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NUCLEAR REGULATORY COMMISSION

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479TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FRIDAY

FEBRUARY 2, 2001

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS:

GEORGE APOSTOLAKIS	Chairman
MARIO V. BONACA	Vice Chairman
THOMAS S. KRESS	Member
GRAHAM M. LEITCH	Member
DANA A. POWERS	Member
ROBERT L. SEALE	Member
WILLIAM J. SHACK	Member

COMMITTEE MEMBERS: (CONT.)

JOHN D. SIEBER	Member
ROBERT E. UHRIG	Member
GRAHAM B. WALLIS	Member

I-N-D-E-X

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

(8:29 a.m.)

CHAIRMAN APOSTOLAKIS: The meeting will now come to order. This is the second day of the 479th meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting the Committee will consider the following: regulatory effectiveness of the ATWS rule, other view of mixed oxide fuel fabrication facility, NRC safety research program, future ACRS activities, report of the planning and procedure subcommittee, reconciliation of ACRS comments and recommendations, proposed ACRS reports.

In addition, the Committee will meet with NRC Chairman Meserve at 1 o'clock to discuss topics of mutual interest.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee.

Mr. Sam Duraiswamy is the designated federal official for the initial portion of this meeting.

We have received no written comments 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 and it is requested that the speakers use one of the microphones, identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

I would remind the Members that we have interviews with candidates during lunch time. We also have cake and coffee for Bob Seale at 12:45 in the subcommittee room.

MR. SEALE: The rest of you are invited.

(Laughter.)

CHAIRMAN APOSTOLAKIS: Including the Chairman. And please review the reconciliation items, No. 14. Each of you must have a copy because we want to go over it quickly later on.

The first item is regulatory effectiveness of the ACWS rule.

Doctor Kress, will you lead us through this?

MR. KRESS: Thank you. If you recall, the former AEOD part of research has been engaged in the activity of a retrospective look at some of the regulations to determine whether they accomplished what we thought they would and whether the regulatory analysis process has worked correctly and we previously reviewed one of these looks. It was the Station Blackout rule a few months ago. I don't remember exactly when. This is the second one and the idea is to look at this and see if it's accomplished what it intended to and see if the regulatory analysis was valid and to see if there are any lessons learned. It sounds like a real good idea to me. So with that I'll turn it over to Jack Rosenthal.

MR. ROSENTHAL: Thank you. My name is Jack Rosenthal, Research. And Farouk Eltawila, my Division Director is also in the room.

I just want to make the point before we start, although this originally started as an AEOD activity, one of the -- as a direction setting issue, it's now been incorporated as an RES function and we have a regulatory effectiveness team which is looking at rules and other matters and we intend to continue looking at rules or regulatory processes at a rate of about two a year.

Let me say no more. George Lanik is the team leader of the Reg Effectiveness and Operating Experience Team. And Bill Raughley who will be the principal spokesman is also a member of that team.

MR. POWERS: Jack, let me ask you a question. When you say "team" that seems to hint that maybe this group of people looking at regulatory effectiveness comes from organizations other than RES. Is that a correct assumption?

MR. ROSENTHAL: No. We've just gone to, instead of sections, where section leaders have administrative functions, to smaller teams where the team leaders can spend more of their time on technical matters and less on administrative matters.

MR. POWERS: I had the sense without attributing why we got that sense, that maybe the enthusiasm for the re-examination of these rules like the ATWS and the Station Blackout is not universally high with the Agency.

MR. KRESS: No comment?

MR. ROSENTHAL: Actually, I got some good feedback on the blackout rule. Bruce Boger was one who, in particular cornered me and said hey, here's a good example of the Agency being able to be introspective and examine itself and he wanted to take credit for it as one of our self-assessments that we promised to do in the strategic plan.

And a number of people listened to the issues in the blackout and we got some change already in the inspection program. So I think it went well and I know on the ATWS, we're now working with NRR and they're quite receptive to what we have to say technically.

MR. SEALE: Is there any predisposition or policy decision that would limit the membership on these teams to people on RES?

MR. ROSENTHAL: No. If I can arrange to get some help, I'd like that.

MR. SEALE: I'm thinking, for example, rules that might have a high inspection element in them that where some help from some qualified inspection people from the regions could be extremely useful and I know we've been in the past been connected with the efforts that some of those people have made contributions they've made in other areas.

MR. ROSENTHAL: Sounds good. No, you're right. We'll try that on the next ones.

MR. LANIK: As Jack said, my name is George Lanik. I'm a Team Leader for this activity. I think Dr. Kress gave us a pretty good introduction. One thing I'd add is these studies basically, the reason we picked the studies we have so far is that they were listed in the IPE inside report as those which are continue to be risk contributors and we're sort of doing them based on that.

The other point I'd like to make about

Research's responsibilities and independent assessment is that we also have some role in independent review of operating experience and I think because at least one aspect of these studies is a looking at the operating experience. We think that also contributes to that role for Research.

On a more technical level, I'd like to make two points about these studies. First of all, the -- if you look at any of these rules, it's really a very short version that you see in the Code of Federal Regulations and you have to go back and look at the background information including the statement of considerations and other documents that were developed at the time these things were implemented to get what they really intended to accomplish.

And in particular for this one, if you read the rule you see that all the PWRs had to install both an automatic driven trip and automatic emergency feed water initiated, but only CE and B&W had to installed the so-called diverse scram system which is a totally diverse system to the normal RPS. And none of that's -- the reason for any of that is not mentioned in the rules so you have to go back and look to see that there were design considerations for why that was true at the time.

And that had to do with the fact that if you did the analysis of these plants and the pressures they would reach during an ATWS event where the CE and B&W plants would typically go above this 3200 pound pressure limit which was the -- a design pressure which they thought would start -- you might start seeing some damage. And in the case of Westinghouse with the design conditions they were operating at that time, they would only exceed that pressure for about 1 percent of the cycle time. So that was one of the considerations in that rule.

The second point I'd like to make is that in the type of risk analysis that we're using in this report, basically what we're doing is we're saying that the risk is the frequency at which during an ATWS event you will exceed that 3200 pounds. We are not using the measure of poor damage probability or large early release. This is the same measure that was used in the initial decision to make about the ATWS rule.

And the other point is that we're using the same basic models that were used then. And one of the reasons for that is that we wanted to show that what the improvements that have been made have been improvements in the operations and equipment performance rather than improvements in the PRA model.

And secondly, in a lot of cases it's easier to understand and you can get a better idea of the big picture if you have the simpler model than the complicated model.

MR. KRESS: Is it all right for us to equate this probability of exceeding this pressure with a core damage frequency? The core damage frequency would be less than that, but --

MR. LANIK: I think what you can say is if you don't exceed 3200 pounds, I don't think anybody is claiming that there will be any core damage.

If you do exceed 3200 pounds, there is some probability and the other thing is with the thermal hydraulics the way they are, it's very difficult to calculate exactly what that is, so you know, if you only go 100 pounds above that, you're probably not going to damage any valves or anything to cause a problem. But if you exceed it by 500 pounds, you probably are going to damage some equipment that you would need to mitigate and prevent core damage.

You haven't reached core damage by the time you've hit that point, of course. It will happen some time afterwards based on damage to equipment and being unable to respond --

MR. KRESS: But in thinking of the risk

implications it would be --

MR. LANIK: Yes, it's a surrogate measure.

MR. KRESS: It would be a surrogate --

MR. LANIK: Obviously, it's going to be a little less.

MR. KRESS: Yes.

MR. LANIK: So without further ado, I'm going to -- Bill Raughley's going to take us through the major findings of the study including discussions of the background and methodology, some of the technical details and the basic conclusions.

MR. RAUGHLEY: I am Bill Raughley, I'm a senior engineer in Research and I've prepared a half a dozen slides that I didn't get stapled. They have the same orientation in the packet. Sorry about that.

Anyway, it's about a 25 to 30 minute presentation and we have slides on the background, the assessment, the results, some of the highlights of the conclusions or the comments received from the industry and the conclusions in the report.

We'll spend a little time on the background just to get every start simple and work up to some of the details you need to know to understand the results in the conclusion.

We are talking about the draft report

mentioned there. That was issued in October 2000 for internal and external comment and we've received the last of the -- we received all of the internal comments in December of 2000 and we received all the external comments as of about two weeks ago.

And that was just to define an ATWS and it's defined in 10 CFR 50 as an expected operational transient which is accompanied by a failure of the reactor trip portion of the protection system and the reactor trip portion includes the RPS system itself, the control rods and the control rod drive mechanisms.

ATWS is usually discussed in terms of the three factors I've listed there, the initiation event frequency, the RPS reliability and the mitigating systems and it's usually also discussed by PWR type, Westinghouse, CE and B&W and the GE BWR type. So all three of these factors are discussed individually for those different reactor types.

The ATWS rule was first detailed in 1973 in WASH 1270. Soon after the Commission made it an unresolved safety issue A9. In response to that issue, the staff prepared NUREG 460 which is four volumes and 18 appendices which detail the deterministic and probabilistic analysis associated with ATWS. That report relies heavily on the manufacturer's analyses for deterministic input and then our own -- and in conjunction with the industry some probabilistic assessment.

Pivotal to the ATWS issue and through the whole discussion of 460 there was considerable discussion or disagreement about the value of the RPS reliability. If you look in 460 it ranges from 10^{-12} up to 10^{-4} and they agree to disagree over the range being 10^{-4} to 10^{-6}.

MR. KRESS: It's hard to measure that, isn't it?

MR. RAUGHLEY: And that was -- the discussion was over the inclusion or exclusion of data, whether you look at it just in the U.S. and include foreign experience and whether we even had all the experience because the RPS system failures aren't all reportable.

MR. LEITCH: I notice in the table here that River Bend, for example, has an ATWS core damage frequency 1 times 10^{-10}. Is that a difference in interpretation?

MR. RAUGHLEY: On the BWRs that was one of the findings or conclusions of the report. On the BWRs there's a very large variation in the human error probability. It ranges from .5 up to 1 in 10,000.

There's a very wide range and largely the answer you get on the BWRs is dependent on what value you select for operator.

MR. LEITCH: So the BWR, of course, and that was very sensitive to operator actions and --

MR. RAUGHLEY: Yes.

MR. LEITCH: That difference --

MR. RAUGHLEY: I would just guess that Riverbend used 10^{-3} or 10^{-4} for operator.

MR. LEITCH: So it's not physical hardware that's different. It's rather a different assumption about operator action --

MR. RAUGHLEY: Yes, and that's one of our principal conclusions.

MR. LANIK: However, there are two sort of two different approaches to BWRs. One of them -- there are a couple of plants out there, the BWRs that actually installed an automatic SLC.

MR. RAUGHLEY: High capacity SLC and those don't rely so much on the human performance and they would do better.

MR. WALLIS: What sort of experiment would you do to assure yourself of the probability of a human error was of the order of 10^{-4}?

MR. RAUGHLEY: Jack, can you take that?

MR. ROSENTHAL: We observe that in the IPE analysis which included ATWS that there was a wide range of human factors. In fact, I don't know how to affirm such a low value and the conclusion, really and I'm jumping all the to the conclusion is that when you do a rule and in that rule you're heavily reliant on human actions, then now in retrospect and retrospect is always 20-20, you should recognize that 10 to 15 years later, you're not going to be able to confirm that the rule is being met within some uncertainty events.

MR. ELTAWILA: This is Farouk Eltawila. To answer your question, I think there are the training center in Chattanooga and things like that that run this type of scenarios and they watch the performance of the operator and there have been a lot of data collected in the Halden Project for ATWS scenario although that was for pressurized water, but they observed the operator and it's a training tool to respond to ATWS event because it has a unique feature that the operator does the counter intuitive things. He has to lower the level of the water in the core, so that's why it makes it extremely difficult compared to other scenarios. But there have been a lot of collection of data on ATWS either through the training centers or through the Halden Project.

MR. KRESS: Let me ask you a question about -- you're next -- about the BWR, human error versus the automatic actuation of the SLC.

In the -- when I looked at the event trees for those two issues that you had in the report, the automatic didn't have a line for failure of the SLC, whereas the one with the operator action did.

It did occur to me that the failure rate of this automatic is probably about the same as this operator action failure rate, if it's really that low and I was wondering if you actually looked at the comparison of how good the automatic actuation was compared to just the operator action?

MR. RAUGHLEY: No, we did not.

MR. KRESS: Okay.

MR. WALLIS: I guess the problem is you want to get a number of 10^{-4}, you have to do what --

MR. ELTAWILA: I am not just defining the 10^{-4}, I'm just saying they are collecting information on that --

MR. WALLIS: You can't collect information, but if you try to get those --

CHAIRMAN APOSTOLAKIS: It's really circumstantial evidence. It's important evidence, but you can't really treat it like a statistical evidence.

MR. KRESS: That's why there's large uncertainty associated with --

CHAIRMAN APOSTOLAKIS: When you do it right, there is uncertainty. You have to do it in a Category 1.

VICE CHAIRMAN BONACA: A question we had was why do you have -- why does the standby liquid system in some cases be automatic and some cases it is not. Is it an option?

MR. RAUGHLEY: Yes, it was for the BWR 5 and 6s. It was required. It was based on a date of licensure for all plants licensed after a certain date.

VICE CHAIRMAN BONACA: So it met the requirement of the -- resulting from the ATWS or was it?

MR. RAUGHLEY: It was as a result of the ATWS rule. BWR 5s and 6s were required to install an automatic initiated high concentration.

VICE CHAIRMAN BONACA: But there was no requirement to backfit the older plants?

