that question.

MS. ABDULLAHI: The only thing that I could add is that for BWRs, they are putting in large batch fractions, and so the time that the bundles stay in the core might be less than it was in the past.

MEMBER FORD: Well, I am just wondering if at the cliff edge that something horrible is going to happen, I would break away oxidation of some sort.

MS. ABDULLAHI: Right, corrosion increase, and affecting the transfer.

MEMBER FORD: So it has not been asked. That particular question has not been asked and answered.

MR. ELLIOTT: No, it has not.

MEMBER SIEBER: The fuel is not safety related.

MEMBER RANSOM: I suggest that we take a break now and return at 3:25, and we will go on to human factors.

MR. PETERS: Okay. Thank you very much.

(Whereupon, at 3:11 p.m., the meeting was recessed and resumed at 3:26 p.m.)

MR. ECKENRODE: I'm Dick Eckenrode, Sr., human factors engineer from the Nuclear Reactor Operations Branch.

Next slide. Our approach to review of the human factors area for EPUs is we have a standard set of five questions that are specific to the human factors areas. We have these on the Web site. And also if they haven't responded in the initial thing, we ask the questions and ask for a response to all of them.

Our review guidance is four sections of the SRP are listed there. We took the opportunity during this EPU, this review standard to upgrade these SRP sections. They were all pretty old. And we decided that this is a good time to do it, didn't think it was going to be too difficult.

The first two, 13.2.1 and .2.2 -- well, we sent them all out to the public for review. And 13.2.1 and .2.2 got no comments whatsoever. 13.5.2.1,

which is the emergency operating procedures, got I think two very minor comments, which we intend to make. We agree with them both. And we're happy with those.

The only problem we have had is with chapter 18. And that is still under review by us. The comments we got were based on one of the NUREGs that we reference in there, NUREG 17.64, which is guidance for the review of changes to human actions. And the reason we are having problems with this one is that we decided to attempt to do a graded approach to the review based on risk. And it's the risk area that is giving us the problems.

So at the moment, our PRA people in NRR and in research are negotiating changes to this. So, as a result, we thought we would put this into the system here for you to see the full picture but not asking you to review chapter 18 yet.

The chapter itself is fine. It's the reference, the one reference, we have in it. There are two other references that are involved: NUREG 07.11, which is the human factors injuries program review plan. This NUREG was reviewed by you several years ago in the Advanced Reactor Program. It's the plan for doing a review of a system that isn't

designed yet. And you looked at it several years ago and were happy with it.

We revised it only to bring it up to date more to the digital systems now that are being used. NUREG 0700, Rev. 2 is the second one. And that again was updated basically to include a lot of digital system work.

MR. SHUAIBI: Yes. I do want to emphasize the chapter 18, the idea of revising it was to reduce the scope of review that we would do. With these comments, we are sticking with our old scope, which is larger than it would have been if it hadn't received these comments and if we were not resolving them. Risk-informing them reduced the scope. And now we're doing full scope, I guess.

MR. ECKENRODE: Correct.

MEMBER RANSOM: These efforts are separate from the review standard for extended power upgrades. I guess that are maintenance work on the SRP.

MR. SHUAIBI: These were maintenance work done in parallel. I think there was an opportunity here for the work that we did for the review standard.

Remember, we took the SRPs. We looked at all of the additional guidance that has been issued, generic communications, et cetera, that were issued

since last update. And this was an opportunity that this branch decided to take in order to update some of this guidance.

I believe some of the other work was already in place, like I think chapter 18 may have already been under -- they are already doing the work to update it. But some of the others, I think they wanted to take this opportunity to update these chapters. And it wasn't that --

MEMBER RANSOM: What sort of review or approval process do they go through, the SRPs?

MR. ECKENRODE: It's got to go through CRGR and UHRS. And that's what we were looking for, the three chapters to look through this process.

MEMBER RANSOM: Are they a part of the review that you are asking for in September or --

MR. SHUAIBI: The third three?

MR. ECKENRODE: Yes, the first three.

MR. SHUAIBI: The first three if that is possible, we would like to get that reviewed since the changes are minor.

MR. ECKENRODE: Really, the changes, basically it's a 1981 version that is being brought up to 2003, '4, wherever we are now. And it's primarily there are a lot of changes and references, and they're

upgrading references and things like that. The documents themselves haven't changed much. And they have been out for public comment.

Okay. The scope of our review, these are the five areas where we asked the questions. Basically, the emergency operating, abnormal operating, procedures don't change as a result of power upgrade. The only changes are things like setpoints and so forth, which we don't consider to be a big change. They will be trained later, but it's not considered to be a change in the EOPs themselves. They still perform the same actions and so forth.

I will get back to the second one in a minute. The third, fourth, and fifth are also the same way. There are very few changes. The control room displays and alarms, sometimes again safe bands, green bands change on some of the instrumentation or setpoints again change.

SPDS, the same way, they are upgrading the SPDS. In these four areas, actually, all five, but the four areas, we're basically asking the licensee to commit to doing the things that they respond to in a question.

In other words, they will upgrade the emergency operating procedures to the latest version

with any new changes they need for the EPU. They will make those changes prior to going to power from the upgrade.

The same with the control room displays and alarms, they have committed to upgrade them beforehand, same as with the safety parameter display system. Operative training program and the simulator, they also in all cases commit to upgrading those. Training program is, they train on differences between what it was before and what the new values and so forth will be in the EPU.

The problem area that we have run into in most cases is the operator actions that are sensitive to power upgrade. And that is why we gave that a different color. The next page shows the question that we ask.

Next. This is the question that we ask. And basically this is describing any new operator actions that are occurring. And so far we haven't had any new operator actions.

And the second part is to describe any changes to operator actions. Again, there are no changes in the operator actions except for things like the time available to do the action. And that's why we put the "i.e." down there and ask them to describe

those things that will change and cause operators to have to do something different or work faster or learn things differently.

We also just to cover ourselves put in work-arounds in there to make sure that they cover any work-arounds that they know of that might be affected by this. And the last part is whether they have gone from automatic to manual or vice versa based on the EPU.

MEMBER SIEBER: Do you permit the instigation of new work-arounds to cover things that aren't covered by equipment resulting from power upgrade?

MR. ECKENRODE: Yes, they can as long as it doesn't affect things. This is why we are asking to look at this, to see what it is that might affect your actions.

MEMBER SIEBER: Well, there was a NUREG many years ago that talked about human factors issues in control rooms. Do you apply those standards to these?

MR. ECKENRODE: Yes, we will. The way we handle this, the production time available, is the first thing we do is do a screening of the operator action using ANSI/ANS 58.8. And if you'll go to the

next slide, basically the 58.8 results in time available for actions based on these items. And the difficult identification here is the plant condition.

The description in the 1984 version had a list of various actions that were to be taken. And those actions were placed as one of the plant conditions.

The '94 version now uses expected frequency of those actions as the term. We allow them to use either one they want to commit to. We will look at both of them and determine the times.

I have used this ANSI standard off and on for 20 years. And I have never yet found it non-conservative. So we use it basically as a screening device. We do not endorse it. And we do not use it actually to license.

We can go back now to the other item. So the screening, we screen them for time based on the ANSI standard. And in general, they are a conservative value. If the time available that they calculate, the licensee calculates, is less than that, then we ask them to prove it, basically demonstrate to us that the operators are going to be able to take this action in the time that they do have available.

We generally ask for training or testing

records. For instance, in one case, they had run this simulation and re-qual 58 times, and it never was a failure. We felt that that was probably good enough to say that you can perform the action in the time available.

So the one action that seems to be the most difficult or the shortest time available is the initiation of SLC in the ATWS event. That's been the same one every single one we have looked at so far. And we have made them basically demonstrate that this could be accomplished.

MEMBER SIEBER: How much time does that take, a 20 to 30-minute deal?

MR. ECKENRODE: No. No. They're much shorter than that. They're in the area of in one case, I think it was six minutes, something like that.

MEMBER SIEBER: Six minutes?

MR. ECKENRODE: Yes. The actions that they have to take --

MEMBER SIEBER: Just two or three actions and --

MR. ECKENRODE: Right. It's basically one switch generally. It's a key lock switch. You have to get the key and put it in and turn it in.

MEMBER ROSEN: The key is in the control

room someplace.

MR. ECKENRODE: In one case, it was in the mode switch. You use the same one --

MEMBER LEITCH: In most cases, the key is kept in the switch.

MR. ECKENRODE: Or it is in the switch, yes.

MEMBER ROSEN: It's captured in the switch switch? It's captured in the switch switch already?

MR. ECKENRODE: It can be. It can be. It depends on how they --

CHAIRMAN WALLIS: It's hardly a key in that case, is it?

MR. ECKENRODE: That's correct.

MEMBER SIEBER: It's a removable handle.

MR. ECKENRODE: Yes, removable. It depends on their administrative controls, how they want to handle it.

MEMBER KRESS: In most places I've been, the key's in the switch.

MR. ECKENRODE: Finally, if they can't demonstrate the ability to do it, we look at the last three there. We get the operating procedures. We get the controls, displays, and alarms that they have to deal with. And we have one of our license examiners

look at this whole thing, go through the process, and make an engineering judgment as to whether he thinks that the operator is going to be able to do this. And basically that's the way we have done it for all the ones so far.

MR. SHUAIBI: Just a clarification. It's not that they cannot demonstrate that they can do it. It's if they're close to the available time, right?

MR. ECKENRODE: That, too, either that. In other words, if they don't have good records of that particular task being performed before, that's one reason why we would do this. The other is if it's close, if their records show that it's close, you'll still have them do it.

MEMBER RANSOM: What are the consequences of not being able to perform in that time frame, plant damage?

MR. ECKENRODE: Yes. In one case, it is, right.

MR. SHUAIBI: I guess it could be depending on the analysis performed to support the EOPs, but the assumption as far as we're concerned in licensing space is that's what it would be, but for all the conservatism, I guess in reality, in real life, there could be enough margin that that wouldn't

happen if they're delayed a few seconds or --

MR. ECKENRODE: I think there are other what they call early and late initiation. If they miss the early initiation, they can still do. And maybe Donnie has --

MR. HARRISON: Yes. This is Donnie Harrison from the PRA Branch again. What a lot of these models do is they have an early initiation, which is the four-minute, six-minute time frame. If they miss that, they still have a chance at like the 12 to 20-minute time frame to do what they call late initiation.

And the impact of that may be that they have to do additional cooling later in the scenario. They don't have to have additional pumps or additional capability laid on. It can be modeled as two parts. So if you risk the one, you are not done yet.

MEMBER SIEBER: But the success criteria changes?

MR. HARRISON: And that's why they do it two ways. That's why you'll have an early and a later because the success criteria changes.

MEMBER SIEBER: Okay.

MR. ECKENRODE: That's the way we do our review.

MEMBER LEITCH: A couple of slides ago you talked about the control room simulator.

MR. ECKENRODE: Yes.

MEMBER LEITCH: You don't necessarily have to go back there. My question is basically what is the timing of the modifications in the simulator?

MR. ECKENRODE: Well, what we have done is we have asked them to commit to having that simulator available for the operators to be trained on prior to going to the actual power.

MEMBER LEITCH: I guess what I'm thinking about is a plant like Brunswick, where that transition may occur over two refueling cycles on one unit and stagger by another year to get to the next unit. So you might be talking about three years from the time it starts until the time it is fully implemented.

MR. ECKENRODE: Right.

MEMBER LEITCH: And my question is, are you concerned about a negative training impact in that? In other words, if you modify the simulator to look like the endpoint --

MR. ECKENRODE: In that case we won't do it. What we will do is they will teach differences training on what it will be. We are going to have that. That is going to be a real serious problem, by

the way, in the near future when they start redoing the control rooms, redesigning control rooms, which they are doing now. You have got two and three-unit plants that are going to be done, totally different cycles. And it's a difficult problem.

MEMBER SIEBER: Will that mean the end of dual licensing or triple licensing, do you think?

MR. ECKENRODE: No. No, I don't think so. They are going to end up having to train the operators on both plants basically is what they are going to have to do. The plant hasn't changed. The interface has changed. And that's the difficult part. It's a training problem that they're going to have to go through that is going to be very difficult.

MEMBER LEITCH: That's the new design control room.

MR. ECKENRODE: Design, yes.

MEMBER LEITCH: Thinking about these power upgrades, there is always a tendency -- it sounds easy, but there's always a tendency in a split second. Have we made those changes on unit 1 or was that unit 2?

MR. ECKENRODE: You have the same problem in the redesign of these things.

MEMBER LEITCH: Yes, yes, that's true.

MR. ECKENRODE: In fact, it's bigger there.

MEMBER ROSEN: You're talking about the digital upgrades that people are doing?

MR. ECKENRODE: Yes, yes.

MEMBER SIEBER: Well, the digital upgrades, they aren't intending to replace the whole control room with the new digital control room. That's usually done system by system.

MR. ECKENRODE: Callaway is.

MEMBER SIEBER: Well, okay.

MR. ECKENRODE: As a matter of fact, I have worked with some of the people from Callaway on this, and they are doing it the right way. They are going to build an entirely new simulator for the new system, new control room, so they can train on it. They will have the old one to train on for re-qual and so forth. And then they will transition into a new.

MEMBER ROSEN: A new simulator is a bunch of blank panels and a CRT.

MR. ECKENRODE: It probably will be.

MEMBER SIEBER: It's a little desk this one that he is sitting on.

MR. ECKENRODE: That's PBMR.

MEMBER SIEBER: Well, they're talking

about phased-in changes. The rule at places where I work is you do design changes during refueling outage. At the end of the outage, the simulator was to be changed to match what it would look like at the start-up of the next cycle. You didn't jump forward two to three cycles. You just did as much to make it correspond to the mods that you made your --

MEMBER LEITCH: That's true. What I am saying is then you would have two units, one simulator.

MR. ECKENRODE: And you're always going to have that. We have to work around that is what we are trying to do, yes.

MEMBER SIEBER: We had studies years ago because we had identical units, but the control room designs were 13 years apart.

MR. ECKENRODE: Yes.

MEMBER SIEBER: And the outcome of our personal study was that the operators made too many mistakes because instrument locations were in different places. The same systems were there, but the readouts were different. Some were on CRTs. Some were on charts.

MR. ECKENRODE: That's why some of the plants --

MEMBER SIEBER: So we withdrew our request for dual licensing.

MR. ECKENRODE: Yes. We have been through that with I guess Beaver Valley recently.

MEMBER SIEBER: Well, that's the point.

MR. ECKENRODE: Yes.

MEMBER SIEBER: They made the initial decision and did the initial study.

MR. ECKENRODE: Okay.

MEMBER ROSEN: So you withdrew the request for dual licensing --

MEMBER SIEBER: Yes.

MEMBER ROSEN: -- and had operators assigned to one unit of the other?

MR. ECKENRODE: Correct. We had two simulators, too.

MEMBER SIEBER: To avoid the human errors. And for us, the operators swore they could do it, but when we actually tested it, it didn't work out, the expectations that we had. So we decided not only did we do that, but we had a seismic glass wall in the middle of the control room to keep the right guys on the right side of the room. They could watch the other guys struggle with a plan that was not performing properly, but they couldn't rush over there

to do any --

MR. ECKENRODE: The cost of the simulators.

MEMBER SIEBER: That was another cost of that. It was a labor cost plus the two simulators.

MR. SHUAIBI: Your earlier point about implementation is a valid one. What we are presenting here is what we do to the review for power up right.

MEMBER SIEBER: Yes.

MR. SHUAIBI: But if you were to go to the majority of our amendments, most of our amendments have an implementation period. Sometimes it's 60 days. When we issue the amendment, then the licensee gets 60 days to implement it. And the reason for that time is so that they can go through and make changes to these types of things and train their operators.

That gets done in every licensing action. The plant has to go back. They have to look at the impact of that licensing action or that change on their procedures, on their training, on these types of things.

Here what we are saying is we are specifically asking questions related to that. We are not just moving it off to the same process, that implementation process. We are actually looking at

that to make sure that we have an opportunity to identify anything like these operator actions that don't have as much time.

MEMBER SIEBER: I think that is a prudent thing to do on the staff's and the licensee's part because it is those kinds of little details where the ball gets dropped. And that sets you up for an operator error. So that's the right thing to do.

MR. ECKENRODE: We actually give the same questions to the small power uprates the same way. There have been no issues with the small power uprates yet that have been significant enough to deal with. So we aren't even --

MEMBER SIEBER: You don't change equipment that much.

MR. ECKENRODE: Right.

MEMBER SIEBER: So the only thing that changes is response times and perhaps some setpoints.

MR. SHUAIBI: Okay. No more questions. Then we can go on to the next presentation.

MEMBER RANSOM: Let's go on the power ascension and/or testing.

