ACRST-1995

ORIGINAL

OFFICIAL TRANSCRIPT OF PROCEEDINGS

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Advisory Committee on Reactor Safeguards

Title: 405th General Meeting

Docket No.

LOCATION: Bethesda, Maryland

DATE: Thursday, January 6, 1994 **PAGES:** 1 - 237

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PUBLIC NOTICE BY THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DATE: January 6, 1994

The contents of this transcript of the proceedings of the United States Nuclear Regulatory Commission's Advisory Committee on Reactor Safeguards, (date) January 6, 1994, as Reported herein, are a record of the discussions recorded at the meeting held on the above date.

This transcript has not been reviewed, corrected or edited, and it may contain inaccuracies.

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

405th GENERAL MEETING

Nuclear Regulatory Commission

7920 Norfolk Avenue

Bethesda, Maryland

Thursday, January 6, 1994

The meeting convened, pursuant to notice, at 8:30 a.m., J. Ernest Wilkins, Chairman of the Committee, presiding.

Members Present:

J. Ernest Wilkins, Chairman

Thomas S. Kress, Vice Chairman

James C. Carroll

Ivan Catton

Peter R. Davis

Harold W. Lewis

William J. Lindblad

Robert L. Seale

William J. Shack

Charles J. Wylie

Designated Federal Official:

Sam Duraiswamy

P R O C E E D I N G S

[8:30 a.m.]

MR. WILKINS: The meeting will come to order. This is the first day of the 405th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting the Committee will discuss and/or hear reports on the following: Proposed final rule for revising emergency planning regulations; proposed resolution of Generic Issue 67.5.1, reassessment of steam generator tube rupture, radiological consequences; result of the public workshop on license renewal; status of resolution of issues associated with BWR core power stability; reliability assurance program for advanced lightwater reactors; proposed ACRS report on certified design material for ABWR; and preparation of ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. Sam Duraiswamy is the designated Federal Official for the initial portion of the meeting.

We have received no written statements or requests for time to make oral statements from members of the public regarding today's sessions.

A transcript of portions of the meeting is being kept. I is requested that each speaker use one of the microphones, identify himself or herself and speak with

sufficient clarity and volume so that he or she can be readily heard.

I will begin with some items of current interest. I would like to make formal recognition of the fact that Mr. Johnny Mathis, who has been with us for the last few months, is going to -- is coming to the end of his assignment with us. As you know, he has been particularly helpful to us in connection with the EPRI passive requirements documents, the thermal-lag issues and CE 80-plus reviews. Johnny, it has been a real pleasure having you here. We wish you well in your subsequent career.

MR. DAVIS: Where is John going?

MR. MATHIS: I will be rotating through AEOD for approximately six months.

MR. LEWIS: Do you get a certificate for having survived contact with the ACRS?

MR. WILKINS: No. He just shows the scars.

MR. LEWIS: The scars.

MR. WILKINS: He just shows the scars.

MR. SEALE: I think it is a disclaimer actually.

[Laughter.]

MR. WILKINS: It may be worth mentioning to the Committee that Dr. Berkholder from Germany was in the United States last month. I had an opportunity to chat with him on the phone. He did speak in more detail with Forest Remick

and Eric Beckjord about some possible ideas for future cooperation between the countries and the advisory committees. There is nothing specific that came out of those meetings, but conversations are in progress.

Dr. Martin Steindler has become the Chairman of the ACNW, replacing Dave Moeller as the Chairman, and John Garrick, whose name will be familiar to most of us around this table, has replaced Moeller as a member of that Committee.

I should remind you that Paul Boehnert is arranging a submarine trip sometime soon. A tentative date of March 18th had been suggested. I told Paul I can't make March 18th. He is going to try to find out what alternates are available. I hope that we will be able to pin that down before the next meeting.

You all have received a letter from Jim Johnston soliciting your individual comments on the ASP program. Hal Lewis, in particular, has already responded to that invitation and I believe that you have in front of you a copy of Hal's comments. I don't plan that the Committee should take any -- make any formal response to that invitation and to the letter. In fact, we weren't invited to make a formal response. But, if any other members of the Committee wish to comment, they should certainly feel free to do so. I would appreciate it when they do so, if they

would let the other members of the Committee see copies of what they send.

I think you also have in front of you at your place a memorandum from our good friend Mr. Scroggins dealing with transportation, travel procedures and the like. I would prefer simply to say that you ought to read it and act accordingly.

I anticipate that the meeting will end tomorrow. The agenda shows a 4:30 termination time. I am aware that 4:30 does the West Coast people no good at all. It is either going to be 3:00 o'clock or we might as well go into Saturday morning. I believe that we can finish by 3:00 o'clock, of course, it depends on how loquacious, verbose, argumentative and the like the members of the Committee become. We do not have a great many letters to get out. We do have at least two and perhaps three letters that we need to get out. I don't know how controversial those letters will be. Bear in mind as we discuss those letters that, if you really want to leave at 3:00 o'clock tomorrow afternoon --

MR. SHACK: Friday afternoon.

MR. WILKINS: Tomorrow afternoon. I want to make it sooner than Friday. I want to call it tomorrow. We will have to exercise a little bit of restraint. Part of our reason for our being able to get away early stems from the

fact that this meeting was scheduled for the first week in January. It turns out that the two or three items that we had hoped to have on the agenda for this meeting were dropped off because of the unavailability of the NRC staff to support those meetings. People take advantage of this week to take extended vacations. I am told that every institution has a rule that says if you don't take your vacation you are going to use it. This week and next week I believe are sort of deadlines for using the vacation that you accrued last year, or at least maybe accrued two years ago. So, if they don't take it now, they really are going to lose it. So, we lost some topics from the agenda.

MR. LEWIS: Ernest, in that context, going back for a moment to the Scroggins thing, you might want to have somebody read it, for its implications for ACRS because, in skimming through it how, as usual, he ignored the fact that people have a job to do. Many of the definitions assume that there is a leeway of 24 hours.

MR. WILKINS: Yes.

MR. LEWIS: That is, of course, stupid for ACRS.

MR. WILKINS: It is "stupid."

MR. LEWIS: Yes, that is true too, but our concern is ACRS.

MR. WILKINS: The ACRS.

MR. LEWIS: I think we should respond.

MR. WILKINS: Even if I were a full-time employee, the thought that I can hang around waiting for 24 hours to take care of some business is --

MR. LEWIS: Absolutely, but we cannot. I think he should be told that.

MR. WILKINS: In any case, I -- you know -- never mind, never mind. I don't wish to say what I really want to say.

MR. CARROLL: At least not on the record.

MR. WILKINS: Not on the record anyway.

All right. Are there any other items of this sort that members would like to call to our attention right now?

[No response.]

MR. WILKINS: All right. If not, then let's discuss the priorities for the letters that we plan to get out.

We have a letter on the certified design material for ABWR that we started discussing at the meeting in December. I guess we are up to draft two now. It wasn't completed partly because of lack of time, and also partly I think because Hal had to leave before we could get to the I&C part of that letter. We really need to finish that letter. That letter has a high priority. It is one I think we really need to do.

Jay?

MR. CARROLL: I don't agree that -- I mean, it is something we have to get out, but I wouldn't say it has a high priority.

MR. WILKINS: Well, it may be higher than any of the others that we have to get out.

MR. CARROLL: Okay. I mean, the world doesn't come to an end if we don't get it out at this meeting.

MR. WILKINS: Okay. I will accept that correction to my statement.

The next is a proposed -- a letter on the proposed final rule to revise emergency planning regulations. We will hear a presentation on that as the very next agenda item. As the cognizant Subcommittee Chairman, it is my opinion that this letter need not be particularly controversial. At least it can be reasonably short.

The third letter, which is proposed resolution of Generic Issue 67.5.1, Mr. Igne advises me that the staff is going to give us only a status report at this meeting and that they will not be requesting a formal letter from the ACRS at this time. So, I think, in light of that, we just cross that letter off anyway.

And then there is a fourth letter which -- which I can describe briefly with one word, that is the diversity letter, which Hal has prepared a draft of. I don't know -- has it been distributed?

MR. BOENHERT: No. I have it right here.

MR. WILKINS: All right. Well, no need to pass it out instantly --

MR. BOENHERT: All right.

MR. WILKINS: -- but sometime this morning pass it around so that people can take a look at it. It is not drafted as a letter. It is more a series of thoughts as to what might go into such a letter. It is something that we ought to come to grips with during our letter-writer -- during the portion of our agenda that is devoted to letters.

Okay. I think that ends our ministerial activities. Ivan?

MR. CATTON: I have some copies of the program for the PCM-II Meeting in San Diego that one of my colleagues asked to give to whoever is interested.

MR. WILKINS: What does that stand for?

MR. CATTON: I do not know what PCM stands for anymore. I think it is Probabilistic Safety Analysis or something like that. But, the meeting title is International Conference Devoted to the Advancement of System-Based Methods for the Design and Operation of Technological Systems and Processes. It was actually a very good meeting. It brings all sorts of disciplines together that use probabilistic methods for risk assessment.

MR. WILKINS: What are the dates of the meeting?

MR. CATTON: I will send this around and you can look at it if you want to.

MR. WILKINS: All right. He may have enough for all of the people who really want to know.

MR. CATTON: Well, that is what I figured. I attended it the last time it was in Beverly Hills, which was a very nice location. It was at a very nice hotel, and it was almost within walking distance of my house. It was a very good meeting.

MR. LEWIS: Incidentally, many of you may have noticed -- I don't know any of the details -- but, the thing in the morning paper about the Mars Observer was a particularly interesting use of probabilistic analysis, because they don't have the foggiest notion what went wrong with it, but they took the most probable thing that could have gone wrong with it and decided that that was what happened.

MR. DAVIS: Oh, the fuel line rupture?

MR. LEWIS: Yes. There was absolutely no evidence that that is what happened; but it was the highest probability thing on the list, so they decided it happened.

MR. WILKINS: With all due respect, it was --

MR. LEWIS: I am sure I am over-simplifying.

MR. WILKINS: -- was the highest probability .2 or .8?

MR. LEWIS: I don't know any more than I read in the newspaper.

MR. WILKINS: The newspaper article didn't address that issue.

MR. LEWIS: They also pointed out that NASA is really getting a little sloppy.

MR. WILKINS: Okay. Let's proceed to item number two on the agenda, proposed final rule to revise Emergency Planning Regulations. I believe you have in your notebook a package. It is in the notebook. Mine is outside of the notebook for some interesting historical reasons that are of no great importance. This deals with a proposal to clarify some of the emergency planning regulations that relate to the emergency exercises, at least with respect to the participation by states and local governments in these exercises. I will let the staff tell you more precisely what the proposal is. But, part of the proposal is that part of the regulation that requires state to participate at least once every seven years would be deleted. Then there are some other 'ngs I believe also. You have the floor.

MR. JAMGOCHIAN: Thank you. Good morning. My name is Mike Jamgochian, I am from the Office of Research. The slides are being handed out. Mr. Igne is passing them out.

MR. WILKINS: Yes.

[Slide.]

MR. JAMGOCHIAN: This rulemaking, to give you some background while the handout is being distributed -- this rulemaking has been discussed by the staff over several years. Probably we started work on this in 1988. Basically the Commission at that time wanted to re-think or re-look at areas that could be cleaned up in the Emergency Planning Regulations. Fundamentally, it is 10 CFR 54, 10 CFR 47, and Appendix E.

The staff at first looked at these regulations and focused on several areas that could use clarification, that could use updating and proposed to the Commission many areas that could be re-thought, re-written.

Okay, since everything has been passed out, slide number two, the background.

[Slide.]

MR. JAMGOCHIAN: A formal memo was written in June of 1989 where the EDO proposed to the Commission 15 areas in the Emergency Planning Regulation that needed updating and clarification. Now, again, try to recall the Emergency Planning Regulations were written or codified right after TMI, 1980. Then in early 1992 the Commission directed the staff to revise only three areas of the Emergency Planning Regulations. Now, they changed their mind from 15 to three areas primarily due to recent adjudicatory decisions and

other Commission actions in Shoreham and Seabrook.

On June 12th of '92 the staff sent to the ACRS a package of the proposed rulemaking that we were planning on sending to the EDO for rulemaking. The ACRS declined to review that proposed rule primarily because -- and this is something that the ACRS has looked at for the last five years, when Dave Moeller was Chairman. He and I sat down and we looked at the beg delta between proposed rulemakings in emergency planning and final rulemakings in emergency planning, and the change is very significant.

Emergency planning, as many of you may know, is a very controversial area, and it very significantly changes between the proposed rule and the final rule, as a result of public comment. So, the ACRS declined to review the proposed rule in '92 -- in June of '92. In June of 1993, a proposed rulemaking was published in the Federal Register for Public Comment for a 75-day public comment period.

Next slide, please.

[Slide.]

MR. JAMGOCHIAN: This lists the area of revisions that the EDO was proposing. Now, this is not a Commission rulemaking, this is an EDO rulemaking. One was to clarify exercise requirements. The regulations, as we wrote them in 1980 after TMI, tended to be very confusing for states that were in the Emergency Planning Zones for two or more

reactors. Again, in 1980, we developed that rulemaking, Appendix E, quite quickly, and the focus was really on the upgrading of emergency planning at that time. After several years, after 10, 12 years of using the exercise requirements, many licensees, as well as the staff, noted how complicated those words tended to be. So, we felt that it was necessary just to clean them up and clarify them.

The second change that was proposed was to change the ingestion pathway exercise from every five to six years. And the last change was to delete the requirement that a state return to a specific site every seven years in order to participate fully in an exercise. To give you some background on this, in 1984 we changed the Emergency Planning Regulations to require biennial full participation exercises from what we originally wrote in 1980, an annual exercise. At that time, the Chairman, Chairman Ahern, was very concern about a state like Illinois, who may not get back to a specific site and would prefer to let's say exercise at one site rather than the other four sites over several years. So, he wanted a return frequency, which was called a seven-year itch, to get back -- make sure that a state did exercise that one particular site within several years. At that time we picked seven because it was anticipated the State of Illinois would have seven reactors. Okay, so that is why we wanted the state to get to each site

once a year.

FEMA objected strenuously to that requirement because that was not in their regulation. In fact, their Deputy Director, who was then Lee Thomas, who became the head of EPA, made a presentation to the Commission requesting them not to put that seven-year return frequency. The Commission nonetheless voted for that seven-year frequency. But, in the Federal Register, we put a notice that said we will look, after several years of experience at this return frequency, to see if it is in fact necessary. After these several years, we have now found that it is not necessary, so we are now in the process of deleting it.

So, again, it is a cleanup kind of thing. We are going back as to what we promised to do in '84 and '85 and taking care of things.

MR. CARROLL: Why do you believe it is no longer necessary?

MR. JAMGOCHIAN: Well, after using the regulation for nine, 10 years now, this seven-year return frequency, we found that, number one, states respond to emergencies on a constant basis. They are all over the state. There are emergency preparedness capabilities functioning all over. So, in reality, there is no need -- they do not negate one part of the state as far as our emergency planning organization.

Secondly, a state participates every two years in their local emergency plan -- when local entities participate in the annual exercises, the state participates to some extent as well. Okay. So --

MR. CARROLL: You know that as universal, or you are assuming that?

MR. JAMGOCHIAN: Oh, no, no. That is a fact. The staff has found that to be so. FEMA has found that to be so as well.

MR. CARROLL: Okay.

MR. KRESS: Along those same lines, why is -- on your second bullet, why is six years better than five years?

MR. JAMGOCHIAN: Well, number one, it is consistent with the FEMA regulation; number two, we now have a biennial exercise -- full participation exercise that is every two years. Now that you have this, the ingestion pathway, every six years, it nicely fits into the -- it can be factored into that biennial.

MR. LINDBLAD: While you are answering questions, what is the average turnover rate for players and their roles?

MR. JAMGOCHIAN: Let's see, my NRR -- Paul, could you answer that question?

MR. CARROLL: What is a player and what is a role?

MR. KANTOR: Paul Kantor, NRC, NRR Staff,

Emergency Preparedness Branch. It is a little difficult to say what the turnover is. Generally, states -- my experience is it isn't that radical of a turnover -- state decision-making, emergency management agencies.

MR. LINDBLAD: Is it more or less in five years?

MR. KANTOR: I don't have any specific data to specifically respond. It is just a general impression. Also, I would like to point out that every two years the local organizations are participating fully. Those are your first-line responders.

MR. CARROLL: You said earlier -- or something caught my ear -- you said something to the effect that this is an EDO rulemaking, as contrasted to a Commission rulemaking?

MR. JAMGOCHIAN: Yes, sir.

MR. CARROLL: Tell me about that. I have never heard of chat distinction.

MR. JAMGOCHIAN: Well, that is more or less a legal distinction. When you have a major rulemaking and, as certain criteria in the regulations, that definitely has to go to the Commission for consideration, for vote and then for codification. There are certain elements by which, if a rulemaking can -- the Commission can designate to the EDO that rulemaking authority, and this is one of them.

When memos were going back and forth to the staff

as to how many areas to clean up, when the Commission finally agreed to the three areas that warranted codification to changes, they told the EDO you go ahead and do this rulemaking, it is not necessary. These are more cleanup types of changes. These are not real controversial. For instance, we have only received 12 public comment periods. I have been working in emergency planning for 20 years. I have never seen a rulemaking or any emergency planning that we have received 12 comment periods. Typically they are in the hundreds. So, this is -- it is really a homework type of thing.

MR. CARROLL: But, the Commission, in this instance, has specifically said, Jim Taylor, you go clean this mess up?

MR. JAMGOCHIAN: Yes, sir.

MR. WILKINS: Let me ask that same question a different way. Is this a case-by-case delegation of authority or is there some generic delegation of authority that describes some general areas in which the EDO has the authority?

MR. JAMGOCHIAN: Okay.

MR. ADER: I don't know if I can help very much. My name is Charles Ader from the Office of Research. There has been some criteria and it has been so long since I have seen them, I don't remember the specifics.

MR. WILKINS: I am aware that the Commission has, in certain instances, delegated this rulemaking authority to the EDO.

MR. ADER: It's generally on minor policy-type issues.

MR. WILKINS: Or operational issues, not even policy issues, which is what is involved here. But, I wasn't clear in my own mind as to whether this was done on a case-by-case basis or there was some -- there was a general overall policy that says if the issue falls within these criteria, then the EDO has the authority to do it. You don't know that either I gather?

MR. ADER: I believe -- it has been some time, but I remember seeing some guidance or criteria.

MR. WILKINS: All right.

MR. JAMGOCHIAN: There is criteria but, very typically what I have seen is that either the EDO says I plan on doing this and the Commission comes back and says yes, go ahead, or the Commission says --

MR. WILKINS: Or there is a negative consent.

MR. JAMGOCHIAN: -- this meets this criteria, you go ahead and do it. But, it is usually documented.

[Slide.]

MR. JAMGOCHIAN: Okay. Public comment analysis.

MR. CARROLL: Mr. Scroggins can write a

prescription on how this ought to be done.

MR. WILKINS: Oh, I am sure he could.

MR. JAMGOCHIAN: There were 12 public comment letters received -- five from the utilities, six from state Governmental agencies, and one from NUMARC. All commenters fundamentally agreed with the proposed rulemaking, except for the following. One state Government agency disagreed with deleting the seven-year return frequency requirement. He felt that we are liberalizing the regulations and that it really wasn't warranted.

MR. CARROLL: It didn't happen to be Illinois did it?

MR. JAMGOCHIAN: As a matter of fact, it was.

MR. CARROLL: Oh, really?

MR. JAMGOCHIAN: As a matter of fact.

Now, I believe we have accommodated his comment. In the Federal Register we have put in there that a state can go back and exercise whenever it perceives it has a need to or a desire to. This does not preclude a state from exercising or returning every several years or every five years, whenever they want. Nonetheless, we feel, as all of the other states do, and other commenters, that it is not necessary to have it as a requirement.

Three commenters suggested additional revisions. Now, these were perceived by the staff to be not within the

scope of this rulemaking. Several suggested we rewording the requirement -- the proposed requirement for the ingestion pathway exercise. Now, this suggested wording was due to potential misinterpretation. And they suggested that we simply use the wording that FEMA has used in their regulation which, in fact, the staff felt explained it just exactly the way we wanted, so that is what we have done. So, we have incorporated really two elements of the public comment concerns. Also, FEMA was consulted during the development of this rulemaking and since this regulation makes our regulations consistent with theirs, they did in fact concur with all of the provisions.

The next slide.

[Slide.]

MR. JAMGOCHIAN: The next three slides outline what the final revisions are that the staff is proposing -- one, clarifying requirements relating to full and partial participation by state and local governments that are within the EPZ for more than two power reactors. Their logic is, after using these regulations for 12 years, the staff and licensees have found them to be unnecessarily complicated and therefore warranted clarification. And the language that we do have basically says, if you are within the EPZ for more than two reactors, you still have to fully participate in an exercise every two years. It is that

simple.

MR. SEALE: For each reactor.

MR. JAMGOCHIAN: That's correct. That's correct.

The next slide.

[Slide.]

MR. JAMGOCHIAN: The proposed revision two. The interval for the ingestion exposure pathway exercise shall be changed from five to six years. Again, the logic is being consistent with the biennial frequency required in exercises for offsite plans and also being consistent with FEMA requirements.

Now, again, as I mentioned, the wording in this revision was changed as a result of the public comment period in order to eliminate potential misunderstandings.

MR. WILKINS: May I ask a question about the language of the proposal? I am reading from something that I believe is the new language. "A state should fully participate in the ingestion pathway portion of exercises at least once every six years." It doesn't say a state must fully participate, it says it should. Does that mean that the state has the option of not participating fully?

MR. JAMGOCHIAN: Well, when Appendix E was written and we incorporated state functions, you have to -- you come very close to a very delicate issue.

MR. WILKINS: Yes.

MR. JAMGOCHIAN: We do not regulate states.

MR. WILKINS: In fact the country fought a Civil War on this question of states' rights.

MR. JAMGOCHIAN: Yes. Yes.

MR. SEALE: States' laws.

MR. WILKINS: States' laws. I know they did.

MR. JAMGOCHIAN: Well, let's go back to 1980 where a licensee -- we put in the regulations a licensee could lose his license based on the non-performance of a state. So, those state involvements in emergency planning was a very delegate, and still continues to be a very delegate issue. So, that is the reason why the wording is such. A state should fully participate in the ingestion pathway portion of an exercise at least every six years.

MR. WILKINS: But the previous language said shall exercise, rather than should.

MR. JAMGOCHIAN: That's correct.

MR. WILKINS: I interpret shall as a much stronger modal auxiliary than should.

MR. JAMGOCHIAN: It is. In the writing of regulation we always use shall.

MR. WILKINS: Except this time when you used should.

MR. JAMGOCHIAN: Because I -- we cannot regulate a state.

MR. KRESS: What does that mean then if a state fails to comply with this regulation?

MR. JAMGOCHIAN: Well, NUREG 0654, which embellishes -- which amplifies our regulation, was rewritten and revised in order to accommodate those states that do not participate in any of our exercises. Ingestion pathway exercise is not our real concern. The biennial exercise -- in the State of Massachusetts several years ago, many of you may remember, refused to participate in the biennial exercise. That is a much bigger problem than this. And, clearly, they have a right not to participate. So, the regulations -- in fact, there was an executive order written by the President that said FEMA and NRC shall develop criteria in the instance that a state does not wish to participate, and permitted licensees to embellish their emergency plan to accommodate states.

Clearly, a state does not -- we are not going to fight a Civil War over it.

MR. KRESS: But you wouldn't shut down the plant? I mean, you do have the authority to do that.

MR. JAMGOCHIAN: Yes. We have the authority to shut down the plant, but there are written contingencies for when a state in fact does not wish to participate, as in the case with the State of Massachusetts.

MR. WILKINS: I guess the only point I wanted to

make was that the language in other sections of this rule use the word shall --

MR. JAMGOCHIAN: Yes, sir.

MR. WILKINS: -- and without any qualification or exceptions for states. Offsite plans for each site shall be exercised biennially, with full participation by each offsite authority having a role under the plan. I assume that would include the states.

MR. JAMGOCHIAN: Yes, sir.

MR. WILKINS: What you are saying is that, as a result of this Executive Order, the Agency has the power to proceed even though a state or any other offsite authority chooses not to participate?

MR. JAMGOCHIAN: Exactly.

MR. WILKINS: All right.

MR. JAMGOCHIAN: As in the past, and I am sure many of you are familiar -- a licensee was in the middle - sort of the man in the middle between political battles between states and local Governments. So, that executive order permitted us to rewrite the criteria which then permitted licensees to continue operation if they took over certain emergency planning functions of the state and local government.

MR. SEALE: Well, this then reduces the possibility of the spectacle of the NRC not abiding by its

own regulations, is that it?

MR. JAMGOCHIAN: That's correct.

MR. CARROLL: This brings up another issue that obviously isn't something you write regulations about. But, are you satisfied today that you have a clear understanding with FEMA about Restart, following an event of some sort -- I have in mind the fiasco that developed after Turkey Point, Hurricane Andrew?

MR. JAMGOCHIAN: Well, rather than just give you a yes, and I would prefer to do that, I would like to turn to the NRR person, Faulk Kantor.

MR. KANTOR: Faulk Kantor again of the NRR staff. Yes. I think we are pretty confident, as a result of the lessons learned from the Turkey Point restart or start-up that we have an understanding with FEMA. In fact, it has been you might say codified or reflected not in our MOU between the two agencies that we will keep each other informed of situations, similar to --

MR. CARROLL: You did. As I read the record in the case of Hurricane Andrew, you just didn't talk to the right people in FEMA I guess.

MR. KANTOR: Right. There was a breakdown in communications there which both agencies recognize. We took -- we have taken steps to correct that. In fact, we followed the new procedure, you might say, during the

flooding episodes we had here this past summer. There were several plants and offsite areas that were affected by the flooding situation where we worked very closely with FEMA, the states, and the licensees in the regions to just see -- to prevent any other -- another occasion like that.

MR. CARROLL: Thank you.

MR. JAMGOCHIAN: Okay, the next slide, page seven.

[Slide.]

MR. JAMGOCHIAN: This is our last revision. This is consistent with what was proposed for public comment -- is delete the requirement that a state return to a specific site every seven years in order to participate fully in an exercise. Again, the logic is that experience has indicated that this requirement is unnecessary, and eliminating it is consistent with FEMA's requirements.

Now, again, I would like to emphasize we did very seriously consider the comments and we did put a provision in the supplemental information, and I will quote: "Nothing prevents a state from returning to a specific site to participate in an exercise whenever it deems warranted." And this spells out what most states know anyway. They can do very much what they would like. So, I think we did accommodate the concerns of that individual or of that individual comment letter.

[Slide.]

MR. JAMGOCHIAN: And the last slide is the conclusion that the staff recommends that the EDO approve this final rulemaking package.

MR. DAVIS: I have a question.

MR. JAMGOCHIAN: Yes, sir?

MR. DAVIS: You said that there were 15 areas originally proposed by the EDO. Can you say what the nature of those areas was in general? Was it a relaxation or --

MR. JAMGOCHIAN: Oh, no, no, no. They were all of the areas that were involved in the Seabrook and Shoreham adjudication and where the Commission in fact made decisions and it was felt part of the staff wanted to codify those decisions and other parts of the staff do not -- let's not bring these to the surface again and open them up to a rulemaking proceeding, which then permits public comments and things. If these decisions in fact had been made by the Commission, let them stand as such.

MR. DAVIS: Okay.

MR. JAMGOCHIAN: Now, to give you specifics, I really --

MR. DAVIS: No, that's find.

MR. JAMGOCHIAN: -- it has been four years.

MR. WILKINS: Are there any other questions for Mr. -- I will pronounce his name correctly?

MR. JAMGOCHIAN: Jamgochian?

MR. WILKINS: Jamgochian?

MR. JAMGOCHIAN: Jamgochian. Mike.

MR. WILKINS: Jamgochian. Yes.

MR. LINDBLAD: I have no questions. I think you did a fine job in making the presentation though.

MR. JAMGOCHIAN: Thank you.

MR. DAVIS: I just had a minor comment. Are you aware that the Europeans are moving away from any emergency planning requirements for their more recent designs? Have you been following their progress?

MR. JAMGOCHIAN: Well, I think that is a very good reason for my boss to send me to Europe. I appreciate that comment.

[Laughter.]

MR. SEALE: We just gave you the word.

MR. JAMGOCHIAN: Yes. I appreciate that. Yes, we have been keeping abreast, especially for advanced reactors. I am involved with the development of emergency planning for advanced reactors.

MR. DAVIS: Thank you.

MR. WILKINS: That is a consequence of their design philosophy. They want to design the containment and so on so that the possibilities of accidents that would require emergency planning is greatly reduced. I am careful not to say eliminated, just greatly reduced.

MR. JAMGOCHIAN: Well, it depends on who you talk to.

MR. WILKINS: I understand.

MR. JAMGOCHIAN: If it is a vendor, they may want to eliminate it.

MR. WILKINS: They might say eliminate it. Yes. I am a little more cautious than that. Okay.

MR. CARROLL: Well, following up on -- I was going to ask the same question Pete did. But, then it leads me to another question, and that is suppose you do come to the conclusion that say the AP-600 is just so much better, from a risk point of view, and an accident mitigation point of view, and so forth than the present fleet of plants and that some relaxation and emergency planning requirements is warranted, get rid of the damn sirens or whatever, how difficult is that going to be with the present regulations?

MR. JAMGOCHIAN: Well, to answer your question, not difficult at all. We write regulations for every type of licensee. I am in the middle of writing a regulation right now for independent spent fuel storage facilities and MRS's, okay. We developed rulemaking for Part 30, 40 and 70 licensees three or four years ago. Okay? Now, we have also wrote a regulation for nuclear power plants. This was for Seabrook and for low-power operation. Now, for low-power operation, for MRS's, for independent spent-fuel storage

facilities, we do not have sirens. We clearly do not have 10-mile emergency planning zones.

These are the things that really -- when someone says -- and many vendors of the --

MR. CARROLL: My point is that the regulations have specific requirements for power reactors.

MR. JAMGOCHIAN: Yes. But, for advanced reactors, it is our perception that we are looking at -- first, the vendor tells me the sourceterm. Once I can appreciate the sourceterm and I understand the risk offsite, then we develop the Emergency Planning Requirements.

MR. SEALE: So, you are truly thinking in terms of risk-based regulation rather than generic plant deterministic regulations --

MR. JAMGOCHIAN: In emergency planning?

MR. SEALE: -- in emergency planning?

MR. JAMGOCHIAN: Yes, sir. We look at sourceterms, and potential offsite doses.

MR. SEALE: That is interesting.

MR. JAMGOCHIAN: I am sorry. Maybe I said something wrong.

MR. KANTOR: No. I just wanted to add that, as a result of a question -- a specific question like that from the Commission, NRR and Research are embarking on a study of this very issue to -- with the object being to develop some

criteria for these various reactors. Perhaps that would eventually be reflected in some rulemaking. We are thinking in terms of, you know, a year's study or something to get to that point.

MR. CARROLL: I guess one thing I am curious about is does a -- do the Emergency Planning Regulations in Part 50 apply necessarily to a Part 52 applicant, or could emergency planning be covered by the Part 52 rulemaking that he would be subjected to? Could he have his own unique emergency planning requirements under Part 52?