MR. RAUGHLEY: No, on the value of impact analysis, that didn't come out to be favorable.

VICE CHAIRMAN BONACA: The other question

I had was regarding the event trees used here in the additional material. It shows -- maybe we can talk about it later, simply that there is some event tree where the standby liquid system is shown to fail with the RPS. When the RPS fails, both the electrical, then the mechanical one is not -- there is no window there, there are not cut sets for that and there are no cut sets for the standby liquid system. Is it because the standby liquid system is tied to the same electric instrumentation of the RPS?

MR. RAUGHLEY: No, it's not tied to the RPS. The fault trees came from -- the origin of the fault trees is they were -- if you let me get to it further, if you look down in the presentation --

VICE CHAIRMAN BONACA: Please, whenever you have an opportunity to address that. That's Figure A2 that has that but we can talk about it later.

MR. RAUGHLEY: So as I was saying, there was considerable uncertainty on RPS. Human error was another point of debate on the BWRs and on the analytical side there was considerable discussion on the codes that would be used. And on the sensitivity of results, the certain operational design factors.

On the PWRs, the B&W and CE reactor pipes have different moderator temperature coefficients throughout the cycle, smaller relief capacity, smaller steam generators and different mechanical design factors and then there's questions on whether you're operating with the rods and auto or manual, whether the PORVs are blocked or unblocked. So you get with quite a maze of conditions to analyze.

In the 1980s, we had the Brown's Ferry event and that was in Brentwood. Not all the rods inserted due to a problem in the scram discharge volume and that resulted in a confirmatory action letter to install a reactor recirc pump trip.

Immediately following that, the NRC issued a Draft ATWs Rule with three option, the Staff Rule, the Henry Rule and the Utility Group Rule. The Staff Rule was largely dependent on the deterministic analysis, analyzing the pressures and temperatures associated with an ATWS. The Henry Rule emphasized improving RPS reliability, a specific program in that area. And the Utility Group was a more practical approach based on modifications focused on preventing and mitigating an ATWS.

In 1983, we had the Salem events. There were two events three days apart and that resulted in several generic letters mandating improvement to the

RPS trip system. Immediately following that, there was a task force and steering committee organized by the Commission and its primary deliverable was SECY-83-293 which contains the technical basis and regulatory analysis for the ATWS rule.

SECY 293 relied heavily on NUREG 460 for the deterministic analysis and it adopted the Utility Group approach for the risk assessment and it also used the Utility Group value impact analysis.

The SECY-83-293 defined P(ATWS) which was the annual frequency of an ATWS event, leading to unacceptable plant conditions that exceed certain design parameters which George referred to earlier in the discussion. And for PWR, that unacceptable design condition was the ASME Service Level C, pressure of 3200 pounds and for the BWR which was suppression of full temperature of 200 degrees F. which was established in 839.

On the BWR, just to quickly run through the event, you start with an initiating event and you have the RPS failure and it's assumed that there's no credit for operator scramming their reactor. Increased pressure, if discharged through the SRV sort of suppression pool and the severity of the heat up depends on whether you close the MSIVs to isolate, in which case you would not have the condenser as a heat sink or nonisolation transient where they don't close and you have the condenser and the suppression pool available for the heat sink.

The outcome is heavily dependent on operator action. The operator is required to lower the water level, to mitigate the event and for the BWRs 1 through 4 standby liquid controls and for most of the 5s and all the 6s start the standby liquid control pump.

MR. KRESS: They lower the water level about halfway into the core?

MR. RAUGHLEY: It is down to level -- I don't know the specific -- which level, 7 or 8.

MR. LEITCH: It is well below the top of active fuel though. It's down like a third of the way down into the --

MR. WALLIS: It is a little touchy because you've got to maintain cooling, but not maintain reactivity.

MR. KRESS: That's the idea.

MR. RAUGHLEY: And for an isolation transient, the operator has two minutes to make that decision and for a nonisolation transient he has 17 minutes to make that decision. And the probabilities for those action are taken --

MR. WALLIS: Does he have good feedback so he knows that his level is the appropriate level that he's trying to get --

MR. RAUGHLEY: I don't know.

MR. WALLIS: That it's really working out --

MR. RAUGHLEY: BWR instrumentation is not -- doesn't have real good feedback.

MR. ROSENTHAL: Can I just chime in? What we tried to do in assessing the rule was say what do we know at the time of the rule and what do we know now and what are the changes? Separate from that activity we now know that if you trip the recirc pumps you will fall into a region of potential instability where you get isolations.

And that introduces a whole new set of technical concerns including what would the instrument displayed to the operator, because the instrument is not connected to the inside of the core and has its own delay times, etcetera. And we're looking at those BWR isolation issues as part of Research's work, but we're trying not to introduce that into the assessment of what was known at the time of the rule and what did we get? So we do have future work planned on those issues.

MR. LANIK: Yeah, and also I think for our particular case here, we did not give a lot of operator credit in our particular analysis, we didn't give anywhere near as much as you noted for River Bend.

MR. RAUGHLEY: Okay, on the PWR, you have an initiating event RPS failure also, no credit for operator action to scram the reactor. You increase the RCS pressure, then the pressure is relieved. You start HPI and aux. feed. And that's also dependent on whether the turbine trips or the turbine doesn't trip, whether you have the condenser available for a heat sinc or not.

The peak pressure on the PWRs is dependent on the moderator temperature coefficient which is a measure of the reactivity as a function of temperature. And in general, sufficiently negative and works with a Doppler to give you a negative feedback coefficient. However, there are points in the fuel cycle at the beginning of the fuel cycle. You have a positive, PMTC sufficiently negative or slightly positive and that can give you a positive feedback characteristic. And the amount of time that it's insufficiently negative or positive is called the unfavorable exposure time.

The ATWS risk analyses were done assuming that the MTC was acceptable 99 percent of the time and that the deterministic analysis supplied by the manufacturers were done assuming the MTC was sufficiently negative 95 percent of the time.

MR. SIEBER: Why did they allow the moderator temperature coefficient to be positive at any time? You can absolutely design that out of the fuel by putting in burnable poisons.

MR. RAUGHLEY: It is a function of the fuel cycle length.

MR. SIEBER: You put in burnable poisons, it's a matter of how many hours worth of neutrons you're willing to spend to maintain the negative moderator temperature coefficient.

MR. RAUGHLEY: Yes, and you would also, it's a function of what you said, the boron concentration --

MR. SIEBER: The less, the better off you are.

MR. RAUGHLEY: But dependent on how you vary all those factors and controls, the --

MR. SIEBER: You can design that out.

MR. RAUGHLEY: Yes.

MR. SIEBER: And so it would seem to me to minimize the exposure you'd have licensees design it out, design out a positive temperature coefficient.

VICE CHAIRMAN BONACA: I don't think you an totally eliminate that effect because of what you have. You have at the beginning of the transient you have number pressure transient, enough scram. You have a temperature increase. I think you're going in a region where you have some positive feedback.

I'm not sure you can leave it at that completely. That has been difficulty there.

MR. SIEBER: I was under the impression -- we managed to do that and I was under the impression it can be done, given sufficient burnable poison, coated pellets, inserts and so forth.

MR. LEITCH: One of the things that I found interesting in that respect and we're concerned about the combined effects of power upgrades and license renewals and extended fuel cycles and so forth is a sentence here on page 17 of the report that I felt was interesting in that regard.

It says fuel designed to achieve longer cycles result in less negative MTCs at full power, but a larger fraction of the cycle time during which time half this mitigation is rendered ineffective. And I just think that's one of these effects of longer cycle time that might not be apparent. That's one of the things that we've been kind of worried about.

MR. KRESS: It's one we ought to put on our list, maybe.

MR. LEITCH: Yeah, right. Just a comment.

MR. RAUGHLEY: That is one of the conclusions the report is -- that we should continue to give that attention because as a result of deregulation and the emphasis to be more competitive, the BWRs would likely go to longer cycle times, 18-month and 24-month cycles which requires you to further increase the MTC.

But this is from NUREG-1000. It's based on Salem-specific factors that has an MTC of -8 which is their normal value at hot, full power, all rods out and the 95 percent -- at 95 percent of the fuel cycle. What you can see is the pressure does go up to 3500 pounds in about 100 seconds and one of the debating points in NUREG-460 is whether the manufacturer was looking at 100 and the NRC's analysis was looking at 60, but the point being is very short, it ramps up real quick in a very short time.

MR. LANIK: Basically, that's timed with usually steam generator dry out time, as soon as the steam generator dries out, the pressure shoots up.

MR. KRESS: What was used to calculate that? RAMONA and RELAP together?

MR. RAUGHLEY: Westinghouse uses four programs. They use LOFTRAN, maybe Farouk -- there's four different codes, so depending on where you are on this curve --

MR. KRESS: I should have known that.

MR. RAUGHLEY: They use LOFTRAN down in this area and they switch off.

Then last but not least, the ATWS rule was passed in 1984 which requires specific modifications by reactor type that we'll discuss in detail on the next slide.

And as George mentioned earlier, when you're looking at a rule, not everything about the rule is written in the Code of Federal Regulations or some important background, one being that along with the FRN that issued the rule, there were two recommendations made by the Commission. One was that they expected that the licensees would undertake an RPS reliability improvement program and the other was that they would reduce the number of automatic scrams.

We'll breeze through this slide quick, since you saw it before in the station blackout presentation.

(Slide change.)

MR. RAUGHLEY: But the --

MR. WALLIS: Well, the regulation is effective if expectations are being achieved. Sometimes the statements of consideration don't give a very clear exposition of just what is expected.

MR. RAUGHLEY: That's true and in this case that's true and we have to go back to SECY. Most of the meat and potatoes for the ATWS rules in SECY-83-293 which the statement of considerations refer to. And then the statement of considerations also refer you, that if you're interested in the deterministic analysis, they're in the appendices of NUREG 460, but it provides you with a roadmap on which documents to go back and review.

The basic approach we took to effect this, as the regulations effect, the expectations are being achieved and we got those expectations from the NRC documents, as I mentioned, largely SECY-82-293 and the outcomes, we used operating experience, the NRC PRA IPE data bases which is available on the webpage LERs, NRC surveys of the moderator temperature coefficient that was done in 1995 and NRC RPS reliability studies.

The scope of the rule was to stay within the confines to compare what, exactly what they did to the outcome. We didn't try to read anything into the rule, change the method. We used their methods, tried to do the calculations the same way they did, so we had an apple to apple comparison.

Certainly, some things could be done better, more precise and with technology today, but then you wouldn't know if you made any progress as far as what the authors expected in 1984.

The ATWS rule required certain modifications by reactor type. For the PWRs, were all required to install AMSAC which is the ATWS mitigation system actuation circuitry which -- that's what I'm referring to in the first line there and that's a diverse means to trip the turbine and auxiliary feedwater and what that does is -- AMSAC monitors steam generator levels and initiates when the level drops below a certain set point.

The CE and B&W PWRs installed a diverse scram system referred to as a DDW and this Scams the reactors on high RCS pressure, about 2450 is what most of them are set at and that signal is derived from the riffle system.

The CE and BWR reactor types have an insufficient MTC, approximately 40 percent of the fuel cycle. It seems like a longer exposure. That was the primary driving force for installing the diverse scram system, but you can -- this is for the -- I want to say CE reactor. They're showing for 18-month and 24-month fuel cycle, the percentage of time that they would be above the 3200 pounds.

MR. WALLIS: Is it worse at the beginning?

MR. RAUGHLEY: Always. Typically, the moderator temperatures --

MR. WALLIS: Counter intuitive. You usually expect new things to be better.

MR. POWERS: Not true in fuel reactivity. You burn the fuel up, see?

(Laughter.)

MR. RAUGHLEY: All PWRs have MTC tech spec limits at hot zero power and how full power. And we'll summarize those a little further down in the discussion.

For the BWRs installed, an alternate rod injection system, which is typically DC scram valves on the exhaust discharge volume. And BWRs have, as we discussed before, high capacity, high concentration standby of the control systems. The systems were typically about 40 GPM and the rule requires them to increase them to 86 GPM and most BWR 5 and 6 is installed automatic standby liquid control.

The ATWS rule also required installation of recirc pump trip which also is redundant to the confirmatory action letter that was issued after the Brown's Ferry event.

As far as another -- all of the modifications were installed in the 1986 to 1990 time frame. As far as the Commission recommendations, the frequency -- the number of automatic scrams was reduced. It was 6 in 1980 and the industry started on a program in the early 1980s to reduce it and it was 4 in 1984 at the time the ATWS rule was passed and that was what was used as an input to the ATWS analysis.

And in 1997, 1998 and 1999, in each of those years it was .5 trips were year and within that it should be noted in each of those years the 60 to 70 percent of the operating reactors had zero scrams and in any one year 10 to 20 percent had 2 to 4 scrams. So they're the two ends.

CHAIRMAN APOSTOLAKIS: But is this reduction frequency the result of the rule?

MR. KRESS: That was sort of a secondary thing the Commission asked for.

MR. RAUGHLEY: It is second, but what did come as a result of the rule was four days before the ATWS rule was passed, the industry briefed the Commission on the fact that they were going to make scram reduction a program, that this would become a PI in 1985, 1986. I think it was a catalyst to formalizing a program and getting it, giving it visibility rather than something that was being done, that we were to assume being done.

CHAIRMAN APOSTOLAKIS: Is it fair to claim that this was the effectiveness of the rule?

MR. KRESS: It was a response to the rule being promulgated.

VICE CHAIRMAN BONACA: This study provided really a lot of sensitivity in the industry in regarding the acquisition and that's part of the drive of the concern with the failure of the RPS was coming from.