MR. SHUAIBI: Okay. And we have Kevin Coyne and Bob Pettis from the staff to talk about that. Again, this is an area where we developed a new

standard review plan section to address power ascension and integral testing.

MR. PETTIS: Good afternoon. I am Robert Pettis of the Emergency Preparedness and Plant Support Branch. To my right is Kevin Coyne, who is primarily responsible for the development of the new SRP section on EPU testing programs.

The SRP is part of the EPU review standard. It provides general guidelines for reviewing EPU testing programs to ensure that the proposed testing program adequately verifies that the plant can be operated safely at the upgraded power level.

At this time I would like to turn the presentation over to Kevin, who will discuss the specific guidance provided in the SRP.

MR. COYNE: Good afternoon. Just to start, when we went through this process, we evaluated our existing guidance in the SRP to determine if we had anything that could be readily adapted to the review of EPU test programs.

The only SRP section that was really close to being applicable was SRP 14.2, which is the initial test program SRP, really intended for original initial licensing. We also use that for design certification

reviews.

In reviewing that, we determined that that guidance really wouldn't be applicable to the EPU test program reviews. We identified the need for a new SRP section, which is 14.2.1. We did rely heavily on the guidance that already exists in SRP 14.2, in addition to the guidance contained in Reg Guide 1.68 in the development of the SRP section.

I also want to note that we did make an attempt to try to come up with definitive criteria that would establish when certain power ascension, particularly large transient tests, would be required for an EPU.

We did consult with the lead technical branches, in addition to other stakeholders in the NRC, and really weren't able to come up with a workable, definitive trigger criteria when a specific or large transient test or other power ascension test would need to be performed.

Consequently, the guidance really is general guidelines to assist the reviewer in determining whether the applicant or EPU has proposed an acceptable test program.

I also want to note that, although we are the lead branch for the review of the test program,

our technical area is quality assurance. And we form more of a coordination review of the overall test program and rely heavily on it but from the various technical branches to determine whether the test program is adequate or if there is a need for a specific test.

Next slide. There are three major areas in the review for the EPU test program. The first area is we do a comparison of the proposed EPU test program to the initial test program that was originally used in plant licensing. The goal is really to identify any test that could be potentially invalidated by the EPU.

Secondly, since the extended power uprates are generally characterized by the need for extensive plant modifications, the review still includes considerations of modifications. In addition, a plant change is necessary to support the EPU. Those plant changes may include setpoint changes or parameter changes, such as temperatures, pressures, flows.

The test program should assure, to the extent practical, that equipment modified to support or impacted by the EPU will perform satisfactorily in service.

MEMBER LEITCH: It seems to me, Kevin,

that we are still kind of dancing around the issue here. In other words, I don't understand what we are really going to require in either power ascension or in what we might call large transient testing. Tell me again.

It's a case-by-case basis based on what, the number of the magnitude of the modifications that are necessary? What?

MR. COYNE: It is a case-by-case basis review. It's primarily based on what the initial test program for the plant looked like. What we have done, for lack of a better word, the default position, is that initial testing should be re-performed, although we do allow in the SRP section that an applicant or a licensee can propose justifications for not performing certain tests and then when you concluded general guidelines for what to look for in an adequate justification for the licensee not to perform a certain power ascension test.

MEMBER ROSEN: The initial testing above 80 percent should be re-performed.

MR. COYNE: As a default position --

MEMBER ROSEN: Yes.

MR. COYNE: -- for consideration of --

MEMBER ROSEN: Above 80 percent because

you're licensing up to 120.

MR. COYNE: Correct, in addition to other factors, but that's the primary one.

MEMBER ROSEN: I would basically assess that anything they did above 80 percent, there was obviously a logical reason for it. You may not remember it, but there was one. And, therefore, now that we are going to 120 percent, it's time to do those tests again.

MEMBER SIEBER: I would think it would be important to know why you did them in the first place; for example, the question of mainstream system isolation. Here there was no mod to the plant. The flow conditions in the main steam system are different, are higher.

And so are you really trying to plot a new point on the power to flow curve? That would be one test objective. Another one would be are you going to break all the pipe supports in the system when the valve hammer is shut?

MEMBER ROSEN: The speed of the main steam isolation valve closer must be faster than a certain amount and not faster than another amount.

MEMBER SIEBER: That's right. That's the third thing.

MEMBER ROSEN: It's got to be a window. And so you want to be sure that.

MEMBER SIEBER: That's the third thing. And the fourth thing is, am I going to break the line with a water hammer and that kind of stuff? So you need to know why you are doing the test in the first place.

For example, if you have an EPU for a plant that was relatively low powered for a model in a BWR, just as an example, for the model reactor that it is -- and there are other reactors, where you already know what the extension of points on the power to flow diagram is, then that should not necessarily be a reason why you would do this because you are not breaking any new ground.

On the other hand, it might be interesting to know whether you are going to break a pipe someplace or destroy its supports, whether the system is strong enough, including the operating valves, to do that. So I think that you need to look at why you did the test in the first place to decide whether you need to do them again or not.

And to me that would be a step in the process, one of the steps in the process, of deciding whether you are going to get an exemption or not.

MR. COYNE: I would agree with that statement. And part of our review will be looking at the initial test program that was performed and the reasons certain testing was elected to be performed during the original licensing to see if those reasons are still valid after the EPU.

MEMBER ROSEN: Now, there is an initial test report that was written by the plant staff --

MR. COYNE: Correct.

MEMBER ROSEN: -- and the vendor usually. And it seems to me that would be a good source of information to help you decide when you ask the licensee to submit it in response to an RAI and make it available for the staff. And then if he proposes to not do any of this testing, you might be able to go back to the original test report and draw some conclusions as to whether that request makes any sense or not based on the original test results.

MR. SHUAIBI: I think in coming up with the standard review plan, the intent was to put the burden on the licensee to justify if they don't want to do the test. I think that we went through this very early, we had all of these deliberations. We had a lot of internal deliberations in terms of whether we wanted to accept or not accept the proposal to not do

testing.

Some believe that we had a lot of burden on us to prove why it is necessary. And the way this SRP was drafted -- and correct me if I am wrong, Kevin -- was to put the burden on the licensee. In other words, our going-in position, the staff is going in saying, "We believe these tests will be a good thing to do. Now convince us otherwise if you don't want to do them. You come in with the justification to convince us that these don't need to be done."

They couldn't come up with the criteria on this, like Kevin indicated, but we did put the burden back on the licensee to justify its application. And that's where you're exactly right. We can go back and say, "Well, what was the basis for that test? And have you validated the basis with this power uprate?" That would be an opportunity for us to --

MEMBER ROSEN: That's what happened when you did the test to 100 percent power last time. And there were some anomalies that showed up. And they could be worse than 100 percent. You apparently thought they were okay then. But at 120 percent license power, they could be worse and maybe not acceptable.

MEMBER SIEBER: I think you have to be

careful in the way you ask the question. For example, if I were a licensee and you asked me that question, "Why don't you want to do that?" I would come back and say, "I think that test is hard on the plant and unnecessary."

Of course, it tells you nothing. It's a crybaby story. And, really, what you need to do is you will get no new information, which in the case of the main steam isolation is not true. You will get new information. And that is, can the steam system withstand that transient without tearing itself apart?

MEMBER ROSEN: And I think you make a good point here that the test would be done under appropriate circumstances. You will see how the plant responds when you trip it when you are watching, when you have special instrumentation on board, when the operators are ready and trained to know what to expect, rather than having the plant pick the time to do the test because you know the test will be done sometime.

The plant will trip from 100 percent, from the new 100 percent, power someday in the future. Then you will get the answer to the questions.

MEMBER SIEBER: Well, you won't because you won't be instrumented to get it.

MEMBER ROSEN: That's true. Well, you get the answer to the question of whether any pipe anchor is pulled out of the wall.

MEMBER SIEBER: Yes. It could be a learning experience.

MEMBER ROSEN: With a capital L and a capital E.

MEMBER SIEBER: With a capital dollar sign. But I think the most important thing is to know why you are doing the test in the first place. What is it that you want to learn? And you can go back to history to the extent that they were as smart back then as we are now or you can come up with a new criteria, but that's the basis upon which you ought to judge whether exemption should be allowed or not.

MEMBER ROSEN: Well, it's also what you want to confirm. I mean, for instance, you have an analysis that says that your pipe supports and anchors will withstand the shock of the main steam isolation valves shutting off flow and with a margin of X. And you know that they did at 100 percent power.

But the velocities are higher, and the forces are quite a bit higher. And so now you are going to do a test. And you can instrument that and see what the forces are and show that the calculations

predict that the support size designed and installed are capable of handling the new higher stresses.

So it's more than just a learning experience. It's a verification, a confirmation of the analysis.

MEMBER SIEBER: Yes. And it goes a step further than that. You know, a lot of pipe supports are fastened to concrete structures by hilti bolts. And hilti bolts age. And so does concrete. So the current structure may be different than the as-installed structure. What your interest is is in knowing what the condition of the plant is now, not what it was 20 years ago.

MEMBER LEITCH: So what I'm hearing is that --

MR. SHUAIBI: I do want to say --

MEMBER LEITCH: -- our position is that we basically are asking that they repeat the power ascension test program.

MR. SHUAIBI: That's what I wanted to clarify. There is a lot of discussion here. I don't want to mislead you to think that we expect from now on that these plants are going to come in and say, "We volunteer to do these tests."

MEMBER SIEBER: They aren't.

MR. SHUAIBI: Our expectation is that they are going to be coming in and saying, "Here is our justification for not doing these tests" and we are going to be asking questions to evaluate the need for that test. Our expectation is that they will come in and say, "Here is our justification. We don't want to do these tests. We believe we have justified it. We believe this guidance puts the burden on them to prove that."

MEMBER ROSEN: I'm not so sure that now that you have put the burden on the other shoe that it means they'll do the test.

MEMBER SIEBER: That doesn't make you a winner. I think you have to prepare now as to what it is you expect to get out of this, as opposed to saying, "You justify the exemption to us and then wait for the letter in the mail."

I think you need to know, at least in your own mind, or have research why it is you think they ought to be doing the test, what it is you want to find out and they should want to find out.

MR. COYNE: One of the struggles we have with developing the SRP section was that the SRP is applicable to a generic body of plants. It's a very plant-specific --

MEMBER SIEBER: All of them different.

MR. COYNE: Right. It is a very plant-specific evaluation for the testing. So it was difficult to come up with general criteria that would be specific enough to identify the need for testing.

So Mohammed's point was very good. We don't want to mislead you. It really is the SRP sets a body of testing that should be on the table for evaluation. And we would expect licensees to come in with evaluations or a proposal to do the appropriate testing.

Part of our assessment of the licensee's evaluation would be factors, like why was the testing initially done and are those factors still valid and would the testing need to be re-performed because of those reasons?

MEMBER SIEBER: I think you are headed in the right direction.

MEMBER LEITCH: That body of testing that has to be justified is the whole initial power ascension program, right?

MR. SHUAIBI: I think we're going to cover that in a little bit. It's a subset of that, but I think Kevin is going to talk about it in a little bit. And I think Dr. Rosen already hinted about the 80

percent criteria, which links back to you are now operating at 80 percent of where you are proposing to go to. And so this is an extension of what was done during initial licensing to the full power level.

I don't want to steal the thunder. I think Kevin is going to cover that. So let me just let him finish his presentation.

MR. COYNE: We are going to cover that. Finally, just to wrap up the scope of the review -- and this is probably the easiest part of the review process, the programmatic aspects. Do they have test procedures that test line scheduling, sequencing, appropriate acceptance criteria methods for dealing with that? That's more typical of the quality assurance-type test program review we do.

Next slide.

MEMBER SIEBER: Do you see that as like a joint test group kind of thing that you have during initial construction?

MR. COYNE: It would be more using their existing Appendix B program under criteria 11 for test control. Maybe Bob can help me out here. I want to envision something equivalent to an initial start-up test program, more using the existing processes under their Appendix B program.

MEMBER SIEBER: All right.

MR. PETTIS: Yes. We think they would probably use the existing Appendix B program because this activity seems to be more like an extension of the existing plant procedures and activities. We're not doing anything that's new.

Plus, some of these plants because of the precedent that was logged in the past was the BWRs that came in under CPPU was a certain body of knowledge there that was gained during the prior BWR CPPU reviews that came before the agency where licensees came in and pretty much made a fairly plausible argument for the need not to perform large transient testing based upon the characteristics of the CPPU with the constant down pressure and not a large extent of secondary plant modifications.

So we have a little bit of historical information with respect to the BWR side of the house.

MEMBER SIEBER: If you have a 20 percent power uprate, you have a 20 percent increase in mass flow rate through your steam system and your feedwater system, you've got a much higher level of decay heat in the plant.

So CPPU doesn't give you everything. There are differences in the plant that make a

difference in the way the plant responds and operates in the stresses they're on.

I think what Steve is talking about is you use the test program, the old one, from 80 percent to 100 and start applying that at 80 percent of the new extended power rating, which covers that last 20 percent.

MR. COYNE: And we've touched on some of these issues. The considerations that went into the development of the SRP, as we discussed, we didn't want the EPU to invalidate the results of the initial test program.

In other words, we want to make sure the initial test programs were still meaningful and valid as far as plant equipment performance. However, we did recognize there is probably only a subset of the initial test program test that would be impacted by the EPU. And we will go through on the next slide how we define that.

Initially based on previous experience with prior EPUs, we did recognize that the modifications performed to support EPUs have been done under 50.59 without prior staff review and approval. In other words, in the absence of an actual increase in power, the regulatory framework that exists, the

licensee can effectively do all of the modifications to support the EPU without us going in and reviewing the testing that they would do for those mods.

So we wanted to be consistent with that framework in that we wanted to focus on the impact of the power increase in conjunction with the modifications, rather than just the modifications themselves.

And, finally, based on previous experience also, we noted that the existing tech spec and quality assurance programs adequately cover certain aspects of component-level and system-level test requirements. In the SRP, we have not tried to duplicate those testing requirements but, instead, tried to augment the QA program and test specs in areas where equipment performance may not be adequately covered by those requirements.

For example, tech spec LCOs and surveillance requirements generally cover the primary success path for mitigation of accidents in transients and may not address all defense-in-depth functions or other balance of plant functions that may serve to minimize unnecessary challenges to safety systems.

Additionally, typically Appendix B QA programs, although there are exceptions, generally

apply to safety-related equipment only. In certain cases, licensees may put non-safety-related equipment under those programs, but from a regulatory perspective, that's generally safety-related equipment.

We do note the majority of equipment you are exercising during a large transient test, at least, tends to be a non-safety-related balance of plant equipment. And we do want to recognize that as going through the SRP development.

MEMBER RANSOM: In the initial testing, did they instrument the plant with things like accelerometers and key components and maybe hydrophones to listen to the --

MEMBER ROSEN: Fast recorders to record pressure spikes.

MEMBER RANSOM: As a function of frequency to see how the plant is changing as you increase the power. Specifically I am thinking of these BWR problems that have arisen. I mean, this is just a study-safe test, but you can hear the difference between are you picking up a resonant vibration and a component?

I mean, you have infellar noise. You have all of these different things going on. But you can

kind of diagnose what is happening in the plant if you have that kind of instrumentation.

MR. SHUAIBI: And I think earlier on when we were talking about the dryer issue, there was a discussion of earlier on when the plants were forced license, there was instrumentation that they use.

One of the things that we're discussing in relation to that, although I said earlier we do not have a position on this -- and I will say that again before I say this. We are considering whether we need to or whether we want them to instrument these dryers or areas that increase flow internally, internal to the vessel, for an EPU.

And I will caution you again. This is not a final position. We're still talking about what we want to do or what kind of information we need. But that is on the table. That is not off the table.

MEMBER RANSOM: I would think if you make a power density plot and you run it up to 100 percent power and then you see new shifts in that spectrum, as you go up to 120 percent, you pick up those kinds of things.

I don't know. Maybe that information was not available from the original start-up testing. So you couldn't tell the difference between the old plant

if you made modifications to it and, say, the new.

MEMBER ROSEN: You could just install the instrumentation now and then at 100 percent power take a baseline set of data.

MEMBER RANSOM: Sure.

MEMBER ROSEN: So you would have it and you can watch it as you go along.

MEMBER RANSOM: Right.

MR. SHUAIBI: In terms of instrumentation, there were areas that were instrumented for these operators as part of their power ascension plan.

We talked earlier about main steam lines that were instrumented. For these power uprates, they are instrumenting main steam lines and taking data. They are going up in small increments. I believe it's three percent or five percent. I forget the exact number.

They are going up in small increments. They stop. They take those readings. They evaluate them to make sure they are consistent with what they are expecting to get. If they're not, they have to do an evaluation of why it is not consistent.

And then once they are satisfied or it's consistent with what we expect for those steam lines to be doing, then they go up to the next three

percent, five percent, the next increment. And then they stop and do the same thing again.