MR. JAMGOCHIAN: If the advanced reactor is licensed under 52, it would then meet the requirements under 52. Currently, they have to meet the planning standards, 50.47. I don't believe they have to meet Appendix E. Oh, they do? But, nonetheless, even Appendix E has an area in it that talks of research reactors for gas-cooled reactors at Fort St. Vrain, when we wrote it in 1980, we said reactors that have lower potential consequences offsite need not have the enhanced -- I am using that -- my own term -- the enhanced emergency planning requirements -- 10-mile EPZs, sirens, FEMA involvement, okay, which research reactors, test reactors, and the gas-cooled reactors were covered in Appendix E when -- from 1980. So, I -- as Faulk had mentioned from NRR, we are seriously looking at what the criteria would be for the Emergency Planning requirements

for reactors that certainly have less concern offsite.

MR. CARROLL: Okay. Thank you.

MR. WILKINS: Okay. We have a few minutes that we could devote to giving guidance to the Subcommittee Chairman on a letter. I would propose that the letter actually be reasonably short and recognize that we have had this presentation, that we have looked at the proposed rule and that we are in agreement with it. Now, we could expand on that at the Committee's desire, or we could write a different letter, if the Committee so desires. Does anyone have any opinions or suggestions to the Subcommittee chairman?

MR. LINDBLAD: I am thinking about Friday at 3:00 o'clock.

[Laughter.]

MR. KRESS: It is not a criteria. I think you are basically right.

MR. WILKINS: All right. Well, thank you very much --

MR. JAMGOCHIAN: Thank you very much.

MR. WILKINS: -- and the other gentleman who spoke from NRR and RES. We appreciate your assistance this morning. We are a little early for the next agenda item. We are quite a bit early for the next agenda item, which is okay with me.

MR. CARROLL: I don't know, as long as we have got these emergency planning types here, would it be interesting to spend a couple of minutes hearing or getting some insights into what the problems were during the flooding this spring and summer?

MR. WILKINS: Well, I am not sure that they are prepared to discuss that off-the-cuff; but, if they are, we will certainly be interested in hearing what they have to say.

MR. KANTOR: Basically, we had situations where evacuation routes would be flooded. There was also some concern about access to the plants themselves. When these issues came up the licensees generally worked with state and local organizations to come up with alternative means of evacuation, if necessary, or some of these areas were already evacuated. But, I don't have specifics on each of these. There were about three plants that were involved -- Calloway was one, I think Prairie Island was another one, Fort Calhoun maybe, Cooper maybe also.

MR. CARROLL: Quad Cities?

MR. KANTOR: Quad Cities initially, right. In fact, I think Quad Cities, they were down. The restart was delayed for about a week until the flooding situation became manageable in that area. So, generally, there was cooperation. And we didn't have to go out and jawbone

anybody to take action. Generally, the licensees and the states were working very closely. That was gratifying to us. We and FEMA coordinated very well, both at the headquarters level and at the regional level.

MR. LINDBLAD: Weren't those areas where tornadoes were common? Wasn't sheltering a good alternative?

MR. KANTOR: Right. If you can't evacuate, then you have the option of sheltering.

MR. LINDBLAD: If they have tornado cellars, they probably are in better shape to shelter than others?

MR. KANTOR: Right. And also, emergency planning is our forth level of defense, so it is highly unlikely you would have an accident as a result of any kind of a flooding situation. And the plants do have criteria for shutting down the plant, if the water levels do reach a certain height. In fact, one plant -- I forget which one, probably Cooper, did reach an unusual event-type level, but they were I think a considerable way away from having to declare an alert or actually go into any kind of operational shutdown. Most of the sites seem to have flood plans, where they do have provisions for taking action to secure the plant for high water situations, and so they exercise those.

MR. LINDBLAD: What were the risks to offsite communications?

MR. KANTOR: For the flooding it was minimal. I

am not aware of any communication problem; whereas, Turkey Point, as you know, we lost communications down there. But, with the flooding situation, we didn't have that problem.

MR. WILKINS: I infer that you didn't detect any necessity for changing your regulations as a result of it?

MR. KANTOR: No, not at all. As I mentioned, the agreement procedure we set up as a result of Turkey Point for keeping everybody informed and reacting to the situation worked very well for the flooding situation.

MR. DAVIS: There is a related problem of seismic events. We are seeing seismic now as being a major contributor to risk in a lot of the PRAs, and we are talking about fairly substantial events of .3G and up, which would be, you know, a serious seismic event which would disrupt traffic arteries, bridges and so forth. I think that that is a concern also in this evacuation program. I have not seen very many contingencies for a seismic event evacuation.

MR. LINDBLAD: Which projects do you see where seismic PRAs have reported to be the significant area? Which ones are those?

MR. DAVIS: Which plants or --

MR. LINDBLAD: Yes.

MR. DAVIS: Well, I would have to go back to some of the data. But, I believe at the higher seismic sites where these safe shutdown events have been fairly low, like

in the Northeast for example, Pilgrim, Seabrook, we see seismic as --

MR. LINDBLAD: Have they done a seismic PRA yet?

MR. DAVIS: Seabrook has, yes.

MR. KRESS: Are these PRAs coming in high for seismic events because they factor into the emergency response part of them -- the fact that you have trouble evacuating?

MR. DAVIS: The only one I know that has taker any detrimental factor for the seismic event is I believe Millstone III, where they actually reduced the evacuation speed assumed in the PRA by a factor of two for seismic events. It didn't -- it didn't make much difference in the overall risk. I am not suggesting that the risks are significant. I am just saying that seismic is showing up as a dominant initiating event in the PRAs.

MR. CARROLL: Does some of that go away now that the controversy between the EPRI and the Livermore --

MR. DAVIS: No. These earlier PRAs did not use the Livermore hazard curve, they used something that was developed by their own analysts.

MR. LINDBLAD: You are suggesting that the sensitivity to seismic is in the community rather than in the plant? If they want an evacuation, the community's bridges and highways and school buildings may be in danger,

is that --

MR. DAVIS: Yes.

MR. WILKINS: All right. I am informed that the NRC staff people who are to make the presentation on agenda item three are in fact already here. So, we don't need to wait for them to show up at a quarter till 10:00. They are already here. I am grateful to them for that. So, I think we will close the discussion on item two, and then move to item three, which is the proposed resolution of Generic Issue 67.5.1 dealing with steam generator tube rupture, radiological consequences. It is my understanding that this will be a status report, and that we are not expected to prepare a letter to the Commission or to the EDO on this issue. Just bring us up to date and inform us and allow us to ask questions for information and so on.

MR. MURPHY: I am Joe Murphy. For the information of the Committee, our former Director of the Division of Safety Issue Resolution, Warren Minners, retired I guess it was last Monday. During the near future at least I will be Acting Director of the division.

I want to make two comments before I start into the detailed comments. The first is to apologize to the Committee. We had a little mix-up in our communications with the Committee staff and became aware of this presentation a little late in the game. As a result, we

don't have a complete presentation for you. I think we have an informative one however. I would also like to express my appreciation to Joe Hopenfeld. He came in off of vacation to be with us today. I really want to express my appreciation to him.

[Slide.]

MR. MURPHY: With that, let me get to Generic Issue 67.5.1, which is the work we are doing on the reassessment of steam generator tube rupture consequences. Let me figure out how to get all of these slides in a position where --

MR. WILKINS: Mr. Murphy, you may be interested to know that the Committee has taken formal note of this problem and has tried to ensure that in the Two White Flint Building to which we will move sometime in this century, there will be space at the podium so you can do what you are trying to do gracefully and conveniently.

MR. MURPHY: It would be nice if it were about six inches away.

[Laughter.]

MR. MURPHY: Basically, we have a situation where --

MR. LEWIS: When he said six inches, he meant 15 centimeters.

MR. MURPHY: I also seem to have a tendency to put

my arm through this loop here too. If you are fixing stuff, that is something you might look at.

MR. CARROLL: Maybe we ought to fix the presenters.

[Laughter.]

MR. MURPHY: Maybe that is the real answer.

[Slide.]

MR. MURPHY: The standard review plan that addresses steam generator tube ruptures was developed in the mid to late '70s. There wasn't a lot of data available in those days. And since then, there's -- some data has become available from a study of transient response, some work that has been done in Oak Ridge, and some operational events in which an item was released to the reactor coolant system. These weren't tube ruptures, but they represent changes in power level and that sort of thing, where we can get a better feel for the item spiking problem.

[Slide.]

MR. MURPHY: The results of the radiological consequences of the tube rupture are assessed under the conditions looking at both the pre-accident item spike and the item spike initiated by the accident. In the process of looking at the calculation, we look at item transport to the atmosphere, and calculate it using a model in which the item is then carried through the steam line directly within the

droplets by entrainment, or indirectly, after scrubbing by the liquid in the secondary system in the form of a partitioning.

Basically, the work we have done on this generic issue shows that there are some changes that are advisable in the standard review plan as it now exists. The example of these -- the standards review plan has an item partitioning factor of a hundred. It does not indicate whether that is on a mass or a volume basis which of course makes a difference. The work was --

MR. WILKINS: Do you want to tell us what an item partitioning coefficient is?

MR. MURPHY: Okay. That is the -- if you have a solution of iodine and water, you will get a partitioning between the iodine and the vapor phase above the liquid and the iodine in the liquid phase. This is the ratio of those two.

MR. KRESS: It is basically Henry's law with an activity coefficient.

[Slide.]

MR. MURPHY: There is an effect for some degree of the pH of the secondary water. I wouldn't call that a major consideration. The data supports some reduction in the magnitude of the items spiked and a significantly lower amount of carry-over. I will get to these quantitatively in

a minute, or at least the more important ones. Then, as a result of this, we have specific changes to the SRP which we can recommend.

We are looking at part of the problem. As you know, there is a much broader effort going on steam generator tube ruptures within NRR. What we see this as -- we are not trying to solve the whole problem, but we have some information which we can then provide to NRR in the context of the bigger problem. And the work we have done is specifically for U-tube steam generators rather than the once through steam generator of the B&W type.

MR. KRESS: Joe, is this an issue of meeting 10 CFR 100 requirements?

MR. MURPHY: It is mainly a Part 100 consideration, yes.

MR. KRESS: Yes.

MR. LINDBLAD: And do you mean U-tube steam generators, or do you mean recirculating steam generators?

MR. MURPHY: I really mean recirculating steam generators.

MR. WILKINS: Just for my information, what fraction of the total population of reactors uses these recirculating steam generators, and what fraction uses those?

MR. MURPHY: I would guess it has got to be in the

70 to 80 percent range. The B&W plants don't -- there are six of them. The difference -- how many of the U-tubes are not recirculating, I don't really know, but I think the number is small.

MR. CARROLL: No. They are all recirculating.

MR. MURPHY: That is what I thought. Yes.

MR. SEALE: More like 90 percent.

MR. CATTON: Maybe 50 to 60 percent of the total.

MR. CARROLL: What?

[Discussion held off record.]

MR. MURPHY: Let me give you an example of where we are coming out on the things we have looked at.

[Slide.]

MR. MURPHY: On the partition coefficient, as I mentioned, the Standard Review Plan says a hundred -- use a factor of a hundred. What we have come up with on a mass basis is a factor of 35. So, this may be a little restrictive than what is on the standard review plan, depending upon whether you interpret it on a mass or a volume basis.

There is a significant difference though on pool entrainment.

MR. LINDBLAD: What did you do previously, mass or volume?

MR. MURPHY: The Standard Review Plan doesn't say.

MR. LINDBLAD: What did you do?

MR. MURPHY: And that I don't know.

MR. HOPENFELD: May I add, sir? What you did --

MR. WILKINS: Identify yourself, please.

MR. HOPENFELD: My name is Joe Hopenfeld.

MR. WILKINS: Can you hear him?

THE REPORTER: He needs a microphone.

MR. MURPHY: There is one on the table.

MR. HOPENFELD: Well, one reason for the revision of this RP was that we frequently were getting calls asking us what number should you use. Obviously, there is a difference in the density ratio, which is a factor of 20, which makes a difference. So, we had a program at Oak Ridge, where we defined by actually running tests under simulated condition, and we have numbers that would -- the temperature range and pressure ranges were interested -- the numbers are on the order of between 10 to a hundred. The most probable number is 35 for the condition we are interested in.

MR. KRESS: The partition coefficient. That tells you how much vapor phase iodine is in the amount of steam that flashes when this event occurs?

MR. HOPENFELD: Yes.

Let me amplify this a little bit. There are two phenomena occurring here. When you have a tube rupture,

because of an integral difference, you have a certain amount of steam -- I mean liquid that will flash into steam. During that time, which occurs on a very fast scale, it is difficult to say what a partition coefficient is. It probably is one. Because what you have -- you have a droplet that the surrounding surface is -- becomes vapor. So, all that that was in that droplet becomes vapor. So, you can assume it is one. However, later on during the transient, where you have liquid in the pool and that -- what we are talking about here is the steady state partition, which is between the liquid and the pool, it is not that transient portion. They bring that transient part of the problem when the steam flushes to the break, the assumption is one, because it is a nonreportable condition.

Did I answer your question, sir?

MR. KRESS: Yes. When water flashes into steam --

MR. HOPENFELD: Correct.

MR. KRESS: -- the vapor itself will contain some vapor phase iodine, and that depends on the partition coefficient at that temperature and pressure that it is flashing at the moment. It will also tear up and carry-over some droplets.

MR. HOPENFELD: That is correct.

MR. KRESS: That part of the droplets, whatever

iodine is in it could be considered one? Is that what you are saying for that part?

MR. HOPENFELD: No. That is not what I am saying. There are two things -- you are absolutely right. There are two things here. One is entrainment of actual liquid phase within the gas phase.

MR. KRESS: Yes.

MR. HOPENFELD: That is the entrainment part of it.

MR. KRESS: Right.

MR. HOPENFELD: The other part of it, if you have a liquid during the microsecond, if this time scale is for flashing, during that time imagine yourself -- you start with a liquid, okay, with a droplet of liquid. The outside surface or layer so to speak evaporates because of the properties.

MR. KRESS: Yes.

MR. HOPENFELD: That liquid within that time, the assumption is that that liquid, whatever it contained before, is in the vapor phase without considering the activity, whatever the activity requires. It is a nonreportable condition. That is the way we will visualize it at this point. On a longer time scale, you have to take that into account. But, for practical purposes, it is not really significant, because you don't know where the break

occurs anyway.

MR. MURPHY: Yes. I think we have this in the next item down.

[Slide.]

MR. MURPHY: As Joe said, this is more a quasi steady-state condition.

MR. LINDBLAD: Mr. Murphy?

MR. MURPHY: The pool entrainment --

MR. LINDBLAD: Excuse me, Mr. Murphy. Before we leave the partition coefficient --

MR. MURPHY: Yes?

MR. LINDBLAD: -- I listened to Mr. Hopenfeld, but I still didn't hear an answer to my question. What has the staff currently used when they are using 100? Do they use mass or volume?

MR. MURPHY: I believe it is mass. Joe, do you know?

MR. HOPENFELD: That is correct.

MR. LINDBLAD: And so this is a change by a factor of three?

MR. MURPHY: A change by a factor of three --

MR. LINDBLAD: Thank you.

MR. MURPHY: -- in a more conservative direction.

MR. KRESS: Let me ask my question another way. I am still not quite sure. On your value of 35, partition

coefficients usually are a function of temperature. During a steam generator rupture, your primary system pressure is decreasing, as well as the temperature. Now, so, a real partition coefficient is a variable in time --

MR. MURPHY: Yes.

MR. KRESS: -- depending on this process of blowdown. This 35 then represents a sort of an integrative value over that time period?

MR. MURPHY: It is an integrated average over the transient.

MR. KRESS: So, at the end point of the blowdown you will have converted a given amount of water to a given amount of steam and water. The 35 is the number you should use to get the amount in that steam volume for that transient.

MR. MURPHY: Now, the entrainment question -- and we have looked at it both in terms of the pool entrainment and the bypass entrainment -- in the standard review plan equations are given and, of course, they are functions of time also. But, the value of these tends to be high, greater than -- on the order of .1 or higher, when you quantify these things, averaged over the transient. This work now shows that these numbers are more in the 10 to the minus five range. So, the difference in entrainment changes substantially by orders of magnitude.

MR. SEALE: Tell me what entrainment does exactly?

MR. MURPHY: Entrainment is during the tube rupture event, as liquid comes out of the primary system, it is expulsed, still in liquid form, up into the steam line --

MR. SEALE: Okay.

MR. MURPHY: -- and then out the relief valve.

MR. SEALE: And 005 is percent?

MR. MURPHY: That is a percent. So, that is five times 10 to the minus five percent of what comes out the break gets released into the --

MR. KRESS: Did that --

MR. MURPHY: -- as opposed to a number before that was closer roughly to .1 or so.

MR. KRESS: That includes the fact that it is blowing down into water --

MR. MURPHY: Yes.

MR. KRESS: -- and that the water will tend to --

MR. MURPHY: This is the primary system entrainment rate, rather than secondary water, if I understand right.

MR. HOPENFELD: Can I amplify on this for a minute, sir? In the early '80s, as you alluded to it, the concept was that when you flush into steam, bubbles entrained are microscopic and very small liquid droplets,

and they would go up with the liquid and carry it through the dryers because they are small amounts, so the dryer efficiency will just go through and find the stuff in the steam line. Now, the concept was formulated in SRP, but it was very vague. At the time it wasn't understood. I believe Westinghouse, and it could be CE also had models on thermal hydraulic codes to take that into account. We couldn't really calculate something like that. It is extremely difficult. There were some models formulated at Bechtel, but they had a lot of problems with them.

Because of that very reason, a program was formulated, which was called AMBI, to find out what that entrainment was. There was no radioactive iodine. We were just plain looking for how much stuff was coming out. We found it was zero for all practical purposes. That is the major impact of this because it cost a lot of money to formulate thermal hydraulic codes with droplets all over, where you don't really know what it is.

Now, the relief here is that you get away from that. We have run about 15 tests, even taking the dryers out completely because of the distance that you have -- the boards that you have and the thought that the liquid stays in. That was the major impact and nothing else.

MR. MURPHY: On the iodine spikes. The standard review --

MR. LINDBLAD: Mr. Murphy, before we leave the mechanics of steam coming out of water, are these roughly the same mechanisms that apply in boiling water reactors with the steam line break?

MR. MURPHY: Well, the mechanisms have to be fairly similar.

MR. LINDBLAD: I beg your pardon?

MR. MURPHY: I would think the mechanisms would have to be.

MR. LINDBLAD: So, would we use the same SRP numbers in evaluating them?

MR. MURPHY: I must admit, I don't know what is used in the boiler in this area. Joe, do you have a feel?

MR. HOPENFELD: We haven't looked into the boiling tube rupture. The chemistry is different however. This was exclusively focused on the recirculating tube rupture.

MR. LINDBLAD: So, it is a chemical problem rather than a mechanical problem?

MR. HOPENFELD: I believe that is the case, because the iodine spike is --

MR. LINDBLAD: I understand that.

MR. HOPENFELD: -- we have been putting a lot of concentration on that.

MR. LINDBLAD: Yes. I understand item spike. I was talking about before we got to the iodine spike. Thank

you.

MR. MURPHY: On the iodine spikes we were running -- the standard review plan has 60 to 275 microcuries per gram. This is where the steam generator tube rupture following the iodine spike, where the iodine spike has come from an operational transient before the tube rupture. Now we would recommend more like 12. Where it is a coincident iodine spike, the standard review plan calls for a factor of 500 increase in release rate. We have an equation that expresses our current recommendation. The difference between these two is about a factor of 10 with our recommendation being about a factor of 10 lower than what was currently in the standard review plan.

MR. DAVIS: Joe, is the composite effect of these changes to increase or decrease the sourceterm?

MR. MURPHY: To decrease it.

MR. DAVIS: Okay. Because it looks like some are going up and some are going down.

MR. MURPHY: We have got one going up essentially, and basically, the rest of them are going down.

MR. CATTON: Okay. By a significant factor?

MR. MURPHY: Yes. And one is going up by about a factor of three, and the other is really -- for instance, the entrainment is coming down by several orders of magnitude.

MR. HOPENFELD: May I make one more comment? The important thing is the initial transient -- the initial blowdown, the initial break period. At that point, the partition coefficient is of secondary importance. The partition coefficient comes in after -- basically after the accident is practically terminated. It comes in later on. During the initial half an hour, the main thing -- the main thing is the iodine spike. That is where the release comes in. On the integrated effect, it would depend on the -- it would be accident-specific.

MR. KRESS: Does it depend on in any way on whether you have one tube rupture or multi-tube ruptures, or does that matter at all?

MR. HOPENFELD: No, it does not. The iodine spike is clearly the fraction that you get released from defective fuel.

MR. KRESS: How many of these numbers carry over in the steam release -- the sourceterm?

MR. HOPENFELD: Yes.

MR. KRESS: Does that depend on whether you have multi-tube ruptures or a single tube?

MR. HOPENFELD: Most of the tests that we have simulated were with one steam generator tube rupture because it was the design basis. So, I cannot answer your question, but I believe that it would probably follow for several

tubes.

[Slide.]

MR. MURPHY: Our position on this is somewhat different than the package we sent you then which was some time ago. I think it was in August. Because we didn't place a high priority on this, it has taken so long to get on to the Committee's agenda.

Basically what has happened is NRR, as you know, is reassessing the way in which radiological doses from the steam generator tube failures are calculated as part of all of the work they are doing on steam generator inspection and repair criteria, which I am sure the Committee knows a lot more about than I do.

What we intend to do is provide the results of our study to NRR and let them fold it into their ongoing activity. What we sent you earlier was that we were going to have separate rulemaking activities on our own. What we propose to do now is to provide this information to NRR and fold it into the broader activity on steam generator tube ruptures. For that reason, we are really not requesting an ACRS letter at this time. Certainly, if you choose to give us advice or comments, we would appreciate it. But, because of the fact that we have decided that it is more appropriate for us to provide this information to NRR and fold it into their broader activities, it is not absolutely

required.

MR. CATTON: Is the radiological dose the only thing that enters into this recommendation? I recollect reading a report that came out of one of Research's projects somewhere on risk-based regulation that showed that steam generator tube rupture was an initiator of lots of other things that contributed to core melt. Is that a consideration in developing your steam generator inspection and repair criteria?

MR. MURPHY: You will have to speak to NRR on the details of this program.

MR. CATTON: It seems to me it is a little near-sighted if you just use this as the criterion for steam generator inspection.

MR. MURPHY: Well what this -- no -- let me.

MR. CATTON: Either that, or the PRA was wrong.

MR. MURPHY: Let me clarify. What we worked on was the radiological doses from a tube rupture. NRR is involved in a much broader activity where they are looking at the proper way of inspecting and all of the new information that is available on steam generators and a much broader area.

MR. CATTON: Maybe I will ask NRR. Are radiological doses the only consideration in developing steam generator inspection and repair criteria?

MR. KADAMBI: My name is Presad Kadambi. The answer to your question is no. They are not the only consideration. In fact, the work that is going on in NRR will encompass many severe accident issues. It is a very wide-ranging activity. What we have done here contributes to a very small portion of this activity.

MR. CATTON: That is better. I feel better.

MR. SEALE: But it is NRR's intent then to pick up on this as a part of the input to the overall response that you are preparing?

MR. KADAMBI: That is what we intend to recommend.

MR. SEALE: Okay.

MR. CATTON: Is there some place where we can get a sort of broader picture? I am having a little difficulty in figuring out how you are going to put it all together.

MR. KADAMBI: There is a task group and a steering committee that is looking into this issue, and they would probably be the best source of information.

MR. WILKINS: Who is the chairman of that task group?

MR. KADAMBI: Jack Stosneyder I believe would be the right person.

MR. KRESS: But, it is basically guidance on how you deal with the design basis accident and chapter 15?

MR. MURPHY: Yes.

MR. KRESS: And we will rechange the standard review plan and give a different way -- guidance on how you calculate that? It is whether or not you look at 10 CFR 100. Then there are equipment qualifications -- issues related to it and worker exposure, in terms of what you do afterward.

MR. CATTON: The reason I raise this question is that we keep talking about risk-based regulation. In my view, the radiological release following a steam generator tube rupture is a small part of that.

MR. KRESS: This is strictly design basis. That has nothing to do with the risk-based regulation.

MR. CATTON: It doesn't?

MR. KRESS: No.

MR. DAVIS: Ivan, I am even more concerned about another aspect. We can chase these small releases and try and prevent them, but sometime that is at the detriment of the larger accidents. And a good example is one I brought up before, and that is the main steam line isolation valve closures, which cuts off a good way to remove heat from the core in an effort to try to remove the possibility of these very small releases.

MR. CATTON: Are you worried about leading yourself into a transient because of the --

MR. DAVIS: Exactly.

MR. CATTON: -- core melt instead?

MR. DAVIS: Exactly. And I know Joe is aware of this. That is my concern. That is why we need to integrate all of these things, instead of just looking at one thing.

MR. CATTON: So, maybe we should invite this fellow, Jack Stosneyder in here to tell us about it, if he is the one that is responsible for the global picture.

MR. SEALE: Could I ask another question just quickly? Is there a research participant on this task group that is looking into the steam generator thing generally?

MR. KADAMBI: Yes. John Craig, who is the Deputy Director of the Division of Engineering in the Office of Research is --

MR. SEALE: Oh, okay.

MR. KADAMBI: -- a member of the Steering Committee.

MR. SEALE: Okay.

MR. HOPENFELD: Can I make one comment? Maybe that was the answer to your question. One consequence of the Trojan experience has been that we are looking into the situation when you have an occurrence -- you have a leakage from the primary site through some tubes, on top of it you have a steam line break, where there could be a stuck open valve or whatever. So, that situation is different than a strictly design-basis accident. Now, the difference is, and

I think that that is what maybe you weren't so comfortable with -- the difference is that now you have a situation where you have a large over-cone, and you have a very large pressure drop because of the steam line break, plus the energy that you removed through the break. That situation -- especially with respect to the iodine spike is different. EPRI is coming here I believe in two or three weeks to address that issue. But, it is different. This is strictly -- this was formulated a long time ago and was focused only on the design basis. Now, this thing that Mr. Kadambi referred to is a different -- it is something that came up last year.

Have I answered your question?

MR. CATTON: Sort of.

MR. LINDBLAD: Mr. Murphy, you say that it is your intention to communicate these results to NRR. Do you do that by revising the standard review plan or do you do it by a memo without revising the standard review plan?

MR. MURPHY: We haven't decided yet. My guess is we will send a memo to NRR making specific suggestions on portions of the Standard Review Plan, but won't attempt to go back and rewrite the whole thing for them.

MR. LINDBLAD: Who is responsible for the authorship -- the editing of the Standard Review Plan?

MR. MURPHY: That is NRR.

MR. KADAMBI: NRR has the responsibility.

MR. LINDBLAD: Thank you.

MR. MURPHY: That completes my presentation, Mr. Chairman.

MR. WILKINS: Are there any other questions that any members of the Committee would like to ask?

MR. CARROLL: Let's see, when Minners was up there, we always got a good lesson in statistics. You haven't given us one yet.

MR. CATTON: Jay, could you take down some of this for me -- how this whole thing is being brought together? Your know, every time I read about the Myama incident and all the strange and bizarre things that go on following a steam generator tube rupture, it just makes me a little bit nervous.

MR. KRESS: I would like to ask Joe Hopenfeld if he had anything to do with the work at OR&M?

MR. HOPENFELD: Yes. That was the prime contractor on measuring these partitioning coefficients.

MR. KRESS: It must be awfully good work then.

[Laughter.]

MR. HOPENFELD: It is good work.

MR. KRESS: I should recuse myself from this issue.

MR. HOPENFELD: I guess, with the academics of

this staff, there are certain aspects that came out during this program that really probably would be worth further examination. We found out that the partition coefficient here at -- what a difference is that we are dealing with extremely small concentrations, 10 to the minus 12. You are playing statistics here. We found out a completely different phenomena that you would predict theoretically. But, you can justify further looking at it, although I believe it is worth looking into, because it is not the way statistical theory would predict because the partition coefficient would appropriate differently.

But, to answer your question, yes, they were the prime contractor.

MR. WILKINS: All right. Let me thank Mr. Murphy, and particularly thank Mr. Hopenfeld for coming in from vacation. One of the members of the Committee, by the way, reminded us that he also is here off of his vacation. And maybe the Chairman has learned a lesson about scheduling this meeting in January.

MR. CARROLL: I would point out one thing. A year ago January we had a full meeting in the first week of the year. I looked at my records.

MR. WILKINS: It generally tends to depend on when the first of the year actually occurs. This time the first of the year was on Saturday, and so people almost had no

time to get ready. But, anyway, that is not your problem, gentlemen, that is our problem. We appreciate your presentation, and we look forward to hearing final presentations when you are prepared to go ahead.

We are moving right along, aren't we? Moving right along. I wouldn't expect the next people to be here. They are not due here until 11:00 o'clock.

I have been looking ahead at the agenda to see if there is anything we might shift forward without doing damage to the fundamental principle that we have told the public in the Federal Register Notice what our agenda is. It is not easy to do so. Well, if I had a draft of the letter on the first issue, we might even talk about it, but I don't have a draft of that yet.

MR. SEALE: What about the design certification?

MR. CARROLL: I don't know. Sam, do you know where my letter is? We could --

MR. SHACK: Just a comment on Ivan's question. We did have a Subcommittee meeting on the steam generator thing in December where Stosneyder and his group were here. They beat him up pretty good on this overall risk perspective thing. I think that the next time they are in, there will be a much more coherent response to that question. I don't think they were really prepared to address it at that time. So, I think they will probably need some time before they

are really ready to address your questions from that point of view. But, they have certainly been made aware that the Committee is interested in that question.

MR. CATTON: They have published a NUREG on this issue.

MR. SHACK: This particular task group was what I meant. I think the ingredients are all there probably.

MR. CATTON: So, what you are saying is this particular task group doesn't read NUREGs?

MR. SHACK: Well, they have to get themselves up to speed.

MR. CATTON: I see.

MR. SEALE: But they did get worked over pretty well on a risk-basis approach.

MR. CATTON: Good.

MR. LEWIS: I admire your optimism in thinking that that will result in an improvement.

MR. SEALE: I didn't say that. I said they got worked over.

[Laughter.]

MR. CARROLL: But he is new.

MR. KRESS: It takes a while to become cynical.

MR. WILKINS: You start out believing that when you say something that it will produce an instantaneous response and improvement.

MR. CATTON: It doesn't have to be instantaneous, there could be some time delay. The problem is the time delay approaches infinity.

MR. DAVIS: Incidentally, Mr. Chairman, while we are on this risk-based regulation issue, I guess we are on it -- we were told last fall I believe by Ashook Thadani that the Agency was preparing a memo that was going to be signed by all of the division directors on risk-based regulations, as I recall, and it was supposed to have been completed by the end of the year. I am wondering what the status of that is. I think we would all be very interested in that. Maybe that would be the subject of a future presentation or if we could get a copy of the letter. You recall what I am talking about?

MR. WILKINS: Yes, I know what you are talking about. It is a fact that we have a meeting scheduled with Mr. Sniezak tomorrow morning. That might be an appropriate question to direct to him at that time.

MR. DAVIS: Very good.

MR. WILKINS: I don't know whether he will be prepared to answer it because we haven't alerted him to the fact that we will be asking him.

MR. LEWIS: He does have a good point. It keeps coming up.