CHAIRMAN APOSTOLAKIS: What were the main reasons that we had this order of magnitude reduction?

What did they do?

MR. RAUGHLEY: More attention to analyzing the scrams that they had.

MR. ROSENTHAL: The dominant contributors to react a trip was number one to the turbine systems and number two to the feedwater systems. And we've gone through a whole generation of improvement. There's now a lot of digital feedwater control systems that help you go up. There's a trip reduction program. You walk around a plant and there's taped off areas, telling people not to trip over stuff.

There was a time when you had technicians -- you'd put a probe inside a cabinet and there's some likelihood you're going to slip, well, there's a lot of banana jacks around so that you connect up your scope right without slipping. So there were real hardware things associated with the turbine and the feedwater which have commercial implications as well as safety implications. And then just plain better maintenance.

VICE CHAIRMAN BONACA: Better training, heavily dependent on training because the sensitivity, for example, testing was an issue.

MR. KRESS: We heard about a reactor in Switzerland yesterday that's gone 10 years without an automatic scram.

MR. LEITCH: One of the things that perhaps is lost up there is where it says upgrade EOPs. I think that was a very significant step in scram reduction, coupled with well thought out emergency operating procedures, coupled with operator training, along in this time is the advent of plant specific simulators which I think helped a great deal in the scram reduction.

But I wonder, like George, if you just upgraded the EOPs and improved operator training and reduced automatic scram frequency, reduced RPS -- increased RPS reliability, wouldn't that have greatly improved the situation? In other words, I guess what I'm wondering is I guess it's not really possible to separate out how effective the hardware modifications were in making these improvements.

MR. RAUGHLEY: Two slides down we do.

MR. LEITCH: Very good, thanks.

MR. RAUGHLEY: I think we're getting to the same place you are. And then the other recommendation as far as RPS reliability -- could you put up that slide?

(Slide change.)

MR. RAUGHLEY: Put a table in the report, basically shows the first line is what SECY-83-293 expected and that was calculated based on one failure from Brown's Ferry and Westinghouse for each of the reactor types to get the value here. This is the improvement expected as a result of RPS reliability --

CHAIRMAN APOSTOLAKIS: Let me understand this. Was the Brown's Ferry incident really a failure?

MR. LEITCH: Not a total, partial failure.

CHAIRMAN APOSTOLAKIS: It was partial failure.

MR. RAUGHLEY: There were --

CHAIRMAN APOSTOLAKIS: They were buying themselves time and they were going to drain the water from the scram discharge volume.

MR. LEITCH: Some of the rods inserted all the way, others failed to insert.

CHAIRMAN APOSTOLAKIS: Right, over a period of time they managed to actually scram. This is really conservative, is it not, to say that there was one failure? This has been the perennial problem with scram reliability. There were raging debates.

MR. RAUGHLEY: It was to find more than, I think it was a third of the rods did not go in, that would be considered a failure.

CHAIRMAN APOSTOLAKIS: It was not that they didn't go in period. I mean this was a dynamic event. The operators intervened and so on and that's not here. So 10^{-5} doesn't really mean much.

MR. LEITCH: Did the rods go in to make

the reactor subcritical? I think they did.

CHAIRMAN APOSTOLAKIS: Pardon me?

MR. LANIK: No, they were at about 20 percent power.

MR. LEITCH: Were they?

MR. LANIK: Yeah.

MR. LEITCH: I'd forgotten the details.

MR. RAUGHLEY: As I mentioned earlier the pivotal to the ATWS is the RPS reliability, does make a difference in the numerical answer, whether you use 10^{-4}, 10^{-6} and the discussion you're starting is exactly the discussion in the 1970s over whether you count this as a failure or not and what number do you use.

CHAIRMAN APOSTOLAKIS: I mean this probably should have been analyzed as a precursor event, following the sequence and seeing what kind of probability you get rather than a straight forward classical statistics analysis because it was not a failure.

I mean that's clearly an upper bound, if you assume it's a failure, the number you have there?

MR. RAUGHLEY: They calculate upper and lower bounds about these values.

CHAIRMAN APOSTOLAKIS: How do they get the lower bound?

MR. RAUGHLEY: They use a binomial distribution.

CHAIRMAN APOSTOLAKIS: Oh God, oh.

MR. RAUGHLEY: Again, I didn't challenge what the people did.

CHAIRMAN APOSTOLAKIS: Is this being recorded? Oh. Let's go off.

MR. RAUGHLEY: That was 1984, George, before you came along.

CHAIRMAN APOSTOLAKIS: I was an Assistant Professor.

MR. POWERS: I get the vague sense that maybe you're a little disappointed?

CHAIRMAN APOSTOLAKIS: You always read me right.

MR. RAUGHLEY: This is the expected improvement. This is the result, if you treat the calculation the same as they did in the ATWS rule. You can see they didn't get the improvement achieved, the improvement you wanted. And then this is using the latest methodology in NUREG-5500 which starts with data from 1984 to the present.

And this is the value you get. But there's not much --

CHAIRMAN APOSTOLAKIS: It that done like a precursor analysis in the 5500 or again is it the straight forward statistics?

MR. RAUGHLEY: 5500 is they modeled the different components. They broke the RPS system down into 30 or 40 different components and got the failure data on those components and modeled it as a system.

CHAIRMAN APOSTOLAKIS: The important lesson from the Brown's Ferry incident is the operators do have time to intervene. It's not a yes, no event.

MR. RAUGHLEY: I think I mentioned at the beginning you have to 2 to 17 minutes depending on -- that's the consideration they gave to it.

CHAIRMAN APOSTOLAKIS: Okay.

MR. KRESS: Before you take that off, if we believe the bottom line why then we can say the expectation was met. If we believe the next to the bottom line, we say a dozen.

Since I'm a Bayesian of sorts, I like the bottom line. I presume that's one we ought to believe?

MR. RAUGHLEY: If you throw out the failure data, you get a good answer.

CHAIRMAN APOSTOLAKIS: That is usually the case.

(Laughter.)

But remember though there is also a question about the denominator, what is the demand?

MR. RAUGHLEY: Yes.

CHAIRMAN APOSTOLAKIS: It is a big question. Right? So the number of demands they use there, one probably --

MR. RAUGHLEY: The denominator is probably a good estimate. We do understand how many time a month they test a reactor. What's in question is the numerator, because not all reactor -- not all of these failures are reported.

CHAIRMAN APOSTOLAKIS: But even the denominator, wasn't there an argument made that they're moving all the time. You don't scram, but that's an indication of how things work and that's a very difficult piece of evidence. It's not that the rods are there and either they go in or not.

That was a big argument in the 1970s. I mean how much credit do you take for that and the NRC finally said no, we'll count real scrams.

I notice a reluctance to show event trees. The report has report trees, but your presentation does not. Is there any reason why you don't have --

MR. RAUGHLEY: We have event trees.

CHAIRMAN APOSTOLAKIS: I know you have event trees. I'm just asking why you don't show it.

Anyway, okay, please go ahead.

MR. RAUGHLEY: This slide next.

(Slide change.)

MR. RAUGHLEY: As far as P(ATWS) in getting to what Mr. Leitch, I think, was headed, most -- as you can see, as far as P(ATWS) goes, it did meet the goal of 1.0E-5 in all cases, but the majority of the improvement came from the initiating event reduction and not from the modifications.

CHAIRMAN APOSTOLAKIS: That is an interesting --

MR. KRESS: That's an interesting --

CHAIRMAN APOSTOLAKIS: Why is that?

MR. KRESS: It's a direct multiplier. The other one, you have to --

CHAIRMAN APOSTOLAKIS: I mean if you install hardware, if you make hardware modifications, shouldn't you see some --

MR. KRESS: It's the number of scrams. You don't challenge the hardware.

CHAIRMAN APOSTOLAKIS: All PWS install diverse means to trip the turbine or that affected what, the initiating event frequency?

MR. LANIK: Basically what that does is affect the operator action time. It lengthens the time you have water in the steam generator. You're talking about tens of seconds.

MR. KRESS: Let me ask you a question about this table. We have a set of ATWS sequences in the event trees. What was their contribution to the overall risk, say CDF, if we use a P as the CDF surrogate to the point for those classes of plants?

MR. LANIK: We did not summarize those in aggregate. They're listed individually in the appendices for each plant of their contribution. What they estimate is their contribution on a plant-specific basis. We didn't go back and add those up.

MR. KRESS: But it was generally a high times 101-5 approaching 10^{-4}. Is that -- I'm trying to figure out why the ATWS events were considered an unacceptable risk in the first place and of course that depends --

MR. RAUGHLEY: It's a low probability, very high consequence. It's an unforgiving event, with the high pressure and the PWRs.

MR. KRESS: And high uncertainty also?

MR. RAUGHLEY: Yes.

MR. KRESS: But I was trying to put some numbers on it. How much contribution does that set of sequences give to the overall CDF of giving class a plant, say it was the number I'm looking for?

MR. LANIK: I am just looking in our appendix and I see look at Tewkesbury and they claim 24 percent as the contribution of ATWS.

On others, you can just look through the list, I guess.

MR. LEITCH: But if you go to the extreme, you've got .000645.

The difference is what one assumes about operator action.

MR. KRESS: But I'm wondering why that was considered unacceptable so we had to have a rule in the first place. That's the point I'm getting to.

MR. LANIK: I think it's the point that Jack made earlier. It was the uncertainties --

MR. KRESS: Large uncertainties.

MR. LANIK: Large uncertainty in these things and the fact that some people were claiming 10^{-8} and I think that's a number that nobody would believe.

MR. KRESS: Frankly, I think that's a good answer, that there was large uncertainty -- that it was a sizable contribution and it was high uncertainty in that number.

MR. ROSENTHAL: And as a matter of fact, we've spoken a number of times and in fact, we got an opportunity to interview Mr. ATWS at the NRC which is our office director. And as much as anything else, at least in my mind the purpose of this rule was not to suppress the risk of the plants so much as to suppress the uncertainty in the risk of the plants. And we had gone back and forth for 15 years with the industry and then came up with what seems like a pragmatic approach to drive down the uncertainty.

But let me just go on with the risk a little bit more. If you take the Limerick Plant which I just happen to know, ATWS is 1 percent of the core damage frequency, so that's a small contributor. However, because in ATWS you fail the containment before you melt the core, it was the dominant contributor to large early release.

Now those are insides that at least I have post the ATWS rule, but that was still as important on boilers, especially because of the fact that you failed the containment before you failed the core.

MR. KRESS: Frankly, I'm very pleased to

hear you say that one good purpose of rules is to reduce uncertainty. I'm really glad to hear that.

MR. RAUGHLEY: I think the other thing they were wrestling with then is you had the very low numbers, but you also had three events. If it's really 10^{-6} or 10^{-8} well why do we have three events?

MR. KRESS: Why do we have three events, that's right. Bayesian thinking again.

MR. RAUGHLEY: We'll go to the comments.

(Slide change.)

MR. RAUGHLEY: We sent this out, as I mentioned in the beginning of the discussion for public comment and we've received internal comments from NRR from Rich Barrett's group, the BRA Assessment Branch and the Reactor Systems Branch and we've received external comments from the people I've listed there.

Some of the highlights of the comments, UCS and Westinghouse commented that the risk approach was very simplistic and that's a --

MR. KRESS: We've made the comment before that the complexity and extent of the risk ought to depend on the application and how much of a risk analysis do you need for retroactive look at something like this? I don't know how simplicity -- simplicity doesn't seem to be too bad to me in this case.

MR. RAUGHLEY: And then alluding to a question -- well, by the --

CHAIRMAN APOSTOLAKIS: The analysis of Brown's Ferry, for example, could have been done better.

MR. KRESS: I don't think that's the analysis I'm talking about.

CHAIRMAN APOSTOLAKIS: That's not the issue here.

MR. RAUGHLEY: In the final value impact analysis, I did not -- the original value impact analysis, the costs were divided up into the modifications and then the costs for lost power due to spurious scrams due to the installation of systems such as AMSAC and I went back and identified the number of spurious scrams which were considerably less than expected which helped make it more favorable. And then I also stuck, there's a couple of sentences in there about I gave the NRC some credit for the scram reduction program because there are significant bucks. It's in excess of $10 billion if you credit -- somebody gets credit for that and a lot of people suggested, as George maybe was, that the NRC had nothing to do with it.

MR. LEITCH: Did you consider the downside of false automatic boron injections?

MR. RAUGHLEY: There weren't any, but that was --

MR. LEITCH: I know there was one at Limerick.

MR. RAUGHLEY: On the original actual just Tewkesbury's actuation of the systems that were being installed under the ATWS rule as calling a scram, diverse AMSAC which there have been several spurious actuations of, I think, 13. But that's a lot lower than the one or two per plant that was expected per year. And the --

MR. LEITCH: But you're talking about false scrams.

MR. RAUGHLEY: Yes.

MR. LEITCH: I'm speaking about false boron injections.

MR. RAUGHLEY: I don't think they considered that in the original rule.

MR. LEITCH: But in the economic benefit of this, did you debit that?

MR. RAUGHLEY: No, because they didn't do it in the original rule. I did whatever they did in the original rule.

MR. LEITCH: I see.

MR. RAUGHLEY: Just so you could measure the expectation versus the outcome.

MR. LEITCH: Because there have been, I think, a few of those and then that increases the outage time because you have to clean up and several days sitting there cleaning up. Okay.