So we have done that. We haven't done that on the internals for the dryers, like I was saying earlier. And I guess if they are going to do a large transient test, I am sure there will be a lot of attention on what is happening and how the plant is responding.

I am not sure about instrumentation. I think maybe one of you guys can address that.

MR. COYNE: I think we would have to defer to the technical lead in that area for exactly what would be installed during the testing, unfortunately.

MEMBER ROSEN: Well in a lot of ways, you are going to have to give them some guidance. Someone has got to give them some guidance on how well we want to characterize the state of the plant as it goes from its current license power level to its new license power level. That is an expectation, a set of expectations, to take to the leadership.

You just want to not have any knowledge at all and then just get to 120 and take some data and say, "It looks okay." Assuming it's okay, what do you want, to do it in increments, as you suggest, look at the reflections of piping, predict, do the kind of

logical and good things you were just laying out, Mohammed, which is take data, compare it to predictions, make sure it is about what you expected for anomalies. Evaluate them if you find any.

MR. SHUAIBI: Right. And for power ascension, which in my mind I separate that from integral testing, for power ascension, that is what we have been doing. That is what they have been proposing. And that is what we have been reviewing and approving, is that incremental increase. In my mind, that is separate from the integral test.

MEMBER SIEBER: Well, that's not transient testing.

MR. SHUAIBI: That's correct. It may be --

MEMBER SIEBER: You are trying to find out how the plant is growing as it heats up.

MR. SHUAIBI: Yes.

MEMBER SIEBER: And you make vibration measurements that are basically steady state. And you may have looked at all of the pumps and --

MEMBER ROSEN: You look at the piping deflections and things like that.

MEMBER SIEBER: And if you trip a plant, you are going to see piping deflections that are

substantially different from what you find when it internally grows.

MEMBER ROSEN: But you can predict those. They can make a prediction.

MEMBER SIEBER: I would like to meet the guy or girl who can do that.

MEMBER ROSEN: You can make a prediction of those and observe what happens and see if it follows your predictions.

MEMBER SIEBER: Well, let me ask a question because my memory is bad. It seems to me that there was a recent report from a plant, BWR, that did a power upgrade and had a plant trip, had not done integral testing. And then the licensee later found that the pipe support on the steam system had separated from the concrete wall. Does anybody remember that?

MR. SHUAIBI: I don't, but I could look into that. I could take that as an item that I could look into.

MEMBER SIEBER: Yes. Well, it seems to me that the plant that comes to mind is Dresden, but I forget which unit. I don't know if my memory is faulty or not. And so if you can't find it, you can't find it, but if you can and it fits into this

scenario, then that is a reason why you ought to look at large transient testing.

MR. SHUAIBI: Yes. I think in the Dresden case, the information that I have -- and I will go back and look to see if they tripped and they experienced what you were just talking about is that some of the smaller pipes off of the main steam system, the larger main steam pipes, have seen some cracking, not that the plant tripped and some support, but I'll go back and look.

What I am saying is I don't know if the plant tripped or not, but --

MEMBER SIEBER: Well, it was probably one of those middle-of-the-night things that I read, and I'm not sure I got it right.

MR. SHUAIBI: Okay.

MEMBER SIEBER: To me, that is the kind of stuff you find. If you have a trip in the big transient plant, one that seems to want to break off or crack or the little ones are attached to this big plant --

MR. SHUAIBI: Right. But this wasn't as a result of a trip. This was as a result of just normal operation vibrations, and that's what we looked at. But I will go back and look. I will go back and

look. I will go back and look to see if there was an event at one of the upgraded plants where that happened.

MEMBER SIEBER: Okay. You don't need to tell me about it, but that is something you would take into account if you are trying to decide what it is you are going to do.

MR. SHUAIBI: I will take that as an action and get back to Ralph on that.

MEMBER SIEBER: All right.

MR. SHUAIBI: And we'll do that. I think it's important if it's out there that we go look and find it.

MR. RULAND: And we'll look more generally, too.

MEMBER SIEBER: All right.

MR. COYNE: We've already discussed this partially. The first phase of the review is basically a comparison of the original licensing testing. For initial testing, it is potentially invalidated by the EPU and tests that we basically are putting on the table for consideration for re-performance are all the initial tests performed at a power level of 80 percent or greater.

In addition, any initial tests performed

at a lower power level, if it would be invalidated by the EPU. And the SRP section requests the licensee to identify that testing. Additionally, the reviewer will have access to the initial test program that was performed in addition to modifications, setpoint changes, and parameter changes necessary to support the EPU.

So we would expect some independent evaluation of the licensee's identification of invalidated tests that are performed at a lower power level. And as we discussed, all tests identified by that criteria must either be re-performed or dispositioned or an adequate justification given for not re-performing the test.

The next area is the testing for modifications. This criteria is a little more complicated. And I think we have an example that will help run through it. But the second criteria we have in the SRP is we need to demonstrate the performance of plant equipment important to safety that meets all the three criteria on this slide.

The performance of the SSE is impacted by an EPU modification. And with modification, we're using it in the broader sense of physical plant modifications, in addition to setpoint changes that

occurred or parameter changes, changes in flow, pressure, temperature.

The equipment is used to mitigate an anticipated operational occurrence in the plant's licensing basis. That criteria is a little odd. And we got there from review of Reg Guide 168 and looking at what is typically accomplished from large transient testing. There is a pretty good linkage -- and we provide this in the SRP -- of the large transient dynamic testing is what Reg Guide 168 refers to it as and anticipated operational occurrences.

We did want to confine that to the plant-specific licensing basis. Although we provide the information in the SRP as an aid to the reviewer, I would expect that reviewer to compare the plant to the actual plant-specific licensing basis for AOOs.

Lastly, the SSEs support a function that relies on the integrated operation of multiple systems and components. We got to this criteria from the consideration that our belief that QA programs and tech spec programs in the 50.59 process based on previous experience can perform system-level and component-level testing adequately. So we didn't want to duplicate the efforts that those programs already provide.

So we really wanted to focus on areas where we had a concern with the integrated operation of multiple plant systems to perform a function and make sure that adequate testing was identified for that.

We did struggle to come up with a real example to fit this, but I can offer a quasi-hypothetical example. I believe it was at Dresden plant or Quad Cities that have the recirculation run-back feature that was a consequence of going from a two out of three main feed pump lineup at full power to a three out of three main feed pump lineup. The concern was that if a main feed pump tripped off-line, the run-back would reduce power to match available feed flow to power output.

Going through the criteria, we would view that overall function of the run-back feature and loss of a single main feed pump as modification that was EPU-related. In other words, the modification was performed to support the EPU.

Again, presuming I haven't done the plant-specific research on this but presuming that loss of the feed pump, which I will anticipate was in the plant's licensing basis as an anticipated operational occurrence, we would presume that it would

meet the second criteria.

Finally, that function would fit the criteria relying on the integrated operation of multiple systems to perform the overall function of load reactor power. That would be a function that we would want to evaluate to make sure it is adequately tested.

Having said that, it doesn't necessarily mean that the test for that function would need to be large transient or an integral test on the plant, but we would expect the licensee to provide justification for performing appropriate testing. That could either be a large transient test or they could demonstrate it through showing that they have adequate overlapping tests that are testing each of the features that go into performing an overall plant-level function.

MEMBER LEITCH: Just so that I understand how this works, let's say you were trying to apply it to, for example, the HPSI system. You would probably get no on the first criteria there and yes on the other two.

So presumably -- I am not looking for a final answer, but I am saying just off the top of my head, I would think, then, that HPSI would not be required to be demonstrated.

MR. COYNE: In that hypothetical example, that would be true with this criterion. That wouldn't mean that we would be blind to the fact that HPSI may need to be tested, but we would rely on existing technical specification requirements and QA programs to meet the testing requirements.

MEMBER LEITCH: Sure. So, then, I guess what I would picture is the licensee has to come up with some kind of a table or matrix that says "No," "Yes," "Yes," "Therefore, we now have to test this thing"?

MR. COYNE: Right. What we have asked for in the SRP is for the licensee to identify all the plant modifications they are making to support the EPU parameter and setpoint changes and to go through this evaluation, identify things that would meet these three criteria. In addition, we would do some independent assessment, knowing what the modifications were to the plant.

MEMBER LEITCH: Okay.

MEMBER ROSEN: I guess I continue to have a problem with your second bullet. It's because I have less than complete faith in tabletop analyses that overlapping individual components' tests are, in fact, the equivalent of a full-scale integral test.

And the reason for that is there are these unexpected interactions, these relay races, contact races, expectations that one gets from looking at drawings of circuits and timing analyses that certain things will happen as predicted, which turn out not always to be true, and that the only way to really see how the overall integrated system works is to ask it to perform in an overall integrated way.

That's just the product. What I just said is just the product of many, many years of experience. And it seems to me that given that bullet at the bottom of the page, there's a pass, free pass, to having the integral tests done when the plant chooses to have it, rather than when the management chooses to have it.

So I guess I would say with respect that I don't agree with that second bullet.

MEMBER RANSOM: Well, I guess the thing that's missing is you have to define, I guess, the adequacy of this overlapping test. I agree with what you say because I think any system really ought to be tested in an integral sense as the final proof of the pudding.

And in the rocket days, you used to call it making smoke and fire. That was the only thing

with any real importance.

MR. COYNE: We can think about that point more. In fact, we will think about that point more. The thought process that went into developing that bullet was that there are examples in the plant where we do rely on overlapping tests to show that a safety function, for example, can be met. Tech spec surveillance requirements for engineered safety feature actuation --

MEMBER ROSEN: That's for repetitive tests. For tests that you do over and over again, that's appropriate. But for something that is being asked for one time, a one-time integral test, this is not something you are going to do once a month or once a quarter or even once every refueling cycle. You do it once.

And then, thereafter, it is going to happen when it happens. You are going to have this test, an integral test, of a plant shutdown from 120 percent power. It is going to be an expected operational occurrence once a year, hopefully not that often. Once every other year I think is the data. So on average, if you let a plant not do this, it will happen when they don't expect it within two years.

So what has been gained by not doing it

and learning the lesson right up front when everybody is ready for it?

CHAIRMAN WALLIS: Well, the whole thing gets back to the question of why you're doing the test and what you expect to learn from it. It's never really been explained to me. I'm listening to all of these experts here on the steam plants and deferring to them, my colleagues with experience with real plants.

MR. COYNE: We'll take that back. We'll consider that further.

Next slide. Lastly was I guess more the programmatic evaluation. The SRP has guidance for an incremental approach to the maximum, EPU maximum, power level. All the previous EPU applications have also specified that type of incremental approach at two percent or five percent increment to the new power level, monitoring of important parameters. These are steady state parameters on the way up to ensure that plant response is as predicted.

We also have some guidance for test acceptance criteria. If a plant will be doing transient testing, for example, your analytical models that you use to do accident analyses won't give you values that are really relevant to an actual plant

performance test. The analysis may use conservative values. The actual plant will use what the actual plant uses.

So there is guidance. And this is consistent with Reg Guide 1.68, which the plant should do an evaluation using realistic parameters so the data is meaningful, particularly for large transient tests.

Lastly, there should be contingency plans included in the test program if test results aren't as expected. We also have some guidance on test scheduling and sequence minimizing reliance on tested systems during the power ascension.

Next one. Okay. The last area is -- and, again, as Mohammed said, we couldn't really come up with a go/no go criteria for whether a specific test should be performed. And we provided the general guidance to the reviewer on things to look for in a licensee justification for not performing a certain test.

Again, we would be the lead branch for the review, but we would rely heavily on the technical experts in the other NRR branches for evaluating the licensee justification.

This list was based on consultation with

the technical branches in addition to previous experience gained from EPUs that have been approved. Some things we addressed: previous operating experience. We would look for the applicability of the operating experience to the facility in question, things like similarities in design, procedures, power levels, plant equipment configuration.

If there is any new thermal hydraulic phenomena or new identified system interactions as a result of the EPU in consultation with the Reactor Systems Branch, we would determine whether testing should be performed or whether the licensee is adequately justified in not performing testing in the presence of those factors.

Additionally, conformance with limitations associated with analytical methods used to analyze the plant, again, we would rely on the Reactor Systems Branch to assist us in that review.

There are several topical reports that are available on power uprates. We do note that although the CPPU topical has been approved for use, it does defer the testing review on a plant-specific basis. So if previous versions of that report have addressed certain elements of testing, we will do all of those reviews on a plant-specific basis using this SRP

guidance.

Finally, we brought up risk implications for the review. Previous EPU amendment requests have identified risk factors associated with the performance of large transient testing in that initiating a transient does represent a certain amount of risk to the plant.

Additionally, we do note that there is a certain benefit that can be gained from performing the testing and identifying preexisting equipment deficiencies and latent defects by performing the testing under controlled circumstances.

Basically in the SRP, we raise both of those issues that there may be risks inherent in performing the tests, in addition to inherent benefits in performing the tests, and note that a risk argument shouldn't be the sole basis for a justification to not perform a certain test.

Additionally, we would consult with the PRA branch for evaluating the adequacy of a risk argument.

MEMBER SIEBER: Well, the interesting thing is that it seems to me that all of these large transient tests are really performance, the anticipated operating occurrences. And so if that is

the case, then they're expected to occur roughly once a year. Then the risks should be small inherent in the plant design.

And so if an applicant would come and complain about the risk, I would expect that would not hold a lot of water if the plant design were adequate. If it shows a lot of risk, that means that there is something wrong with the plant design.

MR. COYNE: That was one of the things we thought about as we went through the development process. And basically we felt we needed to have some words about it in the SRP section, but it basically is a wash. We don't really weigh in one side or the other on the risk argument. We just defer to the PRA --

MEMBER ROSEN: I think the risk argument is framed by our discussion of the ROP, where we said it took 26 reactor SCRAMs to reach the threshold, a red threshold.

MEMBER SIEBER: Yes, a red threshold.

MEMBER ROSEN: So it can't be very much on a per-SCRAM basis.

MR. SHUAIBI: I do want to point out that the guidance -- and correct me if I am wrong -- says do not rely on risk justification alone. So if a

licensee wants to submit risk justification, of course, they can always do that.

MEMBER SIEBER: You can do that.

MR. SHUAIBI: But the caution in the guidance is don't rely on that alone, staff. That is not a good enough justification by itself to --

MEMBER ROSEN: I think the licensees would likely end up trying to play the argument on both sides of the street. One, they would say, "We don't want to do this test because it's too risky." On the other side, they would say, "But a SCRAM isn't a real risky event."

MR. SHUAIBI: You could probably find contradictions. We went through a long debate on this, and our risk people were involved. In the end, it was a matter of "Can you quantify the benefit versus the risk of this risk analysis?" And that's really hard to do. I think it's more difficult to quantify the benefit.

MEMBER ROSEN: That's correct.

MR. SHUAIBI: And on the other hand, I think you have the right idea. So the way you're headed in my opinion is the right way.

MEMBER RANSOM: These are the same items as in 14.2.1. I guess that's what you mean when you

say "SRP" that you're referring to.

MR. SHUAIBI: Correct, the standard review plan, 14.2.1.

MEMBER RANSOM: This is not a part specifically of the review standard?

MR. SHUAIBI: Yes. See, the way the review standard is designed is if there is an existing SRP section that addresses an area. We reference it. In this case, what we did is we developed an SRP section for this area. That's correct. That was developed as part of this effort or at the same time as this effort.

So it's our plan to go final with that SRP section. And when we go final with that SRP section, you'll see in the review standard I don't have a date for when that SRP was issued. I have X's across for a date.

MEMBER RANSOM: Right. This is just Rev. 0, I guess.

MR. SHUAIBI: That would be Rev. 0 when it's issued. And what we would do is when we go final with that SRP, the review standard will reference that SRP. So the spent fuel pool and fire protection, we wrote supplemental guidance to the SRP. In this case, we took on the action of developing a new SRP. And

that's why we --

MEMBER LEITCH: A couple of questions. Is there any reference to just testing one of several similar plants? Perhaps you have a station where there are two identical units, virtually identical, or --

MR. COYNE: We don't specifically go into that in the SRP, although the SRP also went and ruled that out as part of a justification for --

MEMBER LEITCH: It's silent on that.

MR. COYNE: It is silent.

MEMBER LEITCH: That might be a justification for eliminating some of the tests on a second identical unit, for example. I realize the word "identical" is in quotation marks. it probably is as such. These say "identical units," but there might be some that are close.

MR. SHUAIBI: I would offer that under experience. I think there is an experience plant. A plant could, although we won't explicitly say you could do this or we don't explicitly say do this. A plant could come in and say, "Well, we propose to do a test on one of our units, and both of them are identical, again, with justification for what 'identical' means."

If a plant were to do that, that would put it under experience in terms of "Well, we have experience with this one unit. We believe it is applicable to this other unit. And that could be part of the review."