MR. CARROLL: In the last issue of ANS News, or

whatever it is, they published the ANS Policy Statement on Risk-Based Regulation, which I gave to Sam this morning to make copies of for all of you. It is very well written. I liked it. Except they said PSA.

MR. WILKINS: Well, the ANS calls itself an international organizational these days. We don't know yet.

MR. CARROLL: Maybe if we take the break it will be here.

MR. WILKINS: Yes. Why don't we take our 15-minute break now rather than later? Is that legal?

MR. LEWIS: Is this a scheduled break?

MR. WILKINS: The break isn't scheduled until a quarter till 11:00. Since I assume you gentlemen all look at the agenda and you have got your bladders planned for a quarter till 11:00 -- programmed.

MR. SHACK: We had a Subcommittee meeting in December to review the steam generator task action plan. It was really, in this case, directed by the fact that the utilities are having a severe problem with their steam generators, vast instances of cracking. Based on essentially, the conventional Reg Guide wisdom that you have to plug a steam generator tube every time a crack approaches 40 percent through a wall, you would end up plugging huge numbers of these tubes and essentially you would have non-functional steam generators very rapidly under those

conditions.

Now, it turns out that the cracking that is occurring is a very special sort of instance where the cracks, although they can be in fact through a wall, are very short and don't lead to significant leakage, don't lead to particularly higher risks of steam generator tube ruptures. That is because the cracks are so short the actual structural integrity of the tube is not particularly degraded by these short cracks, so that there is an attempt to develop an alternate plugging criteria, different from that in the current Reg Guide, which is based on this 40 percent through-wall limit.

And this plugging criteria is -- in fact, the NRC has tried to develop a more mechanistic one based on crack length and such. It turns out that it is very difficult to do that. And the industry has proposed and NRR is about to accept an interim plugging criteria based on a purely empirical measure -- a voltage limit off of essentially an eddy current measurement. What they have essentially is an empirical correlation that this voltage is a measure of some sort of integrated crack ability in this thing, so that there was discussion of the nature of this interim plugging criteria that they have developed.

Now, what happened I think at the Subcommittee meeting was they were basically here to discuss that interim

plugging criteria in some detail. They were not prepared to sort of discuss what this meant in the larger context of risk-based analysis of the steam generator incident. They were focused on a very specific question, which was important to them because they have essentially immediate response to a number of licensees who have these steam generator problems.

MR. CARROLL: I wouldn't call it immediate response, Bill. It has been on their plate for a couple of years.

MR. SHACK: Well, the licensees would like an immediate response. NRR responses in NRC time. But, they are proceeding in what is for them a timely fashion.

MR. SEALE: It would be worth pointing out that they did acknowledge that there are in fact cases where there have been steam generator rupture events, where significant leakage has occurred. But, these are a different kind of leak, a different length of leak, and generally they occur at other locations than the location of these short length breaks or the basis for this voltage rule. So, the voltage rule has a -- or the empirical criterion has a location in the tube requirement on it that specifically that rule or that criterion applies down in the tube sheet range, but not say in the bow or places like that where the Palo Verde type fish mouth occurred. So, it is

not a carte blanche rule on voltage. It is quite selective with regard to where it happens or what part of the tube the measurement is made.

MR. KRESS: I will tell you what bothered me most about the interim plugging rule. It is the general principle that you write a regulation or a rule that has in it criteria that is specific for a given instrument.

MR. SEALE: Yes.

MR. KRESS: That really bothered me. I don't think rules should be written that way. I agree with the approach. What they should do is just say we will have a rule on burse pressure, and the burse pressure we will allow will be this. And then you measure that by -- we will give you guidance. You may use this type of instrument. If it has a voltage reading of this, we will accept that as the burse pressure, or you may use some other means, if you can justify it. That is what bothered me most about the rule.

MR. SHACK: I think they did believe that they said when they wrote the rule that it was going to focus on a broader measure, like structural integrity and would not include the voltage-based measurements. That was strictly a way of demonstrating structural integrity. But, the rule was really focused on structural integrity.

What they did have was a draft -- a NUREG that really discussed the NRC version of this interim plugging

criterion. They were responding to industry comments on that NUREG. They were fairly polite in the meeting. The letters I think had stronger disagreements. They seem to be coming to closure on this interim plugging criteria. So, they would have some sort of basis that they would proceed for the interim plugging criteria.

In the larger context, there is a task group that looks at the overall steam generator degradation problem that has a longer time span and I think will address these larger issues of the whole risk basis for steam generator degradation and what that really means in a larger context. That one they were very weak in responding to at the Subcommittee meeting. They were really focused on their interim plugging criteria, and getting that into action. I think, from the industry's point of view they are probably almost more concerned with that than they are with the larger question. But, the overall steam generator task action plan will discuss this larger issue of, as Bob mentioned, the divulge requirement is for a very specific kind of degradation, and that is where -- part of what they are looking at is -- the industry and NRR seem to be agreeing that you have to assess this degradation almost on a phenomenon by phenomenon basis. That is, 40 percent plugging makes -- or a 40 percent criterion is sensible if you have uniform wastage, which was what the rule was really

designed to consider back in the early '70s. It makes no sense for this kind of very short cracking in the tube support plate, which is the kind of phenomena that they have today. So, they are looking at some way to integrate this whole degradation management thing that recognizes that different forms of degradation will have different specific criteria rather than what they have now which is this 40 percent plugging which is supposed to apply to all mechanisms and everybody agrees is no longer applicable.

MR. CATTON: Will the measuring devices -- can they distinguish between the different types?

MR. SHACK: Yes. Although, again, the people at the Subcommittee meeting were asked that question and they did not give a particularly responsive -- part of the way that they will do that is that you will simply have to pull a number of tubes and verify that the mechanism that you are discussing is measurable -- is the mechanism that we are talking about -- that is, that there are short cracks in the vicinity of the tube generator support plate.

Part of the debate over the NUREG is how many of these tube pools do you do?

MR. CATTON: I gather there is not a lot of faith in the ability to distinguish the kinds of insults to the tubes?

MR. SHACK: Well, you know, the faith is in the

eye of the beholder. Come people have considerably more faith than others do. So, the question of how many tubes you have to pull to support that faith I think is one of the major issues that remains to be resolved between industry and NRR in the NUREG.

MR. SEALE: Conversion is a personal decision.

MR. CATTON: I would have hoped that it would be a little tighter than that.

MR. SEALE: Well, there is quite a bit of debate on how many tubes you have to sacrifice in order to essentially confirm that you are measuring what you thought you were measuring.

MR. SHACK: It is this ouija board think that you that you know, you are looking at these eddy current signals and you are looking at a particular interpretation of these eddy current signals, and you will find an eddy current expert who tells you that this is characteristic of this kind of degradation.

MR. CATTON: And another one who says it is not.

MR. SHACK: And, yes, other people who are more -- you know -- you have looked at a database of 200 pooled tubes worldwide to build this thing. Well, of course, the population of tubes out there is really several million. Is 200 a representative database? We obviously have different answers to that. I think they are coming to closure. At

least we will have an interim plugging criteria that will come back to the Committee fairly soon.

MR. SEALE: And hopefully it will be physically based.

MR. SHACK: Well, the interim plugging criteria won't. The regulation eventually will be.

MR. CARROLL: Now, there is no new data since we heard about this a year or so ago? Nobody has found a case where all of these short cracks link up and a big plug blows out or anything of that sort?

MR. SHACK: No. Apparently they did make some more data available on leak rates through these cracks that were making the NRR people happier with the notion -- the -- one other one of the very controversial issues in the NUREG was how you were going to actually compute leak rates. The NUREG had a very conservative way to do that -- the draft NUREG did. There seems to be some agreement now that there is sufficient data that they will back off to a certain degree, which was unspecified at the meeting, to a somewhat less conservative approach to computing those leak rates; however, that was not defined. As I say, there does seem to be some merging though.

MR. WILKINS: Is there any action that the Full Committee ought to take as a result of the Subcommittee activities?

MR. SHACK: I don't think so. They are going to come back to us in the February time span. That is, at the moment, I think there is probably more disagreement within the staff over how this -- you know, this particular NUREG, this short-term problem should be addressed for the interim plugging criteria.

The schedule we got was that by the end of this month NRR was supposed to have a coherent internal position. I think what we felt was that they would then come back and present to the Committee that position and, at that point, we would be prepared to respond. They are still working on getting their own ducks in order.

MR. LINDBLAD: Theoretically at least, after NRR does something, does it have to go through CRGR or whatever?

MR. SHACK: Yes.

MR. WILKINS: Any questions that any members of the Committee have?

MR. CARROLL: In the meantime, utilities are plugging tubes that don't need to be plugged and going down a river of no return.

MR. WILKINS: I don't know anything at all about steam generators, except from a theoretical, thermodynamic point of view. How many tubes can you plug -- or what fraction of the tubes can you plug before you don't have a steam generator anymore?

MR. DAVIS: 10 percent.

MR. CARROLL: There is usually a 10 percent margin before you have to de-rate the plant. Then you can de-rate the plant.

MR. CATTON: I guess then you could order it right down to zero?

MR. SHACK: Yes.

MR. SEALE: Yes.

MR. SHACK: But, derating the plant is obviously a step that is extraordinarily painful.

MR. WILKINS: I would think, if I were running a plant, I wouldn't want to derate it at all. I might be compelled to, but I certainly wouldn't want to.

MR. CARROLL: Well, a lot of people derate intentionally to stretch a fuel cycle out to an appropriate time to take an outage.

MR. WILKINS: All right. Now I have got a reason to do it. Now I have got some benefits to achieve from it.

MR. SEALE: In fact, there is a lot of soul-searching going on right now about reducing hotleg temperatures, which effectively derates the plant in order to extend steam generator tube life.

MR. CATTON: Well, the AP-600 just did that in their design.

MR. SEALE: Well, I mean in operating plants.

MR. CATTON: They also upped their power.

MR. CARROLL: Palo Verde is running at 85 percent.

MR. SEALE: Unit 2 is running at 85 percent specifically for that purpose.

MR. SHACK: Again, they are approving these interim plugging criteria on a plant-by-plant basis, even now. I think one of the things that they were facing is that they think -- I believe the numbers were something like perhaps 20 to 25 utilities would be coming in over the next few years asking for relief. Well, obviously, they don't want to be doing this on a case-by-case basis, it is just simply too extraordinarily intensive in man hours. So, the staff has an incentive to get this interim plugging criteria into place, as well as the utilities, who sort of don't want to plug up tubes when they don't have to.

MR. WILKINS: Okay. Thank you for that report.

MR. SEALE: If we have got a minute, could I raise a question which is very closely related to this?

MR. WILKINS: Go ahead.

MR. SEALE: We have something called the individual plant assignments or identifications that supposedly members of this Committee have. There are a few plants which do have some specific things like, for example, Hal, you are the Palo Verde person as I understand -- would it be appropriate -- you know, I really don't know -- would

it be appropriate to try to get a more specific understanding off chapter and verse of what has happened in that particular instance for -- by the appropriate member of the Committee so that we would understand that problem perhaps in greater detail? And how do we do that vis-a-vis the plant representatives and so on so that we are not getting ourselves out of joint with NRR and so on?

MR. WILKINS: I don't know how to answer your question, let me put it that way.

MR. CATTON: Ernest, we have done it. We have done it.

MR. CARROLL: Hal is Chairman, or Hal is having -- that plant invited Ivan and I to go with him a couple of years ago.

MR. LEWIS: Right.

MR. CARROLL: We went and visited Palo Verde and had a very good day.

MR. CATTON: We also did it with San Onofre.

MR. CARROLL: And we also visited Trojan, and we visited Diablo.

MR. WILKINS: Let me try to address Bob's question by sharpening it up a little bit. What steps need to be taken by a member of this Committee, who wishes to exercise his responsibility as the Cognizant member of the Committee for a particular plant, if he wishes to visit the plant?

What did you guys do?

MR. LEWIS: We just told the staff.

MR. CATTON: We told the staff guy whose name is associated with that plant.

MR. WILKINS: The ACRS staff guy?

MR. CATTON: Yes.

MR. WILKINS: All right.

MR. CATTON: And then that person takes care of -- he makes the appropriate arrangements.

MR. LEWIS: The NRC staff.

MR. CARROLL: And the region.

MR. CATTON: He lets them all know what we are coming and then we do it.

MR. LEWIS: It is a tricky number.

MR. CARROLL: Now, the one thing that I guess we have observed when we have gone to these is that the plants put in an enormous amount of effort to prepare for the agenda that we give them. I wish that we could discourage that. I would just as soon have some off-the-cuff answers. When we went to Trojan, they had worked all weekend --

MR. WILKINS: And they put together a real dog and pony show.

MR. CARROLL: And a couple of casual things -- how is the hot particle thing going -- hell, they had a three-hour tutorial on the subject. I didn't need that.

MR. CATTON: Well, for some of us, that is okay.

MR. DAVIS: And needed.

MR. CARROLL: That is just a caution.

MR. WILKINS: Jay is calling attention to an issue that has concerned me too. I have been a little reluctant to go charging say up to Vogtle, which is right in my backyard.

MR. CARROLL: First you better learn how to pronounce it -- Vogtle.

MR. WILKINS: I don't even know how to pronounce it.

[Laughter.]

MR. LEWIS: I think that Bob has raised another class of questions which I think we might want to consider, and that is that we have usually, for specific issues, like the ones we are talking about here, we have usually used the issue-oriented Subcommittee of the Committee to follow that up, even if it involves going to a specific plant, and we have used the individual associations as fairly casual efforts to keep some members of the Committee cognizant of what is going on in a particular plant. We used to have an individual for each plant, and it made no sense at all. I think that that was directed more at the idea that, if there were a major event, it would be nice to have somebody know what the plant was like. So, the issue of substance-

oriented subcommittees, versus individual assignments -- there is a sort of fuzzy breakdown. The individual assignments were usually not used in a trouble-shooting mode. That is I think what you were raising in the question.

MR. SEALE: Well, in particular, the Palo Verde situation is that the thing we are talking about here on the steam generator tubes generally aren't addressed at the fish mouth problem, which is what they had --

MR. LEWIS: Yes.

MR. SEALE: -- and which is likely to affect all three units there, or will possibly affect all of them.

MR. LEWIS: No, I understand that. What I am saying is that typically, in order to follow that up at a particular plant, I think the history of the Committee, you know, you can do it anyway you like -- the history of the Committee would be to follow it up through the substance-oriented subcommittee, which would be this particular one -- your subcommittee. But, as Jay and Ivan have said, you know, when we visited these three plants, we simply collected people to go along and do it. I would love to shovel the responsibility to these people. This one could be followed up either through your Subcommittee or through the individuals or by combining them. All one has to do is tell our staff to arrange it with the NRC staff and, poof,

there you go.

MR. WYLIE: Ernest, I am Chairman of the Adopt A Plant Subcommittee. I started some guidelines several years ago. We had some objection by some of the Committee members that they didn't need the guidelines -- they are no longer here. I will try to put something together for you at the next Committee meeting.

MR. WILKINS: Well, I think that would be useful, Charlie. We have -- in fact, when I look around the table and realize that -- excuse me -- when I look around the table and realize how senior I am on this Committee, I get disturbed, because I haven't really participated in this Adopt A Plant Program. You may have, and Hal may have, and Ivan and Jay may have. As a matter of fact, you folks have, but the rest of us haven't, and we could appreciate -- we would appreciate some assistance along those lines.

MR. WYLIE: I will put that together and pass it around and get the idea. It wasn't to instruct the Committee member on what he should do, it was basically the procedure that you went through to set the thing up to keep out of trouble with NRR and the regions and so forth.

MR. CARROLL: Now, there is another part of this which I guess most of us or we all understand, and that is when you adopt a plant, you also automatically get all of the licensing correspondence on that plant.

MR. CATTON: That can be a headache.

MR. CARROLL: Or a benefit. I mean, it doesn't take me very long to say I am not interested in this and toss it.

MR. WILKINS: Well, I can read that and say, oh yes, they are changing this tech spec this way, thank you, zip.

MR. CARROLL: Once in a while I will see something.

MR. CATTON: It is a curious way of signing up adopted plants. Now we have a lot of stuff to do this time.

MR. CARROLL: Well, but I will occasionally see something that is of great interest, or flag something.

MR. LEWIS: Some people's interest span is wider than others.

MR. KRESS: When you adopt a plant, are you also adopting that particular utility?

MR. CARROLL: No.

MR. WILKINS: No. I am not sure I understand the thrust of your question, but the answer is no.

MR. CATTON: I deliberately chose the Northeast Utility's plants because at one site they have three different kinds of plants. Millstone I and II are different and III. They are all different. It is a nice place to visit. You see everything.

MR. WILKINS: El reminds me that it is possible to visit these plants when they are involved in a full emergency exercise.

MR. CARROLL: Or a refueling outage.

MR. WILKINS: Or a refueling outage. There are a number of good times to visit these things. In fact, we have occasionally chided the staff because we don't know about these emergency exercises. From time to time I get information and it is generally too late for me to decide to go do something.

MR. CATTON: They are not very helpful in how they schedule these things.

MR. WILKINS: Well, they don't take our convenience into consideration, and I am not sure they should. But, these are also things for you to keep in mind.

MR. CARROLL: Anyway, Bob didn't really get his question answered -- a very specific question. He thinks somebody ought to go to Palo Verde and find out what is going on.

MR. LEWIS: That is what he was saying.

MR. CARROLL: I am sure Dr. Lewis would be very happy to arrange for Seale to go.

MR. LEWIS: I think that would be a splendid idea. It is a long trip for him you understand.

MR. CARROLL: Yes.

MR. WILKINS: But, not as long as it would be for me, so --

MR. SEALE: I don't know. Three hours is a long time.

MR. WILKINS: I am just wondering -- I think we -- Ivan, are you willing or prepared to give us a brief report on the thermal hydraulics?

MR. CATTON: Yes. We have got 20 minutes until we break.

MR. WILKINS: Yes.

MR. CATTON: I think that will be more than enough time.

MR. WILKINS: All right.

MR. CATTON: The Thermal Hydraulics Subcommittee met Tuesday and most of Wednesday in its continuing review of RELAP5 Mod 3.01 or 1.1. The meeting was very good. We had been quite concerned about the ability of a code like RELAP5 to yield simulation of plants like the AP-600. In particular, have were several areas. One was the IRWST modeling, also the CMT. The meeting was --

MR. WILKINS: Excuse me, Ivan. Do you guys know what all of that jargon is?

MR. CATTON: Yes. It is the IRWST, I think is the --

MR. DAVIS: In-Reactor Water Storage.

MR. CATTON: Well, RW is Reactor Water Storage Tank. What the I stands for, I don't know.

MR. CARROLL: In-Containment.

MR. CATTON: In-Containment. Okay. The CMT is this big tank that drains into the system following a leak of some kind or another. Well, in order to model these things, there are a number of problems. This is where the basic differences occur between the new advanced plant and the old plants. The codes were never written with these kinds of things in mind. As a result, there is some physical phenomena that just wasn't treated very well.

We have had a problem in the review in the past. The reason is that documentation is just not available. We got caught up in a push-pull where you are sent the documentation, you read the documentation, you hear a presentation, and things are really very different. And then when you push -- start pressing the buttons while it turns out that this particular aspect of the code, it really hasn't been documented yet. Well, that is because we have got documentation that is vintage 1990, '91 or something. We have been assured that all of this is changing. I think it is changing as a result of our pushing. I have seen significant changes in several areas.

In the past there has always been the view I have got a code, the code is good, I don't need to do anything to

it. That has really changed. The two areas are this IRWST modeling. Here the problem was trying to model stratified flow with a finite difference code for very coarse nodalization. And not only is it finite difference, it is one-dimensional. You just really can't do it. Well, they have come around.

They now have a person from Idaho who is developing what appears to me to be very sensible models of this process. I think that his efforts, at this point, are bit elementary would be a nice way to put it, but he is on the right track. They have not or will not admit, at this point, that this is the model they will use. They still want to do it using one-dimensional finite difference code, and they don't accept the fact that that is not going to work. But, we have hope, because there will be a back-up model.

In the CMT the problems were different. What happened in the operation is that initially there is a recirculation of the cold water in the CMT and the hot water that is in the reactor primary system. This hot water bleeds into the top of the CMT. So, what you have is a layer of hot water overlaying a layer of cold water. Now, the diffusion of energy between the two is very low, so the -- you really do have a rather well-defined line between the two regions. They need to know where that is, because when

the ADS system operates, the hot fluid flashes. And, if you are going to model the thing right, you have got to know where it is, and that means level tracking. They don't know what to do about the tracking of this particular kind of level, which is the cold water level.

There are other problems because small break LOCA, and a lot of what goes on in the AP-600 are processes that are very slow on a relative basis, and relative, I mean relative to the large break LOCA. They are almost at a stop. They are quasi-steady. When that happens you get a lot of pipes that are going to be half full of water, and the surface is extremely well-defined. You need to have a way to track that surface. The way the codes are presently written, they won't do that. You have a one-dimensional code; and when it is a horizontal pipe, that whole node is full with fluid. It may have some void fraction. This is difficult, but they are it appears attempting to develop techniques to do it. I don't know how quickly they will be successful.

At the March meeting in Idaho we had a lot of difficulty with people who just really didn't understand the physical processes. In particular, one of the areas was film condensation. Now, again, in a large break LOCA, film condensation is relatively unimportant. And where it is important, you can kind of ignore it, because that part of

the transient is gone very quickly. It is not the case particularly in the CMT, for example, when you are injecting steam into the system, and you have got cold water and cold surfaces. They had a model, but it -- the model that they described in Idaho was hung on to the structure of RELAP5 which uses what they call two-fluid modeling. As a result, the model really just wasn't any good.

Well, they have found a man named Joe Kelly. This guy is really super. It is the first time in a number of years I think that we have had somebody from research in this area stand up in front of us and talk like he really knew what he was doing. He has laid out an approach for dealing with it that I think is probably one of the best treatments of film condensation I have seen here or elsewhere in a number of years. He really did a good job.

The modeling that he -- and he has a difficult task because the two-fluid modeling is used in these codes doesn't extend to the pipe wall. So, they are always stuck with correlations that are based on some overall gross characteristics and trying to take that apart and put it into a two-fluid model. He has come up with a really sensible way of doing that. It was really a pleasure to listen to him. So, both the IRWST and the CMT modeling are being dealt with.

We had a little bit of difficulty with some of the

ways they do business. In the early CMT modeling they just pulled some natural convection correlations out of the air, so you have a surface where condensation is occurring, and they used natural convection based on liquid on the bottom, and natural convection based on steam characteristics on the top. Well, in the circumstance where you are condensing on the top of -- from the top on a layer of water, you have no convection below the surface because it is stably stratified. And you have got to treat it some other way. Well, we sort of got -- I am not sure we convinced them that that was the case, but they are doing something about it.

All in all it was a good meeting. We were assured by some of the Idaho people that they had taken the lesson of the March meeting to heart, and that they realized that a lot of the people who were put before us are really code people. Code people don't understand or don't deal enough with the physical processes that they are at ease with them or even understand them. As a result, when a question is asked as to why do you do it this way, they can't answer it. What that leads you into is a very uncomfortable feeling about the use of the code. The people that put the code together weren't that way. That is a long time ago. We were assured that this is changing.

There were a number of people who were at the meeting: Pete, Bob, Ernest and Tom. Do you want to add to

my comments?

MR. DAVIS: I would like to.

MR. KRESS: I certainly agree with you on the staff, Joe Kelly, being a really bright spot in that whole meeting.

MR. DAVIS: I am concerned that they are not going to be able to get all of this work done on time to service the AP-600 design certification schedule. They are talking about having to have this completed by summer -- these new models -- and I just don't think they are going to be able to do it, particularly in view of the budget cut that Brian has had to assume. He is going to have to make some decisions about what to do. I guess I am a little encouraged by the very extensive experimental program that is going on in support of the AP-600. That may be the thing that will have to be relied on to assure ourselves that the design is adequate.

I was personally surprised when Brian said that RELAP is not a large break code, because that in fact was what it was started out to be. As Ivan said, some of these small break, and very slow transients require different things that a one-dimensional code cannot do. They are trying to make it now adequate to do those things. I think they are going to have a lot of trouble.

MR. CATTON: Well, there is a history behind the

choice of RELAP5 as a small break LOCA code. At the outset there was kind of a competition between three codes. There was one at Brookhaven, there was Track and RELAP5. It got to the point where NRC was going to choose one of the codes. The Brookhaven one lost totally, Thor or something -- Track One, and they were going to get rid of RELAP5. The ACRS, through Milt Plesset at the time, suggested that they should keep RELAP5. In particular, it was the code that was most tested against actual plants, namely the loft. They exercised the hell out of that code, because every experiment they were going to run on loft they had to run their safety evaluation. RELAP5 -- and you know this, Ernest -- RELAP5 was the code. So, the feeling at that time was that you ought to keep RELAP5 because part of what makes these codes good is people knowing how to use them. RELAP5 was certainly being exercised.

Somewhere along the line, changes were made. There is a problem with the finite difference point of view. I mean, you have to somehow lay over these things an analytical way of doing business, and reflood is one of them. They got all caught up in how you treat where the quench front is and a bunch of other things, so it really didn't do a very good job when they tried to predict reflood from a large break LOCA.

Well, Research decided to get out of the arguments

about how bad RELAP5 was by saying okay, Track is a large break code, and RELAP5 is a small break code. I don't think the people at Idaho or the rest of the world ever fully accepted that because RELAP5 has basically the same package that Track does. But, that as a choice made by Research. The Germans use it as a reflood code, and so do the Japanese.

MR. SEALE: There is one other aspect that came out yesterday in some of the discussions. It goes back to this problem that the people who are the care and feeders of the code now are computer analysts rather than people who understand the processes -- and that is that when one questions any particular segment of the procedure, there is a tendency to defend the validity of what is done with uniform vehemence. Clearly, there are compromises that are made in some cases in the treatment, and hopefully that compromise reflects the fact that the thing that has been compromised is a never mind -- that is it is something that is really not significant in the overall analysis. The difficulty you have is that when the defender stakes his life on the validity of the approach, rather than on the fact that what I am calculating is not a very important number, it gives us a real problem, because we know the approach is really not the way it ought to be done.

I hope yesterday in the discussions -- and it is

certainly one of the few things that could help them work effectively within the limited resource problem that they have -- I hope that one of the things that came out of it was an understanding, on their part, that they ought to come clean on these cases. They ought to just tell us that we believe this is good enough for the particular problem for the following reasons. It is clearly not the best analysis, and go from there. But, that is the nature of some of the difficulty that really we have had in March and in some parts of the meeting yesterday as well.

MR. CATTON: I don't know that we fully got that point across.

MR. SEALE: Well, I hope -- yes -- that is something to look for I think in the next few stages of this process.

MR. CARROLL: How does the Thadani Task Force fit into all of this?

MR. CATTON: The Thadani Task Force, as I understand it, was brought together because Neal Tadreas, who is the head of the NSRRC, said you guys had better address the questions that are coming up about your codes, because if you don't do it here, you are going to get to do it later at hearings. I am assuming that this was -- at least that is the feeling I got. The report I believe was given to Beckjord last week.

MR. CARROLL: So, the Thadani Task Force has completed its work?

MR. CATTON: Yes. We do not have a copy yet.

MR. BOEHNERT: Yes. They said they had to see about making further distributions. I guess we may have to push a little bit.

MR. CATTON: I don't know why we can't ask for it.

MR. WILKINS: If you run into any resistance, let me know and we will try to use a different route.

MR. CATTON: Well, we have been told we can have anything we want.

MR. WILKINS: In principle, I am prepared to go all the way to Selin to make sure we get everything we want.

MR. CARROLL: Failing that, we have got the Freedom of Information Act.

[Laughter.]

MR. WYLIE: Wouldn't that be a kick in the air.

MR. CATTON: It will be very interesting to see -- you know, and particular, because Thadani was the Chairman of that Committee and Thadani is the one who needs to have the capability. So, I would expect he is very concerned about the timeliness of things.

MR. CARROLL: He is probably also the point man in terms of the hearing.

MR. CATTON: That's right. And he fully

understands that. That makes what Bob was saying all the more important. When they put those natural convection correlations up there for treating condensation, this is just -- I mean, I would float somebody in the lowest level heat transfer course for doing something like that. Now, it is probably relatively unimportant. But, if that guy can't get up there and tell you why it is relatively unimportant, and if he can't defend its unimportance, what the hell is he going to do in a hearing?

MR. SEALE: That is right.

MR. CATTON: The lawyers will kill him.

MR. SEALE: That's right.

MR. CATTON: I think a lot of the direction that we have been taking is just that.

MR. CARROLL: You see a lot of that come through on that table that was attached to the Thadani stuff we got, where they consider ACRS consultant so and so's comment of low priority because the answer isn't really very important.

MR. CATTON: They need to give the next sentence. And without the why, they may well be right. Because when you sit back here and he puts the thing up there, you see that the correlation is absolutely inappropriate. I mean, it is just wrong. Well, if it really doesn't matter -- well, first, why can't they use the right correlation? It take about the same amount of computer time to do that. It

takes a guy with just a little bit of knowledge to pick the right correlation.

MR. WILKINS: And it is just as easy to program.

MR. CATTON: That's right. Well, it takes probably six months to program that correlation. We will accept that. At least tell us why it doesn't matter.

MR. KRESS: A lot of the times though their assessment of the importance of it is made by using the code that has the wrong correlation in it.

MR. CATTON: And what they don't seem to understand is that when you have an interface and there is a process on either side of the interface and one of them dominates, the other one doesn't matter. But, what about the next set of circumstances where they are using this general heat transfer package and it does matter? So, unless you picked the right problem to look at, you don't know whether you have demonstrated it doesn't matter. All you have demonstrated is that for that particular circumstance it doesn't matter.

I mean, they use the comparisons with George Bankhoff's tests, where he actually had a flow of water in a bottom of a chamber and steam and he would watch the condensation on the surface. Well, they used -- they did a calculation for that using RELAP five and the answers look reasonably okay. But, they used a ditasfelter correlation

in order to get the heat transfer coefficient. The ditasfelter correlation is not correct. It is for a pipe.

MR. KRESS: It is not even relevant.

MR. CATTON: Yet, because it is so built into codes like RELAP5 or Track, it is used for everything. It is just fortunate that, in a number of circumstances, like a thick-walled pipe, the pipe thermal characteristics are what dominate the process so it doesn't matter what you use. So, you have got all of these cases where it really doesn't matter. Now you look at one where it might --

MR. WILKINS: And they don't have a leg to stand on.

MR. CATTON: That's right. And the thing is that most of the problems that are chosen it just happens not to matter.

Anyway, I thought it was a very good meeting.

MR. WILKINS: Let me say that I attended most of this meeting and I was impressed by the give and take between the contractor personnel and also this Mr. Kelly, who I have referred to from NRR -- no, he is RES -- and our consultants and members of the Subcommittee. It was a much more constructive kind of interaction than I observed in Idaho Falls in March. That is a real positive step forward. From a philosophical point of view, I always wonder about the appropriateness of the ACRS trying to micro-manage the

activities of Research. But, this is an area where, as Ivan has said, we have pushed -- he has pushed, the Subcommittee has pushed very hard, and there are starting to be some results that are definitely positive and definitely beneficial to the program.

I think I am going to call a break. We will resume at 11:00 o'clock.

[Recess.]

MR. WILKINS: Will the Committee members, please take their seats?

All right. Let's reconvene the session.

The next agenda item is to hear a discussion of the public workshop on license renewal, and Mr. Lindblad is the cognizant Subcommittee Chairman.