MR. RAUGHLEY: The other discussions on the PWR comments, one is to recognize that there were sensitivities to different design features between the Westinghouse and in contrast to the CE and B&W plants and we have a few sentences in there on that, we'll beef that up in the final report.

And then there were opposing comments from the industry, de-emphasized the MTC/UET issue and the NRR wanted us to increase our emphasis in that area.

We have a lot of "mays" and "could be's" and NRR would like us to make those hard statements.

UCS had a comment tying the steam generator tube issues to the MTC issue and then in all cases, both the BWR and the PWR manufacturers would like us to give more credit for operator action in the scram. We've acknowledged that in the report based on the NUREG-5500, if you credit the operator or scram you halve the factor of 2 on the risk. So we'll roll that up into an observation or conclusion of the report.

And then what we plan to do is each comment will be addressed in an appendix of the report like we did in the station blackouts so you'll see the comment as submitted, and then we'll provide a response to it. And those will be issued with the final report.

The conclusion, we concluded primarily based on the risk that the ATWS rule was effective, the modifications were installed as intended and it was effective in reducing the risk. The target was $1E^{-5}$ for P(ATWS) and as you saw they were in the order of 10^{-6}. However, there's still uncertainties in the RPS reliability. You still have to -- if you give benefit to the full range of the statistics, you can still get some answers that are -- maybe you wouldn't like.

And you still have questions about the data because RPS failures aren't always reported. And then in the area of the mitigative capability, we have the concerns about the fuel management issues as we discussed earlier with the utilities need to become more competitive and a way to do that is to extend the fuel cycle. To do that, you've got to increase the

MTC and that's as Westinghouse has submitted.

VICE CHAIRMAN BONACA: And for BWR isn't it true that given the chance there's some dependency on operator action?

MR. RAUGHLEY: And that was our third problem that we thought we needed attention and as far as getting back to Mr. Wallis as to what to do, we didn't come up with a solution.

VICE CHAIRMAN BONACA: No, the question I had was I thought that I remember a power operates coming in for BWRs and those are likely to accelerate sequences including the ATWS sequence. Wouldn't that challenge further the operator action that -- or defectiveness of it?

MR. ROSENTHAL: Yes, we are planning a separate research initiative on what we call the synergistic effects of the power upgrades, the longer cycles, the change in fuel designs and we'll be coming up with a plan and likely write a Commission paper before we embark to try to figure out some way to put these together in a synergetic effect, rather than looking at the issues one by one.

That's a separate activity.

MR. LEITCH: Just a comment on Table 1B, the column that's headed modification summary, is there any reason why you didn't annotate that to indicate which plants had automatic boron injection, automatic standby liquid injection?

MR. RAUGHLEY: I thought we did for a few of them.

MR. LEITCH: Table B2, there's a table called modification summary and I don't see any indication there which plants have automatic SLC injection.

MR. RAUGHLEY: We can add that.

MR. LEITCH: Just out of curiosity.

MR. RAUGHLEY: We can add that.

VICE CHAIRMAN BONACA: Before I raise the question regarding the Figure A2, Figure A2 shows in the event tree you have the branch where you assume the electrical RPS failure. And that doesn't have any -- of course in a failure you do have also a consequential and mechanical RPS failure. You have no -- not that one. A2.

MR. LANIK: We do not have that first slide.

VICE CHAIRMAN BONACA: It has a branch that essentially shows failure of the electrical RPS and then a straight line, I don't know for the arranged your CAT sets to assume successful failure of the other components downstream. Why is it? I can understand if you have a failure of the RPS electrical you have also failure of the mechanical, but what about the automatic standby liquid system?

MR. LANIK: Well, this is basically the event tree that was in the NUREG and we didn't change these. And as a matter of fact, we didn't really use this in any of the calculations we did. So I would say we didn't look at this one very closely. The other ones we actually have the tables with the numbers that we plugged in and we looked at those closely. This one -- we took it from the original ATWS rule, NUREG and put the numbers in that we got from the people in the reliability area.

I don't know the reason why that was left out. I think it doesn't matter much because the electrical is so reliable, really, I mean in other words you always -- you usually go that way.

You're not going to have many contributions there.

MR. WALLIS: These are all amalgamous LCs. Maybe that makes a difference.

VICE CHAIRMAN BONACA: That's right, but then at that point you would have a gate and you will have success or failure system still.

MR. LANIK: It's almost never -- you know, it's a very small number. That's not going to be much of a problem.

MR. SIEBER: A minor question. It seems to me from my memory, AMSAC was a non-safety grade system?

MR. RAUGHLEY: Yes.

MR. SIEBER: On page 10 you discuss in the report reliability of ATWS mitigating systems. Did the fact that AMSAC is non-safety grade have any impact on the estimate of reliability that's discussed there and in the previous table, top of the page?

MR. RAUGHLEY: No. The reliability we have is from the operating experience. So whether they got it --

MR. SIEBER: One way or the other?

MR. RAUGHLEY: One way or the other. It--

MR. SIEBER: Well, somebody some place must have made a judgment that you don't have to have AMSAC of safety grade.

MR. RAUGHLEY: All the ATWS modifications are non-safety.

MR. SIEBER: Right.

MR. RAUGHLEY: Right.

MR. SIEBER: And that's because they don't have a lot of impact on the risk that scram reductions had a far greater impact?

MR. RAUGHLEY: Yeah, that's the bottom line. The biggest impact was the scram --

MR. ROSENTHAL: Let me just point out, I mean this was anticipated transient, normal transient without scram.

MR. SIEBER: Right.

MR. ROSENTHAL: It wasn't a seismic-initiated event or a Hughes situation, so the special conditions didn't apply. I think this was a very reasonable thing to do to make them, a system without all the pedigree, but it was always expected that they would be -- and of course, they are, high grade commercial.

But it does point out the importance of getting voluntary data collection on the component level with -- through INPO because if it's not reported via an LER because it's not safety-related, you need some other way of collecting the data and so these other ways are important to us.

MR. SIEBER: Thank you.

VICE CHAIRMAN BONACA: The question I had was why was 3200 psi used as a criterion for lack of effectiveness? I mean you mentioned it above 3200 you may have failures of some valves and so on and so forth. But the RCS is designed to withstand much higher pressures than that, I can see --

MR. RAUGHLEY: They considered ASME service level D.

VICE CHAIRMAN BONACA: D, okay.

MR. RAUGHLEY: I think that got above -- I think the steam generator for 3600 psi is what Westinghouse told us the limit was there. But I think the D gets above that and then the D also gets into an area where they really don't know if the valves are going to deform or not where there's a lot of testing really hasn't been done in that neighborhood.

MR. SIEBER: Actually, at that level you get some component deformation, for example, tube sheet bowing and so forth which is maybe not a disaster as far as integrity and continued service, but it's there, nonetheless.

MR. RAUGHLEY: Any other questions?

MR. POWERS: I guess I've got two or three. One of the first questions is an element of phenomenology. Does the appearance of an axial offset anomaly affect significantly the response of the plant to an ATWS condition?

MR. LANIK: I don't know. Do you know,

Jack?

I would say that probably that hasn't been analyzed.

MR. ROSENTHAL: Years ago when I had hair, I ran a 3D space-time kinetics calculations and those were different than a 1D and clearly different from point kinetics. So the axial offset would change, would change the response in the calculational model.

Now I was recently sobered by Norm Laubin who is sitting to my left because we just tried to do some sensitivity studies with just relap with a simple point model, but kinetics model and as -- just to get some feel for this and as Norm did the calculations and you know, you just turn the little knob on the MTC or you turn the little dial on the relief capacity in the primary system, you go from being, having steam in the pressurizer to going solid, you do one thing, you end up with 3100. You turn the knob a little bit differently, you get 4,000 pounds and big differences.

And so that was sobering that the calculational model, the thermohydraulic model had a lot of questions for them and so I would get back to the forte of the rule was it suppressed the concern in these things.

MR. POWERS: I guess what I'm wondering is if we aren't seeing a reimposition of uncertainty as these phenomena associated with longer duty cycles come up and we get these axial offsets.

MR. ROSENTHAL: And that's why research is interested in doing a study of the synergistic effects of all these changes, absolutely.

MR. SEALE: I think it's important to remember that the effect of point kinetics is always to inject a coherence of events into any calculation and you will always over emphasize the simultaneity of a pressure pulse or a radiation pulse or anything else using point kinetics and if --

MR. POWERS: I don't think that's the question here. The question is are they doing any calculations on the neutronics at all here in response to the axial offset anomaly?

MR. SEALE: I was going to say if there was ever a justification for going into those issues of computational capability, there it is.

MR. POWERS: I derive from your study that a substantial amount of the evolution in ATWS probability arose from the reduction in the scram frequency that seemed to be correct.

MR. RAUGHLEY: Yes.

MR. POWERS: And I believe that we now

have a reactor oversight system in which scram frequency, unplanned scram frequency is a performance indicator?

MR. RAUGHLEY: Yes.

MR. POWERS: If a plant were to go from the green to the white in its unplanned scram frequency and for the purposes of the thought let's say that they're all automatic scrams and none of them were manual, how would the frequency of ATWS events change?

MR. RAUGHLEY: If it were to --

MR. POWERS: If the frequency at a plant for unplanned scrams -- I predicate it by saying they're all automatic, were to go from green to white, how does the frequency of ATWS events change?

MR. LANIK: I believe it's about an order of magnitude.

MR. POWERS: Which would put it over the Commission's goal or near the Commission's goal?

MR. LANIK: It would be close. It would be right --

MR. POWERS: And if they went on to yellow, they would definitely be over the Commission's goal?

MR. RAUGHLEY: I don't know where the

white -- you may have to get down to the -- the red is 25 scrams and that's certainly within --

MR. POWERS: An enormous number.

CHAIRMAN APOSTOLAKIS: I think the white is 3.

MR. POWERS: It seems to bring us back where we were and so I'm wondering why is that white? Why is that a little more extreme if you're essentially undoing everything that the ATWS rule did for you?

CHAIRMAN APOSTOLAKIS: You're right. Which is the big question because it was always being what was a rationale because green, white and yellow and most importantly the action matrix.

MR. RAUGHLEY: I'm not aware that --

CHAIRMAN APOSTOLAKIS: I realize you're not, but this is a good comment.

MR. POWERS: I think it's important that this study relate back to the current oversight process.

CHAIRMAN APOSTOLAKIS: Sure.

MR. POWERS: And ask the questions, have we set these levels correctly in light of this objective of the Commission and this finding that those scrams make a difference.

CHAIRMAN APOSTOLAKIS: Yes, yes. And we may even find that some of these have to be plant specific, huh?

MR. POWERS: Well, that would be a stunning revelation, wouldn't it?

CHAIRMAN APOSTOLAKIS: Surprise. Okay, any other questions? I think we will have an opportunity to review the oversight process again this year, right? We have an SRM?

MR. POWERS: Do you think we'll ever get into the SDP?

CHAIRMAN APOSTOLAKIS: There are hopes.

(Laughter.)

Tom, is this done?

MR. KRESS: I think so unless Jack wants to make a few more comments?

MR. ROSENTHAL: Just that what we tried to do was -- well, what we did do was publish a draft report, went for public comment. By the way, we always write to UCS with a letter requesting their comments as well as the industry groups.

And then -- but still as a draft report, we came before you with a near final product because this gives you an opportunity to influence the final product and some of the observations made on the table when you said that we'll incorporate in the report. So what I'd like you to do is tell me is this a good way to go about it because we'll be back again in another six months. Or, would you prepare a final product or earlier input and then in terms of your actions -- the choice is in terms of a letter or not or whatever, is just yours.

MR. POWERS: I think this is just about exactly right. The timing was just about exactly right.

CHAIRMAN APOSTOLAKIS: Are we writing a letter, Tom?

MR. KRESS: I am still debating.

CHAIRMAN APOSTOLAKIS: Debating.

MR. KRESS: I have thoughts on what a draft might look like, but it's not --

CHAIRMAN APOSTOLAKIS: So we can discuss this this afternoon.

MR. KRESS: We'll have to discuss it this afternoon.

CHAIRMAN APOSTOLAKIS: So the staff is not requesting a letter?

MR. KRESS: No sir.

MR. POWERS: Not even an "atta boy, Jack"? Come on.

MR. KRESS: It will be sort of that nature. That's why, I don't know, we sometimes are reluctant to write "atta boy" letters.

CHAIRMAN APOSTOLAKIS: Especially to Jack.

Is there anything else of substance to be discussed at this point? Thank you very much, gentlemen. We'll recess until 10:15.

(Off the record.)

MR. KRESS: Can we come back into session, please?

The next item on our agenda is an overview of the mixed oxide fuel fabrication facility and with some debate over who it's supposed to be. I'm going to turn it over to Jack Sieber for introducing the subject.

MR. SIEBER: Thank you, Mr. Chairman. The licensing of a MOX or a mixed oxide fuel fabrication plant is a relatively new endeavor for the ACRS and the NRC. There is a new standard review plan that covers the staff's responsibilities for that licensing effort. This is sort of a kickoff meeting wherein we learn a little bit about a MOX fuel plant and the schedules and so forth that we will have to keep in order to keep the licensing process for a MOX plant on schedule.

With that, I'd like to introduce Tim Johnson who will give the presentation.

MR. JOHNSON: Thank you very much. I'm the backup project manager for the MOX fuel fabrication facility project and I appreciate the opportunity to brief you on the status of this program.

Before I begin, I'd like to introduce several people who are available to also help me answer your questions: our Deputy Division Director for the Division of Fuel Cycle Facilities and Safeguards, Bob Pearson; my branch chief, Eric Leeds; my Section Chief, Joe Gidder; Patrick Rhodes from DOE's Office of Fissile Material Disposition and Peter Hastings from DOE's Contractor, Duke, Cogema, Stone & Webster who's going to actually build and operate this facility.