Again, I want to throw out at least my thinking -- maybe I shouldn't speculate, but I think it's pretty safe to say that I don't think a plant is going to come in and propose this test. I think they're going to be coming in and saying, "We're not going to do it."

MEMBER SIEBER: Which gets back --

MEMBER LEITCH: Another thing that I am thinking is if a test is done, the magnitude of the instrumentation required. You know, I'm picturing on this initial power testing program -- I don't know. We're probably talking 150 engineers for 6 months and countless instrumentation. I mean, to duplicate that at this point is going to be very, very burdensome.

MEMBER ROSEN: I'm not thinking about that. I didn't have that model --

MEMBER LEITCH: Well, I am. I am, Steve. Let me finish. I just think that one could selectively go through that list of instrumentation and data that is collected and get the very essence of

it and minimize the effort and the instrumentation that is involved.

I mean, this is a tremendous undertaking to duplicate the program. I think you could get the essence of it without the full instrumentation that was present at the initial power testing program.

MEMBER SIEBER: Well, it seems to me -- just a couple of comments -- I remember the initial power testing. There was a lot of component testing that went along and then integrated system tests before you even started function.

When you finally got to the big dynamic tests, 80 percent and above, it took some engineers and it took some instrumentation. I didn't think it was all that much compared to all of the testing, system and component-wise, before you got to that point.

So, actually, other than the modifications that you would make, you would test from the ordinary plant modification program, you aren't asking for any new tests like that, just the changes you make in the plant.

These large transient tests, generally you're only talking about two of them, right, which happens all the time, doesn't require a whole lot of

extra instrumentation.

MEMBER LEITCH: If it's just a matter of going over and SCRAMing a reactor, that's one thing, but my concern is if we're talking about, as someone mentioned here, accelerometers on all sorts of piping systems and so forth and that kind of data, that's a big, big undertaking.

MEMBER SIEBER: I am not sure that you need to do all of that.

MEMBER LEITCH: Nor am I.

MEMBER SIEBER: I think that an adequate thing to do would be to go and do a walk-down of the plant systems after you run the tests to see if there are distortions, broken things, leaks that show up.

MEMBER ROSEN: You do that all the time anyway when you have a SCRAM, right?

MEMBER SIEBER: I'm not sure that everybody does.

MEMBER ROSEN: It's nothing more than you would do after a normal plant transient. You go down and make sure the plant shut down normally. You walk the plant down and find out the root cause. If it's something that is understandable and correctable quickly, you authorize a restart. Otherwise you don't.

MEMBER LEITCH: And that kind of program is fine, but if you are going to say, "We want to go back and duplicate all of the accelerometer readings, the movement of all critical piping," and so forth, that is a very complex thing to do.

MEMBER ROSEN: No. I apologize for interrupting you. I wasn't thinking that at all. I was thinking more along the lines of what we are talking about now, of the post-trip recovery report testing, the post-trip recovery report inspection.

MEMBER LEITCH: Yes.

MR. RULAND: If I could submit for a minute? We're struggling with this whole issue. It was the second bullet on the integral testing should be performed, the comment you had, Dr. Rosen.

I sense the reason we are struggling with this is we're talking theoretical about some testing, about what the testing in general is going to be performed.

I think the same issue that the staff has struggled with, what exactly is this particular test trying to accomplish, what is this particular thing we are trying to accomplish.

I think when we flush out these details -- and we are going to go back and look at this and

actually ask specific questions about a specific kind of test, what the test is going to perform, and what we hope to accomplish. I think we will be able to resolve this question in our mind. But we will look at this.

MEMBER SIEBER: I think that also addresses the question that Graham asked earlier, just a few minutes ago, about what if a licensee comes in and says, "Here are two identical plants. And I agree to perform the test on one and apply that data to the other one"? If you know why you are doing the test, it tells you whether you can do that or not and reach a logical conclusion.

If one of them is to find out where this class of plants operates as far as parameters are concerned, you could do that legitimately. On the other hand, if you are trying to test whether a given plant specifically can tolerate a transient, I think you have to do each one because each plant is unique.

MEMBER ROSEN: One of the objections that licensees will likely have is it's an additional shutdown transient. And it seems to me that's an objection that can be dealt with simply by saying to the licensee that "You don't have to perform this test until the end of the cycle. Just shut the plant down

by SCRAMing it," rather than by taking it down normally.

MEMBER SIEBER: Well, they'll probably trip before they --

MEMBER ROSEN: Yes. No. Most plants will run on average, most of them will run two cycles. So yes, in some cases, you would let some plants experience it for real, but if you said "This test needn't be performed until the end of the cycle," then instead of taking the plant off-line with a normal coast-down and then shutdown, you just get to the end of the career, in which you can sustain 100 percent power and then trip.

MR. SHUAIBI: This is some of the stuff that we struggle with when we go through and try to put down criteria that we want to come and defend in front of you and we want to defend in front of anybody else that challenges us.

How do you say that a plant can run to the end of the cycle and not know whether the plant is going to respond and say, "It's okay"? It's okay if a plant trips during one cycle, but it's not okay if it trips two or three cycles later.

An argument that I heard earlier was, well, how do I know that those pipe supports are going

to hold being that they have aged for 30 years? Well, if I don't know that right now, I don't have the confidence right now, then maybe I ought to be requiring these plants to do this test today without the power uprate. We struggle with these types of arguments when we go back and try to write this down, this criteria.

So we will take some of this back, and we will think about it some more and see if we can come up with something. It's really hard to, but we don't want to come up with criteria and later contradict ourselves.

And we don't want to come up with criteria that -- and if it's necessary to do a plant trip today to prove that those pipe supports still hold after 30 years, maybe we ought to do that. But if we're confident today, then there has to be something from the power uprate that would lead us to believe that -- and I understand that the legs are going to be larger because of the power uprate, but I can't see any justification for 30 years and aging alone is going to cause the problem.

But I could understand that there are loads, increased loads, increased flow rates, increased heat. And we will take some of this back

and think about it.

MEMBER SIEBER: Let's not think about the aging argument and the fastener relaxation, regardless of what brand you use. Let's think about whether the current plant design can tolerate an increase of power and a large transient from that.

MR. SHUAIBI: Right.

MEMBER SIEBER: You aren't testing for aging.

MR. SHUAIBI: We're not. We're not testing for corrosion of pipes, aging of the supports, but if we were to require this test, we would be saying that this power uprate --

MEMBER SIEBER: You would do the test every year, then, because aging occurs year by year.

MR. SHUAIBI: Some decision in terms of a frequency for that.

MEMBER SIEBER: I think that is reasonable.

MR. SHUAIBI: Right. Let me take this back and think about some of the things that came up today. Increased loads I've heard. I've heard, you know, how do you prove that the plant is going to respond in the way -- we will think about it, but I do want to say that we have thought about this for a long

time. But we will go back and see if we could think about it again and if anything changes. And if not, we will be here defending it. Hopefully we can do a better job of defending it next time.

MR. COYNE: I do want to point out that the guidance was written to be somewhat general to address these kinds of concerns, but nothing in the SRP rules out testing one unit on a two-unit site or doing a more limited set of data-taking for large transient tests. I would have to --

MEMBER ROSEN: Or doing it later, as I would suggest, which is principally a response to someone who said that having a test like that requires a bound power transient. And your response can be, "Do the test. And take the bound power transient" when you would otherwise have taken the bound power transient anyway.

MR. COYNE: We would have to look at that, but, again, nothing in the SRP would preclude the licensee from making that kind of argument for sequencing the testing or deferring the testing or doing a more limited set of testing.

So that's kind of how we ended up with a fairly general document in the end, coming up with these kinds of questions and wanting to really keep it

on a plant-specific basis to see what is proposed with the GPU.

MR. CARUSO: I've avoided saying anything, but I will make one point. One other criteria that you might want to include is that since we have all been talking about steam pipes falling off the wall, if a licensee decides to change the pipe-hanger configuration, which one of them did before a power uprate, that should be assigned if there is some concern about the pipe-hangers.

And I am not sure how you are going to capture that, but that certainly is a red flag to say, "Hmm. Maybe I should worry about the pipes falling off the walls."

MR. COYNE: Hopefully with the way the guidance is written, that would be identified as a modification necessary to support the EPU. But, again, if the licensee fails to identify it, it may be difficult to pick up during our review.

MEMBER SIEBER: Well, you test the guy who fixed it and the guy who ignored it doesn't get tested.

MR. SHUAIBI: Yes. In going back, if I remember this correctly, I will caveat that. I think it was a plant who in its licensing basis, they didn't

assume a certain limiting transient. It was equipped with a different limiting transient than the one that they decided to adopt for power uprate.

They were licensed for one transient for those pipe supports. And in the power uprate application, they decided to get licensed for a different, more limiting transient. This is where you get into "Do I go back with them had they decided not to do that? Do I go back and say, 'You shall now be licensed to something other than what you were licensed for before because I have an application in front of me and I want you to do that'?" So I believe that was the situation right off the --

MR. CARUSO: Did they run the transient? I don't believe they did.

MR. SHUAIBI: I'm sorry? Did they?

MR. CARUSO: Did they run the transient or did they not? I believe they did not.

MR. SHUAIBI: I am trying to answer something different. It's not that it was just the power uprate that caused this change to happen.

MR. CARUSO: I understand. I understand they changed the licensing basis. But the question is, did they actually go do the test?

MR. SHUAIBI: None of the plants that have

operated have done these tests that we are talking about. You are exactly right.

MEMBER RANSOM: Well, this is certainly an important issue, but I think today we are trying to come to some conclusion, I guess, on RS-001, which, really, that is not a part of that.

The review standard I guess is the only way you can look at that, but SRP would have to be revised, I guess, to address some of these problems. Is it okay if we move on?

MEMBER ROSEN: Well, I just don't think you are right about that, Vic. Listening to Mohammed, 14.2.1 is part of RS-001.

MEMBER RANSOM: Well, only by reference, actually.

MEMBER ROSEN: If you want to make your speech again, the RS-001 is a road map to all of the things that exist and for things where you felt there was inadequate guidance, you put out new guidance, which is part of RS-001.

MEMBER RANSOM: They have to revise. I don't know. I am trying to separate.

MEMBER ROSEN: 14.2.1 is not a revision. It's not a revision or anything. It's new, right?

MR. SHUAIBI: That's right. It's a new

SRP section.

MR. PETTIS: Some of the previous presentations i think that you heard today check existing SRP guidance, identify its applicability to the risks or to the RS-001 and revised it accordingly.

In this particular case, there was no SRP that existed for any type of transient testing. A brand new section, which we called 14.2.1, was established to get our hands around the power ascension and transient testing issue that was the subject of much discussion over the last year or so.

MR. SHUAIBI: I guess we're here to seek endorsement from the Committee on RS-001. What that means is in the case of 14.2.1 or in the case of the supplementary guidance that we added in RS-001, that's part of what we are seeking with the exception of chapter 18, which we talked about earlier, chapter 18 of the SRP, which talks about human factors, where we said that we are actually going back and addressing public comments. And that is going to take us longer to do.

In the human factors area, the five questions that we have are sufficient for power uprates with chapter 18 is not really necessary, if you will, to do a power uprate review, that when you

look at the fire protection guidance, the spent fuel pool cooling guidance that was developed, the testing guidance that was developed, if you chose to go forward, then it's our intent to start using that and doing power uprate reviews.

So how you want to handle it procedurally is, of course, up to the Committee. But we are here to seek your endorsement on a lot of these things that are in the review standard. The exception is 18, chapter 18 of the SRP.

MR. PETTIS: I guess the other point, too, Mohammed -- correct me if I am wrong, but this review standard is basically going to be a living document. So it's going to benefit from future information and revision and experience and so forth.

So, just like we may revise 14.2.1 to accommodate certain concerns that you have right now, that is not to preclude in the future it is going to get revised again based upon the staff's experience in looking at the next wave of EPU applications that come in.

MR. SHUAIBI: That's correct. And I'll answer that that when we develop our office instructions for developing and revising review standards, we will take into account all of our

stakeholders, including ACRS' endorsement, our CRGR endorsement, public stakeholders, and everybody else in terms of when do we come to you for approval, when do we go out for public comment, when do we revise the review standards.

So that will be part of the task that we will have to undertake in terms of writing an office instruction for ourselves on how to update this review standard.

MEMBER RANSOM: I appreciate that clarification. I guess I was thinking just in terms of this document, but, actually, there is some part that goes along with it, I guess.

MR. SHUAIBI: That's correct. I don't think the document would be complete without the testing.

MEMBER RANSOM: No, I guess not.

MR. SHUAIBI: It makes things harder, but that's --

MEMBER RANSOM: I think Bill Ruland was going to summarize things, I guess.

MR. SHUAIBI: Yes.

MEMBER RANSOM: Bill?

MR. RULAND: If you don't mind, I will just sit here to make my closing comments, if that's

all right.

I would like to thank the Committee for their time in giving us the opportunity to explain our review standard and the diligence with which they have shown to ask us questions about this matter. As always, we appreciate the feedback.

I think you, I hope anyway that you, felt the excitement, I guess I want to say, about this review standard. This is kind of a new venture for us, and we are excited about this. It is going to be a new way of doing business. And hopefully going forward will improve the way we do our work.

So we are excited about this. And hopefully this particular standard will help us not only do better power uprate, extended power uprate reviews, but it will help us hone this process of standards, using these review standards in general.

If you don't have any other questions, this concludes our presentation. Thank you.

MEMBER RANSOM: Thank you, Bill and Mohammed, all of the other people who have made presentations today.

MEMBER RANSOM: As I understand it, we now have one item left on the agenda, which is for the Committee to discuss what goes on. And it seemed that

Ralph I think wrote up the challenge that the expected Subcommittee action was to consider the review standard RS-001, which we have done, and determine whether it contains the elements described in SECY-02-106 and recommend whether it should be reviewed for the review of upcoming power uprate applications and to decide whether to present these recommendations to the full Committee in September.

Out of SECY-101, what I see as the requirements, it says, "This is a review standard that will conceptually include: one, a clearer definition of the review scope; two, references to existing review criteria in that applicable SRP sections, branch technical positions, Office of Nuclear Regulatory Regulation, office instructions, information notices, generic letters, bulletins, NUREGs, industry standards, applicable generic topical reports," and so forth; "and, three, two template safety evaluations, one for boiling water reactors and the other one for PWRs."

So that's I guess what we are trying to do is decide are those requirements satisfied and where do we go? I guess I can start it off if you want. I've been I think except of the comment I made earlier that it seemed like there was a fair amount of

boilerplate in these two examples and that obviously those were what were requested to start out with, frankly, it's been an education for me, the first time I have been through this kind of process.

I believe that it indeed will satisfy the objectives of improving the review process. It looks like it has all of the requirements that were called for in SECY-02-106. So I guess I would favor going ahead with this.

MEMBER ROSEN: Well, I agree with you. I think it's a tour de force. It is going to be a very useful document to the agency. And a lot of good work has been done to put it together, pull everything together in one place. It will be very useful for knowledge management for the agency.

I do have one concern. And that is that integral testing is not required and may be interpreted in a way that is so flexible that even in cases where it is needed, it may not be something that is done. So I don't want to go beyond that right now, but I do have that remaining concern on the second bullet on slide 71.

CHAIRMAN WALLIS: Well, I think it's a good job. It's responsive to the needs. I have already spoken about this need for independent

analysis. Every time you create a bureaucratic framework, people tend to use it as a checklist and go through the motions.

The staff should always be thinking outside the box, if appropriate, and be willing to do some independent analysis if it's appropriate. So I hope that gets reflected in anything that you change, particularly in the way it's presented consistently from matrix to matrix.

The other thing is this business of testing. I sort of stayed out of the discussion, but it didn't seem to me that the issues got clearly resolved. I hope you could come up with better rationale and guidance for decision-making about when to test, when not to test, when to insist upon testing, when to allow people to argue that they should not test, and so on.

It seems to me that it is very much up for grabs. There should be some perhaps clearer rationale about why you test and why you should continue to test or why you should not test.

When it comes, it is going to come before the full Committee, I understand, in September. My first advice was have Mohammed present everything. And you don't need to take too long probably. You

don't have very long anyway. And leave perhaps some backup people around. You don't have to take that advice. You could do a different course.

I think that because George wasn't here, you need to spend some time on the PRA aspects, especially since it's a long section in the document on PRA, which you haven't done similarly from any other items.

Those are the few things I think of. I am very glad to see that after a few years, this document is finally there.

MEMBER RANSOM: Tom?

MEMBER KRESS: Well, I, too, think this was an impressive bit of work and congratulate the staff on a good job. I think not as part of the review standard but as part of the overall considerations of power uprates, I think it would be useful to take MELCOR and see if there are any unanticipated or unthought-about severe accident effects for a significant power uprate. Take a reference plant and do a before and after and just see what the severe accident changes are and see if there is something you need to worry about that isn't captured in LERF, for example.