MR. LINDBLAD: This is a briefing, as the agenda indicates. While we don't anticipate a need for a letter from the Committee, it's very possible that in the course of Mr. Newberry's presentation we'll find reason to. But we're not going into it with the thought that a letter is required at this point.

The meeting was held about six months ago and Scott has prepared a presentation that deals with the comments and the views of the staff with regard to this. And I'll turn it over to Mr. Newberry.

MR. NEWBERRY: Okay. Thank you, Mr. Lindblad.

Good morning. My name is Scott Newberry. I'm the Director of the License Renewal Project Directorate in NNR.

What I'd like to cover today is a summary of the more significant comments that we received at our workshop, as well as the activities that have occurred since the workshop. The most significant of which are the proposals that we recently made to the Commission in SECY-93-331 in early December.

The SECY paper addresses how we think considerably more credit should be given for existing programs and plants and specifically recommends how we could better integrate the maintenance rule directly into the license renewal rule.

I want to point out here before I get into the presentation that the SECY paper 331 does include in an attachment specific rulemaking language that we have recommended as a starting point for moving towards proposed rulemaking.

I hadn't -- I don't plan on specifically in my remarks getting into the particular words in that rulemaking. We can, if you have questions. But the way I have set up the presentation is to really talk about the key issues that are pertinent for the approach that we're recommending to the Commission.

I'll try to emphasize progress since we last talked and, of course, the changes that we've made since we

last talked. I'll try to stay away from the jargon. I think we have a habit of moving into jargon here in license renewal with many acronyms. And please stop me -- I know you will, if I say something you don't understand.

Most of my comments pertain to what's happened since we last talked, but I just have one brief viewgraph on background.

Since the rule became effective, of course you're aware as the staff and industry started to gain implementation experience with it, we received considerable comments from the industry that without at least more implementation guidance the process was simply too burdensome and was not really sufficiently stable or predictable to proceed with an application.

So about a year ago, a little more than a year ago, an NRC senior staff management review of the rule and the process was undertaken and two SECY papers with recommendations were developed last Spring, 049 and 113, which contain implementation approaches which we thought could make the rule more workable.

Now within the language of the existing rule the approach recommended in those papers attempted to lighten the burden by giving more credit to existing programs within the context of the current rule.

That credit was you still had a broad definition

of what was considered to be age-related degradation unique to license renewal, a term I'll use considerably today. But the credit was given in the context of discussing the necessary content and the application for these effective programs that would be required by the rule.

We developed those approaches and met with you several times earlier last year to discuss them. Of course, you responded with your letters.

Now, potential renewal applicants and industry and, of course, the Committee, after those presentations and approaches in the SECY papers, I think still had rather substantial concerns regarding the amount of documentation even with revised approaches that would be drawn into the regulatory process, change control systems, things of that nature.

As a matter of fact, looking back at your June 18 letter, you offered that much more could be done to reduce the necessary scope of license renewal review by giving full credit to maintenance programs currently in place at plants during the initial term of the license and that the rule should be changed.

You recommended specifically that the rule should be changed to permit the staff to recognize these programs.

So, that was in June. Later in June we did receive an SRM from the Commission directing us to conduct a

workshop with a special emphasis of how best to take advantage of existing programs.

And so, I'll move on and get into the workshop.

The License Renewal Workshop was held in September and was attended by more than 180 representatives of the nuclear industry, engineering and consulting firms, federal and state agencies and a few public interest groups.

Those who accepted our invitation to make actual presentations included representatives from the Department of Energy, NUMARC, Yankee Atomic Electric Company -- and Yankee Atomic. Written comments were received from these organizations as well as others; Ohio Citizens for Responsible Energy and Virginia Power Company.

Copies of the workshop transcript and these written comments have been provided to the Commission and the Committee, I believe, and were also made available to the public.

All presenters -- all presenters and commenters at the workshop indicated that the rule needed to be changed.

DOE and industry organizations all indicated the need to simplify the rule; to place more explicit reliance on existing licensee programs, and particularly on programs which are required as a result of the maintenance rule.

They argued that the existing programs and the current NRC regulatory process, as enhanced by the

maintenance rule, already focused on ensuring functionality of important structures and components. That these programs, if simply continued into the renewal period -- because they were continued into the renewal period, that as a result, specific technical evaluations for this equipment shouldn't be required to support an agency license renewal decision.

Let me get into a little bit of the substance, at least in a general way, of the comments at the workshop.

So to accomplish this objective, the Department of Energy and NUMARC recommended a retention of the integrated plan assessment methodology in the rule and the concept of age-related degradation unique to license renewal.

I'll talk about that more -- ARDUTLR. The definition of what ARDUTLR is and is not, however, would be significantly changed. The new definition would be used to establish a license renewal review focus on a certain set of long-lived passive structures and components and on other structures and components whose importance to license renewal -- having important license renewal functions, as defined in the rule, would not be assured by existing programs or the maintenance rule implementation requirements.

Specifically, the proposal would establish via the rule -- via rulemaking, that except for these certain long-

lived passive structures and components all structures and components subject to the maintenance rule -- all structures and components subject to the maintenance rule would not, cannot be subject to age-related degradation unique to license renewal.

Since the staff recommendations for proceeding with rulemaking are quite similar to this NUMARC proposal, I'll explain this in more detail in a few minutes by including some of the differences that have been identified between our approach and the NUMARC proposal.

I'll mention a couple of the other important comments from the workshop, but in contrast to the NUMARC approach, to their proposal, Yankee Atomic and Virginia Power recommended that the term ARDUTLR be eliminated altogether. They believe that the term is an obstacle to establishing a simple straightforward license renewal process. They viewed it as a confusing term and it simply does not account for the fact that aging is a continuous process regardless of time and does not have any unique characteristics in the renewal term as opposed to the initial operating term.

Yankee Atomic's proposal would also eliminate the integrated plan assessment methodology currently in the rule, and their revised rule would establish a requirement for review of programs applicable to the reactor vessel

containment -- you know, specific important structures and other long-lived equipment to ensure that their functions would be reasonably assured in the renewal term.

Yankee's proposal would also include the evaluation of all time limited exemptions and time limited analytical assumptions which are a part of a plant's current licensing basis.

MR. CARROLL: What does that mean, Scott, time limited?

MR. NEWBERRY: Time limited means -- I've got viewgraph on that later, but it's an important point. Those analyses for plants where a time limit, a 40-year -- you know, the intended plant life, was explicitly used, not indirectly but explicitly used in a calculation such that you simply would have to technically consider 60 years.

MR. CARROLL: Like the number of heating and cooling cycles on a vessel in 40 years?

MR. NEWBERRY: If explicitly; yes. Not indirectly. Right.

MR. CARROLL: Fluids?

MR. NEWBERRY: Fluids, I think, is probably the best example. There aren't many to my knowledge. We've looked and haven't found too many, but those are certainly two examples.

The only non-government or non-industry comments

the staff received were submitted in writing from the Ohio Citizens for Responsible Energy, and that was subsequent to the workshop. The OCRE, O-C-R-E comments, urged elimination of the ARDUTLR term in favor of a broader focus, broader review of the management of age-related degradation in general.

They also indicated the belief that ARD mechanisms could be different in the rerewal term and that licensee programs that are adequate today might therefore not be adequate in the renewal term.

They made a number of other points. One concern was that documentation to support the license renewal application might not be contained in the application, such that might not be available for public scrutiny. That's not a directly related issue to what we're talking about today, but issues like that are certainly going to be germane to what we're going to have to think about in rulemaking.

MR. CARROLL: Help me out. Now where do we stand right now? There is a rule on the street, or --

MR. NEWBERRY: There's a rule on the street. Part 54 is on the street.

MR. CARROLL: And what we're talking about it how to modify it to have it make --

MR. NEWBERRY: Right. You'll see my final recommendation today to this proposal to go to rulemaking to

modify the existing rule.

MR. CARROLL: And for a while there there was some thought that maybe we could finesse the thing by a policy statement that would explain what the rule meant?

MR. NEWBERRY: Yes, yes. Within that rule, with the constraints of the rule, the Statement of Considerations which supports the rule. I think we did make progress to make it more workable and I think this is one point here where we made substantial progress, but given the input at the workshop, we think it's time to go ahead and change the rule.

Our recommendations for proceeding to revise Part 54, based on our consideration of the input we've received so far, I think can be addressed in a number of key issues, as I mentioned earlier. So the next few slides are on these key issues, and that's what I'll go through now.

[Slide.]

MR. NEWBERRY: The first one, which we addressed actually previously with the Committee in our presentations earlier last year -- and the Commission -- and which has continued to receive some significant attention as recently as the workshop, is the issue of whether or not license renewal should require a detailed evaluation of aging mechanisms.

The alternative to this would be a focus on

identifying the effects of aging on important plant equipment in terms of degraded performance or condition. Although a technical understanding of the aging mechanisms that are applicable plays a role in developing your monitoring programs and requirements at the plant, the focus of management on aging today is principally on monitoring performance, plant equipment, condition of plant equipment.

Performance and condition monitoring is relied upon to ensure equipment functionality against the effects of aging, regardless of the specific mechanisms involved.

Now the existing rule Statement of Considerations we think contains conflicting language on the need for an aging mechanism evaluation versus a reliance on a monitoring program to look at aging effects. So, this was identified in our previous SECY papers and as I said, I think we talked to you about this before.

And in these papers we acknowledged the inconsistencies in the SOC, Statement of Considerations. We also pointed out importantly that we thought the rule language didn't specify the need for this type of mechanistic evaluation. And we endorsed the technical adequacy from a safety point of view of performance and condition monitoring as being appropriate to manage aging not only today but in the renewal term.

Our current proposal continues to endorse the

appropriateness of programs which focus on performance and condition monitoring, and so we've recommended that if the Commission approves our recommendation to revise the rule, that the Statement of Consideration needs to be made much more clearer. That we would not require in all cases a specific mechanistic evaluation for aging mechanisms that might occur.

As I said, this really flows from actually the senior management review a year ago on the original rule. And this would have been a change we would have made without rulemaking, but since we think we're going to change the rule -- should change the rule, we will do some additional improvement.

Current licensing basis. The concept of current licensing basis as it's used on Part 54 is focused on what's required to demonstrate that this COB, if you will, Current Licensing Basis, will be maintained throughout the renewal term.

This concept is an important one. It's fundamental to the rule, the current rule, and is actually included in the two principles discussed in the Statement of Consideration for the rule.

It's the adequacy of the COB, the Current Licensing Basis, ensured by the broad range of regulatory processes that the NRC oversees which has been used by the

Commission in Part 54 to conclude that only ARDUTLR, age-related degradation unique to license renewal, should be the focus of license renewal and that other issues, issues previously considered, a broad range of issues that when a plant is initially licensed and operated, need not -- need not be evaluated for license renewal.

The specific issue that's been raised and raised now and has begun to get raised more and more as we looked at examples and were implementing the rule with respect to maintaining the current licensing basis, is whether or not the application or review should have an exclusive focus on ensuring equipment function and whether this is a sufficient basis for concluding that the COB can be maintained or will be maintained.

Our proposal modifying Part 54 endorses this focus to ensure that the equipment will be able to perform its function during the renewal term.

If you look at the definition of what the current licensing basis is, which is defined in Part 54 -- and we would not change that -- is very broad. The definition is very broad and it encompasses many aspects of the regulatory process. Such things as technical specifications, requirements that look at operational aspects of the plant, as well as design aspects of the plant, original design aspects of the plant in some cases.

And it's our belief that the license renewal focus should provide the flexibility to focus in on functionality. All COB programs, and I think as you have pointed out to us in your last letter, will carry over into the renewal term. To implement that point would require a rule change and we've recommended that to the Commission.

Age-related degradation unique to license renewal is the next important issue. Perhaps the most important issue. This issue has been very controversial to date. I think just as a point of background, the term was introduced relatively late in the Commission's final rulemaking decision.

The purpose -- and it was good purpose -- to focus on issues that were uniquely relevant and applicable to the license renewal period.

Our experience has been that the current definition, however, has not been totally successful in focusing the renewal review. We've certainly had a lot of discussion at the workshop on this and in virtually every meeting we've had on license renewal on what age-related degradation unique to license renewal is or is not.

The current definition results in a relatively large portion of the plant at least being subject to the possibility of ARDUTLR. We pointed that out to you the last time we were here. It's what the definition results in.

Although the previous staff proposals have indicated how such equipment could be dispositioned with relatively little information based on existing programs, again, the industry, as I said, has expressed fundamental concern with this approach because of the still significant regulatory burden.

As I mentioned, while some industry commenters would eliminate the term altogether, the NUMARC proposal would retain it and retain it as a vehicle or a means to focus the license renewal review. They would, however, significantly, as I mentioned, modify the definition to more directly credit existing programs. And this is where I think one of the major changes we are recommending takes place in the redefinition of ARDUTLR and would thereby greatly reduce the amount of the plant equipment that would be identified as subject to or even possibly subject to ARDUTLR.

In developing our position on license renewal, we took a hard look I think at this point. And I think I should point out to the Committee, we think there's advantages and disadvantages of retaining the ARDUTLR concept. We think it's a useful vehicle to better focus the license renewal review and limit the issues to those stipulated by the Commission and clarified in the Statement of Considerations.

On the other hand, the term unique aging I think can be confusing and I think it gives me -- us trouble with our technical understanding of how aging is a continuous process. The processes in place at the plant in year 39 are really no different than those in place at year 41. But I think on balance our proposal recommends the retention of the term primarily as a means to continue to focus the renewal review.

I met with the Commission just before the holiday and told them that we felt this was a close call, but we do believe that a rule can be developed and effectively implemented doing it this way. But we also acknowledge that we thought you could come up with an effective rule without the term ARDUTLR. As I said, it was a close call.

Our proposal to retain ARDUTLR does recognize I think -- and this is an important point -- that NUMARC represents the industry on this point, particularly those industry organizations which are actively involved in license renewal, have been involved and are involved today. And they've endorsed retention of the ARDUTLR concept.

I think another factor is that the term itself is a principle element in the current rule -- in the principles, actual principles for the original license renewal rule, which we think are good and should be retained.

And related to that then, by not revising the principles but by explaining ourselves in the Statement of Considerations, perhaps the rulemaking could be more efficient.

So, --

MR. LINDBLAD: Mr. Newberry, I understand you to say that you're proposing keeping the term. But did I understand that the definition or the description of what the term is intended to mean will change?

MR. NEWBERRY: It sure will. And that's what I'm going to go through right now.

MR. LINDBLAD: And before we leave this slide, where are you say in the slide "concept explicitly linked to first principle," can you remind me again what the first principle was?

MR. NEWBERRY: Yes.

MR. LINDBLAD: Is that the first principle of mechanics or does it have to do with the rulemaking itself?

MR. NEWBERRY: Principles of license renewal.

MR. LINDBLAD: And so it's that long one there?

MR. NEWBERRY: It's that long one that talks about our reliance on the regulatory process with this exception. So we're going to redefine the exception.

MR. LINDBLAD: Thank you.

MR. CARROLL: I'm disappointed that that's the way

it came out. I wanted to hear about the first principle of mechanics.

MR. KRESS: Stress is proportional to strain or vice versa.

MR. CARROLL: And that's true of Bingham Plastics, is it?

MR. NEWBERRY: Okay. I'm going to discuss now the four points on the viewgraph, use the main aspects of the redefinition of ARDUTLR and really constitute what the focus of license renewal would be.

The first one is it would be a principle focus on certain passive long-lived structures and components that would be specified in the rule. The rule would require an applicant to carry out a relatively detailed evaluation of plant equipment which is not normally replaced and which performs a passive important to license renewal function. Only those functions that are, for example, safety related rather than other non-safety related functions. We use the term important to license renewal function.

Important equipment, such as the reactor vessel, associated primary system piping and the containment whose failure would result in a functional system failure -- that is, they're non-redundant -- would be specifically evaluated and the evaluation results would be included in the license renewal application. This is the primary focus for what

ARDUTLR is.

MR. SHACK: I'm probably getting ahead of you here, but since you're going to list these components specifically in the rule, what's the purpose of the integrated plan assessment?

MR. NEWBERRY: No.

MR. SHACK: Oh, you're not?

MR. NEWBERRY: No.

MR. SHACK: I thought you said you were.

MR. NEWBERRY: No. That has been a proposal. This would be done by each plant in their application based on what is in their current licensing basis. They would methodically do that and then do the evaluation.

Sorry. I didn't -- that's a good question. You should understand that.

MR. DAVIS: Scott, what did you have in mind with respect to the containment? Are you concerned about the penetrations or the structure itself? Is an applicant really going to know what he's supposed to do with the containment?

MR. NEWBERRY: Let me try to answer your question, Pete, by not answering your question. And that is, I think what I'm trying to go through here is a process rather than a particular equipment or structure concern.

In that first point there, rather than me telling

you why I'm particularly concerned about the containment, I'm deciding that if they get down in here there's much of the plant that I'm not going to look at in license renewal. Diesel generators, MOV's, redundant, active equipment, maybe even passive equipment. But we're going to focus on the containment, including things like penetration, I suppose, but --

MR. DAVIS: But -- okay. It's only because it's a passive part of the system that puts it on the list?

MR. NEWBERRY: Yes. It's passive. And should there be a failure, you've lost that function. I think that's the key. A single failure, if you will, you have lost the function as opposed to a single failure in most other systems in the plant.

MR. DAVIS: But part of the containment system is active like the containment isolation.

MR. NEWBERRY: That's correct. Good question. You're getting ahead here, but this is important.

Containment isolation and active control system or engineered safety features which would actuate the containment isolation or sprays or what have you, would under Number 2 be categorically excluded from the license renewal review.

We would rely on the regulatory process, what we're doing today, to ensure that those systems are doing

their job ensuring that plant operates. So under Number 1, we're going to take a piece of this plant and it would become the focus of the license renewal; the reactor vessel, the containment, single tanks, parts of the plant that should they fail you're lost the important function.

We've talked a long time about that; where to draw that line. We've spent many hours going back and forth with the industry talking about that.

MR. SEALE: Well, similarly, with some penetrations that would you perhaps rework under your Number 3, I assume?

MR. NEWBERRY: Yes. You're ahead of me.

MR. CARROLL: One example of ARDUTLR --

MR. NEWBERRY: I didn't say that.

MR. CARROLL: I know. -- on containment, would be some of the PWR containments that are experiencing corrosion.

MR. NEWBERRY: Yes, sir. Yes, sir.

MR. CARROLL: That's certainly age related.

MR. KRESS: Would some redundant passive systems or components be subject to simultaneous aging?

MR. NEWBERRY: Yes, sir.

MR. KRESS: Why would they then be categorically excluded from consideration?

MR. NEWBERRY: It's a good question. That's

probably the one we spent the most time on asking ourselves. And in fact, some of our earlier proposals said let's draw the line between active and passive because of that concern. And it's a judgment call on where to focus license renewal and we concluded -- and we have a surge in those areas and there are some concerns today in those areas, we should be doing something about them today rather than in license renewal.

MR. CARROLL: Yes. I think the answer is the maintenance rule should, if properly implemented, take care of that.

MR. KRESS: I see. That is it. I see. There's more to the sentence than first light.

MR. NEWBERRY: Right. I think in discussions with the Committee here we were asked the question about why are we looking at a particular issue in license renewal as opposed to following our process to look at the issue on operating reactors. And I think that's the way we're going through the maintenance rule and regulatory programs that way.

MR. CARROLL: And later today we will be asking your colleagues that are working on operational reliability assurance programs that same question.

MR. NEWBERRY: Okay. So, just before I leave the first point there, let me just say something. If additional

programs are determined to be needed to manage the effects of aging under Number 1, the license renewal applicant looks at it. The staff looks at it. There's that focused review.

That structure component would be identified as subject to ARDUTLR and then you'd go into the rule and say, okay, now what do I do about ARDUTLR.

Prior to that -- prior to this approach, much of the plant was there. We were down to perhaps a major fraction of the components in the plant as being subject to ARDUTLR and then into effective programs.

Number 1 would lead you to the possibility of the need for effective programs only if you find that current programs are determined to be in need of supplement.

MR. CARROLL: Let's take as an example the cooling water storage tanks, the PWR. Suppose -- I don't know what the practice is but suppose the utility every five years has during a refueling outage gone in looking at the tank and making sure that there's no internal corrosion problems and checking it externally and checking the bolting to see that it's held down properly on some regular basis, would that be a basis for excluding that?

MR. NEWBERRY: If we would look at it and agree, it certainly would.

MR. CARROLL: Just simply because it's a passive long-lived component that you don't do any direct

maintenance on ordinarily doesn't mean that it gets backed into 1?

MR. NEWBERRY: Because it's passive and long-lived means that the applicant would give us an evaluation on it. And perhaps the evaluation contained just what you suggested. We would review that. And if we agreed aging was being managed adequately with reasonable assurance, the conclusion that there would be no ARDUTLR could be an acceptable conclusion. And that's the end of it. But there would be an application and a review, no categorical exclusion. That would be the focus of the review on tanks and plants.

MR. CARROLL: Okay. Good. You're making progress.

MR. NEWBERRY: I think the second point here is important, too. The second practical effect of the proposed definition would be an explicit allowance in the rule that active SC's -- I'm looking for what an active structure is, but bear with me. Active SC's. Let's make sure we're covering everything here.

Active SC's and redundant passive SC's which are within the scope of the maintenance rule cannot be subject to ARDUTLR. We use the term categorical exclusion. That is, in the rule this would be made clear and this is a position that provides, and we believe certainly, maximum credit for licensee programs which are or will be in place

to meet the requirements of the maintenance rule.

We recognize that this is a significant change that is going to require considerable justification in the new Statement of Considerations or the rule. We have to justify ourselves. But we think that we can support this justification based on our experience with maintenance programs in the past and today and, of course, our expectations on what's going to happen with implementation of the maintenance rule which you're all familiar with, which has been required now to supplement the regulatory process.

That's all I plan to say about categorical exclusion on Number 2.

Now, there's a question here about Number 3. The next effect of our proposed definition is the specification of equipment which is replaced to preclude a service life greater than 40 years would also be identified quickly is not subject to ARDUTLR. The applicant would tell us that and that's sufficient. That could apply to a considerable amount of equipment in the plant.

Of course, we took this position in our proposals last Spring and I think we discussed it with you. And we don't see it as a big change from what we said before. But I think it's still an important one with respect to focusing the license renewal review.

The last point in the revised definition would permit structures and components which are not subject to the maintenance rule also to be determined as not subject to ARDUTLR. Now, this in our view should not be a categorical exclusion as we've proposed it but would require some information in the application as a minimum. For example, a reference perhaps to the presence of the program at the plant. And this is one area, I should point out, where I think we have some difference with NUMARC.

NUMARC --

MR. CARROLL: Help me out. I thought the definition of what is included in the maintenance rule was very broad. It's more than safety related. It's important to safety.

What is not included under the maintenance rule?

MR. NEWBERRY: Not much. Very small set of equipment here.

MR. CARROLL: Name one piece?

MR. NEWBERRY: Fire protection.

MR. CARROLL: That isn't covered by the maintenance rule?

MR. NEWBERRY: I don't believe so. Now, unless -- not explicitly, but --

MR. CARROLL: If I'm going to use it in some severe accident mitigation system, it would be?

MR. NEWBERRY: Yes, yes. The proposal that we reacted to here was that for equipment in a plant that was not in the scope of the maintenance rule but there was a program somewhere in the CLB in the licensing basis on the docket, there would be categorical exclusion. Based on what we knew, questions like you just asked, we weren't sure what that was. Therefore, we said, at least tell us in the application what that is.

MR. CARROLL: If there are any of these guys?

MR. NEWBERRY: Yes. And that's why I said in terms of the level of detail, it would probably be a reference or a statement about what the program was.

MR. CARROLL: Okay.

MR. NEWBERRY: So I think your questions were helpful in me going through those four. They are four important points and I think, you know, just in summary on this definition, I think I said it but I'll reemphasize it. In practical terms the result is going to be a much reduced amount of plant equipment being identified as either subject to or possibly subject to age-related degradation unique to license renewal.

Now, Mr. Carroll already asked me a question on time limited issues and I think I responded. I gave the example of reactor vessel toughness, surveillance requirements. These are certainly two examples.

Now I think to support operation beyond 40 years, it is our view that these issues would need to be -- the evaluations of these issues would need to be carried out by a licensee and approved by the NRC.

We've tried to take a pretty good look at plants to see how many kinds of these issues there are and we haven't found very many. I'm not sure our look has been exhaustive but we're pretty confident there aren't very many issues.

Now in it's proposal for revised rulemaking NUMARC indicated that although they agree that technical resolution and staff approval would be require to support operation beyond the time limited analysis point, I think it's their view that these issues ought not be part of the license renewal review. It would be a reliance on the regulatory process.

So there's no technical disagreement as to whether the issue has to be looked at by the licensee and looked at by the staff. But I think we see it as a policy matter more than a technical one and our recommendation as a policy matter is to include these issues under the license renewal review umbrella.

MR. SHACK: Just to get more concrete, for example, would this mean that you would have to redo your whole fatigue analysis or would you simply rely on your

inspection? That if you had a fatigue problem you'd find it?

MR. NEWBERRY: Tnat's a good question. I'm not sure we've decided on what you'd have to do rather than whether you have to consider it or not. Our recommendation here is that it's on the table for license renewal. We're still discussing it.

I had a call the other day about, well, what do you think we have to do. If a plant comes in with an application at year 22, 18 years away from your 40, would we expect all the analyses to be done and included or referenced in the application? I'm not sure. Well, what do we want? At the other end, how's their commitment to meet the code? Would that be sufficient? Well, I'm not sure that's sufficient.

So I think we have to work that out to answer your question.

MR. CARROLL: That brings up the issue of -- I don't know what the lawyers call it, but if an applicant makes a timely submittal at whatever year your regulations are going to require and 40 years expires before the staff settles all these issues. Can he keep operating?

What do you call that?

MR. LINDBLAD: The Administrative Procedures.

MR. CARROLL: Well, there's another term for it

and I can't think of what it is.

MR. TRAVERS: It's -- excuse me. I'm Bill Travers, NRC. And I think the term is timely renewal. But it is within the Administrative Procedures Act, more specifically. And it does allow, Jay, as you say, for continued operation in the face of continued staff review, as long as that timely renewal period has been met.

In the case of license renewal, I believe it's five years prior to the expiration of your license you have to have all these things.

MR. CARROLL: Okay. And that would apply to both the present version of the rule and to what you're contemplating in the revision?

MR. NEWBERRY: Yes, sir. Yes, sir.

MR. CARROLL: All right. Thank you.

MR. NEWBERRY: So, in summary on this point, you know, it was our view that with the old definition these issues were captured by the definition. So as we restructured the definition, they seemed to fall out, so we have taken and inserted in our proposed rule with the paper, a separate paragraph on time limited.

Our proposal retains the integrated plant assessment concept. We believe that the IPA concept can be used to systematically determine which plant equipment should require additional review.

As with the existing rule, the IPA would begin with essentially the entire plant. Following that, and combined with the revised definition of ARDUTLR, we believe that one can be provided with an effective and efficient means to focus their renewal review. And so we have retained this IPA concept. NUMARC has proposed that and we agree.

MR. SHACK: Presumably because of the categorical exclusions this would no longer wipe out the forest to do it?

MR. NEWBERRY: Perhaps. Perhaps. I don't know how big the forest would be to do that. It would take a little work to do that screening to justify what is and is not importance to license renewal. It's a good question. My hope is that we can get a lot smarter, and I think the industry can, on how to be effective.

MR. LINDBLAD: By then we'll be talking about the bandwidth on the information highway.

MR. CARROLL: A number of the things we've been discussing today, Scott, seem to me to be amenable to an industry topical report approach that sort of fell apart in the original license renewal thing. Does there seem to be interest on the part of NUMARC and the industry in reviving that effort?

MR. NEWBERRY: Yes. We're reminded continually

that we should be -- should we go to rulemaking -- be prepared to continue to work with the industry. And that's our intent. I think they're doing some reconfiguration in terms of their focus because of the rule change, but there's considerable activity in the owners groups to eventually start coming in with topical type reports to do the things I think that you're thinking about.

MR. CARROLL: Okay. That's good.

MR. NEWBERRY: The B&W Owners Group, Westinghouse Owners Group and NUMARC have talked to us about those sorts of activities.

MR. CARROLL: Okay.

MR. NEWBERRY: Part 54. In addition to the rule changes I've already discussed, we've proposed or are considering a number of other changes to the rule, if the Commission agrees with us, if we're going to rulemaking.

Other changes identified in SECY-93-31 are focused on doing conditional efficiencies based on this experience. And particularly in the amount of information which needs to be included in the FSAR supplement and as a result subject to change processes and reporting requirements.

The proposal would permit much of the IPA information to be submitted in the application for staff review, but outside the FSAR supplement. For example, the lists of equipment identified in each IPA step would not be

included in the FSAR supplement, such as they would not be subject to the same regulatory oversight as what is required for information in the FSAR.

The FSAR supplement would contain information related to new or enhanced programs required to mitigate ARDULTR and it would also contain a description of the methodology used in preparing the application for actually conducting the integrated plan assessment. It's this information we believe should be subject to the stipulated change processes rather than all the detailed information in the IPA.

In addition, if rulemaking is undertaken, there's a number of other areas in the rule and the Statement of Considerations that we think need to be addressed. For example, we've included in our draft definition, in an attachment to the paper -- or in the draft or our proposed rule, the attachment to the paper, a draft definition of passive as far as license renewal is concerned.

We recognize that this is an important definition given the approach that we're using here, but we think it needs some additional consideration prior to issuing a proposed rule. And we're still working on that one.

So, in conclusion, we've endorsed rulemaking in our SECY paper. We think it's a substantial effort. There's a lot of work to rewrite the Statement of

Considerations to justify our approach, but it's fundamentally directed at a more explicit credit for existing programs that are going to continue through the initial term into the renewal period.

I think -- just making a note here. I think these are the two major points in your June letter in terms of need to change the rule and need to look at giving considerably more credit to existing programs. That's our intent here.

As previously noted, we would retain the concept of ARDUTLR even though the definition would be significantly altered and we would also retain the integrated plant assessment approach for the screening.

Just a little bit on how we would do this. In our paper, if the Commission does endorse rulemaking, we made an estimate that a proposed rule could be forwarded to the Commission within about four months of receiving direction from them and we would target a final rule to be published within about a year.

I think this, as far as the Committee concern, would require close interaction between our staff working on the rule and the Committee to achieve those milestones. Given the nature of the proposed changes, we recognize it's an ambitious schedule, but just say a few things about how we're going to try to make it happen.

Working with the EDO in coordination with OGC and the Office of Research, Dr. Murley has established a dedicated rulemaking team led by NRR with OGC and research support, which has already started to complete all elements of the rulemaking package. And to assure high level management attention, Dr. Murley has set up and will chair a steering group that includes Jim Sniezek and Jim Milhuan, Jack Haltamous from Research and Marty Mulcher, OGC.

So, I guess the last thing I'd point out in addition to rulemaking -- this is what you're mentioning. If that's what the Commission decides to do, we are planning to continue efforts to work with the industry organizations to identify generic technical resolutions, if you will, on as many matters as they would propose, some we have to be careful of that are going to be priority decisions we're going to have to make, but we're certainly planning on doing that.

And that concludes my presentation.