(Slide change.)

MR. JOHNSON: What I'd like to do today is go over a number of different areas. One is to give you an overview of the MOX program and some of its history. I'd like to talk about the NRC licensing process, what we're doing with respect to the National Environmental Policy Act requirements we have. Talk about opportunities for public hearings, what we're doing in terms of public participation, some of the significant issues that we're dealing with and our schedule.

Before I begin though, are there any particular things that you wanted me to focus on as I went through my discussion?

(Slide change.)

MR. JOHNSON: To begin an overview, I'd like to talk a little bit about the history of this project. The MOX project is part of a bilateral plutonium disposition agreement between the United States and Russia. This agreement was intended to reduce nuclear proliferation. Discussions on this agreement began shortly after the fall of the Soviet Union and the initial agreements were prepared in 1993. And I believe you recall that this past summer in June, President Clinton met with Russian Premier Putin and the most significant thing that came out of that summit was an agreement to go forward with this MOX project. And the agreement was formally signed by Vice President Gore and made effective September 1st of 2000.

(Slide change.)

MR. JOHNSON: The objective of the agreement is to take 34 metric tons of surplus plutonium from the weapons programs and irreversibly convert them to forms that are unusable for weapons. In this approach, the U.S. is going to take 25 metric tons of material and convert it into mixed oxide fuel for use in commercial reactors and the remaining 9 metric tons would be immobilized with vitrified high level waste.

The Russians are planning on converting all of their material into mixed oxides fuel and under the agreement both of the programs within the United States and Russia are going to roughly precede and parallel in terms of schedules and timing.

As part of the plutonium disposition program, DOE prepared an overall programmatic environmental assessment that was published in November of 1999 and following that, there was a record of decision in January 2000 and in this EIS and record of decision, DOE evaluated a number of options for dispositioning the excess plutonium and they looked at what you could do with it and also the locations of DOE facilities where these operations can take place.

The record of decision makes a determination that DOE would undertake what's called a hybrid approach that involves making MOX fuel out of a portion of the surplus plutonium immobilizing the rest of it.

Under the approach of making mixed oxide fuel, the whole program involves taking a weapons pits, disassembling them, doing a chemical conversion from plutonium metal into an oxide form. The next phase would be to take that oxide, make fuel with it and the next phase would be, of course, to use it in commercial reactors.

For the mobilization project, what that involves are materials that have significant impurities that don't make it easily adaptable to mixed oxide fuel and for this material DOE would convert the plutonium which is in various forms to a ceramic form. They would put this material in small containers and encapsulate those containers in with vitrified high level waste.

The record of decision also decided that these operations would take place at the Savannah River site. DOE investigated a number of facilities throughout the country for it and settled on the Savannah River site. DOE also decided to place a contract with a consortium of Duke Engineering, Cogema and Stone & Webster Engineering Corporation to do the mixed oxide fuel fabrication and also be responsible for using it in the reactors.

MR. SEALE: Excuse me, I probably missed something earlier. The 34 metric tons that the U.S. would be reasonable for taking care of here is matched by another 34 approximately that the Russians will retain?

MR. JOHNSON: Yes.

MR. SEALE: Where does this set in the total of the amount of material that we either know or think that the Russians have that might be --

MR. JOHNSON: I think it's a relatively small amount.

MR. SEALE: I would think so too. So this is sort of skimming the oxide slag off the top of the crucible, I would imagine.

MR. JOHNSON: That's my understanding that this is a small percentage of the total amount of weapons material.

MR. SEALE: Yes. I just wanted to keep the perspective.

(Slide change.)

MR. JOHNSON: This next slide kind of diagrammatically shows what the overall process is. The weapons plutonium will come into the Savannah River site and under DOE jurisdiction and oversight they will disassemble the pits and chemically convert the plutonium into an oxide and that material will go to the mixed oxide fuel fabrication facility which is under NRC licensing responsibility and from there the fresh MOX fuel will be used at the Catawba and McGuire Stations in their reactors.

MR. POWERS: Do you have any insights on why ICE condenser plants are chosen for this?

MR. JOHNSON: Why these two plants?

MR. POWERS: Yes, I mean they're ICE condensers, aren't they?

MR. SEALE: Yes.

MR. POWERS: Why are ICE condensers particularly suited for MOX fuel I guess comes to mind.

MR. JOHNSON: I don't know if that was a consideration in the selection of these plants.

MR. UHRIG: I suspect it's more related to Duke. They operate those, one of the three partners.

MR. POWERS: They operate other things too. I just wondered if ICE condensers had some peculiarity about them that I didn't know other than vulnerable containment.

(Laughter.)

MR. KRESS: You were reading my mind.

MR. POWERS: I saw you grinning over there.

(Slide change.)

MR. JOHNSON: The fuel fabrication process is going to involve two primary activities. The first step is an aqueous polishing. The plutonium that comes from weapons does contain some impurities, primarily gallium and americium that are desired to be removed and in the removal of these materials, impurities, the proposal here is to use a liquid process, an aqueous process based on a scrap recovery process used at the La Hague processing facility that Cogema operates in France.

MR. KRESS: Does that require you to grind the plutonium up into a powder?

MR. JOHNSON: The plutonium will already be in a powder.

MR. KRESS: You receive it in a powder form?

MR. JOHNSON: Right, it will be received in a powder. And the first step would be nitric acid dissolution, a solvent extraction as an oxalate dissipation step and calcination back into an oxide form.

MR. POWERS: When you say it's received as a powder is that because it's coming from the calcium reduction process as particulates or is it a powder of oxide?

MR. JOHNSON: Right. DOE is going to turn over to the fuel fabrication facility an oxide after they do their conversion.

MR. POWERS: Okay, so we've got some serious criticality headaches here ahead of us.

MR. JOHNSON: Criticality is one of the most important parts of our review.

MR. SEALE: Now, are they on the -- to what extent are those headaches on the NRC side of the fence and to what extent are they on the DOE side of the fence?

MR. JOHNSON: Both.

MR. POWERS: If we're going to dissolve a nitric acid solution and do stuff with it and you're going to avoid the precipitation problem, you've just got headaches because you got to control that nitric acid pretty carefully.

MR. SIEBER: Is this a PUREX type process?

MR. JOHNSON: It's similar to the PUREX process.

MR. SIEBER: Whose responsibility is it to control the particle size at precipitation stage?

MR. JOHNSON: It will be --

MR. SIEBER: DOE?

MR. JOHNSON: It will be DCS's responsibility. What these processes are are processes that will come under the fuel fabrication piece of it --

MR. SIEBER: So the polishing is part of fabrication?

MR. JOHNSON: Correct. And again, this process is a process that is taking place now in the La Hague facilities so there is a good deal of experience in using it and the La Hague designs are basically going to be used at this facility.

MR. SIEBER: There is a PUREX plant in Hanford and also West Valley used a PUREX process too.

MR. JOHNSON: Now this is different, a little bit different than just reprocessing. This is a scrap recovery process that is used at La Hague.

MR. SIEBER: Okay.

MR. UHRIG: Is the removing of these impurities because it affects the fabrication of the fuel or because it affects the operating characteristics of the plant?

MR. SIEBER: They have a pretty tight specification for the operator based on operational use and they want to minimize obviously any impurities that they can.

MR. UHRIG: It would affect the operating characteristics of the plant, as well as the waste --

MR. JOHNSON: I think the concern is more of the operating characteristics of the fuel than the reactor.

MR. UHRIG: Okay. Americium has a pretty good cross section, as I recall.

MR. JOHNSON: Right.

MR. SEALE: Could I ask -- the aqueous polishing is part of the fuel fabrication process?

MR. JOHNSON: Yes.

MR. SEALE: Is it part of the fuel fabrication process for which the NRC is responsible for the licensing?

MR. JOHNSON: Yes.

MR. SEALE: So everything on this chart here, ultimately the NRC is going to have as a concern?

MR. JOHNSON: Right.

MR. SEALE: For licensing.

MR. JOHNSON: Right. We're going to be responsible for the oversight of both of these processes here on the slide.

The next phase after the impurities are removed, the plutonium would go into more of a standard fuel fabrication process and with the exception of the fact that the use here is plutonium and depleted uranium, rather than low enriched uranium, the rest of this fuel fabrication process is very similar to what takes place in a normal uranium fuel fabrication. There would be mixing and blending. The material would be pressed into pellets. The pellets would be centered in a reducing environment. They would be ground to a specification and then put in fuel rods and ultimately into fuel assemblies. And again, this process for fuel fabrication is based on the existing process now at the MELOX facility in Marcul, France.

In Cogema, one of the partners in the consortium has been making MOX fuel for about 20 years and MOX fuel is being used right now in 35 reactors in Europe, 20 of which are in France.

MR. SEALE: Could I ask, is that process, you say it's similar. Does the similarity go so far as to allow hand contact, or is this a remote process?

MR. JOHNSON: This is a remote process from the point of getting the plutonium canisters in from the DOE facility to the point where the fuel rods are taken and assembled into assemblies. But the entire operation is done remotely in glove boxes.

MR. UHRIG: Is the enrichment comparable to ordinary fuel?

MR. JOHNSON: The plutonium percentage will be about 4 to 5 percent and the rest will be depleted uranium.

MR. POWERS: In NRC's examination of this facility, carrying out its regulatory responsibilities, is fuel quality part of that or not?

MR. JOHNSON: Well, one of the steps in the NRC program is to evaluate the qualification data for the fuel. Part of the -- this is outside of the fuel fabrication project, but in terms of the use and the reactors, NRC is going to be evaluating that and like I said it kind of opens up our next slide here.

(Slide change.)

MR. POWERS: Which is the depth of darkness.

MR. UHRIG: That is a true Freudian slip.

MR. JOHNSON: Yes. One of the pieces in our review is the reactor piece on the qualification of the fuel. It's outside of the fuel fabrication project, but it is something we're involved in and the steps will be -- they'll be two lead test assemblies that will be produced and they will be radiated at the McGuire Station and data from that will be used in qualifying the entire program and one of the issues that I can talk about this a little bit later, but one of the primary issues right now is who is going to make those lead test assemblies. Originally DOE was going to use the Los Alamos facility to fabricate the lead assemblies, but that was changed and right now the proposal is to use material, plutonium, from the United Kingdom, have the fabrication done in France and have that fuel shipped over here.

So yes, part of our program is to evaluate the fuel use and qualify it for the whole program.

MR. UHRIG: Do you have estimates of the burn up that would be allowed in fuel of this sort? Is it 30, 40, 50,000 megawatts --

MR. JOHNSON: It will be on the order of 40,000.

MR. UHRIG: What would the plutonium content at that point be? Do you have any --

MR. JOHNSON: It's about the same.

MR. UHRIG: Is it generated about as fast as --

MR. JOHNSON: There are some numbers. I don't recall.

Peter, do you recall what the numbers are?

MR. HASTINGS: I don't have those numbers with me.

This is Peter Hastings. I don't have that number off the top of my head, no. We can get it.

The final plutonium concentration of spent fuel is about 2.5 percent. The IC topics are dramatically shifted from 93 down to the 59 range.

MR. UHRIG: Thank you.

(Slide change.)

MR. JOHNSON: Again, the areas of the NRC review involve the licensing of the fuel fabrication facility and that is required by law. It was -- the law was 1999 Defense Authorization Act that required the NRC to license a plutonium fuel fabrication plant where the fuel was going to be used in commercial reactors.

We're also going to be involved in some transportation aspects. The proposal is that there will be a new package designed for transporting the fresh fuel from the fuel fabrication facility to the reactors and NRC will certify that package.

Again, for the reactors, we'll be licensing the use of the fuel at the McGuire and Catawba Stations and NRC would also be licensing the disposal of the spent fuel at the high level waste repository.

(Slide change.)

MR. JOHNSON: For the fuel facility, we're going to be using a two-stage licensing process and this process falls out of our regulations which requires us to issue a construction approval prior to construction. This is a little bit different from the way normal uranium fuel fabrication facilities are licensed. It doesn't require approval prior to construction. And this process is also -- turns out to be most convenient for the applicant. They have a requirement to irradiate MOX fuel in 2007 and they feel that they can best do this by submitting its application in two pieces. One is a construction application which is due at the end of this month and the second would be an operating license application and that's scheduled to be submitted in June of 2002.

(Slide change.)

MR. JOHNSON: For the construction authorization, the regulations require that the application include a site description, a safety analysis of the design bases of the principal structures, systems and components and also quality assurance program. And in order for us to approve the construction application, we're going to need to conclude that the environment will be protected and that the principal structures, systems and components are going to provide reasonable assurance against projection for natural hazards and accidents.

MR. SIEBER: When this facility is finishing processing the 25 metric tons of heavy metal, is that the end of the facility or would you contemplate additional processing as time goes on?

MR. JOHNSON: The current program now is the facility would operate for 20 years. At this point, DOE hasn't decided what the future uses of the facility will be, but I mean it is conceivable that it could be used for additional processing, if that's what the decision is or it could be deactivated and perhaps used for other things. But as of right now, DOE has not indicated what uses beyond the 20 years of operation will be.

MR. POWERS: Does the disposal or decommissioning of the facility, is that an NRC oversight responsibility or does it revert to DOE's responsibility?

MR. JOHNSON: Under the contract that DCS has with DOE, the facility would revert to DOE and DCS's responsibilities would be to deactivate it, to place a facility in a safe, shutdown mode and then it would be turned over to DOE and DOE could make decisions on further use or dismantlement if they wish.