You may even want to do a Level III with

MELCOR in max because that would circumvent all of the questions about the proper definition of LERF, how it's calculated, and so forth.

So I would like to see that somewhere along the line. It's not really part of this review standard, I don't think, but it's a consideration.

Along the same line, I would be interested in knowing what limits the power uprate. What is a level of power that you can no longer tolerate from the standpoint of Appendix K and 10 CFR 100? Assuming the plant could be modified to accept power or flows and other things, just what power would be a limit?

And somewhere down along the line, I would like to know whether this might be part of another program. But I would like to know whether a power uprate would be allowed under a definition of the large break LOCA.

Now, most of these things I am saying are side issues. They're not really part of this review document. And so I think the document itself is very good and entirely comprehensive.

As far as what to do at the full Committee, boy, that is a real challenge because you have got a lot of stuff here. And my advice would be to get rid of all of the background and agenda slides

and analytical methods even and just stick with the content of the thing and the scope of the review.

I would put in some criteria for independent calculations. And I agree with Graham that that looks like it should be a generic thing, rather than an individual for each section.

I think the full Committee would be interested in public comments and how they're dispositioned and how you disposition the ACRS comments.

MEMBER SIEBER: I concur with my colleagues that this is a job well done. I think that it will help power uprates. I think it will help us review them because now we have a set of criteria against which we can expect all of the operate's SERs to be structured toward. So this is the kind of work that I think I expected the staff to produce. And they have done a really good job in doing it.

We have made a lot of statements today. We have asked a lot of questions. But there are only a couple of questions I think that hinge on whether we would give our unblemished concurrence or have a remaining question. One of them is the resolution of the integral testing. And I tend to agree with Mr. Rosen on that. The more I think about it, my position

moves closer to his than existed six months ago.

I would also agree with Dr. Wallis' comment that perhaps you need to reword things so that the implication does not exist so that confirmatory calculations are not permitted in some sections. To me, I think this was an unfortunate way and if we read, it doesn't mean what the staff intended, that maybe that should be fixed up.

I guess there are a couple of others. In order for us to write a letter, you have to give a presentation before the full Committee. This is a very complex document. It does make interesting reading, but I ponder how you are going to be able to cover it in the limited amount of time that you will have before the full Committee.

I think that anything that is not crucial to the major thrust and philosophy and structure of the document itself ought to be eliminated. I also think that you need to address the issues that we brought up today one way or another, the integral testing and discussion of confirmatory calculations and a couple of other things that you may have noted, because those would be issues that I think the full Committee would be interested in. And if somebody recommends that we put recommendations in our letter

and our concurrence, it's more than likely that one of those will appear in the process.

But overall I actually enjoyed reading the document. It was clear to me what it was you were trying to do. It satisfied what I thought you needed to do from the earliest days of several years ago when it was brought up. So I am very happy with the presentation that you made.

MEMBER ROSEN: May I make one observation in response to that? I think, Jack, with respect to what this said to the full Committee, there are 7 members of an 11-member committee here.

MEMBER SIEBER: Right.

MEMBER ROSEN: So we are really talking about what to say to the other four members. And that may be useful for you to think about who those other four members are and their particular interests or maybe Ralph could help you with that.

MEMBER SIEBER: So you can have a discussion with Dr. Apostolakis about PRA.

MEMBER ROSEN: Dana Powers isn't here and Mario, the chairman and Bill Shack, Argonne.

MR. CARUSO: They've all got copies of the documents. I sent documents to everybody in anticipation that we would be going in September.

MEMBER ROSEN: But we're not really acting as the subcommittee of a few for the many.

MR. CARUSO: Right.

MEMBER ROSEN: We're really acting as a subcommittee of the many for the few.

MR. CARUSO: Yes.

MEMBER SIEBER: Right. I think that is a good point.

MR. CARUSO: Well, what I'll try to do is I will try to get a set of minutes of this meeting with these recommendations out to everybody maybe by the end of next week.

MEMBER SIEBER: Super.

MR. CARUSO: And if I can get these conclusions -- I'm sorry. I don't want to --

MEMBER SIEBER: Get these four to sign off.

MR. CARUSO: I will get all of your words down in the minutes. And we will get them out to everybody so that the other members can see what the conclusions are.

CHAIRMAN WALLIS: All of our words?

MR. CARUSO: Yes.

MEMBER KRESS: The essence.

MR. CARUSO: The essence.

MEMBER SIEBER: I'm not exactly sure I want to read the entire transcript.

MEMBER FORD: Okay. My comments. I've got five. And they relate to materials degradation issues, which are scattered throughout the review standard.

The first is that I think that all of the materials degradation phenomena, which could be affected by EPUs, have been identified.

The second is to observe that all of those phenomena are evolving technologies. The review documents that are cited in the review standard are all fully dated. And, therefore, since it has been an evolving technology, I think the staff should be fully aware that changes have taken place since those documents are published and, therefore, the ability to ask the right questions.

I am not as worried as some of my other colleagues about the independent evaluations as far as materials degradation is concerned. I think they have independent capabilities. They are probably the most safety-significant ones. However, there should be an adequate ability to audit things, such as flow-induced vibration, flow-assisted corrosion, et cetera.

For the licensee to say "No problem" is

not an adequate reply to some of the problems. And we have seen that. The staff has got to have the ability to challenge on data analysis.

I think that the staff should challenge the Office of Research to look into some proactive thinking. In the last 30 years, we have all been having an "Oh, heck" feeling that another materials degradation phenomena occurs. I hate to see us just going over the cliff edge with the EPUs review coming off we talked about and the question of the synergy between static stress corrosion cracking and slow vibratory loads.

The final one is we started off by saying the synergisms between the power uprate license renewal applications were not in the scope, but I think that that might be a danger because in another five years, most of our reactor feeds are going to be on license renewal as well as power uprate. And do we foresee synergistic problems associated with that? The answer I don't know. Someone should be looking into that, although I think, like all of my colleagues have said so far, I think this particular review standard meets the SECY challenges.

MEMBER LEITCH: Yes. It was a good presentation. I think the review standard satisfies

the criteria laid out for it. And we should bring it to the full Committee meeting in September.

I think it is going to be valuable, both to the NRC and to the licensee. I think had we had such a standard back in 1989 or whenever the Maine Yankee power uprate was approved, that it would have prevented us all from getting into some pitfalls that occurred back in that time frame. So I think it will really be of help to us.

I guess generally I support the comments from my colleagues. Some of the others have expressed a little bit of concern about this power sanction and large transient testing. I think if we leave it vague, as vague as it now is, we are really pushing a bow wave of discussion ahead of us here. And I think we will be doing a lot of discussion with utilities and trying to resolve comments and so forth. I think we could do a few things here that would try to clarify to a certain extent what our expectations are in this regard.

I do think there may be a certain minimum set of data that could be rather easily obtained that would give us most, if not all, of what we really need to know as far as this power sanction testing is concerned.

I am a little concerned that we may appear to be going so far in this area that it would really be burdensome to the utilities and we'll have a big flack that will take a long time to be resolved. And I really think it's important that we do get these power uprates moving forward. It's an easy way to get a few more megawatts. I want to support this effort expeditiously.

So that's basically my comments. Thanks for a fine job, good piece of work.

MEMBER KRESS: When you were referring to power ascensions, do you mean the actual transient shutdown or are you worried about --

MEMBER LEITCH: I think that whole thing needs to be described. In other words, we are talking about moving incrementally beyond 80 percent, I suppose, is what I am hearing. I don't think there is any problem with moving in 5 percent increments up to the new 100 percent, each 5 percent step has been there for a couple of days collecting some data, seeing how the plant responds, and so forth.

MEMBER KRESS: I thought that was pretty low --

MEMBER LEITCH: I don't really have a --

MEMBER KRESS: So you are worried about

AOOs and SCRAMs, the integral effect of that?

MEMBER LEITCH: And there are a lot of other things involved in a power ascension program besides SCRAM. So, I mean, there is tripping of feedwater pumps and seeing how the reactor level responds, tuning of the feedwater control system. Now, that is probably a valid test because we are going to have a higher feedwater flow, and there are probably things along those lines that we could be doing.

But there are other things like HPSI and RCCI and thinking about it for five or ten minutes, I don't see that HPSI and RCCI are particularly affected by a constant pressure power uprate.

MEMBER SIEBER: Probably not.

MEMBER LEITCH: So I think some more thought could be given to exactly what is and is not required and to try to pare it down to what we really want to know and then really say, "This is it. This is for sure we want to get this stuff." I am afraid that, as we stand now, we are going to have a contest going back and forth that will be almost never-ending.

MEMBER ROSEN: Be more explicit. And when you are more explicit, be more explicit and limited and say, "And that's it. Take it or leave it."

MEMBER SIEBER: Yes. I think I agree with that.

MEMBER LEITCH: That's my comments.

MEMBER RANSOM: I'll turn it back over to you, Mr. Chairman.

CHAIRMAN WALLIS: Okay. Do we have anything else to do today or can we recess?

MR. CARUSO: I only have one piece of information. The knowledge base for tomorrow, tomorrow we are going to have this meeting on the draft reg guide and the SRP. One of this documents is this knowledge base for effect of debris.

I gave you Adam's address or something. I have hard copies here. So if anyone wants something to read tonight, I have one for everyone.

(Whereupon, at 5:19 p.m., the foregoing matter was recessed, to reconvene at 8:30 a.m. on Wednesday, August 20, 2003.)

CERTIFICATE

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

Name of Proceeding: Advisory Committee on Reactor Safeguards Thermal-Hydraulic Phenomena Subcommittee

Docket Number: n/a

Location: Rockville, MD

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

Debra Wilensky

Debra Wilensky
Official Reporter
Neal R. Gross & Co., Inc.

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MEETING OF THE SUBCOMMITTEE ON
THERMAL-HYDRAULIC PHENOMENA
ROOM T-2B3, 11545 ROCKVILLE PIKE, ROCKVILLE, MD
August 19-20, 2003

ACRS Contact: Ralph Caruso (301) 415-8065
E-mail: rxc@nrc.gov

- PROPOSED SCHEDULE -

Tuesday, August 19, 2003 - Review Standard for Extended Power Uprates

	TOPIC	PRESENTER	TIME
1)	Introduction	G. Wallis, V. Ransom - ACRS	8:30-8:35 am
2)	Opening Remarks	W. Ruland - NRR	8:35-8:50 am
3)	Development of RS-001	M. Shuaibi - NRR	8:50-9:20 am
4)	Containment Review	R. Lobel - NRR	9:20-9:50am
5)	Mechanical Engineering	K. Manoly - NRR	9:50-10:35 am
	BREAK		10:35-10:50 am
6)	Plant Systems	J. Tatum - NRR	10:50-11:20 am
7)	Risk Evaluation,	D. Harrison - NRR	11:20 am-12:00 noon
	LUNCH		Noon-1:00 pm
8)	Material Engineering	T. Sullivan - NRR	1:00-1:30 pm
9)	Reactor Systems	S. Peters, Z. Abdullahi - NRR	1:30-2:15 pm
10)	Human Factors	R. Eckenrode - NRR	2:15-2:45 pm
	** BREAK**		2:45-3:00 pm
11)	Power Ascension/Testing	K. Coyne, R. Pettis - NRR	3:00-3:30 pm
12)	ACRS/Public Comments	M. Shuaibi - NRR	3:30-4:00 pm
13)	Closing	W. Ruland - NRR	4:00-4:15 pm
14)	Committee Discussion	V. Ransom, ACRS	4:15-5:00 pm
	ADJORN		5:00 pm

EXTENDED POWER UPRATE REVIEW STANARD

NRR Briefing for

Advisory Committee on Reactor Safeguards

Subcommittee on T/H Phenomena

August 19, 2003

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OPENING REMARKS

William H. Ruland
SES Program Champion for Power Uprates
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

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MEETING AGENDA (Morning Session)

- Opening Remarks - W. Ruland
- Development of RS-001 - M. Shuaibi
- Containment Review Considerations - R. Lobel
- Mechanical Engineering - K. Manoly
- Plant Systems - J. Tatum
- Risk Evaluation - D. Harrison

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MEETING AGENDA (Afternoon Session)

- Materials Engineering - T. Sullivan
- Reactor Systems - S. Peters
- Human Factors - R. Eckenrode
- Power Ascension & Testing - K. Coyne
- ACRS and Public Comments - M. Shuaibi
- Closing – W. Ruland

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DEVELOPMENT OF RS-001

Mohammed Shuaibi
Lead Project Manager for Power Uprates
Project Directorate III-1
Division of Licensing Project Management

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DEVELOPMENT OF RS-001

- Background
- Purpose of a Review Standard
- Development of the EPU Review Standard
- Contents of the EPU Review Standard

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BACKGROUND

- Maine Yankee Lessons Learned
- Template Safety Evaluations
- SECY-01-0124, dated July 9, 2001
- Commission Meeting with ACRS, December 5, 2001
- ACRS Letters on EPU Reviews
- SECY-02-0106, dated June 14, 2002

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BACKGROUND (Continued)

- ACRS Meeting, July 2002
- ACRS Meeting, December 2002
- Issued RS-001 for Public Comment, December 2002
- Comment Period, December 2002 to March 2003
- Evaluated Public Comments and Finalized RS-001
- Briefing ACRS on RS-001, August/September 2003

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PURPOSE OF A REVIEW STANDARD

- Provide:
  - Comprehensive Guidance
  - Mechanism for Retention of Institutional Knowledge
  - Technical Review Criteria and Procedural Guidance
  - Updated Guidance

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PURPOSE OF A REVIEW STANDARD (Cont'd)

- Increase Effectiveness and Efficiency of Reviews by:
  - Implementing NRR's Vision for Centralized Work Planning
  - Improving Focus, Consistency, Completeness, and Thoroughness of Reviews
- Improve Documentation of Reviews

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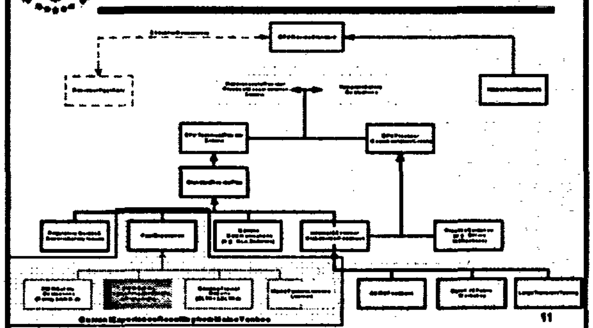
DEVELOPMENT OF RS-001



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REVIEW STANDARD FOR EXTENDED POWER UPRATES

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CONTENTS OF RS-001

REVIEW STANDARD FOR
EXTENDED POWER UPRATES

CONTENTS OF RS-001

Covers:
- *Technical Review*
- *Environmental Assessment*
- *Proprietary Review*
- *Noticing in Federal Register*

Provides Flowchart for Process

Identifies Procedural Guidance

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TECHNICAL REVIEW GUIDANCE

SECTIO
DOCUMENTATION OF REVIEW

SECTIO
INSPECTION GUIDANCE

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Responsible NRR Review Branches

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Guidance for Independent Analyses

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SECTION
DOCUMENTATION OF REVIEW

SECTION
INSPECTION GUIDANCE

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Standardize Format and Content

Provide Regulatory Evaluation and Conclusion for Each Area of Review

Technical Evaluation Provided After Review

Consistent with NRR Guidance

SECTION 3
DOCUMENTATION OF REVIEW

SECTI...
INSPECTION GUIDANCE

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Inspection Procedure for Power Uprates

Documentation Highlights Recommended Areas for Inspection

SECTION 4
INSPECTION GUIDANCE

CONTAINMENT REVIEW CONSIDERATIONS

Review Guidance - Matrix 6
BWR Safety Evaluation - Insert 6
PWR Safety Evaluation - Insert 6

Richard Lobel
Containment & Accident Dose Assessment Section
Probabilistic Safety Assessment Branch

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Containment Review Considerations

Scope of Review

- Peak Containment Pressure and Temperature Analyses
  - LOCA
  - MSLB
- Subcompartment Analysis
- Combustible Gas Control
- Containment Heat Removal
  - Containment Spray System
  - Containment Fan Cooler System

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Containment Review Considerations

Scope of Review - Continued

- Minimum Containment Pressure
  - Input to 10 CFR 50.46 LOCA Analysis
- Net Positive Suction Head
- Environmental Qualification Envelope
- BWR Suppression Pool Hydrodynamic Loads
- BWR Drywell Bypass

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Containment Review Considerations

Analytical Methods
BWRs

- Mark I Containment Load Definition Report
- GE Pressure Suppression Containment Analytical Model (NEDO-10320, April 1971)
- GE Mark III Pressure Suppression Containment System Analytical Model (NEDO-20533, June 1974)
- SHEX