MR. DAVIS: Scott, remind me. When it the first plant scheduled to go through this process? It's not for several years yet, is it?

MR. NEWBERRY: Not for several years. Get some help over there. It was '96. Maybe '97, in that range.

MR. DAVIS: For an application?

VOICE: B&W.

MR. NEWBERRY: Well, yes. B&W Owners Group is on a generic license renewal program plan with a goal of an application in '96 time frame.

MR. CARROLL: That's five years before whatever plant's 40 years is up?

MR. NEWBERRY: Yes. It certainly is. I think I shared with the Committee some more recent information that there may be an earlier application. Virginia Power is coming in to talk with us later this month. They're actively considering what to do with respect to an application.

MR. CARROLL: For Surrey?

MR. NEWBERRY: I'm not sure which of their units. Do you know which one?

VOICE: All four.

MR. NEWBERRY: All four is the answer.

MR. CARROLL: Well, five years may be fine for the NRC but from a planning standpoint I think the utility really needs to do it a lot earlier than that because it takes a long time to get new generation or live power or whatever you're going to do.

MR. TRAVERS: If I could just make a comment. The rule as it's configured today and as we would expect it to remain allows for application submittals between 20 years and 5 years of your fixed rate license, so there's a broad

window.

MR. CARROLL: But it has to be at least five years.

MR. DAVIS: Has there been an estimate made, Scott, on what it's going to take in terms of manpower for a utility to respond to this rule, either you or NUMARC?

MR. NEWBERRY: Not to this one, I don't believe. I think the estimates we had were for the original rule and I could probably get my staff to give you an estimate.

MR. DAVIS: Just an order of magnitude.

MR. NEWBERRY: Steve, do you remember the estimates in the original rule for a utility?

MR. CARROLL: I think Monticello told us it was going to cost them $70 million and the price was going up every day, just before they pulled out of it.

MR. NEWBERRY: Our estimate was obviously lower. I think it was $20 [million] to $30 [million], an average of $25 [million] to $30 million, wasn't it, for an application?

VOICE: Yes.

MR. NEWBERRY: This, I would hope, would be certainly lower. That's the intent.

MR. CARROLL: Now a couple of years ago I was very frustrated but it didn't seem like the people on the staff that were worrying about license renewal were talking to the people on the staff with blinders on that were looking at

the maintenance rule. I take that situation has greatly improved.

MR. NEWBERRY: It's improved.

MR. CARROLL: You understand the maintenance rule and how it's going to be implemented?

MR. NEWBERRY: We're still learning but we're working at it, I think harder than we were before and in fact, we've moved staff that worked on the maintenance rule under my group.

MR. CARROLL: Good.

MR. NEWBERRY: And they're working on the rulemaking team.

MR. CARROLL: Now, how about these cowboys that are working on ope¨ational reliability assurance? Do you ever see them? Do you know what you're doing?

MR. NEWBERRY: Maybe that's an area we need to look at. I'll take that to the next meeting.

MR. CATTON: We can't do everything once.

MR. CARROLL: We'll talk to them this afternoon.

MR. NEWBERRY: Any other questions?

MR. LINDBLAD: Any other questions of the Committee for Mr. Newberry?

[No response.]

MR. LINDBLAD: Thank you very much, Scott.

MR. NEWBERRY: You're welcome.

MR. SEALE: Let me turn to our visitors. Anyone over here from industry to say anything? It might be that they want to add anything.

MS. GINSBERG: My name is Ellen Ginsberg. I'm the Assistant General Counsel for NUMARC and as Scott has said, a lot of the proposal that is represented in the SECY is very similar to that which NUMARC recommended, so that we are encouraged at the very least to see that license renewal rule is moving forward and forward in a way that we think will be productive for everyone concerned.

There are still some issues outstanding. I suppose it comes as no surprise to anyone. And we are continuing to work on them and to develop our views and our positions. And as we do, we are committed to passing them on to the NRC.

It's been very productive working with the NRC thus far and we expect it to continue to be so as the rule progresses.

Questions?

MR. CARROLL: I'm just curious. How large is the inside law firm at NUMARC or the house counsel or whatever you call yourself?

MS. GINSBERG: You're looking at a large laboring oar and the other laboring oar is Bob Bishop who's the General Counsel.

MR. CARROLL: Oh, there's just the two of you?

MS. GINSBERG: There are two of us. But we work very, very closely with the other law firms who represent a good portion of the industry with respect to licensing issues.

MR. CARROLL: Thank you.

MR. WILKINS: All right. I believe when we started this discussion there was an agreement that we did not need to write a letter at this time, so I'd like to thank Mr. Newberry and the lady from NUMARC.

And we have 25 minutes on the schedule.

[Off the record discussion.]

MR. WILKINS: All right. Do you want me to read it again?

MR. CARROLL: I don't believe so.

MR. WILKINS: I don't believe we can get through with it by 12:30 but we may make significant progress.

MR. CARROLL: One section that has had no Committee discussion is beginning on page 7.

MR. WILKINS: Yes. Paragraphs 17, 18.

MR. LEWIS: I think you've made the point very scholarly, learned and --

MR. CARROLL: I actually plagiarized Bill Kerr's consultant report. That's why it sounds -- has all those adjectives. It's plagiarized.

MR. LEWIS: With good sources you can't go wrong.

MR. WILKINS: All right. Why don't we do what Jay suggests, then.

MR. CARROLL: And then when we get to page 7 we could read that. That's new.

MR. WILKINS: We don't need this on the record.

[Whereupon, following an off the record discussion, the luncheon recess was taken from 12:00 noon to 1:30 p.m.]

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

[1:30 p.m.]

MR. WILKINS: Let's convene the meeting. The next agenda items deals with core power stability, BWR core power stability, and Ivan is chairman for the thermohydraulics subcommittee, and I'm chairman of the core performance subcommittee. Ivan has agreed to take the meeting on this issue, so why don't I defer.

MR. CATTON: I'm not sure when I agreed, but I'll do it. I think it just sort of happened. What we're going to do today, I believe, is to be brought up to the -- the staff is going to bring us up to speed as to where they're at. Our interest early on has been strictly with the ATWS portion of the oscillation question. The ACRS wrote a letter a couple of years ago indicating that --

MR. BOEHNERT: 1989 -- It's in the notebook.

MR. CATTON: Four years ago. We were only interested in ATWS with oscillations because it wasn't the -- oscillations under normal operating conditions was not perceived as an extreme safety issue. The regulations or whatever that were in place would allow the staff to take care of it.

With regard to the ATWS with oscillations, we came to the understanding that a way of dealing with it is to

lower the level, and I guess there was a meeting at Santa Barbara that I attended where I heard the owners group talk about lowering the level well into the core. The reason they do this is when they drop the level, they can cut way down on the power, and this reduces the heating of the suppression pool. You hold it there until you get all the boron you want in, then you raise the level back up, and the fluid starts to recirculate again and mixes the boron and then you shut it down. The argument is that overall you put less energy into the containment and therefore the threat is less.

I have some concerns, and I've expressed them to these people in the past about how fast you will mix in this boron. See, as you lower the level, you get to the point that the gross circulation around the core and back up through the core stops. There's internal circulation. Now, any boron that they dump in just sinks into the bottom of the vessel. Now you raise the level and you start this recirculation process, and the cross flow and the bottom part has to mix the boron in before it will do you any good. We were told that there's lots of evidence about the mixing, but no matter how many times we request to see it, it's either proprietary or not in hand.

Anyway, I think that's enough from me unless anybody has any questions.

MR. LINDBLAD: And it goes down to the bottom of the vessel on a density difference?

MR. CATTON: Yes, and then it just sits there stratified.

MR. LINDBLAD: What's the temperature? It's colder than fluid as well?

MR. CATTON: I'd have to ask. Is the temperature of the --

MR. JONES: The injected fluid would be colder.

MR. CATTON: It is cold. So, it's cold and salted, but the main thing is, you lose the circulation around the core. As long as you have that circulation, the tests done by Thefanous seem to point to really good mixing.

MR. CARROLL: Why do you lose circulation?

MR. CATTON: Oh, you drop the level down into the core.

MR. KRESS: Along with the downcomer.

MR. CARROLL: I know that, but why do you lose it in general? If you didn't drop level, wouldn't you get --

MR. CATTON: Oh, it would continue to circulate until you boil away the water. If you're adding water, it would continue to reflux like --

MR. CARROLL: Wouldn't you get good mixing?

MR. CATTON: As long as you have the recirculation, yes. It's thought that that is not the -- it

stops because the level is dropped into the core.

MR. CARROLL: And it's thought that intentionally dropping the level is the better strategy?

MR. CATTON: Well, what they do is because they reduce the power that's being produced, this reduces the amount of steam that's being dumped into the suppression pool and reduced the insult to the containment. Really what it gets to be is how reliable is the mixing process or will it happen versus the insult to the containment, which is worse.

MR. DAVIS: I think it also stops these power oscillations.

MR. CATTON: Well it does, yes. Lower it stops the power oscillations, but how far do you want to lower it?

MR. DAVIS: And how far do you have to lower it. But that's the reason for lowering it.

MR. KRESS: I understand there's a race going on between while you're waiting for the right amount of boron to get put into the core region, you're also adding steam to the suppression pool and heating it up, heating it up to a level of temperature that you're going to have an action then. The idea is to have that race won by getting enough boron in before you turn the thing back on.

MR. CATTON: That's correct.

MR. KRESS: I'm particularly interested in the

calculations that go into deciding how you know when you've got enough boron into the system.

MR. CATTON: We've seen the calculations, and I saw them at the meeting that was held in Santa Barbara. The problem is certain assumptions are made about the rate of mixing the boron back into the recirculating flow.

MR. KRESS: I'm not too interested in that. I want to know how they know when they have enough boron into the system before they start remixing.

MR. CATTON: Okay. I imagine the staff will be able to answer some of these questions, but my concern is the assumptions that they make about the remixing rate. I don't know that I have seen anything that tells them what that rate is. I think they are somewhat optimistic on how fast they think it will remix.

Anyway, with that, I will introduce Bob Jones.

MR. JONES: Okay.

MR. CARROLL: Who really needs no introduction.

MR. CATTON: Who needs no introduction.

MR. JONES: I've been here before. Ivan, you were right. We are here to provide a status report on our efforts on the stability issue, primarily focusing, as you stated, on the ATWS with instability concerns. Larry Phillips will get up and go through all the slides and go through some of the issues you've touched upon. We're not

going to answer all your questions here. We don't have all the answers yet. We are going to tell you where we are with the work we've been doing since we last talked to you, which was back in May of '93 as a subcommittee. I think the full committee, last time we talked to the full committee was October of '92, and bring you up to speed with the work that we've previously talked to with the subcommittee, and then we'll move on to some new analyses and efforts we've done which the subcommittee has not seen, just to give you a flavor as to where we're going with the issue, and then our long range plans for hopefully closing this thing out.

There's also a related issue here which is a petition we have to reopen the ATWS rule, an OCRA petition, Ohio Committee for Responsible Energy, I believe it stands for -- citizens, that's correct, sorry, that we will also be touching upon because it's all related to this issue, and finally closing the whole item out. I do want to note, although the committee's primary focus has been on the ATWS with oscillations, the long term stability issue, solutions issues related to suppressing and detecting oscillations during normal operation. We've made substantial progress on that. We have accepted the owners group proposed long term solutions with some modifications that we've outlined in SER. We have discussed this, I believe, with both the subcommittee and the full committee. We have issued a

generic letter for public comment. We have the comments back, including the industry comments. We are revising the generic letter now, and we expect to issue it next month. So, we are basically wrapping up what I would call normal operation type issues and, indeed all that's left is the ATWS stability concerns.

With that, I'm done and Mr. Phillips will present where we are.

MR. PHILLIPS: I'm Larry Phillips. I don't get here very often. NRR staff, reactor systems branch. So, I'm going to talk about ATWS with power oscillation. These are the key issues. Basically we're looking to see if the power oscillations have impacted the results of ATWS analyses that were done several years ago, and which were the basis for the ATWS rule. We're looking at the impact, primarily at the impact on the fuel coolable geometry and the containment integrity, and the effectiveness of the mitigation actions in response to ATWS. Our current emergency procedure guidelines are used as a basis for the mitigation actions.

A question which ACRS raised very early and which has been the primary factor in the long delay in this study, and that is to validate the analytical models and codes used to predict the core behavior with power oscillations.

These are the documents prepared by the BWR owners

group which we have reviewed. We have done our own studies with our consultants at Brookhaven National Lab and at Oak Ridge and have done some of our own calculations. This NUREG represents a study done on the engineering plan analyzer at Brookhaven which substantially confirms the type of results that General Electric is getting doing their TRACG code. After some early disagreements, the results tended to converge when we were calculating the same thing, and so we have some fair degree of confidence in our ability to predict what's going on. We also did a team audit at the TRACG validation and verification. I believe that was provided to you some time ago, and we are satisfied with the capability of TRAC for these calculations.

The conclusions that were reached in these analyses were that we could not preclude some fuel and clad melting, and the occurrence of very large oscillations over a short period of time until effective mitigation actions are taken. These are based on rather bounding analyses, and the chances of getting the particular conditions for which calculations represent, that type of ATWS are remote.

MR. CARROLL: Now, when you say some fuel and cladding and clad melting, this is centerline melting of the fuel or melting of the entire pellet?

MR. PHILLIPS: Melting of the entire pellet, less than one percent of the core.

MR. CARROLL: In that one percent or less than one percent, you'd actually melt fuel pellets?

MR. PHILLIPS: Yes.

MR. CARROLL: And in turn melt the clad?

MR. PHILLIPS: Yes.

MR. CATTON: Jay, I suspect if you went in and did an uncertainty analysis with the TRAC and boosted the heat transfer as high and low as plus or minus 25 percent or so, you'd get a bit more. That's why I think they use the word can't preclude. The can't preclude is based on a small amount being predicted by the TRAC code, I believe.

MR. CARROLL: I wasn't so much worried about the amount. I just wanted to know what those words meant.

MR. CATTON: The words mean they can't calculate it any closer, and it looks kind of bad. That's my interpretation of those words.

MR. PHILLIPS: The fuel dries out and doesn't rewet.

MR. CATTON: And also, there's been a pretty good amount of energy deposited by these cycles, and that's kind of iffy as to how well they can calculate it.

MR. PHILLIPS: We've looked at the emergency procedure guideline changes to improve the mitigating actions and reduce the probability that some fuel melting will occur. The way to do this, of course, is to reduce the

time period what you're subject to the very large oscillations. The worst case is the transient, is the turbine trip with bypass, actually, wherein, the old ATWS analyses we were mainly worrying about isolation transients for the oscillations, we're more concerned with the non-isolation transients because you need a large degree of subcooling which you get from the feedwater in order to promote the oscillations.

The most effective mitigating action to combat it is to take immediate action to reduce the feedwater flow actually to cut it off completely, and you keep it that way until the water level drops to at least about one meter below the feedwater spargers. At that level, if feedwater flow is reinstituted and maintained at that level, as it falls through the steam, it will resaturate and oscillations won't re-initiate.

MR. DAVIS: Larry, doesn't the operator also have to disable the RCIC because it will come on automatically on low vessel level?

MR. PHILLIPS: Yes.

MR. DAVIS: Yes, I think he does.

MR. PHILLIPS: Actually, the most important first action he has to take is to bypass the MSIV closure. That's the one that is tricky to get to. I'll get into that a little later.

MR. CATTON: That's a nice opportunity for a PRA.

MR. DAVIS: Now, will ADS also activate on low vessel level without RCIC?

MR. PHILLIPS: No. We try to avoid depressurization. That's one of our primary objectives in the EPGs, which I'll get to.

MR. DAVIS: I know, but I was just asking if the operator had to disable the ADS.

MR. PHILLIPS: No.

MR. DAVIS: He'll start timing out -- okay.

MR. CATTON: No, the reason you don't want to reduce pressure is that instability is promoted by lower pressure.

MR. PHILLIPS: That's one reason, yes. We think that if we blow down and depressurize or depressurize, the core can become uncovered for some extended period, and it just becomes very unpredictable on how much core damage you might get.

MR. DAVIS: And you dump a lot of energy to the suppression pool, too.

MR. PHILLIPS: Yes.

MR. DAVIS: Which is not good.

MR. PHILLIPS: So, the best course of action is to try to avoid depressurization initially.

MR. CARROLL: Now, this strategy of reducing water

level implies that we have all sorts of confidence in the ability of the level indication system telling us what's going on. That is an assumption in all of this. We're going to fix the problems we have on level indications.

MR. JONES: That is correct.

MR. PHILLIPS: Yes.

MR. CATTON: That's why we had a subcommittee meeting on that subject, was for this reason, this concern.

MR. CARROLL: I know, I was there.

MR. WILKINS: Is it possible to say now what sort of plus or minuses you can expect on level indication? I've heard figures of three feet to three inches.

MR. PHILLIPS: There have been studies done on that, and we do have some answers. This is independent of the other water level problems, the condensation problems and so forth. We were worried about the impact of oscillations on water level, and EPRI did some studies for the owners group, and it turned out that even under the worst conditions, they were predicting that the instrument behavior would be reasonable, and by reasonable, my recollection is we were talking about a couple of feet on the oscillations.

MR. CATTON: That's because of the large plenum, isn't it? It's sort of any pressure pulse you might get internal that drives the water out gets attenuated in the

upper and lower plumbing.

MR. KRESS: Does the indications of core power help any under ATWS conditions or for establishing where the water level is, or is that too crude a connection?

MR. PHILLIPS: Well, only in that when you start dropping down into the core, you're going to get a fairly sharp reduction of the water level. Incidentally, let me just mention that the dropping of the water level was nothing new. That's in the existing EPGs, and that was done independent of the oscillation concerns. That was done in order to do just what we're talking about, drop the water level down, reduce power, reduce the load on containment until the reactor could be shut down by boron injection.

So, the only thing that's changed here is that we're hitting that much faster. We're taking quicker action to shut down the feedwater so that we can get that subcooling impact on the oscillations.

MR. CARROLL: What do the EPGs say about lowering water level? Do they say drop the level to one meter below the feedwater sparger come hell or high water, or do they say drop the level until power level is reduced and is not changing anymore, and in no case go below one meter?

MR. PHILLIPS: As I'll get to a little later, that facet of the EPGs hasn't been implemented yet. That's a change, the one meter below the feedwater sparger. That's

been recommended based on these studies. It hasn't actually yet been implemented.

MR. CATTON: So, are they no longer recommending drop it into the core?

MR. PHILLIPS: No, no. We're saying that you have to drop it to at least one meter below the feedwater spargers.

MR. CATTON: How far is that above the top of the core?

MR. PHILLIPS: It's three, four feet. What is it, Howard?

MR. JONES: It's about five feet above the core.

MR. PHILLIPS: Five feet.

MR. CATTON: But now, the owners group is talking about taking it further down, aren't they, so that they can stop the recirculation?

MR. JONES: Let me just try to go through the procedures quickly, through how it works. Given the indication of an ATWS event with oscillations, they're going to drop the level down immediately to at least one foot, one meter below the feedwater sparger. From there, the operator is directed to continue to drop water level until he either reduces power below some point, and I don't remember the number, or he reaches the minimum steam cooling water level which is the one that's about three feet below the top of

the core. It's a downcomer level. It's not an internal vessel number that's three feet below the top of the core based on the solid column of water in the downcomer. So, he still has two phase level well above the core at this time.

MR. CATTON: And when does this gross recirculation stop? At what level?

MR. JONES: Well, I think that's a matter of -- that's part of the issue, and we're still looking at that. Larry will touch on that in a few minutes.

MR. PHILLIPS: Basically, his direction is to keep dropping level until he reduces power based on some criterion which I don't remember but which I believe is related to the steam flow. The minimum he can take the level is this minimum steam cooling water level, about three feet into the core, and the way the EPGs currently read, if he drops below that level, then he has to depressurize.

I'm now addressing the OCRE petition because we feel that, and I'll get later into why we feel the EPGs were converging at some point, but we feel that the studies that were done in those two BWROG reports and our review as a result of it has concluded that as soon as you drop the level to this point below the feedwater spargers, and if you maintain it there, that the stability issue is done. We looked at alternatives like not tripping the recirculation pumps and this, that and the other thing. We're fairly well

convinced that there are more problems than solutions that result when you go to that approach, and that there's no reason to change the ATWS rule.

So, we feel like that based on these studies, that we've reached a conclusion that the ATWS rule is appropriate, and we're going to proceed with the issuance of the ATWS SER which provides the basis for that study, and we're working with RES, NRR is working with RES on a commission paper requesting approval of a staff recommendation for denial of the rulemaking petition based on the ATWS SER for those two reports.

MR. CATTON: What's the schedule on this?

MR. PHILLIPS: I'll give that to you at the end.

MR. CATTON: Okay. I can wait.

MR. CARROLL: What specifically did the Ohio group ask for in their petition?

MR. PHILLIPS: All right. The Ohio group, their petition was actually much broader than that. It was a 2.602, I believe it is, petition, which was asking for relief because of the LaSalle oscillation event, and basically was asking for all of the BWRs to be shut down. That was reviewed and denied by the NRR director's decision, but at the same time, he felt the portion of their petition directed to the rulemaking and the recirculation trip had some merit and should be studied further. So, he directed

RES to evaluate rulemaking in connection with this. So, that's where we've been up until now.

This expanded also from not only a stability study but an EPG study, as we already discussed. The existing EPGs permit water level reduction to this minimum steam cooling water level until the hot shutdown boron weight is reached. That's actually a calculated way, and it's after they've calculated the amount of boron it will take to shut down the reactor completely. It's some 400 ppm or something on that order in the core, and it takes them about 30 minutes to inject that much boron. So, essentially, according to the existing procedures, you start the boron injection fairly early, which is another one of the recommended revisions that you started even earlier, but it will effectively mix until you've dropped down into the core and the flow is reduced according to the experiments down around the order of four to five percent, the recirculating flow. Then it stratifies.

We're still continuing to evaluate the most effective shutdown strategy, and one of the considerations is boron mixing, of course, and the other one is standby liquid control system considerations.

MR. CATTON: Have you been able to get the reports on the experiments that they claim to have carried out?

MR. PHILLIPS: Yes.

MR. CATTON: Is it possible for you to communicate them to us?

MR. PHILLIPS: Sure.

MR. JONES: It's our understanding that GE did send a set to the committee.

MR. BOEHNERT: I got a nonproprietary version, Bob, and I just haven't gotten around to asking them for the proprietary version because, you know, it doesn't say much in the nonproprietary.

MR. PHILLIPS: I doubt that that was intentional.

MR. BOEHNERT: Yeah, I doubt it.

MR. JONES: Let us take an action to go back and look, and we'll send you the propriety version. No problem.

MR. BOEHNERT: That's why I haven't sent it to you, Ivan.

MR. CATTON: Nonproprietary, I mean, figures with nothing on them doesn't do me much good.

MR. PHILLIPS: It has the title of the report probably. Okay, just to review the boron mixing problem again, and everything up until now, incidentally of course, and including this boron mixing, has been previously heard by the subcommittee.

For boron injection into the lower plenum standpipes, and this is the BWR three and four reactors only that inject this way. The boron mixing doesn't occur until

you get to a low core flow about four to six percent of rated. This is true whether you're in the core or above it because of course, if you're above the core and you're shutting down, your flow will also reduce because as your power drops, your driving head due to the thermal, the voids in the core, the thermal circulation will drop, and this is one of the big points that's made of the owners group consultant. Whenever you argue against dropping it all the way, is well, even if you keep it up, you're still going to have to raise the level in order to accomplish complete shutdown. I'm not sure that's too important. I mean, temperature is going to do things too. It just means you might be getting some bouncing around at low power for awhile.

The experimental basis for the boron mixing is the Theofanous study, fairly recent experimental data, in which he basically concluded that the mixing efficiency is almost perfect down to four to six percent of rated flow. So, he actually shows a better mixing efficiency than was shown by the OGE data, which shows that it decreases below 20 percent flow and ceases at about the same point that Theofanous said.

MR. CARROLL: What is mixing efficiency?

MR. PHILLIPS: Mixing efficiency means you inject it, and 100 percent is it mixes uniformly in all of the

water.

MR. CATTON: A hundred percent carried up into the core.

MR. PHILLIPS: Right, and then the water circulating around.

MR. CATTON: It injects into the flow, and it's all literally carried out. When they lose it, it drops into the bottom.

MR. KRESS: Before you put that one off, could you put that slide back for just a minute?

MR. PHILLIPS: Sure.

MR. KRESS: Could you clarify for me what's meant by four to six percent of rated core flow? Is that four to six percent of what you would have at full flow reactor power?

MR. PHILLIPS: At 100 percent power, yes.

MR. KRESS: What level flow does it take, what percentage of that flow does it take to hold the water level at the desired position in here? You know, to keep it there, you have to balance the steam by the thing, and you're talking about four percent, five percent, six percent power. I presume you need five percent of the flow or six percent of the flow.

MR. PHILLIPS: Well, for natural circulation, say if you get a reactor or pumps trip, for natural circulation

conditions, you would be at about 30 or 35 percent flow, Howard? And what, 50 percent power, 60, something like that. That's your normal -- that would be your normal recirculation. You'd be at about 35 percent. And then of course, as you reduce the water level, the recirculation rate is going to decrease, and I suppose as you get -- but you're also, at the same time, you're injecting boron, which is helping to shut you down. So, that's going to further reduce your natural circulation rate. So, you have two factors that are reducing it. One, you're dropping level, which is reducing your head, and then you're also --

MR. KRESS: But that core power level, I thought I saw, goes down about five percent?

MR. PHILLIPS: At the four to six percent flow you mean?

MR. KRESS: Yes.

MR. PHILLIPS: I don't know. Is that --

MR. KRESS: Yes, that's my question.

MR. PHILLIPS: Yes, the answer is yes.

MR. KRESS: So, you're almost at a case with Theophanous's study where you don't stratify.

MR. PHILLIPS: But no, you're still injecting boron. You want to shut the reactor power down completely, and you can't do that. You'll start stratifying.

MR. CATTON: The point that Tom is making is that

from what you said, it sounds like the boron would still be mixing and the power would still be coming down.

MR. PHILLIPS: Yes.

MR. CATTON: Well, but see, they continue to lower the level, see, and they lose the head that drives the core flow. Then they lose the circulation around the core and up through the core.

MR. PHILLIPS: I understand, but even --

MR. CATTON: That's when they lose the boron mixing.

MR. PHILLIPS: But according to Theophanous's, you only need four to six percent of rated flow to mix it.

MR. CATTON: That's right, but they also --

MR. PHILLIPS: Which is well below that.

MR. CATTON: But he also maintains, and I haven't seen anything to really prove one way or the other, that this occurs with the level above the core.

MR. KRESS: So he's making use of that recirculation. He's not counting that.

MR. PHILLIPS: Yes. In fact, his main point is to keep the level high.

MR. KRESS: I didn't understand that part.

MR. PHILLIPS: So, you have competing shutdown strategies that we're talking about. One is the existing EPGs that does it the way where they drop it to the minimum

steam cooling water level, about three feet into the core, but not necessarily. Keep in mind that when I say this, they may be stopping well above there, depending on how the power is responding. But, they're permitted to drop this low is a better way to phrase it.

Then they're instructed to, after they've injected this precalculated amount of boron that they have pretty good confidence that it's going to shut down the reactor, then they're instructed to raise the level and pick up the stratified boron, which will shut down the reactor. If they have miscalculated and it doesn't shut down the reactor, then they go back down, but the idea is they haven't miscalculated.

The advantage of this approach, or at least the preconceived advantage and the one that's been argued for some time, is that it minimizes the containment heat load, the integrated heat load, until shutdown because of the high void content when you drop the water level this far into the core.

MR. KRESS: Let me ask you a question about your last statement. You said let's presume they've miscalculated and they turn the mixing back on the pumps, and the power doesn't shut off. You say they can go through the same procedure again.

MR. PHILLIPS: And inject some more boron.

MR. KRESS: Inject some more. Now, I worry a little about that because I thought this was a race. Before you heated up the suppression pool to the point where you have to depressurize the whole system because of some rule or some requirement.

MR. PHILLIPS: That's right.

MR. KRESS: So, it seems to me like you're flirting with that race. If you didn't do it right the first time, do you still have time to go back and do it again?

MR. PHILLIPS: It depends on how conservative their calculations are, and their calculations have been extremely conservative until now, and because of other problems, they're reducing the conservatism in the calculation. So, that seems to be correct.

MR. KRESS: You say it's likely that they'll miss it the first time.

MR. CATTON: There's one part in the conservatism that's a little bit suspect, and that's the heat up rate of the suppression pool. They assume they mix the whole damn thing, and you know that the entire heat sink capability of the suppression pool is not available to you. I don't know how that's going to be accounted for. If it's 50 percent, then you have the time. It depends on where the SRVs are located and all sorts of things. Bob Jones probably

remembers. These were measurements that were going to be made at Zimmer.

MR. PHILLIPS: The heat load or the suppression pool cooling, though, is pretty small. Whether you have it or not doesn't make a whole lot of difference I don't think.

MR. CATTON: I'm not talking about suppression pool cooling. I'm talking about stratification. If you have pumps that can move the water around, you have no problem because then it's fully mixed. But if you for any reason don't, you lose a good part of your heat sink, possibly. I just wanted to temper your words about conservatism.

MR. JONES: I think here what we've been looking at in this hot shutdown boron lead is they use an extremely large, for example, an extremely large vessel volume. I mean, I think it's basically a solid vessel almost for the total volume of liquid. So, to come up with how much boron you have to inject, well, it's a substantial, because just the pure liquid volume you're trying to fill up, after the shutdown margin, is just highly overestimated. I think it's like a factor of two.

MR. KRESS: Do they include the hot legs and cold legs and the water in the steam generator?

MR. JONES: It includes all the down pump, the lower head, the vessel. It assumes it's non-voided. It

assumes some water level. I don't know the exact point, but it's fairly clear that how they're currently calculating the hot shutdown boron weight is conservative. As far as telling you when to raise the water level back up, that you should have more than adequate shutdown margin at that time.

MR. PHILLIPS: Well, it's clear they were doing that a couple of months ago.

MR. JONES: Right, now where they're going to be in a few months related to the EPG changes, as you will hear shortly, that's one of the areas they're looking at because they would like to improve this race between the containment and how quick they can bring this back, which is going to put only more emphasis on better understanding of some of this mixing phenomena or at least some of the uncertainties associated with it to provide some assurance that these uncertainties do not lead us to the wrong conclusion.

MR. KRESS: Are you going to talk about that more later then?

MR. JONES: Just briefly. Again, a lot of this information, the types of issues you're raising or exactly the kind of issues we've been discussing with the owners groups over the last year, roughly, and certainly the meeting that was held in Santa Barbara was part of that effort to give this information to the owners group for them to look at. They have done some considering of it. They

still believe their position is right. We're waiting to see what they're going to come back with. They have presented to us some information, but we have nothing in hand. We are trying to put together models of our own, simple models, to try to look at some pros and cons of the GE data and the Theophanous data to see what we can come up with independently.

So, we're looking along those lines to help draw that conclusion, but we're not there yet.

MR. KRESS: Are there plans or another meeting with the owners group in the near future to talk about this?

MR. JONES: There will be future meetings with the owners groups. There are several submittals that we are awaiting in the next couple of months, as you will see, and when we get them, I'm sure we will have further discussions with the owners group.

MR. CARROLL: I'm not absolutely sure that you understood Ivan's point about the ability of the suppression pool to absorb energy.