MR. SIEBER: The EIS does not discuss anything about decommissioning, I presume?

MR. JOHNSON: Other than what I just said.

MR. SIEBER: Okay.

MR. JOHNSON: Because there isn't a decision yet that it would be decommissioned after operation. The environmental report just indicates that it would be turned over to DOE and final decisions on its use would be made later.

MR. SIEBER: It seems to me that 25 metric tons is not a lot of material. I presume that to operate for 20 years, you're going to have to have additional feed stock?

MR. JOHNSON: Right. But the project is really intended to provide about a third of a core for four reactors for 20 years, so you're correct, it's not a great deal of material.

(Slide change.)

MR. JOHNSON: As I mentioned, there are two parts to the whole licensing project. One is construction authorization and the other is review of an operating license application. And for the operating license application, we would address the overall safety analyses, the detailed design of the facility, management measures, emergency plans, physical protection plans and materials accountability plans.

(Slide change.)

MR. JOHNSON: One the most important things that's a part of our licensing process is the preparation of the environmental impact statement. And this, of course, is required for all major federal activities and it's also explicitly required under Part 51 for fuel fabrication facilities. So we are going to be preparing an EIS for this activity.

One of the benefits we have though, as I mentioned before, DOE has prepared a programmatic EIS in a Record of Decision and we're hoping to be able to use a lot of that material and not have to regenerate material that's already been done by DOE.

MR. KRESS: In the EIS I'm familiar with, the nuclear part uses a source term for fission products.

MR. JOHNSON: Yes.

MR. KRESS: Will you use that same source term for this fuel, you think, that's used in the normal EISs?

MR. JOHNSON: Are you referring to Table S-3?

MR. KRESS: Yes.

MR. JOHNSON: I don't really know the details of Table S-3, but we'll try to use what's already been used, if it's appropriate. If it's not appropriate, we're going to have to generate our own source term based on information on the design of the facility.

And again, we're going to try to use as much of the DOE EIS as possible, but because the DOE EIS dealt with the facility and the impacts on a very broad level, there will be a need to review it at the detailed design level of our application.

(Slide change.)

MR. JOHNSON: The process that we'll be using is the standard process that's described in Part 51. We've already received the environmental report. Our next step will be to issue a Notice of Intent to Prepare an EIS. We'll start a scoping process. Our intent at this point is to have scoping meetings at three locations, one in August, Georgia near the Savannah River site; also in Savannah, Georgia and Charlotte, North Carolina. The Charlotte, North

Carolina site is so that we can get public input from people in the vicinity of the two reactors that will end up using this fuel.

(Slide change.)

MR. JOHNSON: We'll do the coordination with federal and state agencies and the product of the scoping will be a scoping summary report upon which we'll develop a draft EIS, receive public comments and then issue a final EIS.

It turns out that for licensing, the EIS is a critical part of our schedule development and our goal here is to try to prepare a final EIS in 18 months and that's going to be a very aggressive schedule, but the EIS people think that they can do it primarily because we'll be able to use a lot of the information from the DOE's prior EIS.

MR. SIEBER: That's 18 months from the art of the NEPA process?

MR. JOHNSON: From the application date.

MR. SIEBER: Which is March?

MR. JOHNSON: Which is the end of this month.

MR. SIEBER: Okay.

(Slide change.)

MR. JOHNSON: The next thing I'd like to

talk about are opportunities for public hearing and I think you're aware that there's a great deal of interest in use of MOX fuel and opportunities for a public hearing are going to be an important factor in our licensing process.

Basically, because of the two step licensing in which we receive a construction application and then an operating license application, there will be two opportunities for a hearing, one at the construction authorization stage and this hearing, if it's -- if one takes place, will be limited to issues related to our authorization of construction. And likewise, for operating, those issues involved with that hearing would be limited to those issues on which we base a decision on issuing an operating license.

The intent would not be to relitigate construction authorization issues at the operating approval stage. And under the requirements of Part 2, the hearing proceedings would be the informal hearing proceedings in Subpart L.

MR. SIEBER: Are NRC folks participating in DOE's preparation for their part of the EIS?

MR. JOHNSON: Well, DOE's EIS has already been prepared.

MR. SIEBER: And there's public hearings going on?

MR. JOHNSON: Well, that's already been completed.

MR. SIEBER: Everything is done?

MR. JOHNSON: Right, and the record of decision was issued in January of 2000 on that, but there were a whole series of public meetings that DOE undertook in their overall programmatic EISs and those meetings occurred across the country, primarily because at that time they were evaluating where these -- the plutonium disposition activities would take place and ultimately the decision by DOE was to have these activities take place at the Savannah River site.

MR. KRESS: Is there any plants for PRA at the Savannah River site?

MR. JOHNSON: I am not sure I completely understand your question, but for the MOX facility, one of the requirements in Part 70 is to do an integrated safety assessment.

MR. KRESS: An ISA.

MR. JOHNSON: And that will be applicable to the fuel fabrication project and it's our expectation that the integrated safety assessment would use both a qualitative and quantitative evaluation as part of their integrated safety assessment.

Another important activity is public participation. I think you're aware that that's one of the strategic goals of our Agency and in response to that, we've prepared a project communications plan in December and in there it describes a number of activities that we will be using to encourage participation. We obviously have the NEPA process that involves scoping meetings and other meetings in going through the EIS process. We'll have two opportunities for hearings. We'll have periodic public meetings. Last July, we did have a public meeting. We had actually two of them. One was in Augusta and the other was in Columbia, South Carolina to introduce people to the NRC. People in the Savannah River area are very familiar with nuclear issues, but most of them aren't familiar with NRC licensing activities because their involvements have been primarily dealing with DOE.

So this was an opportunity for us to kind of explain the differences in our roles with respect to DOE and the program.

We've also established a website for the

MOX project. We're going to be publishing a newsletter. The first issue will be out within the next two months and of course, there's the normal availability of ADAMS for other documents. Our MOX site is intended to allow easy access to some of the major documents that we produce, but it won't have all of the correspondence and memorandum related to the project, but that information can be obtained through the normal public access to ADAMS.

MR. SIEBER: Who will be the recipients of the MOX newsletter?

MR. JOHNSON: We have generated a mailing list and we'll be expanding that as people want copies of it.

MR. SIEBER: Yeah, but what types of organizations or individuals are on that list right now?

MR. JOHNSON: It will be internally within the NRC. It will also be externally to the applicant, to DOE and individual members of the public that have been involved in the public meetings and other activities and that have requested to be put on the mailing list. But there are a number of intervenor groups that have shown interest in this project and they will be on the distribution list for the newsletter.

MR. WALLIS: How does the website work? Is it mostly a source for documents or is it an opportunity for dialogue?

MR. JOHNSON: Both.

MR. WALLIS: Do you have experience with the dialogue?

MR. JOHNSON: Well, no, the dialogue piece isn't quite in place at the present time, but we're working with our Office of -- our Chief Information Officer to get that, but the overall objective is to provide not only a place to go for information and easy access to some of the significant documents, but it would also allow comment on documents and allow people to see the comments and others to comment on those comments.

MR. WALLIS: It's not going to be a chat room thing where conversations are carried on, is it?

MR. JOHNSON: Yes, it could be that.

MR. WALLIS: That kind of thing, okay.

MR. JOHNSON: But the Agency does have, does use that in a number of other of their websites and it's our intent to adopt that into this.

(Slide change.)

MR. JOHNSON: Some of the significant

issues that we're wrestling with at this point in time involve a couple of areas. One is technical issues. Since fall of 1999 we've been conducting a series of technical meetings with DCS with the objective of ensuring that we get an understanding between both parties as to what the application should look like. Our desire is to get a complete application that will not require a large number of requests for additional information.

And these technical meetings have, I think, have been pretty good. We recently completed one regarding design bases. As I mentioned, one of the elements for making a determination on a construction authorization is to evaluate the design bases of principal systems, structures and components and we wanted to make sure we had an understanding of the level of detail that would be necessary for us to do the review. And in early January we had a two-day meeting to talk about that.

Other areas relate to seismic design, safeguard security issues. We've had discussions on glove box materials, accident analyses, how to define the controlled areas and so on.

Another issue I talked about earlier was the production of lead test assemblies. Again, one of our jobs will be to review the qualification data that comes from these lead test assemblies to ensure that the actual MOX fuel can be used safely at the Catawba and McGuire Stations.

With regard to security, there are a number of overlapping areas of responsibility we found between DOE and NRC on a number of security issues and clearance issues. This facility is going to be done under DOE contract. It's going to be done under DOE site and in order to resolve some of these overlapping security issues we're in the process of preparing a Memorandum of Understanding with DOE to outline what our responsibilities are and what DOE responsibilities will be.

Another important consideration is this is really the first application of the revised Part 70 requirements and the new Part 70 introduces integrated safety assessments which haven't been required in the past and this will be our first opportunity to really put an application through the mill on this.

MR. WALLIS: Does that include transportation?

MR. JOHNSON: Pardon?

MR. WALLIS: That includes transportation, Part 70?

MR. JOHNSON: No.

MR. WALLIS: It doesn't.

MR. JOHNSON: Part 70 is for the fuel fabrication facility itself.

Part 71 is the transportation requirements.

MR. WALLIS: Okay.

MR. JOHNSON: And that will be used to certify the package that will be used for fresh fuel shipments to the reactors.

MR. WALLIS: Are you also concerned with the shipment of the powder or is that DOE?

MR. JOHNSON: Well, DOE is going to be principally responsible for transporting the powder from their conversion facility to the fuel fabrication facility, but once it enters the jurisdiction of DCS, it will be part of our responsibility. But the package that will be used will be developed by the Department of Energy.

MR. SIEBER: I have a couple of questions. Going back to the lead test assembly bullet there. To use mixed oxide fuel in a commercial reactor in steady state is not particularly challenging, but if you have nuclear transients, particle size makes a pretty big difference, for example, a reactivity pulse to a mixed oxide fuel assembly creates a hot particle at the MOX particle point which could, for example, perforate clad.

What's the data base that will be used to assure that specifications for the mixed oxide materials are suitable to take care of these nuclear transients and other effects?

MR. JOHNSON: The data base will be the European experience of 20 years of operations and also, the qualification data from the lead test assemblies.

Again, I mentioned earlier that there are currently 35 European reactors that use MOX fuel and there is a substantial data base from that and DCS intends on using that in their fuel qualification program.

MR. POWERS: I think it is also true, however, that the isotopic mixture used in the European reactors is substantially different.

MR. JOHNSON: It is slightly different in terms of the isotopics and that again is one of the reasons for the lead test assembly program to verify the similarities in the actual operation data.

MR. POWERS: In the past, a lot of the lead test assemblies have been located in fairly benign locations in the core. We perhaps learned from high burn up fuel it's not a good idea to do that. Are we going to locate these late test assembles in more aggressive parts of the core?

MR. JOHNSON: I don't know the answer to that, but -- is there someone else?

MR. CARUSO: This is Ralph Caruso from NRR. Yes, for the retest assembles for MOX, we are encouraging DCS to load these assemblies in, not necessarily the limiting locations in the core, but near the limiting locations so that they're burned in a prototypical fashion.

MR. SIEBER: Getting back to the hot particle issue, what comes to my mind is the work of Battelle Northwest, did it at Hanford in the 1970s on the plutonium utilization project where they actually test fuel rods with mixed oxide fuel under some of these conditions. Perhaps that should be a part of the database that one uses in order to cite characteristics the pellets should have.

MR. JOHNSON: A lot of people feel that the United States just has never done anything with MOX, but that's really incorrect.

MR. SIEBER: That's not true.

MR. JOHNSON: In fact, in the late 1960s

and early 1970s, there was a substantial mixed oxide fuel program in the United States.

MR. SIEBER: That's right.

MR. JOHNSON: Although since the 1970s, it hasn't been used. But you know, your particle size question is a major concern and that's one of the critical components in the development of the fuel is to ultimately get the appropriate particle sizes and homogenization in the actual fuel pellets.

MR. SIEBER: Right. An additional question. When you talk about the security of mixed oxide fuel, when you ship a new unburned fuel assembly from the fabrication plant to the reactor, does that follow the rules of shipping special nuclear material or is it something greater than that since --

MR. JOHNSON: It would fall under the transportation regulations.

MR. SIEBER: Well, it would seem to me that some relatively simple chemical processing could be used to concentrate the plutonium and separate it from the depleted uranium just as it was put together in the first place, say as opposed to slightly enriched uranium where making a more fissile material is virtually impossible without a diffusion plant or centrifuge or something like that.

You see what I mean?

MR. JOHNSON: No, could you --

MR. SIEBER: Well, you could take this fuel assembly, put it in nitric acid, again, run it through an organic separation process and separate the uranium from the plutonium.

MR. JOHNSON: This is after the radiation?

MR. SIEBER: No, this is at the point where it leaves the fabrication plant, before it's inserted into the reactor. So you end up with high grade plutonium again after you do that which would be an opportunity for somebody --

MR. JOHNSON: Right, well, the security of that shipment will be an important consideration.

MR. SIEBER: Okay. You would take something like that into consideration?

MR. JOHNSON: Yes. And the security plans for use at the reactors, as well as the transport will be a key thing for our review.

MR. SIEBER: Well, once it's installed in the reactor and becomes irradiated, it actually has all the same safeguards that normal uranium fuel wold have. It's too hot to handle easily.