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Containment Review Considerations

Analytical Methods
PWRs

- COPATTA (Bechtel)
- COCO (Westinghouse)
- LOTIC (Westinghouse)
- TMD (Westinghouse)
- LOCTIC (Stone & Webster)
- CONTRANS (Combustion Engineering)
- GOTHIC (EPRI)

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Containment Review Considerations

New Models

- Necessary to Recover Margin to Accommodate Increase in Power Level
- Emphasis on Physical Phenomena Rather than Empirical Correlations
  Forced Flow Condensation, Entrainment, Water Aerosols, Droplet Break Flow, Droplet Drop-Out From Atmosphere, Multi-Node
- Positions Still Being Developed on New Models
  Real Effects, Quantification, Conservatism

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Containment Review Considerations

Independent Calculations
(NRC Uses CONTAIN 2.0)

- Substantial Change in Analyses
- New Application of Method for Plant Type or Power Level
- New Type of Analysis
- First-of-a-Kind Method
- Questionable Use of Method
- Questionable Results
- Significant Reduction in Margin

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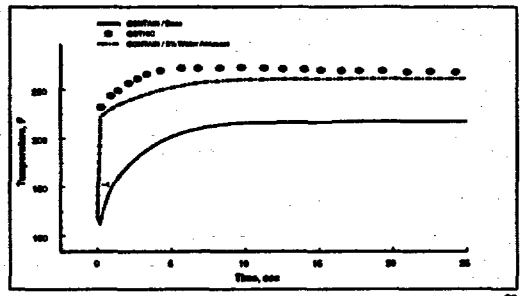
Containment Review Considerations



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MECHANICAL AND CIVIL ENGINEERING

Review Guidance - Matrix 2
BWR Safety Evaluation - Insert 2
PWR Safety Evaluation - Insert 2

Kamal Manoly
Civil and Engineering Mechanics Section
Mechanical and Civil Engineering Branch

21

Mechanical and Civil Engineering

Scope of Review

- Reactor Vessel, Nozzles, and Supports
- Reactor Internal components and Core Support Structures
- Control Rod Drive Mechanisms
- Steam Generator, Nozzles, and Supports (PWR)

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Mechanical and Civil Engineering

Scope of Review - Continued

- Reactor Coolant Pump, Nozzles and Supports (PWR)
- Pressurizer, Nozzles and Supports (PWR)
- Reactor Recirculation Pumps and Supports (BWR)
- NSSS and BOP Piping, Components and Supports
- Safety Related Valves (MOVs, AOVs, and SRVs)

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Mechanical and Civil Engineering

Technical Areas Reviewed

- Evaluation Methodology and Loadings (including normal, transient and accident loads)
- Calculated Stresses and Cumulative Fatigue Usage Factors
- Acceptance Criteria, Codes and Applicable Addenda

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Mechanical and Civil Engineering

Technical Areas Reviewed - Continued

- Functionality and Impact of EPU on Previous Responses to Generic Communication (i.e., GLs 88-11, 89-10, 95-07 and 96-06)
- Impact of EPU on Postulated Pipe Rupture Locations
- Impact of EPU on Dynamic Responses of Structures, and Qualification of Mechanical and Electrical Equipment

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Mechanical and Civil Engineering

Flow Induced Vibration

- Flow Induced Vibration on BWR Reactor Steam Dryers/Separators and Other Reactor Internal Components

  FW Sparger, Jet Pump, Core Spray Sparger, Core Spray Piping, Fuel Assembly, Dryer Support Brackets, Dryer Guide Rods, Shroud Head Guide Rods, and Instrument Nozzles

- Flow Induced Vibration on Steam Separators/Dryers inside PWR Steam Generator (where applicable) and Primary/Secondary Heat Exchanger Tubes (e.g., u-bend tubes)

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Mechanical and Civil Engineering

Flow Induced Vibration - Continued

- Pressure Pulsations due to Increased Recirculation Pump Vane Passing Frequency on BWR Jet Pump Sensing Lines and Jet Pump Riser Brace
- Main Steam Line, Associated Components (including MSIV, PORVs and HPCI and RCIC Isolation Valves) and Attached Piping that may be Susceptible to FIV due to EPU

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Mechanical and Civil Engineering

Structural Integrity of BWR Dryer

- Steam Dryer Designed to Maintain its Structural Integrity During a Steam Line Break
- Significant Increase in Steam Flow Rate Due to EPU Conditions
- GE SILs Recommend Visual Inspection of Steam Dryer for any Evidence of Cracking during each Refueling Outage

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Mechanical and Civil Engineering

Structural Integrity of BWR Dryer – Cont'd

- In Light of Quad Cities Unit 2 Steam Dryer Failures, Staff will Review Licensee's Actions to Address the Effects of FIV and Acoustic Vibration on Affected Reactor Internal Components
- Staff is Interacting with GE and BWROG to Assess Generic Implications of the Quad Cities Steam Dryer Failures and the Need to Establish Additional Regulatory Actions

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Mechanical and Civil Engineering

Pipe Stress Evaluation

- Affected NSSS and BOP Piping Systems, Components and Supports
- Evaluation Methodology, Assumptions, Load Combinations, and Computer Codes
- Flow Induced Vibration due to the Increased MS and FW Flow and Higher FW Temperature for EPU

30

Mechanical and Civil Engineering

Pipe Stress Evaluation - Continued

- Pipe Stresses and CUFs for the EPU, Acceptance Criteria, Applicable Codes and Standards
- Pipe Support Evaluations for Higher EPU Thermal Loads and the Increased MS and FW Flow
- Pipe Support Modifications (where necessary) to be Completed Prior to Implementation of the EPU

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PLANT SYSTEMS

Review Guidance - Matrix 5
BWR Safety Evaluation - Insert 5
PWR Safety Evaluation - Insert 5

James Tatum
Balance of Plant Section
Plant Systems Branch

32

Plant Systems

Scope of Review

- Flood Protection
- Equipment and Floor Drainage System
- Circulating Water System
- Internally Generated Missiles (Outside Containment)
- Internally Generated Missiles (Inside Containment)
- Turbine Generator
- Protection Against Postulated Piping Failures in Fluid Systems Outside Containment

33

Plant Systems

Scope of Review - Continued

- Fire Protection Program
- Pressurizer Relief Tank
- Fission Product Control Systems and Structures
- Main Condenser Evacuation System
- Turbine Gland Sealing System
- MSIV Leakage Control System
- Spent Fuel Pool Cooling and Cleanup System

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Plant Systems

Scope of Review - Continued

- Station Service Water
- Reactor Auxiliary Cooling Water Systems
- Ultimate Heat Sink
- Auxiliary Feedwater System
- Main Steam Supply System
- Main Condenser
- Turbine Bypass System

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Plant Systems

Scope of Review - Continued

- Condensate and Feedwater System
- Gaseous Waste Management Systems
- Liquid Waste Management Systems
- Solid Waste Management Systems
- EDG Fuel Oil Storage and Transfer System
- Light Load Handling System

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Plant Systems

Fire Protection Program

(SRP Section 9.5.1 + Suppl. Guidance in RS-001)

- Review Guidance Supplemented to Include Confirmation of Program Elements NOT Affected by EPU
- Review Guidance Supplemented to Caution that Revised Fire Analyses May Be Needed When Less Than Full Capability Systems Are Relied Upon

37

Plant Systems

Fire Protection Program - Continued

(SRP Section 9.5.1 + Suppl. Guidance in RS-001)

- Review Guidance Supplemented to Caution that EPU May Impact Post-Fire Safe Shutdown Procedures (e.g., Allowable Time for Operators to Take Action)

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Plant Systems

Spent Fuel Pool Cooling

(SRP Section 9.1.3 + Suppl. Guidance in RS-001)

- Review Guidance Supplemented with Resolution of GSI-173A
- Review Guidance Supplemented to Identify Bounding Spent Fuel Pool Cooling Scenarios

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Plant Systems

Station Service Water and Reactor Auxiliary Cooling Water Systems

(SRP Sections 9.2.1 and 9.2.2 + GLs 89-13 and 96-06)

- Review Guidance Supplemented to Address Validity of GL 89-13 Programs at EPU Conditions
- Review Guidance Supplemented to Address Waterhammer and Two-Phase Flow Conditions for EPU

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RISK EVALUATION

Review Guidance - Matrix 13
BWR Safety Evaluation - Insert 13
PWR Safety Evaluation - Insert 13

Donald Harrison
Safety Programs Section
Probabilistic Safety Assessment Branch

41

Risk Evaluation

Purpose of Review

- Verify that Risks Associated with Proposed EPU are Acceptable
- Determine if "Special Circumstances" are Created

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Risk Evaluation

Scope of Review

- Internal Events
  - Initiating Event Frequencies
  - Component Reliability
  - Success Criteria
  - Operator Actions (HEPs)
- External Events
  - Seismic Events
  - Fires
  - High Winds, Floods, and Other Events

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Risk Evaluation

Scope of Review - Continued

- Shutdown Operations
- PRA Quality

44

Risk Evaluation

Guidance

- Matrix 13 in RS-001 and Attachments
- RG 1.174
- SRP Chapter 19
- RIS 2001-02

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Risk Evaluation

Independent Calculations/Audits

- Potentially Significant Risk Impact Identified
- Questionable Results
- Questions Regarding PRA Quality
- Augment Non-PRA Methods (e.g., Seismic Margins Analysis)
- Special Circumstances Identified Per Appendix D of SRP Chapter 19

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MATERIAL AND CHEMICAL ENGINEERING

Review Guidance - Matrix 1
BWR Safety Evaluation - Insert 1
PWR Safety Evaluation - Insert 1

Edmund Sullivan
Materials and Chemical Engineering Branch

47

Materials and Chemical Engineering

Scope of Review

- Reactor Vessel Materials Surveillance Program
- Pressure-Temperature (P-T) Limits and Upper Shelf Energy (USE)
- Pressurized Thermal Shock (PTS)
- Reactor Internals and Core Support Materials
- Reactor Coolant Pressure Boundary Materials
- Leak-Before-Break

48

Materials and Chemical Engineering

Scope of Review - Continued

- Protective Coatings Systems
- Flow Accelerated Corrosion (FAC)
- Steam Generator Tube Inservice Inspection
- Steam Generator Blowdown System
- Chemical and Volume Control System
- Reactor Water Cleanup System

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Materials and Chemical Engineering

PTS
(PWRs Only)

- Evaluate Effects of Increased Fluence on RT_{PTS}
- Ensure Calculated RT_{PTS} Complies with 10 CFR 50.61
  - Methodology
  - Screening Criteria
- Ensure Structural Integrity of Reactor Coolant Pressure Boundary

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Materials and Chemical Engineering

FAC
(NSAC-0202L-R2)

- Evaluate Effects of Changes in Flow Rates and Thermodynamic Conditions in Piping on FAC Corrosion Rates
- Evaluate Licensee Modeling/Monitoring Programs
- Ensure Structural Integrity of Systems

51

Materials and Chemical Engineering

Independent Calculations

- RT_{PTS}
- Upper Shelf Energy

52

REACTOR SYSTEMS

Review Guidance - Matrix 8
BWR Safety Evaluation - Insert 8
PWR Safety Evaluation - Insert 8

Sean Peters
Zena Abdullahi
Reactor Systems Branch

53

Reactor Systems

Scope of Review

- Fuel System Design
  - Normal Operation and AOOs
    - SAFDLs
  - Non-LOCA Accidents
    - Limited Fuel Failure
  - LOCAs
    - 10 CFR 50.46

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Reactor Systems

Scope of Review - Continued

- Nuclear Design
  - Normal Operation and AOOs
    - SAFDLS
  - Reactivity Accidents
    - No RCPB Failure
    - Core Coolability Maintained

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Reactor Systems

Scope of Review - Continued

- Thermal-Hydraulic Design
  - Analytical Methodology
  - Thermal-Hydraulic Stability
  - Hydraulic Loads - Core, RCS Components
  - Normal Operations and AOOs
    - Margin of Safety from Fuel Damage
      - DNBR, CHFR

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Reactor Systems

Scope of Review - Continued

- Systems
  - CRDM
  - RCIC
  - RHR
  - ECCS
  - SLCS
  - Overpressure Protection

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Reactor Systems

Scope of Review - Continued

- SRP Chapter 15 Accidents and Transients
  - AOOs, Non-LOCAs, LOCAs
  - Codes and Methodologies
    - Approved for Plant-Specific Applications
    - Implementation Complies with Limitations, Restrictions, and Conditions Specified in Approving SE
    - Assumptions Account for Changes Caused by EPU

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Reactor Systems

Scope of Review - Continued

- Other
  - ATWS
    - BWR - Instability
    - PWR - Plants without DSS
  - Spent Fuel/New Fuel Storage
  - Fluence

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Reactor Systems

Audits and Independent Calculations

Analyses and Methodologies

- First-of-a-Kind Methodologies
- New Application of Method for Plant Type, Power Level, or Power Density
- Deviations Not Previously Approved
- Applicability Extended Beyond Approved Limits
- Assumptions
- Questionable Results
- Significant Reduction in Margin

90

HUMAN FACTORS

Review Guidance - Matrix 11
BWR Safety Evaluation - Insert 11
PWR Safety Evaluation - Insert 11

Richard Eckenrode
Operator Licensing and
Human Performance Section
Reactor Operations Branch

61

Human Factors

Approach for Review

- Standard Set of Questions Specific to Areas of Interest
- Review Guidance
  - SRP 13.2.1, "Reactor Operator Training"
  - SRP 13.2.2, "Training for Nonlicensed Plant Staff"
  - SRP 13.5.2.1, "Operating and Emergency Operating Procedures"
  - SRP 18, "Human Factors Engineering"

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Human Factors

Scope of Review

Changes To:

- Emergency and Abnormal Operating Procedures
- Operator Actions Sensitive to Power Uprate
- Control Room Controls, Displays, and Alarms
- Safety Parameter Display Systems
- Operator Training Program and Control Room Simulator

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Human Factors

Sensitive Operator Actions

Describe any new operator actions required as a result of the proposed EPU. Describe changes to any current operator actions related to emergency or abnormal operating procedures that will occur as a result of the proposed EPU.

(i.e., identify and describe operator actions that will require additional response time or will have reduced time available. Your response should address any operator workarounds that might affect these response times. Identify any operator actions that are being automated or being changed from automatic to manual as a result of the power uprate. Provide justification for the acceptability of these changes.