MR. PHILLIPS: No, I didn't.

MR. CATTON: Well, part of the timing that's associated with all of this is the effectiveness of the suppression pool as a heat sink, because that's what determines how fast it will heat up. I think what you're trying to do is to avoid letting it -- is to get these

actions completed before it gets too hot.

MR. PHILLIPS: That's true.

MR. CATTON: That's right. How fast it gets hot is a function of how effective it is. How effective it is is determined by how much stratification you get, and we have not yet addressed that question in any kind of thoroughness.

MR. JONES: We certainly haven't, and these evaluations --

MR. CATTON: And so, if you're going to start getting close to the edge, we're going to have to go do that. We're going to have to take a look at that.

MR. JONES: And that's fair, and we'll bring that back.

MR. CATTON: That's right.

MR. PHILLIPS: And maybe half the water in there never sees steam condensing.

MR. CATTON: That came up on the review of Zimmer, and the Zimmer people at the time promised, and GE promised, that they would put special instrumentation into the pool and during startup testing, these things would be evaluated. Well, we all know what happened to Zimmer, and nothing has come along to replace it as far as evaluating the effectiveness. So, I just think we don't know.

MR. PHILLIPS: Well, basically now they're

instructed to depressurize when they reach a temperature limit in the separation pool, which we don't want to get to because again --

MR. CATTON: Then you had better take a look at the effectiveness of the suppression pool because you may reach that limit a lot sooner than you thought.

MR. KRESS: Where is that temperature measured?

MR. JONES: I would have to have the containment people here to answer that question. This is really more --

MR. CATTON: I've been watching for this issue for a long time, and this is the first opportunity --

MR. JONES: We've got it. We have captured your comment, and I will talk to Rich Barrett and his people to try to make sure this is soon. I know that development, there is a method of developing what this temperature limit is. It considers plant specific volumes. It includes how much heat you've got to dump in during a blowdown and things like that. Now, how much it includes stratification in the pool, et cetera, that I am not aware of, but we will check it.

MR. CATTON: I asked the owners group people who were at Santa Barbara about this, and they use a bulk temperature, which means you dump the heat in they throw CP and volume delta T. It's very simple.

MR. PHILLIPS: Okay, just one major point about this. One of the reasons that they are so insistent on taking this strategy on the shutdown is they feel that the probability of the standby liquid control not working at all is significant, and they want to buy as much time as they can through the shutdown by voids if that's the case. That's one argument that can't be refuted, at least as far as -- yeah, this would definitely be better under those conditions.

This is where the new GE data comes in regarding the boron remixing from the lower plenum. The effectiveness has depended upon this GE 1/6 scale model data, which we still have under review and what you will get, although I'm dubious at any firm conclusions that can be reached in that regard.

MR. CATTON: One of the other arguments that the owners group was making at Santa Barbara that came through very loud and clear is that if they take this pathway, it just deals with a whole lot of things, and they don't have to have a number of different EPGs for different things. That's a compelling argument.

MR. JONES: I mean, without taking away a little bit of Larry's thunder, I mean, what we find when you -- let's not deal with the specifics of how the containment was modeled, but the differences between whether you use a GE

type model with minimal mixing and lower water level to a fully mixed model and play around with some of that a little bit doesn't result in substantially difference in pressure pool temperatures. You know, maybe it doubles or triples because of a mixing deficiency or stratification if we haven't considered it, but it still gives you roughly the same answer. Then you get into these other considerations like procedures being the same et cetera, that I think may drive the problem.

At this point, what we're really finding is we're really leaning pretty hard to conclude that the level detail needs to be worked out in order to finalize the procedures, but we don't see that that difference at this point to be significant enough to not allow us to close the petition, which is where we're going to get as we go through this process.

MR. CATTON: You pulled that other slide off a little too quick.

MR. PHILLIPS: I thought it was there a long time.

MR. CATTON: Well, we were having a lot of trouble working our way down through it. This last issue, I think, is where it's at, too. Now, the GE tests that I heard about, the number was matched, but wasn't it done thermally? There was some question about whether the tests that they did with the salt were appropriate. Have you addressed

these issues?

MR. PHILLIPS: Tony is the only one that's looked at that in any detail.

MR. ULSES: I'm Tony Ulses of the reactor systems branch. When we did our review of this document, we concluded basically that there were some potential deficiencies in the density modeling due to the lack of numbers scaling. They did a linear type of scaling, and that lead us to believe that there were some problems in the density scale, which basically you referred to the injection that they used --

MR. CATTON: In other words, two sets of tests done, I understand. One, they just had cool water in the bottom, and then in the other test they actually had salted water in the bottom. Is that correct?

MR. ULSES: The tests that we have the data from deals with only the cold water, and then they start an injected fluid at a certain time into the transient. You know, they let the model stabilize, and they started their injection.

MR. CATTON: So, that was thermal stratification, is that what you're saying?

MR. ULSES: What I'm saying is that they didn't do it at reactor temperatures. They did it at low temperature, and then they scaled the temperatures.

MR. CATTON: The scaling parameter is density in this case.

MR. ULSES: Right, and they did not scale the density, like I said earlier, and that's --

MR. CATTON: How did they achieve the delta row?

MR. ULSES: I can't specifically answer that because it wasn't referred to in their document. I think that that's something that we'll need to look into further.

MR. CATTON: You bet, you see, because Theofanous was making the arguments about their tests that they had used cold water and hot water in order to get the delta row that causes the stratification. Mixing processes are very different for salted water than for hot water because the salt has a very low thermal diffusivity, and you can even mix it up, and it will fall back down, where if it's thermal, it's very easy to mix it. It's much easier to mix it. The big concern that I recollect in Santa Barbara was the fact that they had used thermal stratification and tried to extrapolate that to the salt stratification that would exist in this case. That's why I'm eager to see these reports.

Now, the owners group said that there were tests done with salt but they wouldn't give them to us because they said it was proprietary and whoever did it wouldn't release it. Have you overcome that problem?

MR. ULSES: The only report we have is the one from General Electric that is --

MR. CATTON: Thermal?

MR. ULSES: It is thermal. It's how they developed their efficiencies.

MR. CATTON: I don't think this question is addressed yet. You can't base anything on that.

MR. PHILLIPS: This is the one they say they're relying on.

MR. CATTON: Well, I'm sorry.

MR. CARROLL: They can say anything they want, I guess.

MR. JONES: Again, I think the point that I would like to emphasize a little bit here, though, is that I'm not sure we're going to conclude their tests are acceptable, as to come up with what is the actual mixing. So, a lot of our focus has been gee, Theofanous's tests look pretty good. What's the difference? Well, Theofanous's tests were for the mixing with circulation, and he established a cut-off.

MR. CATTON: The kind of mixing that you're going to depend on when you raise the level is totally different. I mean, it's completely different. You're literally having to mix up off the bottom of the vessel. What Theofanous's did is he's injecting it into the cross-flow. There are very different processes. I think he established in my own

mind fairly well, that in the cross flow, down to this four or 6 percent, the mixing is extremely effectively. The open question is, can you mix salted fluid up off the bottom. I use the word salted to keep it separate from thermal.

MR. SEALE: And it's really the pickup off the bottom that's the problem.

MR. CATTON: That's right. You know, the Israelis built solar collector or solar stills this way. What they do is they run the salted water in on the bottom. It stabilizes this whole thing when they heat it up in stabilizing, and it doesn't mix.

MR. PHILLIPS: The alternate strategy is to maintain the level higher, we say above the top of the active fuel because we're more comfortable when you keep it above the top of the active fuel, and you have a fairly large height to work in between the meter below the feedwater sparger and the top of the active fuel. It's our judgment that you need that. The level is not all that easy to control.

MR. CATTON: But you say then raise the level and mix stratified boron. In this particular case, I thought that boron would be mixed in. It doesn't stratify.

MR. PHILLIPS: Actually, I think what we're talking about is when you get down to the point that the power stops -- if Rogers is right and you get down to the

point where the power stops dropping with the boron injection because your flow has gotten too low, then you raise the level to increase the flow.

MR. CATTON: Okay, so in this case, you get below the four or six percent recirculation because you don't have the driving from the power.

MR. PHILLIPS: Right.

MR. CATTON: The same question still exists here then, whether or not you can mix it back up.

MR. PHILLIPS: Right, and that's the point that he keeps driving on, but I don't think it's nearly as critical here. At least you're down to four percent power.

So, this starts getting new now, what the subcommittee hasn't heard before. So, we've been continuing to work with them on the EPG review, and basically our objectives and what strategy we end up with here is to minimize the time interval when the reactor is vulnerable to very large power spikes during an ATWS event. That's taken care of by the shut off or shut down the feedwater as soon as you can.

Avoid a strategy which has a high probability of leading to reactor pressure vessel depressurization, and there's several strategies that can do this, but one of them is the level control in that the current EPGs say if you go below MSCWRL that you depressurize, correct it to do that.

You assure that the level control and the boron mixing strategy in the EPGs provide a high confidence of acceptable heat load to the containment during a reactor shutdown by soluble poison which is what you were talking about. That's been our review objectives.

We did a simulation at the technical training center. Fortunately, they had upgraded the analytical model in the simulator, and it was a fairly good neutronic thermal hydraulic model. The simulator was an old -- our BWR simulator was one that was originally built for Black Fox, and it's now been modified to -- it's supposed to represent Perry. So, you might say it's a little bit of a hybrid between Perry and Black Fox.

We did identify several issues during the simulation. The purpose of the simulation being let's see if -- we've talked about these revisions. Now let's see if they're workable, if there is any big pitfalls. One of them which I will get to in a little more detail, though I don't plan to go into a lot of technical detail here. It's something the subcommittee hasn't heard.

The depressurization is a difficult void following isolation in the BWR 5 and BWR 6 plants with high pressure core spray. What I'm saying there is the BWR 5 and 6 plants do have high pressure core spray. This is a large volume system which is an on/off control basically. Now, if you

isolate the BWR/5-6 plants and you don't use the high pressure core spray and you're instructed not to use it by the current EPGs, you simply don't have enough capacity to follow the power under these conditions. You don't have enough makeup. You can't do it. So, you're going to drop the level down to this level where you have to depressurize. That's what our simulation found.

The first time they went through this scenario, one of the operators turned on the high pressure core spray because he knew this, but we found that he had the same problem here. In a sense, the EPGs were right because with this on/off high volume control, you hit the level going like this. You can't control it anyway. You go below that point anyway, and you're still instructed to depressurize. So, that was one problem we identified.

Another problem we identified was man, you have to jump on that control pretty quick to keep from isolating. What you want to do is override the level one or two, whichever it is, MSIV closure so that you keep on feedwater control. For this plant, they didn't have a key lock bypass. You had to send somebody out into the plant to do it. So, we assumed, I think ten minutes it was going to take them to do it, which isn't going to get done. We were after a try or two, they were able to maintain the level, but it took an awful lot of attention to a quick response,

and really good operator action. So, we felt that not having a key lock bypass was a real problem because that level had to be maintained until they could get out in the plant and take care of it. If you isolate, it's a lost ball game.

Finally, the proposed changes provide no guidance to maintain the water level of the isolation set point or training, and as I said, once he had done this a time or two, he took the proper response, but initially, he didn't realize what was going to happen if he didn't jump on it and keep it from isolating.

Incidentally, we sent a letter to the owners group this reference, which includes a report on the TTC simulation. Did we send a copy of that report to you? I think we did, and pointed out these problems.

MR. CARROLL: GE, or the owners group had never tried to simulate this for purposes of validating their EPGs?

MR. PHILLIPS: Well, that was the point of some of our questions, yeah. Remember that this is one plant. This is Perry, and they felt like there could be modeling deficiencies here, which is an area we're still looking into by modeling deficiencies. I mean, maybe we don't have distances just right somewhere. I don't think that's the case. They were pretty careful.

MR. CARROLL: My question is, though, have they not tried their EPGs on some of their simulators?

MR. PHILLIPS: On some of their simulators, yes.

MR. CARROLL: And what was the result of that?

MR. PHILLIPS: Well, I can't really answer that. They were -- let's say that some of these problems apparently did not surprise them, particularly on the key lock bypass. It did not surprise them, and they admitted that they had similar concerns. It was part of what they were looking into in their continuing review of the EPGs and how they were going to respond.

MR. JONES: I think in all fairness to them, I'd like to say that again, these were their what I would call first cut at where they thought they were going with the EPGs based on the analysis that had been done which had not yet gotten to the point of really looking at what I would call feasibility of using them at a plant. So, you had kind of an outline as to what the EPGs would look like. They still needed to go through the remainder of their evaluation through their operator support committees, and come up with a final EPG submittal. We took those EPGs and what I would call concepts, and that's what we were playing with to look at doability from our end.

MR. CARROLL: Okay, so you sort of jumped the gun on it then?

MR. PHILLIPS: Yes, a little bit, and they were very appreciative and cooperative, I think, in looking at what happened here.

The reasons for our concerns are that the simulations suggest that we get the unnecessary -- we may get more unnecessary isolation events from level control and isolation events increased risk. During the simulation, we couldn't maintain the water level above the depressurization point, the MSCRWL, and there were -- we also noted that when you depressurized, there were long periods when the core was uncovered during depressurization actions.

So, it made me at least -- I felt even less comfortable about depressurization because I sure don't want to -- I think it becomes very difficult to predict how much core damage you're getting. When you've got low water level, if you raise it up at low pressure, you may go back into oscillations, whatever. So, depressurization, I think it's a viable action, but it's not one that you want to make part of your primary strategy. It's a backup. You've got two containments for a reason. You want to use one of them as long as you can.

MR. CATTON: This seems to me might be a good place for application of some of your thoughts on risk based regulation. You have alternatives in front of you. Use PRA to decide which one.

MR. PHILLIPS: Well, I think basically that we're -- I guess I'll get into a little bit here. I think we're more converging. On looking at the problems with control, level contro. that is, and problems, new problems that they've been identifying and backing off a little bit on where they are and what they're doing, and also looking at the fact that -- well, one big item which made me a lot more comfortable is in responding to these concerns, we've now -- the BWR/5 and 6 plants, and it was after all, a five, or a six actually, that we were simulating, and for those plants, you're injecting the boron into the core spray spargers above the core and within the shroud. You're concentrating it in the core. So, they've been playing with their calculations again. They're getting fairly fast reaction of shutdown from the boron when they do this. So, it's very likely it's unnecessary to go down into the core, to the way they've been doing it.

MR. CATTON: Let me understand. Does this say that the -- so, what's the path of the boron, over the top of the core?

MR. PHILLIPS: Over the top of the core into the core.

MR. CATTON: How does it get into the core if you've got flow? Boron doesn't go upstream. It seems to me it would be mixed, carried down the annulus and back up

through the core, not into the core.

MR. PHILLIPS: Well, you're --

MR. CATTON: If your analysis is showing it going into the core, I suggest maybe you take another look at the analysis.

MR. PHILLIPS: Yeah, you're still dropping water level.

MR. CATTON: If you drop the water level down, oh, then you're dumping right into the core?

MR. SEALE: If you haven't dropped the water level, you've still got circulation.

MR. CATTON: Well, as long as you have circulation, you're going to carry it around the core and up into the bottom.

MR. PHILLIPS: So that's great. So, it's fine then, and as soon as you drop the water level, you're going to be injecting it directly into the core.

MR. CATTON: So gee, that's another alternative that you probably, or another aspect that needs a PRA, right Pete?

MR. JONES: I'm not sure I would agree that I want to do a PRA on this issue, but I think what you're hearing to a large extent is what this study showed us, and the amplication, and then what we made the owners basically do in response to this, was to look real hard at their plants

and the plant specific features and how it impacts this problem. I think we were a little surprised with some of our results, and then when the owners went back and looked at it, what you find is oh yeah, we have key lock bypass switches on the plants in general that are going to be affected by this. So, it's probably not an issue.

MR. PHILLIPS: Others are talking about putting them in now.

MR. JONES: Right.

MR. CATTON: I bet they are.

MR. JONES: The BWR/3, 4's don't have this problem. They can maintain water level. So, I think what we've done from this study and looking at the useabilities, we learned something, and I think they learned something. They've looked a lot harder as to where is their isolation set points. Do they have a key lock bypass or not or would it be helpful to put one in from the standpoint of operator control.

So, I think we learned a lot and they went back and looked at what they've got, and I think they presented a pretty convincing argument in response to our concerns in the meeting we had, and again, they still need to document this. We and they have a much better appreciation for the issue. I don't think it's a PRA issue. I think it's understand your plant issue.

MR. PHILLIPS: I think it's converging, as I said, because with the 5's and 6's, they may be shut down before they ever get to that type of situation. With the 3's and 4's, they have high pressure coolant injection, which can be controlled.

MR. CATTON: In the 5's and 6's, the boron is injected all over the core in all of them?

MR. PHILLIPS: Yeah.

MR. CATTON: So, in that case, you're going to get mixing down until the natural circulation stops.

MR. PHILLIPS: Right.

MR. CATTON: Which means down to one or two percent you would still be getting your mixing.

MR. CARROLL: You're going to establish another natural circulation situation at that point, Ivan, where water is going to go down the cooler channels or between the channels.

MR. CATTON: Yeah, that's right, so the mixing would continue. You mix down -- actually, it might even be more effective. So, it's really only the three's and four's where you worry about this mixing up from the bottom.

MR. PHILLIPS: Right, and they have high pressure coolant injection where they shouldn't have all these control problems, although we haven't simulated it, I'm sure.

MR. DAVIS: Larry, let me ask you something about this key lock situation. Does that override all signals to close the MSIVs?

MR. PHILLIPS: I'm sorry, I didn't hear the first part of your question.

MR. DAVIS: Does this key lock bypass override all signals to close the MSIV?

MR. PHILLIPS: Yes.

MR. DAVIS: Well, it seems to me that what you'll get in this event is an iodine spike probably, so you're going to be putting radioactive iodine into the MSIVs, which normally would shut the MSIV valves.

MR. PHILLIPS: The EPGs tell them if they get that, that's an area that's been discussed, and at least in the discussions up until now, they are not supposed to override if they get iodine spikes during the early part of the --

MR. DAVIS: I think they will. And then you won't bypass in that case?

MR. PHILLIPS: That's right.

MR. DAVIS: I think you've got the problem back again.

MR. CARROLL: How do you know you had an iodine spike?

MR. DAVIS: Because you've got --

MR. CARROLL: No, what instrument tells you?

MR. DAVIS: There's an radiation monitor in the steam lines.

MR. CARROLL: But isn't it swamped out by hydrogen 16?

MR. DAVIS: No.

MR. CARROLL: It should be.

MR. DAVIS: I don't think so. If it sees high radiation, it will close the MSIVs. If it doesn't, then the iodine will get into the condenser, close the air rejectors, you lose condenser vacuum, and then you'll close the MSIVs for sure then. I think this needs to be looked at. I don't think you can in this case override the MSIV closure.

MR. PHILLIPS: If you get MSIV closure on that early stage, we have looked at that transient, and we're not as bad off as we are on this other transient. We have looked at that.

MR. DAVIS: I though you said if you couldn't keep the MSIVs open, you lose control of the feedwater.

MR. PHILLIPS: Well, the reason we want to keep the MSIVs open, one of the reasons is that when you close the MSIV, it's a higher risk event than if you keep all your water sources available for cooling. That's the reason we want to keep it open. One of the early questions by ACRS, what's the change in risk between -- of ATWS risk, impact of

oscillations, and the largest impact on risk is that you turn a lot of non-isolation events into isolation events.

We found from a pure calculational standpoint that the MSIV closure events are not as bad oscillation-wise I should say, as the others. But yeah, you raise some interesting points, and we'll think back that path again.

MR. DAVIS: Don, if this kind of thing is captured in the simulators --

MR. PHILLIPS: Oh, no, it isn't.

MR. DAVIS: Yeah, I think you should look at it. I think you're going to get an iodine spike, and that's going to mess up the bypass of the MSIV closure. It seems like this is a PRA issue to me, or a risk issue.

MR. CATTON: Well that's what I suggested.

MR. JONES: We have looked at the PRA, the effect of some of these things and the increased number of oscillation -- of isolation events which may occur due to stability issues, including the control. In trying to look at the answer here, I'm not sure I understand the details quick enough to give it to you to say these are exactly right, but just for illustrative purposes right now.

In the original SECY paper, it was estimated that the core damage frequency was on the order of 12 times 10 to the minus six for all ATWS events. When we tried to account for the impact of stability -- the increased stability

effects or instability impacts, you end up with about 15 times 10 to the minus 6. So, it's not a large increase as a result of that. Now again, I think we discussed this before. I think you have the information. This is a response to some questions that we did ask. We did get a handle on how large in effect do large oscillations have on risk? We don't think it's very significant.

MR. CATTON: My recollection is that when they responded to this request for risk estimation, it was highly based on arm waiving, strongly based on arm waiving.

MR. DAVIS: I remember those numbers, by the way.

MR. PHILLIPS: They have charts, in answer to our question.

MR. CATTON: We haven't seen any of those, but I think, Pete, you ought to take a look at it.

MR. CARROLL: What strikes me is if you look at this whole can of worms from a safety goal point of view, it's below the level where you should be really event worrying about it.

MR. CATTON: If, indeed, the numbers are that low.

MR. PHILLIPS: Their calculation was a 10 percent increase in risk.

MR. BOEHNERT: Yes, that's what I remember, was 10 percent.

MR. CARROLL: What does that mean, 10 percent

increase?

MR. PHILLIPS: In core damage frequency.

MR. BOEHNERT: But it sounds like it's highly plant specific.

MR. CATTON: What about some specific numbers? What fraction of ATWS events would you expect to have a stability problem? Does it always coast through that unstable zone?

MR. PHILLIPS: No. About half of them are non-isolation events. Isn't that right, Bob, half of them are non-isolation? You know, it's anybody's guess as to how many, but I think it could be as high as half of those. It depends on the conditions at the time that this takes place.

MR. JONES: I think that's why we tried to look at -- we looked at the risk impacts or asked the owners to, we asked them to take -- again, the issue is fundamental basis for the ATWS rule. What we were looking at is challenges to the ATWS rule, so we're trying to say given now that you have large oscillations, it appears to us at first glance that its effect is to lead to fuel failures based on the calculations, which means an increased likelihood of going to an isolation event, which means the risk numbers and perception we had when we wrote the rule has been altered, how much and how significant. So, what I'm saying is when we do that, and I think that's what they've done here, and

these numbers are comparable to numbers I did on the back of an envelope a couple of years ago. It's about a 10, 20 percent increase, but given the nature of that rule, I don't think that's unreasonable. I don't think that's a big change.

MR. CATTON: That's a 10 or 20 percent increase in the ATWS risk.

MR. JONES: And the ATWS risk at the time that we wrote the rule, given the rule changes, it would change that number, about 10 to 20 percent. When you look at the impact on all of the decision making, processes that went on through that rule, you don't see anything that would really have changed it. That's really the bottom line. So, from a role perspective, we don't think it changes the role.

Now, that doesn't mean we want all of these different oscillations, thus what we're trying to do with the procedures is to try to quickly deal with oscillations? Should they occur? Then take control of the plant so that you do not bet these isolation events because those are the ones that really are the challenge ultimately.

MR. PHILLIPS: But we have looked at it from the standpoint of assuming a fuel failure an iodine spike also when we got the big isolation peaks, and looking at isolating when that happened. Incidentally, the isolation isn't necessarily automatic anymore. That's been taken off,

out of the tech specs for many plants. They're all permitted to. some of them haven't done it yet.

We said the procedures say isolate anyway. So, we had them look at, do the calculations, assuming they had to isolate under those conditions. Those were included in the study. I don't remember the details of the result, but it wasn't the worst path.

MR. JONES: Larry, why don't you just put up the schedule slide. Our time's running out. I think we've covered all of these bullets anyway by this time.

MR. PHILLIPS: So, this is a schedule. We're proceeding, now that we've got Roy Woods from research back in here from his long leave, we can get together and work on his commission paper. We're going to -- we plan to issue the SER essentially as is that we presented to you some time ago, and we're shooting to get that out next month. We plan to work on the commission paper and have it for denial of the OCRE petition and have that at least to the commission by March.

The owners are committing to get their EPG document submittal in in March. That is, incorporating all of the revised EPGs, both the early changes to take care of stability and then later ones. In April, we'll get a TER from Oak Ridge on what they submit. In May, we expect to have our draft SER ready on the revised EPGs, and to go to

CRGR by June or whatever organization exists at that time.

MR. CARROLL: What does that mean?

MR. PHILLIPS: Well, there's been rumors that that's all being changed. Forget I said it.

MR. WILKINS: Yeah, I think you should.

MR. PHILLIPS: Our final SER on the EPGs would be issued in July.

MR. DAVIS: I think, Ivan, we should stay on top of this. I wonder when would be a good time for us to have another meeting, or do you plan to have another one?

MR. CATTON: Did we write a letter on the SCR?

MR. BOEHNERT: No, because they held off, you know, after they came in, we were just about ready to go forward, and correct me if I'm wrong, Larry, but you understood, well, we're going to now combine this with the solution for the EPG, so we all just stood back.

MR. CATTON: We've been carrying a subcommittee meeting on this subject on our books now for a long time. I think we probably ought to revisit the whole thing via a subcommittee meeting. If you're going to do that in February, it sounds like it ought to be tomorrow.

MR. PHILLIPS: Well, the SER you've reviewed.

MR. CATTON: Maybe we'll let you and Bob decide when it would be best.

MR. BOEHNERT: Yeah, I'll harass Bob about that.

MR. WILKINS: Well, the question is, just philosophically, where does it belong in this schedule?

MR. DAVIS: After the draft SER, I would think.

MR. WILKINS: P · does it come before? It has nothing to do with the OCRE rulemaking.

MR. PHILLIPS: Well, it does. As a matter of fact, it does. The SER is the basis for the OCRE petition.

MR. WILKINS: Your recommendation can deny the petition.

MR. PHILLIPS: Yes.

MR. JONES: Recognizing the SER and ATWS is primarily -- it's not going to answer any of these control problems on the EPGs. What it's really going to say is we believe that these kind of controls, that is, lowering water level, at least below the feedwater sparger, is effective ways of stability oscillations during an ATWS event. Subsequent to that and how you control it, the SER is silent. As a matter of fact, I wouldn't say silent. The SCR says we're still studying that, but from the standpoint of ATWS oscillations, and its impact on safety, that's what this SER deals with, and it deals with things like some of the risk perspective. It deals with some of the things like were there alternative hardware options that could have been pursued to improve -- I guess improve is a bad word, but were there other options available that seemed to be

practicable beyond what was in the current rule, and that says no.

MR. CATTON: So your bottom line is that oscillations may increase risk. Added elements of EPGs balance that the net result is basically no change?

MR. JONES: Basically, I would say we don't say it's no change. I think what we say is the change is small.

MR. CATTON: Okay.

MR. JONES: And that the EPGs need to continue to be brought to fruition and just get this level control issue resolved.

MR. PHILLIPS: Let me say the difference between now and almost a year ago when we wrote this SER is that at that time, we were so uncomfortable with the differences in how we were going to get to an end in this, that we just weren't -- we were not 100 percent positive that we may want to go back and reconsider what we were doing with the pumps again. We're now convinced that we can get there. We feel we're converging, and we're not going to want to go back and consider what we're doing with the pumps differently.

MR. CATTON: No, I can see where you can come to that conclusion with the fives and sixes, but the three's and four's, until you address the mixing issue, you are sort of still in the dark.

MR. PHILLIPS: Well, I don't think we're in the

dark as far as dropping below the feedwater sparger.

MR. CATTON: But you still get caught in this four to six percent recirculation rate.

MR. PHILLIPS: Well, we're going to get caught in it either way. I mean --

MR. CATTON: Well, that's true.

MR. PHILLIPS: But I think we're going to have to go through the first part of this the way it is to answer that. So, what we're saying is look, there's no need to reconsider the ATWS rule. The ATWS rule was fine. We've completed that part of the study. We'll continue to look at the EPGs.

MR. CARROLL: I would argue that there is a great reason to reconsider the ATWS rule. It's totally inconsistent with the safety goals.

MR. PHILLIPS: I think that's another petition.

MR. CARROLL: I don't understand these things.

MR. PHILLIPS: So that's basically our position.

MR. CATTON: So, what are you going to do if it turns out that this remixing from the bottom of the vessel just isn't going to do what it's supposed to do? Are you going to ask for a hardware fix on the three's and four's?

MR. PHILLIPS: No, I think if that's the conclusion we come to, we keep the level higher.

MR. CATTON: Okay.

MR. JONES: I think the whole point here is where do you run level. So, we don't think the EPG issue is anywhere near being done, but we don't think it's important from the standpoint of the rule itself. Now, this is a separate generic issue not related to the LaSalle event, which is really, again, what the whole purpose of the petition is. It's in response to the large oscillation scene from LaSalle. This is not an oscillation related issue. It is an ATWS issue we will continue to work on.

MR. CATTON: You sort of signed off on the LaSalle type issue quite awhile ago.

MR. JONES: For the normal one but not the ATWS implication of it, and that's what the OCRE petition basically is, is what is the implications of the LaSalle event with respect to the ATWS rule, and what we're doing is wiping that out, saying we think we have the fix. Procedures are sufficient. We don't need to change the rule, and now we're just refining the details of some of the other parts of the procedure.

MR. CATTON: So, in that case, we're talking about May, June time frame?

MR. PHILLIPS: Yeah, right. Now, I think as far as the commission paper goes, the part down to below the feedwater sparger, you've heard all of the that and reviewed it before.

MR. JONES: Larry, I'm not going to argue with them about meeting with them. I'm more than willing to meet with the committee.

MR. PHILLIPS: Oh, sure.

MR. JONES: And the subcommittee. I just wanted to make sure you understood the relevant document, and I'll just -- let Paul and I discuss this further on the side. I just want to make sure that you understand what's in these documents. I think you have a copy. You can take a quick look yourself, and you can decide also whether you think you want to do it earlier. We will be glad to come down at whatever time the subcommittee finds convenient for both of us.

MR. CATTON: Your cooperative nature is overwhelming.

MR. WILKINS: Ivan, are we essentially finished with this? And there's no action that the committee needs to take at this time?

MR. CATTON: I don't think so, based on what I've just heard. We don't need to interact with this at all until it gets down further in that process.

MR. BOEHNERT: Okay. I'll make that note in the minutes because you know, there's this business about the SER. So, they're basically going to say they're going to go forward with that, that we'll be looking at the EPG issue

down the road.

MR. CATTON: Right, as to whether or not they can lower the level down there.

MR. BOEHNERT: Yes.

MR. WILKINS: Thank you very much, Mr. Jones and Mr. Phillips. We should take a break and try to pick up the six minutes we're behind on schedule. So, let's try to pick up some of it. Let's be back at 20 after.

[Brief recess.]

MR. WILKINS: Gentlemen, the next item on our agenda is the discussion of the reliability assurance program. Jay, I guess you're the cognizant subcommittee chairman.

MR. CARROLL: Okay. Well, I was responsible for putting this on our agenda. We had been hearing about the RAP program in connection with the ABWR, and a lot of things that came up seemed to be overlaps of the maintenance rule, license renewal rule, and I thought it might be useful if we got the staff to tell us where they are on the RAP program and how it will assure that individual components will have high reliability. So with that, I will turn it over to Mr. Polich.

MR. LEWIS: Jay, can you explain to me, the word reliability means that you're sure of something. So, reliability assurance program means the reliability of

reliability. Is that what it means?