MR. JOHNSON: Correct, and I understand that the time that the fuel, the fresh fuel is at the reactor site, they're going to try to minimize that to the extent possible because that is recognized as a vulnerable period for that in terms of safeguards.

MR. SIEBER: Right.

MR. JOHNSON: Pete, did you have something you wanted to say?

MR. HASTINGS: Yes, this is Peter Hastings. Let me clarify. The fresh fuel shipment from the MOX facility to the mission reactors will be in a Part 71 certified shipping container in terms of safety requirements, but it will be under DOE safe secure transport and so it will be within the DOE security provisions and then once it's received at the reactors, the current plans are to load it directly into the spent fuel pool and not into a dry, fresh fuel storage.

MR. POWERS: If we look at this transportation cask, do we have an understanding of what happens in the event of an accident on these fuel rods crushing or shattering?

(Pause.)

MR. RHODES: Yeah, the answer to that is there's a series of tests for the packages. It's Type B package and it will go through a series of tests under Part 71 regulations.

I'm Patrick Rhodes. I'm the MOX program manager for DOE.

MR. POWERS: That will contain some sort of fuel rod mock up or an actual fuel rod?

MR. RHODES: The test is going to be done, we'll have three assemblies, two of which are mock, one of which is a realistic assembly, a paratypical assembly and they'll actually measure the distortions after the drop test.

MR. POWERS: And that's a drop test, how about accident test?

MR. RHODES: Well, in the Part 71 regulations it specifies the series of tests one has to do. By analysis, it's fire, it's drop, it's perforation and puncture and maybe others and it will by demonstration, testing or analysis demonstrate all those requirements.

MR. JOHNSON: The remaining issue that is kind of at the forefront has to do with the hearing process. Under the regulations you would use the informal Subpart L hearing proceedings. However, there are some stakeholders that want to see the formal Subpart G hearing proceedings used and so I think that will probably end up getting sorted out as a -- if there is a hearing.

Did you have a question?

(Pause.)

(Slide change.)

MR. JOHNSON: The next thing I'd like to talk about is some of the things we've done and our schedule for the rest of the process.

We've prepared a standard review plan for review of the mixed oxide fuel fabrication project. That was completed in August of 2000. I mentioned that we have a MOX website on line. We've been having a series of technical meetings with DCS and DOE. We had the public meeting last July in South Carolina. In December, we received the environmental report for the fuel fabrication facility. We expect to get the application for construction authorization at the end of this month. We would expect that we can complete the review for construction authorization in September 2000 so that construction can begin at that time. We expect an operating license application in June of 2002.

On the reactor side, in order to use the lead test assemblies, we're going to need to receive an amendment. That is expected in August 2001. We expect the irradiation of those lead test assemblies to begin in October 2003. We expect the license amendment for the use of the MOX fuel, other than the lead test assemblies, at both McGuire and Catawba to be submitted in January 2004 and the objective of DCS is to begin fuel irradiation in September 2007.

MR. WALLIS: There must be a detailed plan of what you can learn from this radiation of the lead test assemblies?

MR. JOHNSON: Yes. NRR and Research are very much involved with DCS and DCS's contractor, Framaton in doing the fuel qualifications studies, that program is -- Framaton had submitted to us an overall qualification plan that is currently under review by NRR.

MR. SIEBER: The capacity of the fuel fabrication plant is such that you could actually provide reload for four reactors?

MR. JOHNSON: It's intended to provide a third of a core for each of four reactors over 20 years.

MR. SIEBER: So do you -- is there a thought about who the other two reactors will be?

MR. JOHNSON: The four reactors are at McGuire 1 and 2 and at Catawba 1 and 2.

MR. SIEBER: Okay.

MR. POWERS: I'm telling you, there's

something unique about a nice condenser of MOX fuel.

MR. SIEBER: It sounds like it should be going in to cook.

MR. JOHNSON: Well, that concludes my remarks. If you have any questions, I'll be happy to try to answer them.

Basically, I tried to talk about the history of the MOX program, our licensing process, how we're going to deal with the EIS in preparation of that, public hearings, public participation and our schedules and if you have any additional questions, I'll try to answer them for you.

MR. POWERS: I have a comment for -- not for you, but for the rest of the Committee. If you look at the schedule, you see that it goes out to 2007 which means that most of the Members on the current Committee will not see the end of this process. So we're going to have to establish some sort of a procedure for continuity throughout this so that people -- the institutional memory is going to atrophy if we don't do something fairly formal in this process.

We need to struggle with that, actually to the extent of going through a documented plan to assure that we have some continuity in this process.

MR. SIEBER: I think that that is a good point. I think that we're going to have to have some kind of a subcommittee meeting early this summer or late spring and that certainly is one of the things that we will need to address at that time.

I think the other one is the Standard Review Plan. We should probably attack that the same way that we addressed license renewal where we divide up the section among the members so that each of us has an expertise and a certain part of the review process and I know that I have a copy of that SRP, but I don't know if it's been distributed to -- everybody has it.

MR. SIEBER: I think -- well, it's not that big.

MR. POWERS: Are you going to be asking the reactor fuels subcommittee to look at these LTA amendments?

MR. SIEBER: I think that last week when we redistributed the work amongst the various subcommittees of the ACRS, the fuels folks actually inherited a substantial portion of the overall responsibility for completing ACR's work with regards to the facility. On the other hand, at the same time, fire protection is heavily involved and that's why we got the assignment initially. So I see us working together and perhaps even forming a special ad hoc or special subcommittee just to handle issues here.

I also would point out to me the schedule seems very aggressive, which means that there will be a fair amount of work, both on the part of the NRC, DOE, the applicant and the ACRS and so I think it's important for us to keep that in mind so that we don't end up impeding progress on this process.

Does anybody else have any comments at this time?

MR. LEITCH: There's a sense here in the Standard Review Plan that -- in the Executive Summary, that I was just wondering if you could expand upon a little bit. It says the NRC staff has attempted to ensure that this SRP is consistent with the requirements of on-going rule making. Could you say a word or two about what that means?

MR. JOHNSON: Yeah, basically what that means is our schedule for producing the standard review plan was actually ahead of the promulgation schedule for the revised Part 70. And we tried to incorporate the thinking that was going into the revised Part 70 as we went ahead, even though it hadn't been finally promulgated.

MR. LEITCH: Thank you.

MR. JOHNSON: And it turns out, I think the revised Part 70 was ended up promulgated a month or two after publication of the SRP, so there wasn't a great deal of time and change between the two products.

MR. LEITCH: Okay, thanks.

MR. SIEBER: I guess at this time I'd like to ask if since we have DOE representatives here, if they have anything they would like to state or add to the presentation?

MR. RHODES: Thanks for the opportunity. My name is Patrick Rhodes. I'm the manager of that activity. Let me first start with a couple of little minor corrections.

Tim said the facility will operate for 20 years. Actually, that is its design operating lifetime, but we're actually only expecting it to be 12 or 13 years. We're expecting initial production in 2007, final production in something like 2019.

Second one is this facility is designed nominally for 70 metric tons, heavy metal throughput per year which is more than enough for six or seven or eight reactors. Realistically, if one wanted to push, I'm sure we could even get more through it than that.

When this contract was originally awarded to the DCS contract, the contractor, there were actually two other plants, the North Anna plants were also involved which are not ICE condenser plants, so it just happened to be a coincidence if the ones that were resolved, had returned, actually are ICE condensers and consistent with the comment the fact that ICE condensers had no bearing on the selection per se.

The last thing I would like to comment on is what the gentleman said, it seems aggressive and indeed it is, but rightly so. This is something that the National Academy of Sciences has dictated to be a clear national, clear and present danger, both to the United States and for the world. There are large amounts of inventories in the United States and Russia to get rid of. Nobody has really advocated or suggested the U.S. materials are in any way, shape or form going to be unsecure. However, people don't make that same comment about the Russians and the way to get the Russians to make their moves, to make their stuff secure so it's not available for theft or diversion, to give it to us first.

MR. POWERS: Let me ask you a question in that regard. We have a cooperative agreement with the

Russians dealing with space stations and what not and they have been consistently tardy in their contributions on things. Will Russians be similarly tardy in this?

MR. RHODES: Well, if you're relying on the Russians to pay for it I think absolutely the answer is yes, but the agreement that was signed in September required the United States in concert with the G-8 nations to secure funding and financing for the Russians to do the activities.

The biggest problem for the Russians in meeting their obligations under many nuclear activities around the world really has been a lack of resources. They're basically a bankrupt country when it comes to finding funds for major activities. So in this case, the Western nations are going to fund the lion's share and perhaps all of the Russian activity.

VICE CHAIRMAN BONACA: I wasn't here during the presentation, so I apologize for that, but I had a question regarding in reviewing somewhat the Standard Review Plan, there is an establishment of quantitative guidelines for use with acceptance criteria based on the highly unlikely and highly likely frequency of events, etcetera. It is not a probabilistic approach to this establishment, is it?

Or is it just the traditional approach that is being used?

MR. JOHNSON: Well, the approach that will be used will be consistent with the regulations in the revised Part 70 and I mean we haven't gotten the submittal yet, so I can't really say in detail how all of that is going to be resolved, but the requirements would be for the applicant to describe how they meet the highly unlikely and likely scenarios in their integrated safety assessment.

VICE CHAIRMAN BONACA: It seems more of a standard approach.

MR. JOHNSON: Now we anticipate that they're going to be using kind of a combination qualitative and quantitative approach for this, so it will -- it looks like it will involve both aspects.

VICE CHAIRMAN BONACA: Thank you.

MR. POWERS: You are allowed under the Commission's policies to ask explicitly for risk information. Are you going to do that?

MR. JOHNSON: I think we can ask for information that we need to review the application under the regulations. And I guess if that means asking for specific risk information, I think it's legitimate in asking that and requesting that.

MR. POWERS: But you don't have any plans to do so right now?

MR. JOHNSON: I think it will be dependent on when we see the application and what is in there. I think it's a little premature to say exactly what it is we're going to be asking for at this point.

MR. KRESS: I think you'll find that the ISA process is a qualitative risk information.

MR. POWERS: And many of us feel that qualitative risk information is an oxymoron.

(Laughter.)

MR. KRESS: Right. Let's go a little further, it's semi-quantitative --

CHAIRMAN APOSTOLAKIS: Semi-oxymoron?

(Laughter.)

MR. KRESS: Semi-oxymoron.

MR. POWERS: I think Stan Kaplan had a statement on that. If you're having trouble quantifying things, go figure out a way to quantify it.

VICE CHAIRMAN BONACA: But the guidelines are quantitative. That's what it says here.

MR. LEITCH: At what point in time will they be submitting the ISA?

MR. JOHNSON: Will they be submitting

that?

MR. LEITCH: The ISA.

MR. JOHNSON: The complete ISA will be submitted with the operating license application. The construction authorization does require a safety analysis of the design bases, so there will be kind of a partial, but not the finished product ISA. The construction authorization will include a safety analysis, will look at some of the ISA matters, but the full, complete ISA will be submitted at the time of the operating license application.

MR. SIEBER: Are there any other further questions from the Members or comments?

If not, thank you very much for your presentation.

Mr. Chairman?

CHAIRMAN APOSTOLAKIS: Thank you, Jack. Thank you very much again. We will recess until 12:45 where we have the reception in the room there, but several of us will be interviewing candidates.

(Whereupon, at 11:23 p.m., the meeting was recessed, to reconvene at 12:45 p.m., Friday, February 2, 2001.)

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

(12:50 p.m.)

CHAIRMAN APOSTOLAKIS: It's a great pleasure to welcome the Chairman of the Commission, Dr. Meserve who is here to tell us what is happening up there and what his priorities are, so maybe we can adjust our priorities. So without much ado, I will turn it to you, Mr. Chairman.

CHAIRMAN MESERVE: Thank you, George. Actually, I arrived here with a little trepidation. Usually, the circumstances are different. There are five of us on the other side of the table and we get the chance to ask all the questions and I could realize that this is an opportunity to turn the tables on me.

(Laughter.)

George had asked if I would come in, as he's indicated, and give you some sense of my feelings for the priorities of the Commission over the coming year and I'm going to do that, although let me start out by saying that what I said a few minutes ago in connection with an event for Bob Seale is that we do extraordinarily value your input. It's very, very important to us in the process.

And in that context, we want you to give us your best advice. Call them the way you see them. Don't worry about the consequences of it. Your job is to give us the best advice and we'll have to deal with it. I recognize that on occasion that may mean you're passing us a few hot potatoes, but that's exactly what you're supposed to do and I am never going to criticize you and I don't think my colleagues are for giving us a straight shot on the issues that you deal with.

As I go through a couple of the issues that I see as ones that are important to the Commission over the coming year and I would like to -- I will leave plenty of time for questions. I think most of the things I'm going to mention are going to be things with which all of you are fully aware and are not going to be a surprise. I will try to give you my sense of the context in which I think the Commission is going to be dealing with some of these issues in the hope that that might be of some interest to you.

First, I mention license renewal. This is a very high visibility issue for the Commission. As you know, we all had some challenges that were being presented to us by the Congress, a number of years ago, and we had pledged that we were going to make decisions with regards to these license renewal issues within a designated time period. That doesn't obviously preclude us from saying no to some. We may find that to be necessary. But we are trying to abide by the time lines for this in that people are monitoring whether we are able to do the job within the time that we've allowed ourselves.

I am concerned that that is going to be a challenge for the Commission, particularly as the queue of plants gets longer and larger. There is hope in anticipation in NRR that efficiencies are going to arise out of that process and the generic lessons learned is obviously an effort to try to find a way to take some issues off the table if that's possible, to do that.