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Human Factors

Reduction in Time Available

- Initial Action Time Screening (ANSI/ANS-58.8)
- Training/Testing Records
- Operating Procedures
- Controls, Displays, and Alarms
- License Examiner Review

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Human Factors

Time Response Calculations (ANSI/ANS-58.8)

Plant Condition	T Diagnosis	+	T Operator	+	n Manipulations
1	(Normal Operations)				
2	5 minutes	+	1 minute	+	n minutes
3	10 minutes	+	3 minutes	+	n minutes
4 and 5	20 minutes	+	5 minutes	+	n minutes

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POWER ASCENSION AND TESTING

Review Guidance - Matrix 12
BWR Safety Evaluation - Insert 12
PWR Safety Evaluation - Insert 12

Kevin Coyne/Robert Pettis
Quality and Maintenance Section
Emergency Preparedness and
Plant Support Branch

67

Power Ascension and Testing

Scope of Review
(New SRP 14.2.1)

- Initial Plant Testing Potentially Invalidated by EPU
- Plant Modifications Necessary to Support the EPU
- Programmatic Aspects Related to Test Program
  - Control
  - Scheduling
  - Sequencing

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Power Ascension and Testing

Considerations

- Initial Plant Testing Invalidated by the EPU
- Modifications for Previous EPUs Performed Under 10 CFR 50.59
- System/Component Performance Adequately Covered
  - Technical Specification Testing
  - Quality Assurance Programs

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Power Ascension and Testing

Review Methodology
(Power Ascension Testing - Original Licensing)

- Identification of Initial Testing Invalidated by the EPU
  - Initial Tests Performed at 80% Power or Greater
  - Initial Tests Performed at Lower Power Level if Invalidated
- All Tests Identified by Above Criteria Must be Performed or Dispositioned in EPU Application

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Power Ascension and Testing

Review Methodology – Continued
(Modification Testing)

- Demonstrate the Performance of SSCs Important to Safety Meeting All of the Following:
  - Performance of SSC is Impacted by EPU Modification
  - SSC is Used to Mitigate AOO in Plant's Licensing Basis
  - SSC Supports a Function that Relies on Integrated Operation of Multiple Systems and Components
- Integral Testing Should be Performed if SSC Cannot be Adequately Tested by Overlapping Individual Components or System-Level Tests

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Power Ascension and Testing

Review Methodology - Continued
(Programmatic Evaluation of Proposed Testing Plans)

- Incremental Approach to Maximum Power Level
- Monitoring of Important Parameters
- Test Acceptance Criteria
- Contingency Plans

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Power Ascension and Testing

Review Methodology - Continued

(Review of Proposed Test Exception)

- Previous Operating Experience
- Introduction of new Thermal-Hydraulic Phenomena
- Introduction of new System Interactions
- Conformance with Limitations Associated with Analytical Methods
- Testing Guidance in Vendor Topical Reports
- Risk Implications

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ACRS AND PUBLIC COMMENTS

Mohammed Shuaibi
Lead Project Manager for Power Uprates
Project Directorate III-1
Division of Licensing Project Management

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PUBLIC COMMENTS

- Draft RS-001 Issued December 31, 2002
- Public Comment Period Closed on March 31, 2003
- Received Three Comment Letters
  - STARS (March 28, 2003)
  - NEI (March 31, 2003)
  - Framatome ANP (May 2, 2003)

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Public Comments

Summary

- Backfit/Plant-Specific Licensing Bases
- Burden of Completing Matrices
- Need for Independent Calculations
- Use of Precedent
- Impact on NRC Approved Topical Reports
- Control of Future Changes to RS-001
- Pilot Initial Use

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Public Comments

Summary - Continued

- NRC Management Oversight
- Acceptance Review ("Sufficient Detail")
- Evaluate Resulting Review Cost/RAI Savings
- Need for Review of Non-Licensed Plant Staff Training
- Stand-Alone References Section
- Establishing Standard Application Format
- NRC Fee-Billing Practices

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ACRS COMMENTS

- ACRS Reviews Extended Power Uprates
  - Historical Threshold Established as > 5 Percent
  - Staff Proposal to Link ACRS Review to Plant Design Capacity
- Letters on Past EPU Reviews
  - Duane Arnold (October 17, 2001)
  - Dresden and Quad Cities (December 12, 2001)
  - Clinton (March 14, 2002)
  - ANO-2 (March 14, 2002)
  - GE CPPU Topical Report (April 17, 2002)
  - Brunswick (May 10, 2002)

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ACRS Comments

Summary

- Documentation
- Communication with Inspection Staff
- Criteria for Independent Calculation
- Standard Review Plan
- Integral Testing
- Transition Reload Safety Analyses
- Need for More Detailed Thermal/Hydraulic Models

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ACRS Comments

Summary - Continued

- Important Areas
  - Reduction in Time Available for Operator Actions
  - Irradiation-Assisted Stress Corrosion Cracking of Internals
  - Flow-Accelerated Corrosion
  - Fatigue of Feedwater Piping
  - Containment Response
  - Local Power Oscillations
  - ATWS and ATWS Recovery

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ACRS Comments

Summary - Continued

- Use of Human Reliability Models Not Approved by the NRC
- Ability of PRAs to Model Margin Reduction
- Level of Review of Risk Information/PRA Quality
- RG 1.174 Interpretation Issues

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CLOSING REMARKS

William H. Ruland
SES Program Champion for Power Uprates
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

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EXTENDED POWER UPRATE REVIEW STANARD

NRR Briefing for

Advisory Committee on Reactor Safeguards

Subcommittee on T/H Phenomena

August 19, 2003

OPENING REMARKS

William H. Ruland

SES Program Champion for Power Uprates

Division of Licensing Project Management

Office of Nuclear Reactor Regulation

MEETING AGENDA (Morning Session)

- Opening Remarks - W. Ruland
- Development of RS-001 - M. Shuaibi
- Containment Review Considerations - R. Lobel
- Mechanical Engineering - K. Manoly
- Plant Systems - J. Tatum
- Risk Evaluation - D. Harrison

MEETING AGENDA (Afternoon Session)

- Materials Engineering - T. Sullivan
- Reactor Systems - S. Peters
- Human Factors - R. Eckenrode
- Power Ascension & Testing - K. Coyne
- ACRS and Public Comments - M. Shuaibi
- Closing – W. Ruland

DEVELOPMENT OF RS-001

Mohammed Shuaibi

Lead Project Manager for Power Uprates

Project Directorate III-1

Division of Licensing Project Management

DEVELOPMENT OF RS-001

- Background
- Purpose of a Review Standard
- Development of the EPU Review Standard
- Contents of the EPU Review Standard

BACKGROUND

- Maine Yankee Lessons Learned
- Template Safety Evaluations
- SECY-01-0124, dated July 9, 2001
- Commission Meeting with ACRS, December 5, 2001
- ACRS Letters on EPU Reviews
- SECY-02-0106, dated June 14, 2002

BACKGROUND (Continued)

- ACRS Meeting, July 2002
- ACRS Meeting, December 2002
- Issued RS-001 for Public Comment, December 2002
- Comment Period, December 2002 to March 2003
- Evaluated Public Comments and Finalized RS-001
- Briefing ACRS on RS-001, August/September 2003

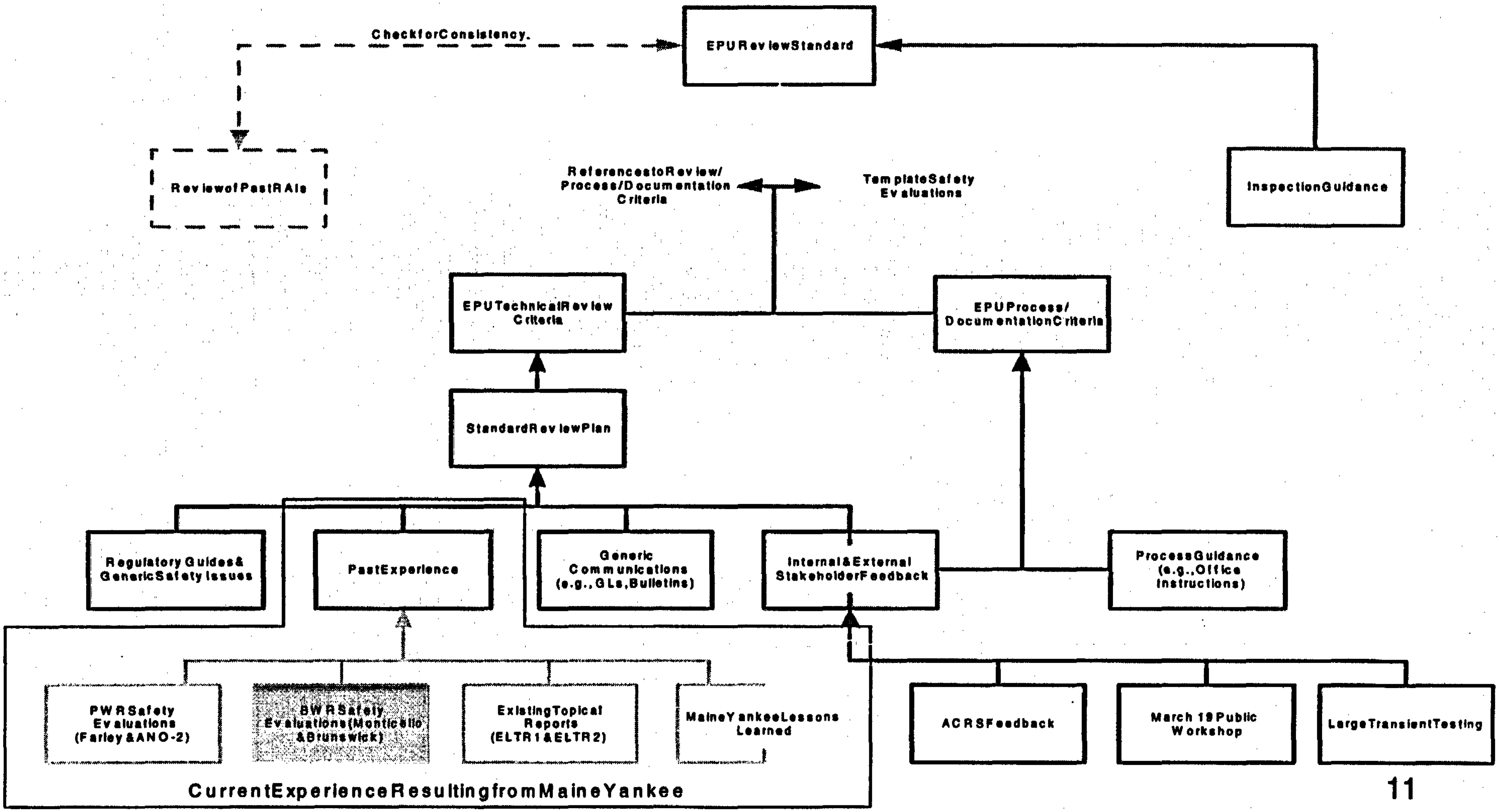
PURPOSE OF A REVIEW STANDARD

- Provide:
  - Comprehensive Guidance
  - Mechanism for Retention of Institutional Knowledge
  - Technical Review Criteria and Procedural Guidance
  - Updated Guidance

PURPOSE OF A REVIEW STANDARD (Cont'd)

- **Increase Effectiveness and Efficiency of Reviews by:**
  - **Implementing NRR's Vision for Centralized Work Planning**
  - **Improving Focus, Consistency, Completeness, and Thoroughness of Reviews**
- **Improve Documentation of Reviews**

DEVELOPMENT OF RS-001



CONTENTS OF RS-001

REVIEW STANDARD FOR EXTENDED POWER UPRATES

CONTENTS OF RS-001

Covers:
- *Technical Review*
- *Environmental Assessment*
- *Proprietary Review*
- *Noticing in Federal Register*

Provides Flowchart for Process

Identifies Procedural Guidance

SECTION 1
PROCEDURAL GUIDANCE

SECTIO
TECHNICAL REVIEW GUIDANCE

SECTIO
DOCUMENTATION OF REVIEW

SECTIO
INSPECTION GUIDANCE

CONTENTS OF RS-001

Areas of Review

Acceptance Review Checklist

Responsible NRR Review Branches

Guidance Documents

Guidance for Independent Analyses

SECTION 2
TECHNICAL REVIEW GUIDANCE

SECTI
DOCUMENTATION OF REVIEW

SECTI
INSPECTION GUIDANCE

CONTENTS OF RS-001

Standardize Format and Content

Provide Regulatory Evaluation and Conclusion for Each Area of Review

Technical Evaluation Provided After Review

Consistent with NRR Guidance

SECTION 3
DOCUMENTATION OF REVIEW

SECTI...
INSPECTION GUIDANCE

CONTENTS OF RS-001

Inspection Procedure for Power Uprates

Documentation Highlights Recommended Areas for Inspection

SECTION 4
INSPECTION GUIDANCE

CONTAINMENT REVIEW CONSIDERATIONS

Review Guidance - Matrix 6

BWR Safety Evaluation - Insert 6

PWR Safety Evaluation - Insert 6

Richard Lobel

Containment & Accident Dose Assessment Section

Probabilistic Safety Assessment Branch

Containment Review Considerations

Scope of Review

- Peak Containment Pressure and Temperature Analyses
  - LOCA
  - MSLB
- Subcompartment Analysis
- Combustible Gas Control
- Containment Heat Removal
  - Containment Spray System
  - Containment Fan Cooler System

Containment Review Considerations

Scope of Review - Continued

- Minimum Containment Pressure
  - Input to 10 CFR 50.46 LOCA Analysis
- Net Positive Suction Head
- Environmental Qualification Envelope
- BWR Suppression Pool Hydrodynamic Loads
- BWR Drywell Bypass

Containment Review Considerations

Analytical Methods

BWRs

- Mark I Containment Load Definition Report
- GE Pressure Suppression Containment Analytical Model (NEDO-10320, April 1971)
- GE Mark III Pressure Suppression Containment System Analytical Model (NEDO-20533, June 1974)
- SHEX

Containment Review Considerations

Analytical Methods

PWRs

- COPATTA (Bechtel)
- COCO (Westinghouse)
- LOTIC (Westinghouse)
- TMD (Westinghouse)
- LOCTIC (Stone & Webster)
- CONTRANS (Combustion Engineering)
- GOTHIC (EPRI)

Containment Review Considerations

New Models

- **Necessary to Recover Margin to Accommodate Increase in Power Level**
- **Emphasis on Physical Phenomena Rather than Empirical Correlations**
  Forced Flow Condensation, Entrainment, Water Aerosols, Droplet Break Flow, Droplet Drop-Out From Atmosphere, Multi-Node
- **Positions Still Being Developed on New Models**
  Real Effects, Quantification, Conservatism

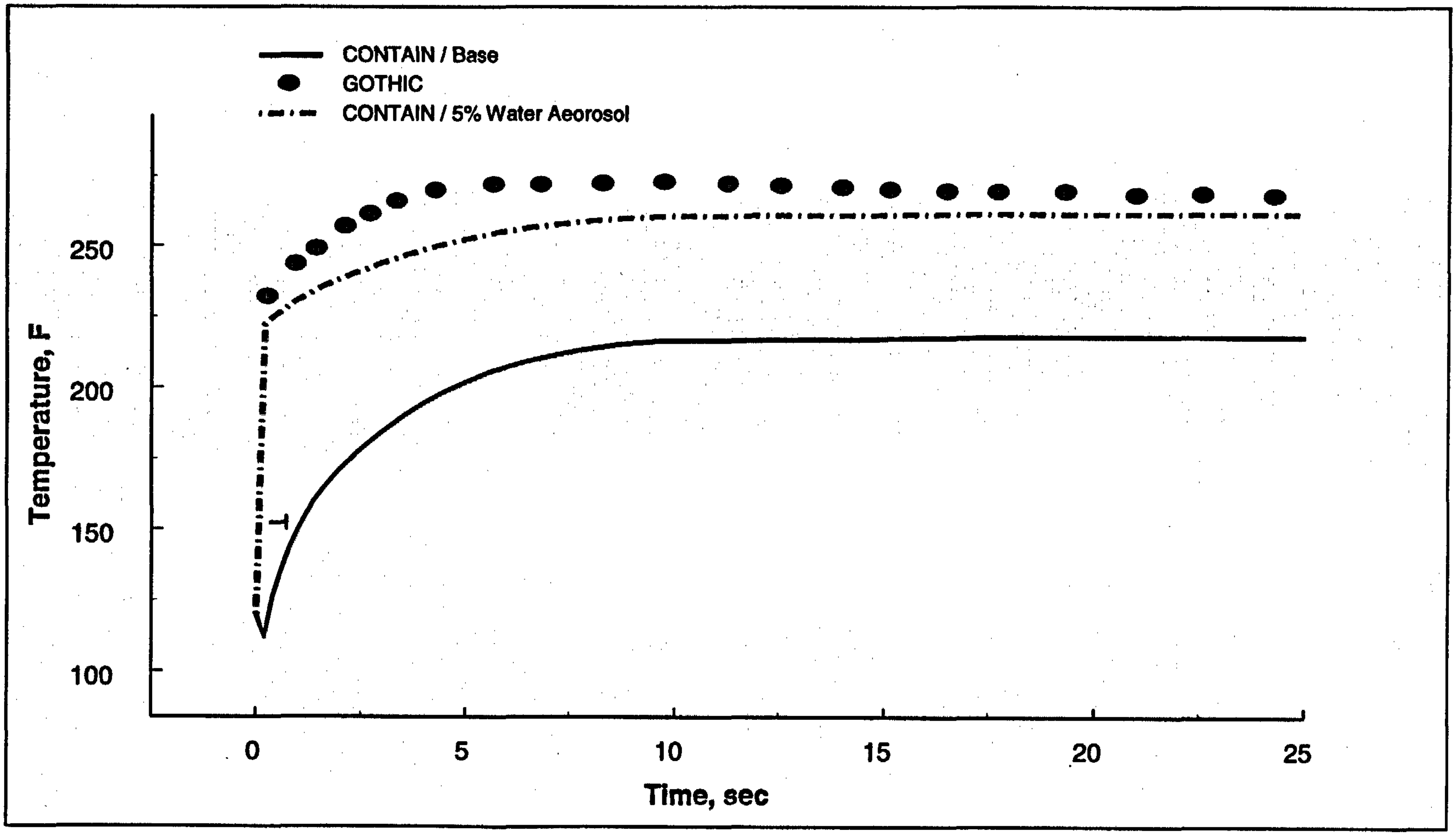
Containment Review Considerations

Independent Calculations

(NRC Uses CONTAIN 2.0)

- Substantial Change in Analyses
- New Application of Method for Plant Type or Power Level
- New Type of Analysis
- First-of-a-Kind Method
- Questionable Use of Method
- Questionable Results
- Significant Reduction in Margin

Containment Review Considerations



MECHANICAL AND CIVIL ENGINEERING

Review Guidance - Matrix 2

BWR Safety Evaluation - Insert 2

PWR Safety Evaluation - Insert 2

Kamal Manoly

Civil and Engineering Mechanics Section

Mechanical and Civil Engineering Branch

Mechanical and Civil Engineering

Scope of Review

- Reactor Vessel, Nozzles, and Supports
- Reactor Internal components and Core Support Structures
- Control Rod Drive Mechanisms
- Steam Generator, Nozzles, and Supports (PWR)