MR. CARROLL: I don't know. Tim will tell you, though.

MR. LEWIS: It seems to me what the English says.

MR. POLICH: Happy New Year and good afternoon. I'm Tim Polich with the performance and quality evaluation branch of NRR, and I'll be making the presentation this afternoon. Also, my section chief, Rich Correia is here, and from projects, Denny Crutchfield and Jerry Wilson are here. We found out about this on Monday, and since January 1 was my birthday, this is what they did for a birthday present for me. So, thanks.

I'll briefly describe the ALWR reliability assurance program, which we call RAP, concentrating on the operational phase, and give a status of the staff reviews. Also, I understand there was some interest, back in August we answered some questions from Commissioner Remick on reliability assurance, and then the staff's responses to those questions.

MR. CARROLL: You'll find that correspondence that Tim just referred to in Tab 6, page 7, the lower middle.

MR. POLICH: I've also got copies back here if you need them. The reliability assurance program spans the lifecycle of the plant, from the design all the way through the operation, including the procurement construction,

maintenance and any modifications that might take place. The program, if implemented, should provide a reasonable assurance that the risk significant system structures and components for those systems that the operational reliability and the design reliability assumptions will be consistent. This will be a two-phase program, starting with the design or D-RAP, and continuing on with the operational, or O-RAP.

In the D-RAP, now it has actually two parts. The first part is the responsibility of the design certification applicant, or the vendor, and that's what takes us up to design certification. In there, there will be identifying and prioritizing the risk significant system structures and components. They will determine the dominant failure modes of those risk significant SSCs, and they will be providing the key reliability assumptions that they made to come up with the basis for that.

The second part of the D-RAP program comes in with the COL applicant. I just want to add here, this one's based on the design certification PRA, and the other reliability assumptions that they have at that point. For the COL applicant, they will be doing a site specific PRA, and any site specific information or any changes on other risk significant items that may be added to the program at that time, again in the identification and prioritization in

determining dominant failure modes, that would be the responsibility of the applicant to provide that information at that time.

MR. CARROLL: Tell me how I do all those good things with respect to a -- oh, let's say control rod system? How do I prioritize and identify the assumptions and all that good stuff?

MR. POLICH: Through using the PRA as a primary vehicle and by finding in there what they're using is the risk achievement worths, and by using the risk achievement worths, saying that that component fails all of the time, they're saying if that risk achievement worth is above a certain threshold, that should be included in the reliability assurance program.

MR. CARROLL: But the PRA isn't done to that level of detail for a system like the control rod system, is it?

MR. POLICH: I'm not sure of all of the details on a control rod system for the PRA, but for a lot of the systems, it is done to a level where they can make those determinations.

MR. CARROLL: Let's talk about then an RHR pump and its motor.

MR. POLICH: Okay.

MR. DAVIS: That certainly is included.

MR. POLICH: That would --

MR. DAVIS: And it's failure probability would be included, and that would be --

MR. CARROLL: That won't help me with components particularly or identifying --

MR. DAVIS: Well, not in all cases, no.

MR. POLICH: Yes, to the level that the PRA has modeled that, and that's one way of getting there. Another way of potentially getting there is from operational experience with the item or just engineering judgment between if the staff has a major -- and we found this out. If the staff has a major concern with a particular component because we have never seen that type of reliability before or we question why that reliability number was used, then from -- and some of this is coming from what we're calling the PRA insights, maybe not necessarily the number, but because that part of the PRA gives you a ten to the minus six what assumptions did you make to get ten to the minus six, and that this system always works. Well, maybe we don't believe that that system always works or it isn't designed yet, and in many cases, I would think, and like where we have for the DAC, when we only have a bubble and a black box for something, later on when the design specific information comes in, that's where we would add to, through a site specific PRA, we would add to the list of risk significant components.

MR. LINDBLAD: This sounds very much like a desktop program exercise. How does the RHR motor know that it got higher reliability? What does the mechanic do in this program?

MR. POLICH: Okay, that would move over into this part of it, and at that point, when you identified your systems and you've also identified your dominant failure modes for that system, in the operational reliability assurance program, you would come up with some maintenance monitoring, either maintenance or condition monitoring requirements for that system because if it's that important, if it's risk significant, that you either through engineering judgment or through the PRA, or maybe just questions that you don't understand about it yet, you can't quantify it very well, you would take the conservative approach, put it in the program.

At that point, you would establish, as in the maintenance rule, some goals and targets for reliability. At that point --

MR. CARROLL: Different than what you'd have in the maintenance rule?

MR. POLICH: Not necessarily different than what you have in the maintenance rule. We would be looking for an integrated program for this plant that would operate the maintenance rule and the reliability assurance. We see

those working together. With the maintenance rule, I would categorize as having actually a broader scope, and the reliability assurance program I would categorize as having a greater depth. There would be some overlap in the components that would be in -- they're covered under the maintenance rule, but they're also risk significant through the PRA and therefore would fall under the program.

MR. CARROLL: Okay, let's explore that with the depth notion. Let's talk about this RHR function.

MR. POLICH: Okay.

MR. CARROLL: What would I do with respect to the maintenance rule if the O-RAP program didn't even exist, for example? And now I'm going to ask you what do you have when you put the O-RAP program in?

MR. CORREIA: If I could answer that, this is Rich Correia. The maintenance rule doesn't necessarily require looking at a PRA to determine risk significance. If a utility or licensee chose to, they would either set performance or condition goals and monitor against those goals without a reliability assurance program.

With a reliability assurance program, I think that would almost mandate that they do monitor against reliability and availability goals under the maintenance rule.

MR. POLICH: Yeah, the maintenance rule, by doing

proper maintenance, you can avoid monitoring, as I understand it, and under the reliability assurance program, you would put you into the monitoring box already, and you wouldn't have a choice in that respect. So, those things that overlapped in that case, if it fell in the reliability assurance program, it would be in that case more restrictive in that sense. But something that's not risk significant but it is "designated safety related," could be handled in the manner of just with maintenance, not specifically monitoring.

MR. CARROLL: Okay. How do I go about monitoring this RHR under the O-RAP program? Let's assume back in the design that somebody plugged in some PRA numbers for the pump.

MR. POLICH: Okay, maybe they picked a number of, let's say ten to the minus six, and maybe for a target value, maybe they want to pick something, you know, that's more conservative than that so that they will get it before it gets to that point as a goal, that they want to monitor the reliability to make sure it doesn't get beyond that number.

MR. CARROLL: So, they might pick ten to the minus eight?

MR. POLICH: Sure.

MR. CARROLL: As more conservative than ten to the

minus six.

MR. POLICH: But the way we would do this was monitoring it based on its performance through either its tech specs or other maintenance that you're doing on it, through any failures that you have, and any trending of any maintenance that you have established through your maintenance program. By monitoring for failures, it doesn't take too many failures to prove that it's not meeting a ten to the minus eight. So, in that case, you've got to do a root cause and re-evaluate what was the real problem here, and can you correct it.

MR. DAVIS: You won't have any pumps that reliable. Generally, you're running around ten to the minus three for failure to start, but even at that level, you're not going to see any failures.

MR. POLICH: In how many hours?

MR. DAVIS: Well, I'm talking about per start. I mean, you might start several times a year as part of the surveillance program, and that still won't get you enough to verify that number.

MR. POLICH: But you're also going to be looking -- while you are running it, you're going to be looking at other parameters of format, and that's the degradation also. So, there's two pieces here --

MR. CARROLL: What's the degradation now?

MR. POLICH: That's the degradation of the pump. If you're noticing that the flow is decreasing over time, you're trending that. It's got to be monitored. So, you're doing performance and condition monitoring. You look in to see if it's got this -- for PWR, big boric acid stalactite hanging off of it, and these kinds of things, which you know, all of these things would add to the reasons why you're looking at that component.

MR. CARROLL: But how do I relate this to some quantitative reliability goal, the stalactite of boric acid or a slight decreased in pump flow because the wear rings are wearing or whatever.

MR. POLICH: This is what you would -- those things would be the things that you would keep an eye on, you're right. You wouldn't -- not necessarily saying that yes, it's met a number by these things. This is kind of objective evidence, but it's a subjective call on what the number could be. The point is with the program is not to statistically prove the target reliability, but to monitor and provide a reliability for those components that you've already predetermined that are risk significant.

On the other side, if you find something that you hadn't categorized as risk significant and you start seeing failures, the maintenance rule would probably pick that up, and working these two programs in conjunction, if ones goes

back and looks at the PRA numbers for these new plants since you have the PRA, you would look at that component, and that would be a reason to put something that you hadn't thought of that it was going to fail that often before into the program which would require more monitoring and that sort of thing.

MR. CARROLL: If I did a conscientious job under the maintenance rule of putting everything that -- of every structure system and component that played a role in safety, if I got them all in under the maintenance rule, why do I need this?

MR. DAVIS: Well, the maintenance rule won't do anything for the procurement of the component.

MR. CARROLL: No, no, I'm talking about the O-RAP program.

MR. POLICH: But the O-RAP includes the construction and procurement, so you would want to --

MR. CARROLL: Let's move up to the fourth line.

MR. POLICH: Okay, so in here, because you've already said that the thing and the design space is risk significant, then you would want to procure a better component.

MR. CARROLL: Fine, but now that I've got it and it's installed and my plant is running, why do I need the operation maintenance and modification part of the O-RAP

program if, in fact, I've included all of these things in my maintenance program?

MR. CORREIA: This is Rich Correia again. The maintenance program won't necessarily kick it back into a designer modification change.

MR. CARROLL: How do you know that?

MR. CORREIA: There's no requirement.

MR. CARROLL: Are you sure? Have you talked to the guys that are -- there has to be a requirement.

MR. CORREIA: If it was safety related, perhaps under appendix B criterion, but basically, the approach we've adopted for the maintenance rule is unless it's a maintenance problem, it's outside the scope of the maintenance rule.

MR. CARROLL: Yeah, but we've defined maintenance so broadly under the maintenance rule, and I just, you know, it's been a long time since I looked at the exact words, but I'm pretty convinced that it bags in modifications you do during the operating life of the plant.

MR. SEALE: Certainly if the maintenance rule is going to be operating to be in connection with the life extension and so on, it's got to cover all of that.

MR. POLICH: If a utility, right now they have a choice whether they're just going to do good maintenance and not monitor or that they put it into the thing to monitor,

so you may not keep the records. They may just be doing maintenance, and all you would have was maintenance records and not necessarily the trending which we found as a shortcoming way back when we were doing the maintenance team inspections, that trending was done at very few plants. Having the operational reliability assurance program, it's going to -- if they are those risk significant components, then those are the ones that you would want to monitor and keep track of.

MR. CARROLL: Now, we're not talking here about the fleet of plants that are out there currently. This has nothing to do with those.

MR. POLICH: That's correct.

MR. CARROLL: We're talking about plants that would be licensed under part 52, and it would seem to me that -- I'm playing devil's advocate here. Without an O-RAP program for this last phase, you could so craft the certification rule that in the tech specs that they'd have to do exactly what you're talking about without having something called an O-RAP program.

MR. CORREIA: I think in large part, the maintenance rule will be the O-RAP, but as Tim said, the O-RAP is more focused on those risk significance systems where the maintenance rule is much, much broader than that.

MR. POLICH: For the most part, the O-RAP is only

a subset of the maintenance rule.

MR. CARROLL: Then why have a name for it? Why not just make sure that all right things get into the program.

MR. POLICH: Then we have to recraft the maintenance rule for advanced reactors to say that for those risk significant components as determined by the PRA and all these other things, that's how you can craft it -- you'd have to change the maintenance rule for the advance reactors as opposed to what is there now.

MR. CARROLL: Is that not preferable to having another kind of a maintenance rule? It seems to me that the poor maintenance guy at this advanced boiling water reactor plant that's bought some time off in the future is going to have staring him in the face, let's see, I've got to comply with this maintenance rule, and then I've got this thing call O-RAP I've got to comply with, and then if my plant is starting to get old, I've got to comply with something called a license renewal rule. When it comes down to it, any of those are a high quality maintenance program.

MR. POLICH: You're correct. I think if somebody took under the maintenance rule and said everything that's risk significant, I'm going to put that in the monitoring category and I'm going to monitor that thing for the next years, I don't think you would have a problem coming for

license renewal at that point because he would have all of the data that people just aren't collecting at this point, and that's what the problem is. You would have the records, you would show the trends, you'd have it all the way from design all the way through operation what you've done with those components and how they behaved.

MR. LINDBLAD: If they all use the same scope and definitions.

MR. POLICH: That's correct.

MR. CARROLL: Okay.

MR. LINDBLAD: Will the commitments of the licensees under O-RAP and the like affect the tech specs and LCOs?

MR. POLICH: Specifically, there isn't a tech spec or that sort of thing, but one I would expect they would use, the tech specs surveillance as when they establish their monitoring and maintenance requirements, that they would take a look at those kinds of tests that they're doing and include those in saying this is risk significant and part of my monitoring will be using that tech spec surveillance and keeping track. Another piece of data would be maybe keeping track of maintenance down time because you took this tech spec piece of equipment out of service and what was its availability.

MR. LINDBLAD: Well, is it expected that with the

maintenance rule and with the O-RAP we will have better reliability than we have today?

MR. POLICH: Yes, because we're hoping, and we've seen it, is that they're -- the big thing is they're making the changes to designs. By using the PRA and a feedback, they're making things that are even transparent before they even get to this point. They're finding using the PRA, that they can't meet some things out in the future for reliability, so they're changing the design to increase the reliability design and then going forward from there. So, you make --

MR. LINDBLAD: You've also said the O-RAP is substantial in maintaining that reliability.

MR. POLICH: Yes, because as you pointed out, this is a paper exercise at the front end, and that's exactly where you can get the more bang for your buck and changing it while it's paper than when it's putting on a micro-flow -- there's a mini-flow line, and then they had to put micro-flow lines out there and things because they didn't do as good a job in the design up front and that sort of thing.

MR. LINDBLAD: It seems to me if in our design phase, we get more reliable equipment by doing this? We can relax the surveillance requirements in the future.

MR. POLICH: And you very may well be able to do that because you're going to be monitoring it, and because

you'll have an initial tech specs, and over time you're going to have a trend of what this thing has been doing, how it's been behaving, and I would think that the data there one could use to come in for a tech spec amendment change to move that surveillance interval our farther.

MR. LINDBLAD: Why wouldn't that be in the original tech spec, though, if we have confidence in our reliability assurance program will give us greater reliability?

MR. POLICH: I would think that because of the -- depending on where they got the data, I mean, if they've been testing a lot of these things, if they've got a prototype testing, but if it's a brand new one, and we think we've got the designs, the bugs worked out of it, I think that's -- and you're right, with the PRA, they may have that number, but another way is the deterministic, and if the engineering judgment of the staff at the time is that --

MR. LINDBLAD: I think that tells me that you don't have confidence that the O-RAP program will add value. It may add value and you can only see and experience whether it adds value or not, but if you're not willing at the outset to say yes, it adds value and its going to be more reliable, and yes, we can reduce surveillances in the original tech spec. You really -- it's an experiment to see if it adds value. Is that what you're saying to me?

MR. POLICH: It adds you --

MR. LINDBLAD: It adds value, improves reliability. You've said well no, the original tech spec couldn't reflect these improvements until they've been realized with experience. I think that's what you told me.

MR. POLICH: Right.

MR. LINDBLAD: But we're telling the industry that the agency believes that this definitely will improve reliability.

MR. LEWIS: Bill, how are you going to tell, even in retrospect, whether it improved reliability?

MR. LINDBLAD: I don't know. They say maybe they will have data that will permit them to amend the tech spec or maybe they won't.

MR. LEWIS: But in principle, you know, you -- well, you only can tell if you compare alternate worlds, and you're never going to be able to do that, so it's always a matter of faith.

MR. DAVIS: In my mind, it doesn't improve reliability. It insures reliability. That's what it's called. What we don't want to have happen is somebody to have a lemon out there and a piece of equipment that's risk significant. We've seen this happen.

The PRA now is using numbers from a generic database, and what we want to do is make sure these

components are at least that good. That's the way I view it, anyway. You may have a different view. But you don't want any lemons slipping by.

MR. LINDBLAD: That's what the quality assurance program does.

MR. DAVIS: That's part of it, yes.

MR. LINDBLAD: And the quality assurance program applies to maintenance. So, tell me, why do we have something call the reliability assurance program on top of that.

MR. POLICH: The quality assurance only applies if it's safety related. If it's not safety related but it is risk significant --

MR. LINDBLAD: Now wait. I understood appendix B to say that things applied to everything, depending on how important they were. Is that not true? The sounds to me like risk significant. Doesn't the QA program have a graduated application?

MR. POLICH: It does.

MR. CORREIA: It can, but I think in practice, though, it does not.

MR. CARROLL: Sure it does. I absolutely refuse to --

MR. LINDBLAD: In my experience, it has had, yes.

MR. CARROLL: I absolutely refuse to buy quality

assured bullets for the guns for our security people, and I got away with it. No, in practice, people have been using a graded QA program for years. Emergency planning you use it, reactor techs certainly use it, security you use it.

MR. LINDBLAD: But I, too, have the same problem that Jay speaks of, of seeing whether there is any difference between multiple names programs with multiple named staffs with multiple named reports. They all seem to come back to an original quality assurance program.

MR. POLICH: You're right. I think with the quality assurance, a lot of that is done on the front end and the effort is put in on the initial procurement and getting that thing, but then over time a lot of those things don't have trending over time. That's what the reliability assurance program would be, the quality integrated over the time factor.

MR. CARROLL: But Appendix B, Tim, is so broad and so interpretable that it would seem to me that if Podunk Light and Power comes in and says I'm going to build an ABWR, under the QA program you could insist that they include in their maintenance program this trending issue. You could read that into Appendix B.

MR. LINDBLAD: I think it comes down to Part 52 which has the requirement for a reliability assurance program that says they have got to come up with one.

MR. CARROLL: I think that's right.

MR. CORREIA: I believe it's really an integrated program where reliability assurance integrates aspects of QA, maintenance, tech specs, and not necessarily an independent, separate function. Taking into consideration information from those other programs, you develop your reliability assurance program.

MR. POLICH: We've never wanted to do this thing in isolation. It should have been integrated in kind of an umbrella program that would use the inputs from the QA. Under the procurement I would fully expect them to say it's procured under this class of procurement under the quality assurance program, Appendix B. I wouldn't expect them to have a separate quality assurance program just for the O-RAP.

MR. DAVIS: But this slide sort of implies that it is separate. It would have been helpful to show the relationship with these other programs on a slide like this.

I agree with what you just said, but that wasn't the impression I got in looking.

MR. CORREIA: That was essentially the essence of Commissioner Remick's question, which was, what is the relationship between RAP, the maintenance rule, Appendix B, and QA?

MR. POLICH: The only attempt that we are trying

to make here was that these things would all be in the operations phase and all the pieces there. The maintenance part of that could be covered by the maintenance rule; the construction and procurement covered by Appendix B; modifications also covered under the design part of Appendix B; your operations covered by your tech specs.

It wasn't meant to be separate new things. These were all the things that the licensee was responsible for. If somebody else came in for a submittal and they wanted to have a C-RAP for construction that did those kinds of things under their QA program, we didn't want to preclude them if they wanted to structure it that way because of their organization.

MR. LINDBLAD: Is human performance excluded from this scope, operator training and operator performance?

MR. POLICH: Yes. We are not looking into the operations point of it. This was for structure, systems and components.

MR. CARROLL: To quote Appendix B, "The quality assurance program shall provide control over activities affecting quality of identified SSCs to an extent consistent with their importance to safety."

So Appendix B is not focusing identified safety-related structure, systems and components; it's anything that is important to safety.

MR. WYLIE: What is the intent, to simply say in this operation phase that you procure equipment in accordance with Appendix B?

MR. POLICH: Yes. This was not meant to have a special procurement under O-RAP.

MR. LINDBLAD: Can you tell us how the RHR pump is going to look different in this plant as distinguished from Oconee's RHR pump? Do you have any feel for what is going to be different about design and procurement of these systems?

MR. POLICH: I would expect that, since they do have the PRA and they have some numbers that could be used as input into the procurement of what you want for your plant. I don't know if that would be as much of an improvement. By using the PRA maybe they decided that they needed four pumps instead of three or something like that.

One of the examples that was used for one of the vendors was they found by doing their PRA that the failure to start of a pump made something very risk-significant. So one of their potential design change options is that they will have not only two trains with one pump in each loop, which is what they initially had, but they would now have two trains with two pumps in a loop and one pump always running.

Maybe the hardware itself is the same but maybe

there are multiple pieces of hardware or maybe they have decided to go with diverse pieces of hardware to get a reliability number.

MR. WYLIE: What do you base that kind of decision on?

MR. POLICH: That was an example that one of the vendors gave me. They had done that by looking at their PRA numbers. This is the example that is in the CE SSAR. It's Chapter 17.3. The System 80+ component cooling water has two trains, one pump in each loop, and they found by doing the PRA and matching that to the System 80+ that one of their potential design changes may be to have two pumps and one pump always running in each loop.

MR. LEWIS: You used the word "diverse." Did you mean "redundant"?

MR. POLICH: Yes.

MR. LINDBLAD: Can it go the other way as well? Can they reduce the number of components if they find that it has no other added value?

MR. POLICH: I think it's the risk reduction. It's if it always worked and never failed, is there any kind of an improvement there?

MR. DAVIS: In fact there is an example of that also in the ABWR where they went from four trains to three.

MR. LINDBLAD: But he's talking about the design

phase. Doesn't that come after design certification, and on these advanced plants aren't we identifying how many components?

MR. POLICH: That would happen before design certification. The one you procure would happen before licensing.

MR. LINDBLAD: You're saying that people already have a reliability assurance?

MR. POLICH: In practice it's being used in the design phase.

MR. LINDBLAD: Is that being inspected by the inspectors?

MR. POLICH: To my knowledge, we have not specifically gone out to the vendors and done an inspection on this. However, what we did request in the reliability assurance program is provide an example. In both cases they provided us an example. The example I gave you was Combustion Engineering's example that they provided to see if their program is indeed working.

MR. KRESS: That raises an interesting question. How does NRC do anything with respect to assurance compliance to any kind of rule if it's in the design phase? That's not taking place at a reactor site. It may be in the minds of the designers.

MR. POLICH: What we are requesting is that they

identify the risk-significant SSCs. While they are still doing their design work, if they themselves realize that they don't like the risk numbers they are getting from that one, they'll make that change even before they present the design to us. They have been making those changes prior to that just by virtue of having to do a PRA.

MR. KRESS: Really all you are saying, though, is when they hand you a design you want to see in it the risk-significant components in a list.

MR. POLICH: That's correct. The design reliability assurance program takes the design certification PRA and takes those components by using their risk achievement words, risk reduction words. They take those and they say these are the ones that from our design as it is now for design certification going forward are the ones that are the most risk-significant. That is the information that we want passed on. They would also determine the dominant failure modes of those components and any other key reliability assumptions. That is the design information that would be passed on to the COL applicant.

When they do the site-specific PRA, if there are any changes in delta, at that time we would review this before the license. That is what we would look for as the benchmark, if you will, to be used. From that they would set up goals in the operations side and you would monitor

and trend the performance at that point.

MR. KRESS: What would you expect to find out from the monitoring, which is the only real difference between it and the maintenance? Let's say it's a pump. What are you monitoring, flow? Whether or not it starts and stops when you turn it on?

MR. POLICH: You would monitor probably the same parameters that you are doing under a tech spec or something equivalent to that.

MR. CARROLL: ISI.

MR. POLICH: ISI, IST.

MR. KRESS: What would you do with those sets of data?

MR. CORREIA: That's the information that you would use to compare against the goals that you've established.

MR. KRESS: The goals are reliability?

MR. CORREIA: It can be reliability; it can be availability. You can do condition monitoring where you would monitor pressures, temperatures, delta T's. For the maintenance rule those are all options. It depends on what the licensee wants to monitor, parameters or performance.

The key is the reliability assurance program focuses the licensee's attention to certain risk-significant structure, systems and components.

MR. CARROLL: Where do I cut it off? I've done my PRA and I do all these fancy things to find out what the risk-significant components are. Are there some quantitative rules that tell me this is risk-significant if it's above this line and not risk-significant if it's below the line? Or is this just good engineering judgment?

MR. KRESS: We heard in the regulatory treatment of non-safety systems how they would do that.

MR. CARROLL: Oh, that thing.

MR. KRESS: Yes.

MR. CARROLL: That's ridiculous. Is that right?

MR. KRESS: That's the only possible way to do this, isn't it? You do a focus PRA and use as guides the safety goals, for example. You choose the equipment you want to have in your focus PRA and those that have to go in there at that reliability level to meet these goals are the ones you put on the list.

MR. CARROLL: Is that what you plan to do?

MR. POLICH: That may be a method. The one method that we have just gotten in from Combustion Engineering was they have come up with a risk achievement worth greater than 5 would put the thing in the reliability assurance program. They have come up with some parameters, saying that if you procured the worst possible thing and it failed all the time, you would still be a factor of two below the safety

goal for a current plant.

MR. CARROLL: You went on and said once we have identified these risk-significant structure, systems and components that you were also going to make m as a vendor identify the dominant failure modes; is that correct?

MR. POLICH: Yes.

MR. CARROLL: What is the dominant failure mode of an RHR pump?

MR. POLICH: There could be several. It may be failure to start. Thrcugh the PRA, what they used for the failure within that PRA.

MR. CARROLL: Pete, correct me if I'm wrong. You don't look at it to that level of detail.

MR. DAVIS: Oh, yes. You include failure to start and failure to run, and usually one of those dominates.

MR. CARROLL: Okay. That's isn't very helpful to me. If I'm the maintenance guy, I want to know that the reason for failure to start is predominantly due the overheating or the switch not working or whatever.

MR. CORREIA: Those would be the reasons for failure but what you would trend is the fact that it did fail. You would monitor that against what you assumed in your PRA.

MR. POLICH: That's where in the operations side your root cause analysis would come into play.

MR. CARROLL: But you do recognize that in a component that has one chance in 100 of failing to start one failure doesn't say that anything bad has happened.

MR. POLICH: Correct.

MR. CARROLL: It could be totally random.

MR. CORREIA: The key is that you identify the failure, determine the root cause, correct the problem, and continue trending performance or condition.

MR. WYLIE: I'm having a little difficulty understanding what you do with procurement. Part of procurement is specifications. That's the first step. You write a spec. What are you looking for in a spec? Are you looking for reliability numbers from your PRA?

MR. POLICH: I'm not looking for a specific reliability number but within your QA program, which uses a graded approach, we would expect that for the most risk-significant stuff you are procuring the better stuff for those kinds of components.

MR. WYLIE: How do you do that?

MR. POLICH: If there were two different pumps and one came with an N stamp and one didn't, you would go ahead and --

MR. WYLIE: If it's a safety system component, it's going to have to meet safety system requirements, and you are going to specify those. What else do you look for?

MR. CORREIA: In the case of a pump, for example, if you told the vendor you needed something that was required to be highly reliable, he may choose better bearings, different materials.

MR. CARROLL: Like hell he will. Not unless you tell him to, because from a competitive point of view he's going to lose the bid.

MR. WYLIE: The truth of the matter is the only way you get quality equipment is the procuring engineer has to analyze each pump. You allow certain bidders to bid on that pump and then he evaluates the bidders and he buys the highest quality at a reasonable price. That's the way you do it.

It says in here that you are consistent with the reliability assumptions in the design PRA. I don't know how you do that.

MR. POLICH: With the reliability assumptions from the PRA you have now identified and prioritized which are the most risk-significant, and for the most risk-significant you would procure the better quality.

MR. WYLIE: You always do that.

MR. CARROLL: What is the better quality, Tim? When I go out to four vendors for a pump, unless I very specifically put in my spec details --

MR. POLICH: The procurement engineer would make

the call, that he understands that this is risk-significant and he needs to procure the stuff to meet the specifications for that.

MR. LINDBLAD: That's not new.

MR. POLICH: I'm not saying it's new.

MR. LINDBLAD: That's how all design has been done for the last several years.

MR. DAVIS: Yes, but we didn't have the risk-significant information.

MR. LINDBLAD: You didn't have the numerics. How does a design engineer use the PRA numerics to relate to how heavy a shaft he's going to put in his pump? If the stiffness of the shaft has something to do with the reliability, does the PRA man convert his numeric to a design description?

MR. POLICH: What he would be doing would be providing you the list and the relative importance on that list. From there the procuring engineer would use his judgment on saying this is at the top of the list, this is at the bottom of the list, that sort of thing.

It is not specifically taking the numeric number and plugging it in and saying I have to make this shaft this good. If this covers the core damage frequency for this thing, then it means I'd better try to put in as many things in the specification that I can. For things that are at the

very bottom of the list maybe you don't need to put in all those kinds of specifications; you are going to pick something that is commercial grade, or whatever.

MR. CORREIA: Looking at the current industry experience with a similar piece of equipment would give you an indication also as to how reliable it performed under similar conditions. You may want to say that's adequate for my design or you may want to mandate certain design changes to give you higher reliability or maybe longer intervals between maintenance and things like that.

MR. WYLIE: How do you enforce that they buy something that meets the reliability numbers used in the PRA?

MR. KRESS: That was my question.

MR. POLICH: We're not trying to enforce a number to meet the PRA.

MR. WYLIE: We talked about how you achieve quality. You achieve quality by specifying certain requirements for the piece of equipment. I don't know what this program does to ensure that.

MR. CORREIA: It probably would be a similar process to what we have now. These programs are implemented by licensees' procedures as we do now largely in Appendix B to assure that licensees are following the procedures that they have implemented for their programs.

MR. CARROLL: For the record, let me say that Mr. Wylie has probably spent more years procuring equipment than the aggregate of the agency's expertise in procuring equipment.

MR. LEWIS: You mean he's a professional procurer?

MR. CARROLL: Yes.

MR. DAVIS: And look where he ended up, at ACRS.

[Laughter.]

MR. LINDBLAD: I would like to point out that he's wearing his letterman's sweater today too.

MR. CARROLL: Tim, we have five more minutes. What are you going to tell us in your remaining five minutes?

MR. POLICH: I think we pretty much went over this portion of it.

A quick status of where we are with these things:

We have written the EPRI utilities requirements document.

The FSARs for both passive and evolutionary have been written.

The Chapter 17.3 for both GE and CE has been written.

The draft RTNSS SECY paper, section E on reliability assurance, is currently in concurrence.

I have under review the Westinghouse AP600 and GE

SBWR. As a matter of fact, five minutes before I came here I just got the latest submittal from SBWR amending their previous stuff. So those things are moving along.

MR. CARROLL: I guess I had the reaction that the vendors at this stage aren't really sticking their neck out very much. They are just sort of dumping a problem into the laps of the COL holder by providing a lot of nice words about what they are going to do.

MR. SEALE: It may make it awful hard to find one of those.

MR. CARROLL: Yes, it might.

MR. POLICH: The questions that Commissioner Remick asked were the relationship between reliability assurance and Appendix B, the maintenance rule and the utilities requirements documents. Both span the life of the plant, both use a graded approach, and both consider equipment selection and procurement. I would expect that the procurement being done for the risk-significant stuff would be Appendix B itself.

MR. CARROLL: You would almost conclude from this slide, if you knew nothing else, that if both do this, why do I need both?

MR. DAVIS: I would like to see what is different about them. I guess you said the RAP is really an umbrella for these things.

MR. CARROLL: The other way around.

MR. SEALE: The RAP is the thing that ties all of these together.

MR. POLICH: For this one what the RAP does differently is it now takes the integrated quality and it measures it against the goal. So you are going to get more of a feedback than you would for normal Appendix B, although under Appendix B there is a corrective action and that sort of thing for failures.

I think we talked a little bit earlier about the difference between the maintenance rule and reliability assurance, the maintenance rule being broader in scope and reliability assurance being greater in depth.

For the last one, D-RAP is consistent with the staff's position on reliability assurance.

MR. CARROLL: I guess I want to spend some more time looking at FSAR sections. It has been helpful to hear about this perspective.

MR. WILSON: On that note, I want to point out that the ABWR SER has been delivered to the ACRS.

MR. CARROLL: I know that. In fact, I think that is what triggered my suggestion that we hear a presentation on this subject.

We thank you, Tim. I will turn it back to Mr. Kress right on time.

MR. KRESS: Very good. We are at a point where we need Mr. Wilkins back, and he is here.

MR. CARROLL: Before we leave O-RAP or RAP, let me ask a question. Do others feel as uncomfortable about these fine words as I do, or the way they are being implemented?

I think the staff and the vendors, just because the words appeared in Part 52, are doing something, and what they are doing is just dumping a mess in the hands of the COL holder.

MR. LINDBLAD: I think so too. I think the vendors see there is a hurdle in the Part 52 and so they will leap the hurdle rather than argue with it, because it's basically a desktop exercise. We'll see what happens out on the operating floor some day.

I don't see that there is a great amount of attention to actually improving the reliability of some of the systems other than what Pete Davis just mentioned to me, reducing their complexity and taking off many of the trips that shut down a system when it should be running. That, I think, probably has more to do with reliability of the systems than the mechanical reliability.

MR. WILSON: I want to make sure there is a clarification here. As the crafter of Part 52, I don't remember putting in a requirement for RAP. I'm not sure what you are talking about when you say that Part 52

required a RAP. What the staff decided is that we wanted to assure that the reliability that was there when we approve the design will continue to be there, and so we developed a RAP requirement. That is what you heard about. That's not a spinoff from Part 52 per se. We are going to have that become a requirement as part of our certification, but Part 52 doesn't say you have to have a RAP program.

MR. CARROLL: So Part 52 has no words in it about reliability assurance programs?

MR. POLICH: The only words they have in there are requiring a PRA.

MR. WILSON: And they have used that PRA as part of this process of deciding what is significant. Now they want to translate that into a program.

MR. CARROLL: So if the staff can invent something, they can make it go away; it isn't part of the regulation.

MR. SEALE: Or they could redefine it.

MR. WILSON: As part of the certification we are going to specifically state which requirements apply and which don't.

MR. LEWIS: Everyone is in favor of better reliability. That's a given. Other industries have been gradually improving their reliability over the years, learning lessons. I ran into a friend on the airplane

coming in last night who is president of a large aircraft manufacturing company and he mentioned to me out of the blue that they have really learned a lot in the last ten years about how to integrate maintenance reliability with manufacturing reliability.

Have you had extensive interaction with such people?

MR. POLICH: What I have done is looked back at where reliability engineering started, and that was back in the 1950s with the electron tubes, combining them with a jet aircraft.

MR. LEWIS: I'm sorry. I was using electron tubes a lot before the 1950s. But go on.

MR. POLICH: Putting it on a shaker table at one frequency vibrated one grid and putting it on the jet was causing white noise and things to short out and bad communications and things like this. I did go back for this and looked back through what had been done through the electronics industry, through the military. They have reliability programs based mostly on contracting. That's Mil Standard 785 and 781. I looked through those.

As part of TMI there was an action item 2C4. That was reliability engineering. I looked through what we did for that.

As part of the Clinch River Breeder Reactor, at

that time we were requesting a reliability assurance program. One was submitted for that, and we had a contractor review that.

All those were linked to the aircraft industry and to other industries. I've had conversations and discussions with folks from some of the Navy programs, some of the folks from NASA, and DOE.

MR. LEWIS: TMI was 14 years ago, nearly 15 years ago. So that's pretty much obsolete. There is a lot that has been learned in the last ten years. NASA has hardly been a paragon for reliability engineering in recent years. The military procurement people are really not at what you might call the cutting edge of the issue of aircraft reliability. That resides in the manufacturers of both civilian and military aircraft. In fact the requirements are much tighter on civilian aircraft than they are on military aircraft because they are expected to fall down from time to time.

MR. CARROLL: And parachutes.

MR. LEWIS: Yes.

Reading the reports doesn't give you the sense for what people are really doing. While I recognize that reactors are not the same as aircraft, there is an art of reliability engineering and it has advanced a great deal in the past ten or 15 years.

MR. CARROLL: Med just showed me something he got just before the meeting. It is some comments that Gary Mizuno of OGC wrote on a number of topics, one of which is what we have just been discussing. He says, "At this time it is unclear why O-RAP and D-RAP are necessary or why they need to be addressed in Part 52 space. In many respects the intended functions of O-RAP and D-RAP are covered by existing Part 50 Appendix B requirements, Part 21 requirements, and the requirements of the maintenance rule. Thus O-RAP and D-RAP appear to be superfluous and unnecessary."

I couldn't have said it better myself.

MR. WILKINS: And that's a lawyer?

MR. CARROLL: That's a lawyer.

MR. LEWIS: You say that's OGC?

MR. CARROLL: Yes.

MR. LEWIS: So we have to change the sign.

MR. WILKINS: I guess we had better move on.

MR. DAVIS: I think we should thank Mr. Polich for a good presentation. Despite our pestering, I think he did quite well.

MR. POLICH: One last thing. I've also taken a couple of classes over at the University of Maryland. There are only two universities in the country that teach reliability engineering. One of them is Maryland and the

other one is the University of Arizona.

MR. LEWIS: Maryland is one of the few universities that has had a theoretical physicist as president.

MR. CARROLL: But the real secret of Tim is the fact that he got well broken in at Diablo as a resident inspector.

MR. LEWIS: And survived.

MR. CARROLL: Apparently.

MR. WILLIAMS: All right. Let's see how far we can get on this green letter.

[Whereupon at 4:30 p.m., the recorded portion of the meeting was concluded.]

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission
in the matter of:

NAME OF PROCEEDING: 405th ACRS Meeting

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, 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.

Michael Sanders

Official Reporter
Ann Riley & Associates, Ltd.

LICENSE RENEWAL BRIEFING FOR THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

January 6, 1994
Bethesda, Maryland

PURPOSE

- Summarize the significant results of the September 30, 1993 license renewal workshop.
- Provide staff conclusions and proposals regarding an approach to license renewal that

  (1) allows greater credit for existing licensee programs, and
  (2) integrates the provisions and focus of the maintenance rule in the license renewal process.

- Discuss key license renewal issues.

BACKGROUND

- Industry and staff experience with final rule.
- Senior management review.
- SECY-93-049 and SECY-93-113 proposed interpretive implementation without rulemaking.
- Workshop to solicit comments.

WORKSHOP SUMMARY

- Conducted on September 30, 1993, in Bethesda, Maryland.
- Over 180 representatives from utility, organizations, consulting firms, engineer and architect firms, nuclear industry organizations, public interest groups, and state and local governments.
- Written comments received from the Department of Energy, the Nuclear Management and Resources Council, Yankee Atomic Electric Company, Virginia Power Company, and the Ohio Citizens for Responsible Energy.
- Consensus view that the license renewal rule needs to be revised to establish appropriate credit for existing licensee programs.

AGING MECHANISMS AND MANAGEMENT OF AGING EFFECTS

- The current SOC emphasizes the need to evaluate specific aging mechanisms and contains conflicting language regarding the acceptability of an "effects" approach.
- SECY-93-049 and -113 endorsed the concept of managing aging effects via performance or condition monitoring.
- SOC should be clarified to remove the inconsistencies.
- Revised rule will establish an "effects" approach.

CURRENT LICENSING BASIS

- CLB is the foundation for the two principles of license renewal.
- Intent of maintaining the CLB is to ensure continuation of an acceptable level of safety.
- The CLB encompasses operational, functional, and design aspects.
- License renewal process should focus on ensuring SC functions in the renewal term.
- Reasonable assurance that function will be maintained, together with other CLB requirements and the regulatory process being brought forward, are sufficient to conclude that the CLB will be maintained.
- Rule, SOC, and associated documents require revisions to reflect this position.

DEFINITION OF ARDUTLR

- Broad range of interpretations: difficult to implement.
- Concept explicitly linked to first principle.
- Proposed definition:

  (1) principal focus on certain passive, long-lived SCs (e.g., vessel, containment, non-redundant portions of systems);

  (2) categorical exclusion of active SCs and redundant passive SCs subject to the maintenance rule;

  (3) categorical exclusion of SCs replaced within 40 years; and

  (4) SCs not included in provisions of the maintenance rule, but subject to existing performance or condition monitoring programs, could be dispositioned as not subject to ARDUTLR with justification in application.

TIME-LIMITED ANALYSES

- The CLB contains certain explicit time-limited provisions or analyses.
- Time-limited analyses are considered to be within the definition of ARDUTLR in the existing rule.
- Revised rule clarifies time-limited analyses requirements.

INTEGRATED PLANT ASSESSMENT

- The IPA, together with the definitions of SSCs ITLR and ARDUTLR, provides a process which begins broadly and then focuses on significant SCs to determine the need for additional aging management programs in the renewal term.

ADDITIONAL AREAS FOR RULE CHANGE

- Proposed changes to the rule:
  - Clarify level of detail in the application
  - Separate the details of the IPA from the FSAR supplement
  - Clarify change processes and reporting requirements
- Other areas the staff is considering for potential rule/SOC change include:
  - Defining the term "passive" as it applies to ITLR SSCs and functions
  - Clarifying ITLR screening requirements for support systems
  - Clarifying licensee evaluation requirements for passive long-lived structures and components.

CONCLUSIONS

- Rule and SOC should be changed to:

  (1) appropriately credit existing programs and the maintenance rule,
  (2) resolve ambiguities between the SOC and the rule, and
  (3) establish a more efficient, stable, and predictable license renewal process.

- Approve the general approach discussed in SECY-93-331 for revising the license renewal rule.

RULEMAKING

- Dedicated interoffice rulemaking team with oversight from an interoffice senior management steering group; NRR lead.
- Ambitious schedule which will forward a proposed rule to the Commission within 4 months after Commission directs the staff to proceed with rulemaking.
- Final rule published 12 months after Commission direction.
- Continue, as practicable, to work with industry organizations to identify and resolve license renewal inspection, technical, and implementation issues which are outside the scope of rulemaking.

FINAL RULEMAKING

CLARIFYING EMERGENCY PLANNING EXERCISES REQUIREMENTS

PRESENTED TO

THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

JANUARY 6, 1994

BY

MIKE JAMGOCHIAN
SEVERE ACCIDENTS ISSUES BRANCH
DIVISION OF SAFETY ISSUES RESOLUTION
OFFICE OF NUCLEAR REGULATORY RESEARCH

301 - 492-3918

BACKGROUND

- MEMO ON JUNE 29, 1989; EDO PROPOSED TO COMMISSION TO REVISE 15 AREAS IN THE EMERGENCY PLANNING REGULATIONS
- EARLY 1992; COMMISSION DIRECTED EDO TO REVISE ONLY 3 AREAS IN EP REGULATIONS
- JUNE 12, 1992; ACRS DECLINED TO REVIEW PROPOSED RULEMAKING PACKAGE UNTIL AFTER PUBLIC COMMENT PERIOD.
- JUNE 28, 1993, PROPOSED RULEMAKING PUBLISHED IN FEDERAL REGISTER FOR PUBLIC COMMENTS

PROPOSED REGULATORY REVISION

- CLARIFY EXERCISE REQUIREMENTS
- CHANGE THE INGESTION PATHWAY EXERCISE FROM ONCE EVERY 5 YEARS TO ONCE EVERY 6 YEARS
- DELETE THE REQUIREMENT THAT A STATE RETURN TO A SPECIFIC SITE EVERY 7 YEARS IN ORDER TO PARTICIPATE FULLY IN AN EXERCISE

PUBLIC COMMENT ANALYSIS

- 12 PUBLIC COMMENT LETTERS RECEIVED
  - 5 FROM UTILITIES
  - 6 FROM STATE AGENCIES
  - 1 FROM NUMARC
- ALL COMMENTORS AGREED WITH PROPOSED RULEMAKING EXCEPT
  - 1 STATE AGENCY DISAGREED WITH DELETING 7 YEARS RETURN FREQUENCY
  - 3 COMMENTORS SUGGESTED ADDITIONAL REVISIONS
  - SEVERAL SUGGESTED REWORDING THE INGESTION PATHWAY EXERCISE REQUIREMENT

FINAL REGULATORY REVISIONS

PROPOSED REVISION 1: CLARIFY REQUIREMENTS RELATING TO "FULL" AND "PARTIAL" PARTICIPATION BY STATE AND LOCAL GOVERNMENTS THAT ARE WITHIN THE EPZ OF MORE THAN TWO NUCLEAR POWER PLANTS

RATIONAL: AFTER USING THIS REGULATION FOR YEARS, THE STAFF AND LICENSEE FOUND THEM TO BE UNNECESSARILY COMPLICATED AND THEREFORE WARRANTED CLARIFICATION

FINAL REGULATORY REVISIONS (CONTINUED)

PROPOSED REVISION 2: THE INTERVAL FOR AN INGESTION EXPOSURE PATHWAY EXERCISE SHALL BE CHANGED FROM 5 TO 6 YEARS.

RATIONAL: CONSISTANT WITH THE BIENNIAL FREQUENCY REQUIRED IN EXERCISES OF OFFSITE PLANS, AND CONSISTANT WITH FEMA REQUIREMENTS

FINAL REGULATORY REVISIONS (CONTINUED)

PROPOSED REVISION 3: DELETE THE REQUIREMENT THAT A STATE RETURN TO A SPECIFIC SITE EVERY 7 YEARS IN ORDER TO PARTICIPATE FULLY IN AN EXERCISE

RATIONAL: EXPERIENCE HAS INDICATED THAT THIS REQUIREMENT IS UNNECESSARY AND ELIMINATING IT IS CONSISTANT WITH FEMA's REQUIREMENT.

CONCLUSION

- STAFF RECOMMENDS THAT THE EDO APPROVE THIS FINAL RULEMAKING PACKAGE

GENERIC ISSUE 67.5.1

REASSESSMENT OF SGTR RADIOLOGICAL CONSEQUENCES

JANUARY 6, 1994

JOE MURPHY, RES

STANDARD REVIEW PLAN SECTION 15.6.3 ADDRESSES SGTR

SRP SECTION DEVELOPED IN LATE 1970S, WHEN VERY LITTLE DATA WAS AVAILABLE

SOME DATA BECAME AVAILABLE FROM THE MB-2 STEAM GENERATOR TRANSIENT RESPONSE PROGRAM, ORNL WORK ON IODINE SPECIATION AND PARTITIONING, AND OPERATIONAL EVENTS DURING WHICH IODINE WAS RELEASED TO THE REACTOR COOLANT

THE ACTIVITY UNDER THIS GENERIC ISSUE SOUGHT TO TAKE ACCOUNT OF THE NEW INFORMATION

SGTR RADIOLOGICAL ASSESSMENT IS ASSESSED UNDER CONDITIONS OF PRE-ACCIDENT IODINE SPIKE AND ACCIDENT INITIATED IODINE SPIKE

IODINE TRANSPORT TO ATMOSPHERE CALCULATED USING A MODEL IN WHICH IODINE IS CARRIED TO STEAM LINE DIRECTLY WITHIN DROPLETS AND INDIRECTLY AFTER "SCRUBBING" IN THE SECONDARY SYSTEM

THE WORK DONE ON THE GENERIC ISSUE 67.5.1 SHOWED THAT IMPROVEMENTS IN THE SRP SHOULD BE PURSUED

SRP SPECIFIES THAT IODINE PARTITIONING COEFFICIENT OF 100 BE USED, BUT DOES NOT INDICATE WHETHER IT SHOULD BE ON A MASS OR VOLUME BASIS

THERE IS SOME INDICATION THAT THE pH OF SECONDARY WATER SHOULD BE A CONSIDERATION

THE DATA APPEARS TO SUPPORT A REDUCTION IN THE MAGNITUDE OF THE IODINE SPIKE AND A LOWER AMOUNT OF IODINE CARRIED OVER DIRECTLY

OUR WORK LEADS US TO RECOMMENDATIONS OF SPECIFIC CHANGES TO THE SRP, BUT MAY NOT CONSTITUTE THE COMPLETE LIST OF CHANGES THAT OUGHT TO BE PURSUED

OUR RECOMMENDATIONS ARE ONLY FOR U-TUBE STEAM GENERATORS

	Current SRP Guidelines	Proposed Change to SRP
Partition Coefficient	100 No Basis given (Mass or Volume)	35 (MASS BASIS)
Pool Entrainment (Recirculating Type)	Equation 27, Ref. 8	0.005%
Bypass Entrainment (Recirculating Type)	Equation 32, Ref. 8	0.001%
Entrainment (Once through)	None	All Break Flow Enters Steamline
(a) SGTR Following Iodine Spike	Iodine Concentration In RCS 60 - 275 μCi/g	12 μCi/g
(b) SGTR with A Coincident Iodine Spike	500 Increase in release rate (Initial Concentration = 1 μCi/gr)	1.33 $\frac{Ci}{hr*MW(e)}$ (Initial Concentration 1 μCi/gr)

SUMMARY OF RESULTS

NRR IS REASSESSING THE WAY IN WHICH RADIOLOGICAL DOSES FROM STEAM GENERATOR TUBE FAILURES ARE CALCULATED AS PART OF THE RESPONSE TO DEVELOPING RECOMMENDATIONS ON STEAM GENERATOR INSPECTION AND REPAIR CRITERIA

WE INTEND TO PROVIDE THE RES RESULTS TO NRR FOR INCORPORATION INTO THE ON-GOING ACTIVITY

ACRS FULL COMMITTEE

NRC Staff Presentation on ATWS/Stability

L. E. Phillips
NRC/NRR/DSSA/SRXB

January 6, 1994

ATWS With Power Oscillations

Key Issues

- Validity of Assumptions and Results of ATWS Analyses Supporting the ATWS Rule
  - Impact of Large Power Oscillations on Fuel Coolable Geometry and Containment Integrity
  - Effectiveness of Automatic and Manual (EPG) Mitigation Actions in Response to ATWS
  - Validation of Analytical Models and Codes Used to Predict the Core Behavior with Power Oscillations

NRC Review

- NEDO-32047 - ATWS Rule Issues Relative to BWR Core Thermal-Hydraulic Stability
- NEDO-32164 - Mitigation of BWR Core Thermal-Hydraulic Instabilities in ATWS
- NUREG/CR-5817 - BWR Stability Analysis with the BNL Engineering Plant Analyzer
- Team Audit of TRACG Validation & Verification

Summary of ATWS Review Conclusions

- TRACG is an adequate analytical tool to evaluate the impact of power oscillations on ATWS events though large uncertainties exist about quantitative results for very large oscillations

- Although some fuel and clad melting cannot be precluded by analysis, core coolability and containment integrity in the presence of large oscillations can be maintained and the prescriptive requirements of the ATWS rule remain appropriate

Summary of ATWS Review Conclusions (cont.)

- EPG changes to improve instability mitigating actions to reduce the probability of some fuel melting should be implemented:
  - Reduce core inlet subcooling by immediate actions to reduce feedwater flow until water level drops to about one meter below feedwater spargers
  - Earlier boron injection

Status of OCRE 2.802 Rulemaking Petition for ATWS

- Draft SER for preceding ATWS/Stability review provided to ACRS prior to May 1993 subcommittee meeting
- Issuance of the ATWS SER has been delayed awaiting resolution of related EPG issues
- NRR is now proceeding with issuance of the ATWS SER
- RES and NRR are working on a commission paper requesting approval of a staff recommendation for denial of the rulemaking petition based on the ATWS SER for NEDO-32047 and NEDO-32164

Other Unresolved EPG Issues

- Existing EPGs permit water level reduction below the TAF until HSBW is reached (up to about 30 minutes)
- The staff is continuing to evaluate the most effective shutdown strategy
  - Boron mixing considerations
  - Inoperable SLC considerations

Boron Mixing

- Stratification
  - For boron injection via lower plenum standpipes (BWR/3 and BWR/4), boron mixing does not occur at low core flow (about 4 to 6 percent of rated)
  - Complete shutdown by boron addition with a constantly maintained water level is not possible because recirculation flow will drop below the mixing threshold at low power
  - Experimental basis for boron mixing
    - Theofanous Study - Mixing efficiency is almost perfect down to 4 to 6 percent of rated core flow
    - Old GE data - Mixing efficiency decreases below 20 percent flow and mixing ceases at about 5 percent flow

Competing Shutdown Strategies

- Existing EPGs maintain level above the MSCRWL (below TAF) during boron injection until HSBW has been injected. Then operators are instructed by the EPGs to raise the level to increase the recirculation flow and mix the stratified boron

  - Advantage - Minimizes containment heat load versus time due to high core voids in the event the SLCS fails

  - Issue - Assumptions regarding boron remixing from the lower plenum are dependent upon data from the GE 1/6 Froude number scaled model. These data are under review.

Competing Shutdown Stategies (continued)

- Alternate strategy - Maintain level between one meter below the feedwater sparger and TAF until reactor power reduction ceases. Then raise level and mix stratified boron.

  - Advantage - Reactor shutdown is accomplished when sufficient boron has been injected to compensate for actual ATWS condition. Lesser ATWS events are not magnified by waiting until worst case HSBW has been injected

NRC EPG Review Objectives

- Minimize the time interval when the reactor is vulnerable to very large power spikes during an ATWS event
- Avoid an EPG strategy which has a high probability of leading to RPV depressurization
- Assure that the reactor vessel water level control and boron mixing strategy inherent in the EPGs provide high confidence of acceptable heat load to the containment during a reactor shutdown by soluble poison

Issues Raised During the NRC Simulation of the Proposed EPGs

Reference: Letter, A. Thadani to L. English, "Modification of BWROG emergency procedure guidelines for mitigation of thermal-hydraulic instability during ATWS," Aug. 17, 1993, with team report of simulation findings

- RPV depressurization is difficult to avoid following isolation in BWR/5 and BWR/6 plants with HPCS
- The proposed EPG changes may lead to unnecessary isolations at plants without a key-lock bypass
- The proposed EPG changes provide no guidance to maintain RPV water level above the isolation set point

Reasons for NRC Concerns

- The simulation suggests that the proposed EPGs may lead to unnecessary isolation events because the water level may dip below the isolation set point and plants without an isolation bypass would automatically isolate

- During the simulation the operators were unable to maintain the water level above the MSCRWL even when, contrary to procedures, HPCS was used

- Long periods when the core was uncovered were observed during depressurization actions at TTC

NRC/BWROG Meeting (Oct. 18, 1993)
EPG Issues

- BWROG evaluation of TTC issues
  - BWROG analyses concluded that existing EPGs are likely to require depressurization due to excess heat load under a full isolation ATWS from a high rod line
  - EPG revisions are in progress to reduce the boron injection time interval
    - Reduce the conservatism in the HSBW calculation assumptions
  - In order to decrease the probability of depressurization, increasing the heat capacity temperature limit is being considered
  - No problem with BWR/5 and BWR/6 plants which inject SLC via the sparger inside the shroud and above the core
  - Plant modifications (e.g., key-lock bypass) are being considered

NRC/BWROG Meeting (Oct. 18, 1993)
EPG Issues (continued)

- All non-HPCS plants (BWR/3 and BWR/4 series) have sufficient high pressure injection (HPCI) to maintain level

- The BWROG believes that modeling errors in the simulated plant contributed to water level control problems

  - BWROG agreed to evaluate the EPGs using the same inputs and model geometry used in the simulation

Submittal and Review Schedule

- FEB '94: SER on ATWS and mitigation actions to BWROG (response to NEDO-32047 and 32164)
- MAR '94: Commission paper for denial of OCRE 2.802 rulemaking petition
- MAR '94: EPG document submittal
- APR '94: TER on revised EPGs (ORNL)
- MAY '94: Draft SER on revised EPGs
- JUN '94: Draft SER to CRGR
- JUL '94: Final SER on EPGs

ACRS Full Committee
NRC Staff Presentation on ATWS/Stability

1. Introduction (Bob Jones)

   - Background

2. NRC ATWS/Stability Issues and Review Conclusions (Larry Phillips)

   - Previously presented to the ACRS Joint Subcommittee on Thermal-Hydraulic Phenomena and Core Performance (Sep. 1992 and May. 1993)

3. Status of OCRE 2.802 Rulemaking Petition for ATWS (Larry Phillips)

4. Other Unresolved EPG Issues (Larry Phillips)

   - Boron Mixing
     (Previously presented to ACRS Joint Subcommittee

5. Continuing Review of EPG Issues (Larry Phillips)

   - New information

6. NRC Review Schedule Milestones (Larry Phillips)

ACRS ATWS/Stability Meetings

- Full Committee Meetings
  - Dec. 1988
  - Jun. 1989
  - Oct. 1992
- Joint Subcommittee on Thermal-Hydraulic Phenomena and Core Performance
  - May 23, 1989
  - Apr. 27, 1990
  - Sept. 17, 1992
  - May 12, 1993
- Subcommittee on Thermal-Hydraulic Phenomena
  - Nov. 8-9, 1989

Reliability Assurance Program (RAP) Information in Support of the ACRS Briefing

Contact:
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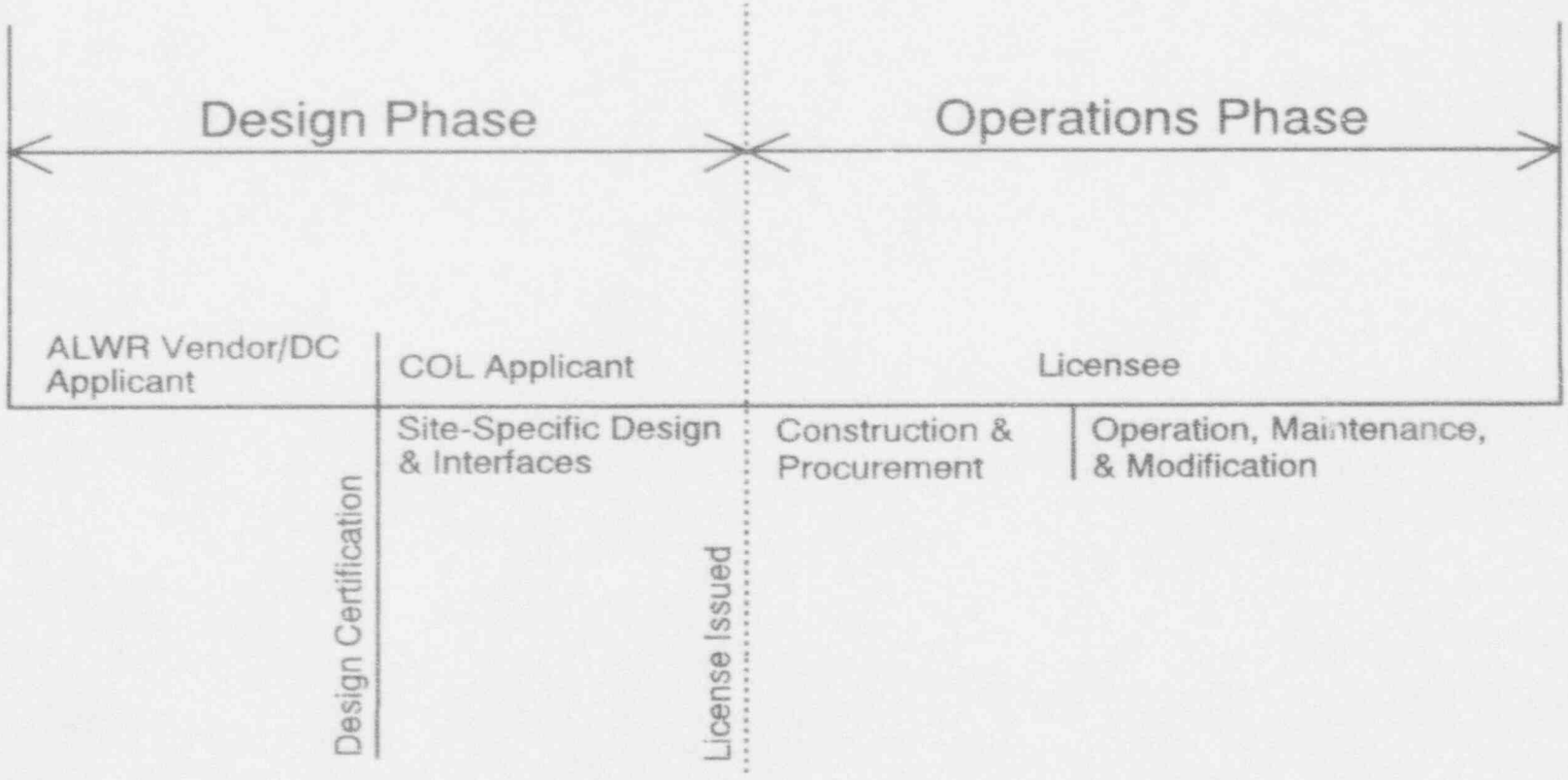
Performance and Quality Evaluation Branch
Division of Reactor Inspection
and Licensee Performance
Office of Nuclear Reactor Regulation

January 6, 1994

ALWR Reliability Assurance Program

- Spans complete lifecycle of plant
- Provides reasonable assurance that plant design, construction, and operations are consistent with reliability assumptions in design certification PRA and other sources
- Two part program: Design Reliability Assurance Program (D-RAP) and Operational Reliability Assurance Program (O-RAP)

ALWR RAP PLAN
Implementation Phases



(Slide 3)

Reliability Assurance Program

O-RAP

- Applies to construction and operation phases and is the responsibility of the COL applicant
- Establishes the performance goals for risk-significant equipment based on input from the D-RAP (consistent with 10 CFR 50.65)
- Establishes the maintenance and condition monitoring requirements for risk-significant SSCs
- Provides a feedback mechanism for periodically re-evaluating risk significance based on actual equipment/system performance

Status of the RAP for ALWR's

EPRI Utility Requirements Document Chapter i
Section 6 — FSER Written

GE ABWR Chapter 17 Section 3 — FSER Written

CE System 80+ Chapter 17 Section 3 — FSER Written

DRAFT RTNSS SECY Section E — In concurrence

Westinghouse AP600 Chapter 16 Section 2 — Under review

GE SBWR Chapter 17 Section 3 — Under review

Commissioner Remick's Questions On RAP

- The Relationship Between RAP and 10 CFR 50 Appendix B
- The Relationship Between RAP and the Maintenance Rule (10 CFR 50.65)
- The Relationship Between RAP and the Utility Requirements Document

Staff's Responses to Commissioner Remick's Questions

RAP and 10 CFR 50 Appendix B

- Both span the entire life of the plant.
- Both use a graded approach.
- Both consider equipment selection and procurement

RAP and the Maintenance Rule (10 CFR 50.65)

- Both use performance goals
- Both require a feedback mechanism for periodically re-evaluating.

RAP and the Utility Requirements Document

- The EPRI D-RAP is consistent with the staff position on RAP.