Mechanical and Civil Engineering

Scope of Review - Continued

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- Pressurizer, Nozzles and Supports (PWR)
- Reactor Recirculation Pumps and Supports (BWR)
- NSSS and BOP Piping, Components and Supports
- Safety Related Valves (MOVs, AOVs, and SRVs)

Mechanical and Civil Engineering

Technical Areas Reviewed

- Evaluation Methodology and Loadings (including normal, transient and accident loads)
- Calculated Stresses and Cumulative Fatigue Usage Factors
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- Functionality and Impact of EPU on Previous Responses to Generic Communication (i.e., GLs 88-11, 89-10, 95-07 and 96-06)
- Impact of EPU on Postulated Pipe Rupture Locations
- Impact of EPU on Dynamic Responses of Structures, and Qualification of Mechanical and Electrical Equipment

Mechanical and Civil Engineering

Flow Induced Vibration

- **Flow Induced Vibration on BWR Reactor Steam Dryers/Separators and Other Reactor Internal Components**

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- **Flow Induced Vibration on Steam Separators/Dryers Inside PWR Steam Generator (where applicable) and Primary/Secondary Heat Exchanger Tubes (e.g., u-bend tubes)**

Mechanical and Civil Engineering

Flow Induced Vibration - Continued

- Pressure Pulsations due to Increased Recirculation Pump Vane Passing Frequency on BWR Jet Pump Sensing Lines and Jet Pump Riser Brace

- Main Steam Line, Associated Components (including MSIV, PORVs and HPCI and RCIC Isolation Valves) and Attached Piping that may be Susceptible to FIV due to EPU

Mechanical and Civil Engineering

Structural Integrity of BWR Dryer

- Steam Dryer Designed to Maintain its Structural Integrity During a Steam Line Break

- Significant Increase in Steam Flow Rate Due to EPU Conditions

- GE SILs Recommend Visual Inspection of Steam Dryer for any Evidence of Cracking during each Refueling Outage

Mechanical and Civil Engineering

Structural Integrity of BWR Dryer – Cont'd

- In Light of Quad Cities Unit 2 Steam Dryer Failures, Staff will Review Licensee's Actions to Address the Effects of FIV and Acoustic Vibration on Affected Reactor Internal Components

- Staff is Interacting with GE and BWROG to Assess Generic Implications of the Quad Cities Steam Dryer Failures and the Need to Establish Additional Regulatory Actions

Mechanical and Civil Engineering

Pipe Stress Evaluation

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- Evaluation Methodology, Assumptions, Load Combinations, and Computer Codes
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Mechanical and Civil Engineering

Pipe Stress Evaluation - Continued

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- Pipe Support Evaluations for Higher EPU Thermal Loads and the Increased MS and FW Flow
- Pipe Support Modifications (where necessary) to be Completed Prior to Implementation of the EPU

PLANT SYSTEMS

Review Guidance - Matrix 5

BWR Safety Evaluation - Insert 5

PWR Safety Evaluation - Insert 5

James Tatum

Balance of Plant Section

Plant Systems Branch

Plant Systems

Scope of Review

- Flood Protection
- Equipment and Floor Drainage System
- Circulating Water System
- Internally Generated Missiles (Outside Containment)
- Internally Generated Missiles (Inside Containment)
- Turbine Generator
- Protection Against Postulated Piping Failures in Fluid Systems Outside Containment

Plant Systems

Scope of Review - Continued

- Fire Protection Program
- Pressurizer Relief Tank
- Fission Product Control Systems and Structures
- Main Condenser Evacuation System
- Turbine Gland Sealing System
- MSIV Leakage Control System
- Spent Fuel Pool Cooling and Cleanup System

Plant Systems

Scope of Review - Continued

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- Reactor Auxiliary Cooling Water Systems
- Ultimate Heat Sink
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Plant Systems

Scope of Review - Continued

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- Solid Waste Management Systems
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- Light Load Handling System

Plant Systems

Fire Protection Program

(SRP Section 9.5.1 + Suppl. Guidance in RS-001)

- Review Guidance Supplemented to Include Confirmation of Program Elements NOT Affected by EPU

- Review Guidance Supplemented to Caution that Revised Fire Analyses May Be Needed When Less Than Full Capability Systems Are Relied Upon

Plant Systems

Fire Protection Program - Continued

(SRP Section 9.5.1 + Suppl. Guidance in RS-001)

- Review Guidance Supplemented to Caution that EPU May Impact Post-Fire Safe Shutdown Procedures (e.g., Allowable Time for Operators to Take Action)

Plant Systems

Spent Fuel Pool Cooling

(SRP Section 9.1.3 + Suppl. Guidance in RS-001)

- Review Guidance Supplemented with Resolution of GSI-173A

- Review Guidance Supplemented to Identify Bounding Spent Fuel Pool Cooling Scenarios

Plant Systems

Station Service Water and Reactor Auxiliary Cooling Water Systems

(SRP Sections 9.2.1 and 9.2.2 + GLs 89-13 and 96-06)

- **Review Guidance Supplemented to Address Validity of GL 89-13 Programs at EPU Conditions**

- **Review Guidance Supplemented to Address Waterhammer and Two-Phase Flow Conditions for EPU**

RISK EVALUATION

Review Guidance - Matrix 13
BWR Safety Evaluation - Insert 13
PWR Safety Evaluation - Insert 13

Donald Harrison
Safety Programs Section
Probabilistic Safety Assessment Branch

Risk Evaluation

Purpose of Review

- Verify that Risks Associated with Proposed EPU are Acceptable
- Determine if “Special Circumstances” are Created

Risk Evaluation

Scope of Review

- Internal Events
  - Initiating Event Frequencies
  - Component Reliability
  - Success Criteria
  - Operator Actions (HEPs)

- External Events
  - Seismic Events
  - Fires
  - High Winds, Floods, and Other Events

Risk Evaluation

Scope of Review - Continued

- Shutdown Operations
- PRA Quality

Risk Evaluation

Guidance

- Matrix 13 in RS-001 and Attachments
- RG 1.174
- SRP Chapter 19
- RIS 2001-02

Risk Evaluation

Independent Calculations/Audits

- Potentially Significant Risk Impact Identified
- Questionable Results
- Questions Regarding PRA Quality
- Augment Non-PRA Methods (e.g., Seismic Margins Analysis)
- Special Circumstances Identified Per Appendix D of SRP Chapter 19

MATERIAL AND CHEMICAL ENGINEERING

Review Guidance - Matrix 1

BWR Safety Evaluation - Insert 1

PWR Safety Evaluation - Insert 1

Edmund Sullivan

Materials and Chemical Engineering Branch

Materials and Chemical Engineering

Scope of Review

- Reactor Vessel Materials Surveillance Program
- Pressure-Temperature (P-T) Limits and Upper Shelf Energy (USE)
- Pressurized Thermal Shock (PTS)
- Reactor Internals and Core Support Materials
- Reactor Coolant Pressure Boundary Materials
- Leak-Before-Break

Materials and Chemical Engineering

Scope of Review - Continued

- Protective Coatings Systems
- Flow Accelerated Corrosion (FAC)
- Steam Generator Tube Inservice Inspection
- Steam Generator Blowdown System
- Chemical and Volume Control System
- Reactor Water Cleanup System

Materials and Chemical Engineering

PTS

(PWRs Only)

- **Evaluate Effects of Increased Fluence on RT_{PTS}**
- **Ensure Calculated RT_{PTS} Complies with 10 CFR 50.61**
  - Methodology
  - Screening Criteria
- **Ensure Structural Integrity of Reactor Coolant Pressure Boundary**

Materials and Chemical Engineering

FAC

(NSAC-0202L-R2)

- Evaluate Effects of Changes in Flow Rates and Thermodynamic Conditions in Piping on FAC Corrosion Rates

- Evaluate Licensee Modeling/Monitoring Programs

- Ensure Structural Integrity of Systems

Materials and Chemical Engineering

Independent Calculations

- RT_{PTS}
- Upper Shelf Energy

REACTOR SYSTEMS

Review Guidance - Matrix 8
BWR Safety Evaluation - Insert 8
PWR Safety Evaluation - Insert 8

Sean Peters
Zena Abdullahi
Reactor Systems Branch

Reactor Systems

Scope of Review

- Fuel System Design
  - Normal Operation and AOOs
    - SAFDLs
  - Non-LOCA Accidents
    - Limited Fuel Failure
  - LOCAs
    - 10 CFR 50.46

Reactor Systems

Scope of Review - Continued

- Nuclear Design
  - Normal Operation and AOOs
    - SAFDLS
  - Reactivity Accidents
    - No RCPB Failure
    - Core Coolability Maintained

Reactor Systems

Scope of Review - Continued

- Thermal-Hydraulic Design
  - Analytical Methodology
  - Thermal-Hydraulic Stability
  - Hydraulic Loads - Core, RCS Components
  - Normal Operations and AOOs
    - Margin of Safety from Fuel Damage
      - DNBR, CHFR

Reactor Systems

Scope of Review - Continued

- Systems
  - CRDM
  - RCIC
  - RHR
  - ECCS
  - SLCS
  - Overpressure Protection

Reactor Systems

Scope of Review - Continued

- SRP Chapter 15 Accidents and Transients
  - AOOs, Non-LOCAs, LOCAs
  - Codes and Methodologies
    - Approved for Plant-Specific Applications
    - Implementation Complies with Limitations, Restrictions, and Conditions Specified in Approving SE
    - Assumptions Account for Changes Caused by EPU

Reactor Systems

Scope of Review - Continued

- Other
  - ATWS
    - BWR - Instability
    - PWR - Plants without DSS
  - Spent Fuel/New Fuel Storage
  - Fluence

Reactor Systems

Audits and Independent Calculations

Analyses and Methodologies

- First-of-a-Kind Methodologies
- New Application of Method for Plant Type, Power Level, or Power Density
- Deviations Not Previously Approved
- Applicability Extended Beyond Approved Limits
- Assumptions
- Questionable Results
- Significant Reduction in Margin

HUMAN FACTORS

Review Guidance - Matrix 11
BWR Safety Evaluation - Insert 11
PWR Safety Evaluation - Insert 11

Richard Eckenrode
Operator Licensing and
Human Performance Section
Reactor Operations Branch

Human Factors

Approach for Review

- **Standard Set of Questions Specific to Areas of Interest**
- **Review Guidance**
  - SRP 13.2.1, "Reactor Operator Training"
  - SRP 13.2.2, "Training for Nonlicensed Plant Staff"
  - SRP 13.5.2.1, "Operating and Emergency Operating Procedures"
  - SRP 18, "Human Factors Engineering"

Human Factors

Scope of Review

Changes To:

- Emergency and Abnormal Operating Procedures
- Operator Actions Sensitive to Power Uprate
- Control Room Controls, Displays, and Alarms
- Safety Parameter Display Systems
- Operator Training Program and Control Room Simulator

Human Factors

Sensitive Operator Actions

Describe any new operator actions required as a result of the proposed EPU. Describe changes to any current operator actions related to emergency or abnormal operating procedures that will occur as a result of the proposed EPU.

(i.e., Identify and describe operator actions that will require additional response time or will have reduced time available. Your response should address any operator workarounds that might affect these response times. Identify any operator actions that are being automated or being changed from automatic to manual as a result of the power uprate. Provide justification for the acceptability of these changes.

Human Factors

Reduction in Time Available

- Initial Action Time Screening (ANSI/ANS-58.8)

- Training/Testing Records

- Operating Procedures
- Controls, Displays, and Alarms
- License Examiner Review

Human Factors

Time Response Calculations
(ANSI/ANS-58.8)

Plant Condition	T Diagnosis	+	T Operator	+	n Manipulations
1	(Normal Operations)				
2	5 minutes	+	1 minute	+	n minutes
3	10 minutes	+	3 minutes	+	n minutes
4 and 5	20 minutes	+	5 minutes	+	n minutes

POWER ASCENSION AND TESTING

Review Guidance - Matrix 12
BWR Safety Evaluation - Insert 12
PWR Safety Evaluation - Insert 12

Kevin Coyne/Robert Pettis
Quality and Maintenance Section
Emergency Preparedness and Plant Support Branch

Power Ascension and Testing

Scope of Review

(New SRP 14.2.1)

- Initial Plant Testing Potentially Invalidated by EPU
- Plant Modifications Necessary to Support the EPU
- Programmatic Aspects Related to Test Program
  - Control
  - Scheduling
  - Sequencing

Power Ascension and Testing

Considerations

- Initial Plant Testing Invalidated by the EPU
- Modifications for Previous EPUs Performed Under 10 CFR 50.59
- System/Component Performance Adequately Covered
  - Technical Specification Testing
  - Quality Assurance Programs

Power Ascension and Testing

Review Methodology

(Power Ascension Testing - Original Licensing)

- **Identification of Initial Testing Invalidated by the EPU**
  - Initial Tests Performed at 80% Power or Greater
  - Initial Tests Performed at Lower Power Level if Invalidated

- **All Tests Identified by Above Criteria Must be Performed or Dispositioned in EPU Application**

Power Ascension and Testing

Review Methodology – Continued

(Modification Testing)

- **Demonstrate the Performance of SSCs Important to Safety Meeting All of the Following:**
  - Performance of SSC is Impacted by EPU Modification
  - SSC is Used to Mitigate AOO in Plant's Licensing Basis
  - SSC Supports a Function that Relies on Integrated Operation of Multiple Systems and Components
- **Integral Testing Should be Performed if SSC Cannot be Adequately Tested by Overlapping Individual Components or System-Level Tests**

Power Ascension and Testing

Review Methodology - Continued

(Programmatic Evaluation of Proposed Testing Plans)

- Incremental Approach to Maximum Power Level
- Monitoring of Important Parameters
- Test Acceptance Criteria
- Contingency Plans

Power Ascension and Testing

Review Methodology - Continued

(Review of Proposed Test Exception)

- Previous Operating Experience
- Introduction of new Thermal-Hydraulic Phenomena
- Introduction of new System Interactions
- Conformance with Limitations Associated with Analytical Methods
- Testing Guidance in Vendor Topical Reports
- Risk Implications

ACRS AND PUBLIC COMMENTS

Mohammed Shuaibi

Lead Project Manager for Power Uprates

Project Directorate III-1

Division of Licensing Project Management

PUBLIC COMMENTS

- Draft RS-001 Issued December 31, 2002
- Public Comment Period Closed on March 31, 2003
- Received Three Comment Letters
  - STARS (March 28, 2003)
  - NEI (March 31, 2003)
  - Framatome ANP (May 2, 2003)

Public Comments

Summary

- Backfit/Plant-Specific Licensing Bases
- Burden of Completing Matrices
- Need for Independent Calculations
- Use of Precedent
- Impact on NRC Approved Topical Reports
- Control of Future Changes to RS-001
- Pilot Initial Use

Public Comments

Summary - Continued

- NRC Management Oversight
- Acceptance Review ("Sufficient Detail")
- Evaluate Resulting Review Cost/RAI Savings
- Need for Review of Non-Licensed Plant Staff Training
- Stand-Alone References Section
- Establishing Standard Application Format
- NRC Fee-Billing Practices

ACRS COMMENTS

- ACRS Reviews Extended Power Uprates
  - Historical Threshold Established as > 5 Percent
  - Staff Proposal to Link ACRS Review to Plant Design Capacity

- Letters on Past EPU Reviews
  - Duane Arnold (October 17, 2001)
  - Dresden and Quad Cities (December 12, 2001)
  - Clinton (March 14, 2002)
  - ANO-2 (March 14, 2002)
  - GE CPPU Topical Report (April 17, 2002)
  - Brunswick (May 10, 2002)

ACRS Comments

Summary

- Documentation
- Communication with Inspection Staff
- Criteria for Independent Calculation
- Standard Review Plan
- Integral Testing
- Transition Reload Safety Analyses
- Need for More Detailed Thermal/Hydraulic Models

ACRS Comments

Summary - Continued

- Important Areas
  - Reduction in Time Available for Operator Actions
  - Irradiation-Assisted Stress Corrosion Cracking of Internals
  - Flow-Accelerated Corrosion
  - Fatigue of Feedwater Piping
  - Containment Response
  - Local Power Oscillations
  - ATWS and ATWS Recovery

ACRS Comments

Summary - Continued

- Use of Human Reliability Models Not Approved by the NRC
- Ability of PRAs to Model Margin Reduction
- Level of Review of Risk Information/PRA Quality
- RG 1.174 Interpretation Issues

CLOSING REMARKS

William H. Ruland

SES Program Champion for Power Uprates

Division of Licensing Project Management

Office of Nuclear Reactor Regulation