We'll see if that has been effective. As all of you know, we've heard from, on some of that that report may not be as effective in achieving that goal as we might have hoped. We'll see.

It is essential in that process obviously to look at the aging issues that we get strong, reliable, technical input on matters there. I know that you are involved in that. There's going to be a continuing challenge for you as well as for us because of the fact that as the queue gets longer, and the number of applications in our process get larger, that's going to increase the burden on you. I hope that it gets something that is more routinized as time goes on and that it will facilitate that, but I am conscious of the challenge that we're presenting to you. And this is an important area for uss, not only because of the importance of doing the job, but also because we're being assessed in terms, at least the timeliness of our action in that area.

The second area I'd mentioned and I know this is one that is an area within which this group has been very helpful in its briefing to the Commission and that is our efforts to risk-inform our regulatory system. It is apparent to all of us that we are feeling our way into that process and it is proving, perhaps, to be a more intricate and challenging task than some might have expected. You might have had the wisdom to see what we were getting into.

I'm not sure that all of us on the Commission side of the table had an awareness of that, but we clearly have a serious technical challenge in order to think through our regulatory system, particularly where the regulatory system is so interconnected and to be able to make a change in one area without having implications you haven't thought through, at least, in another area in making sure that you can do this in a sensible fashion. At one point I think we had talked with this group about whether a clean sheet of paper might be an alternative approach. The problem is that would be such an immense task, we'd be many, many years until we could make progress on it. So I think that the incremental approach that we're taking is the right one and we're learning as we go through it.

But it's hard for me to tell at this juncture how fast the pace is going to be, but this is also a high visibility issue and it does seem to me it is one that is very important for the Commission because it provides us with a principled way to think through our regulations and decide which ones can be reduced for purposes of efficiency, give us confidence that what we have is either adequate or needs to be supplemented and there is the prospect here for sort of a win-win situation for modifying the regulatory system in a way that gives us improved confidence that we're achieving our objective of protecting public health and safety while simultaneously perhaps in some areas, reducing the burden of licensees where it's needless to have that burden.

And it gives us a principled way in which to go through that analysis. Of course, we have had the benefit of 25 years of work since the WASH 1400 and probabilistic risk assessment. We've always been using it in some fashion in our efforts, but this is a more systematic way to include it. And we should do it. The learning is ripe enough to allow us to take that step.

We're clearly going to encounter some problems along the way. We have one that we have to work through now with the fire protection standard, for example, where we're headed off in a direction on that with a standard in which it appears from the letter we've received the Nuclear Energy Institute that there may be no takers on our efforts to take a different approach.

So that there are going to be those sorts of pitfalls that we're going to encounter along the way and we're going to have to work our way through them. Again, this is an area where the insights that this group can bring to bear and has brought to bear in the past is going to be very important for the Commission in trying to help us work our way through the challenges that this effort provides.

This is going to be a continuing challenge because I'm sure that this is going to be a decade or more of work for the Commission as it does its job. I say in the anticipation of at least the early efforts are ones that we're going to view as successful and therefore we should continue. But if that's the case, then this is something that's going to be a continuing challenge for us and one that -- which your help is going to be essential.

The third area I'd mention is the challenges that we confront in reactor operations. And there are many. We have issues with the steam generators. I know that there's a report that you have on that issue that at least I understand it's headed toward EDO.

We have the revised reactor oversight program and our evaluation of that and the development of improved performance indicators. We have the spent fuel risk study which is intended to provide a foundation for rethinking recommissioning regulations. We're going to have to grapple with that. We have a whole series of things that relate to the interest of operating plants to go to higher burn ups on fuel, power-up rates and things of that nature.

We confront some near term challenges on those and let me say that I think that the pressure on us in many of these areas is going to increase and I say that because I think that the political fall out from the California situation is going to be one where there is going to be great interest in assuring that existing plants are in a position to contribute and there will be great interest in power-up rates and improvements in longer burnup capacity and so forth as a result of that.

And so I would anticipate that this is going to be an area in which there will be, if anything, increased interest by the licensees. The economic interest was already there, but there will be increased interest as a matter of energy policy of making sure that we can squeeze as much power from existing power plants as we can in a safe fashion.

And so there is going to be, this is going to be an area where I would expect there is going to be a variety of influences on us to be looking at this very carefully.

Obviously, none of us want to go beyond any point at which we're comfortable with adequate protection of public health and safety and we will not do that, but we're going to have to look at the issue very carefully and I anticipate some changes there. And if anything, that's something that I think the emerging situation in California may result in some heightened interest in that area that may have some spinoff effects for you, as well as for us.

The related issue as I go into the political context, is something that I think would have been unthinkable for anyone to mention a year ago and that is the prospect that we may have some new construction in the United States. We have had -- the Commission has been visited by representatives of PECO.

There was a meeting the other day that Research held on the PBMR reactor and obviously there's interest in that. It was a prospect that if events go in South Africa as the utility hopes that this may be something that will be advanced in the United States. There obviously is interest in light water reactors and upgrades in those of various types that might also be pursued. And so I think that this is something that would have been, I say, unthinkable a year ago.

Nobody was talking about the prospect that we might have new construction in the United States a year ago and it's now being looked at seriously by people who are thinking about the prospect they might put some money in this. This, too, I would imagine and would expect is going to be affected by the California situation and that there will be no doubt there's interest in the Congress and in an energy policy that will encompass a large number of areas.

Nuclear, I would expect, if I don't know any more than any of you on this, Nuclear is likely to be a component in that and exactly what shape this takes is of course uncertain, but one would expect that there will be interest in the prospect of a portfolio of energy technology and that may well include nuclear interest, encouraging and creating an environment where to exploit nuclear when and if it's appropriate to do so.

I think that that is perhaps a longer term issue for us, but it is something that obviously, ACRS is going to have to be in the middle of.

We have made an offer to participate in some fashion in the events in South Africa. We did that originally with the idea that we would -- the intention as we understood it was the South Africans were trying to use the risk-informed approach to thinking about this reactor. We thought that we would gain from involvement in that exercise.

Perhaps at the initial stages we didn't' realize that it might truly ripen into something that might come home to the United States, but it's premature to say that. But we are, at the staff level, are going to be basically intensifying our efforts on PBMR and alternative concepts with the need to prepare today for the possibility that we may have to be dealing with issues in the future and that will include, of course, not only the technical side, but also making sure that we have the regulatory apparatus in place so we don't place needless impediments on new ideas, but are able to regulate them in an efficient and effective way and provide adequate assurance of safety.

I'll just mention two other areas and then throw this open to questions. One of the other areas is research. When I came to the Agency, now about 15 months ago, one of the data points that I checked on before I came here was to look at the research situation at the NRC, at least in an aggregate form. And I was concerned to see a program that had fallen from a level of about $200 million in the 1980s down to something that's about $40 millon today.

Even to deal with the existing fleet of reactors and dealing with issues, embrittlement materials issues and embrittlement type issues, higher burnups, MOX fuel, it was clear to me there were a lot of areas in which we were necessarily going to have to tread in which we would need a technical foundation for it being able to make decisions and I was concerned about that.

We have two groups that are looking at research. Ken Rogers is leading a group of outside experts that has been examining the research enterprise and I know that you have a report that is headed in our direction this spring that is also going to be directed at the research enterprise.

And let me say for my part in it I think for the remainder of the Commission, I can say that we are going to look at those reports very carefully and to make some decisions as to what changes we should make in that area, so let me suggest that that's an area where -- I am thinking outside the box by this group and by Ken Rogers' group is going to be very welcome in that we are going to take that very seriously and I anticipate that we will be holding a Commission meeting that will be focused on the research after we receive these two reports for the purpose of our making, perhaps, making some decisions for change in that area.

This is obviously of a different, sort of broad public salience than the other issues I've mentioned, but I think it's an underpinning for a lot of our long-term success is our making sure that we have the capacity to be able to answer the questions that we're confronting today and even more importantly that we have a research foundation to be able to look at the issues that are over the horizon for us today.

I had been worried in our research program, for understandable reasons, that over time we've gotten increased emphasis on being a -- doing confirmative research, what we cal lit internally here which is basically being available to answer questions as they're presented from NMSS or from NRR, rather than the harder job of looking over the horizon and seeing what's coming.

Having that capacity to do what they call anticipatory research is an essential thing for us, just because of the long lead time to be able to get results in the research area. You need to have some capacities to be able to ask the questions before the people who are doing licensing decisions ask them, so that you have some information in place that can guide the decision process.

Your insights about this program are going to be very important to us and I think that is, summing it, is essential for the long term of the

Agency.

The final thing I will just mention quickly and it's of a different nature than us is that we have -- anticipate that we will be getting an application for mixed oxide fuel fabrication facility. I read in the Energy Daily that that may have some environmental issues associated with it that are different from those that we had, I guess, understood were going to be the case and it's a lot more liquid waste that we may have to deal with in that facility.

We are obviously, the purpose of that is so that we can take surplused plutonium from weapons and then turn it into mixed oxide fuel and then burn that in some reactor so there is the counterpart issue of using mixed oxide fuel in some reactors which obviously is going to raise some technical questions.

We've been getting mail on that issue and that is another area in which I anticipate that this group is going to have to be providing us with some insights and again it will be welcomed to us because that's moving us into some territory and it's a little different in the things that we've been regulating in the past.

With that, I'll close. Again, I would very much welcome your questions and let me say again how much I appreciate your work.

CHAIRMAN APOSTOLAKIS: Thank you, Mr. Chairman.

Do Members have any questions?

MR. POWERS: I have a couple of things i would like to bring up. We are moving in the direction of risk-informed regulation and this group, of course, is enthusiastic about that. But I will comment that one of the things that surprises us about risk-informed regulation is how far we've been able to get with so little risk information into the process.

One of the areas you mentioned was fire protection and I'll remind you that I don't think you were a Member of the Commission at the time, that when we first looked at the performance-based ideas that NFPA was advancing on fire protection, that we said this is not meeting the NRC's needs and they really need to start thinking about how to make fire protection risk-informed as well. And I think it's possible to do that because of the structure of the regulations are well built for fire protection.

Another area that this continues to interest this Committee is the area of risk during operations other than normal operations. And particular risk during shutdown operations. Our own feeling is that if one is really going to look at this risk informing the regulations in a unit by unit basis because of the tendrils of any given regulation into other regulations, you're going to need a comprehensive risk assessment. And one can't help wondering if it isn't useful to at least have a couple of people sitting down and thinking what does it take to do a clean sheet of paper approach while you're carrying on this more incremental approach?

CHAIRMAN MESERVE: You may be right that as to the -- doing something in parallel, there may be insights that come from one that bear in the other that could be useful. I think that this has been an area in which we have been resource constrained and therefore have, as much as anything, I think have taken a path in order to not be duplicating effort and maybe that's a wrong strategy. I'll raise it.

I am very much aware that all of you as I think as all of our staff has got concerns about making sure if we go forward on risk-informed regulatory approach that we have PRAs on which we can rely for doing that work. And you know, there has been this effort in developing the ANSI standard for PRAs, the NS has got its work underway and I think that all of that is something -- it's unfortunate it's been moving so slowly, but it is the -- it obviously has to underlay what we're doing in this area.

You do mention the -- you did mention the fact that we ought to be concerned about the risk at all stages of operation and we have, as I think you know that is particularly in the low power and shutdown risk that that is an area that I share your views, that this is something that perhaps we ought to be looking at more seriously than we have in the past.

MR. POWERS: If I can just continue one other step and then ask a little more controversial question, but I'd appreciate, maybe you've got some insights that I don't have.

You have spoken about the California situation and it may be a renewed interest in the potentialities that nuclear power offers for the country and its energy mix and even spoken of the potential of using commercial nuclear plants to aid us in ridding ourselves of excess plutonium beyond any logical defense needs.

Do you have any sense that there's any interest in reprocessing fuel?

CHAIRMAN MESERVE: I'm not aware of any one prepared to enter that debate. Right now we have a narrowly focused effort on this MOX facility that is to deal with the plutonium that you would like to be able to put in a state where it doesn't present a risk for generations. And that that is the objective.

I don't think that there is anyone who is seriously considering the reprocessing option now and of course that's largely driven, I think, at the moment because uranium fuel is so inexpensive and there seems to be such an abundant supply and an overcapacity internationally, at least, in terms of enrichment capacity, that the situation is one that it would be economic reasons alone you'd have lots of -- you don't have any pressures to be thinking about going to a plutonium fuel cycle.

MR. POWERS: Whereas, as you said, we have an abundance of supply of the input to the process, we're rapidly running out of supply of things to handle the output of the process and that is a major headache that you have ahead of yourself.

CHAIRMAN MESERVE: That's true. I mean that's a much different fibrillated problem by dealing with the back end of the process. And we're in a situation where we await decisions that get made with regard to Yucca Mountain on that.

CHAIRMAN APOSTOLAKIS: Any other comments, questions?

MR. POWERS: I'd also like to kick in a couple of other comments, least there be any -- maybe we need to realign our wheels. You spoke of the research report. We are preparing a research report in which we did not plan to speak at all to the issue of the way RES is organized. We would speak in this report to the technical content of the work of research and perhaps some of its relationship to the line organizations, but not to anything about the organization and feeling that if there were things to be said in that regard, it might be better for the Rogers committee to speak to that issue than ourselves. We have addressed the issue in the past and didn't plan to in this report. If you want us to do something different, speak now or forever hold your peace.

(Laughter.)

CHAIRMAN MESERVE: Let me say that I would welcome this group, giving us advice, broadly as it chooses on the research area. If whatever reason you conclude that there are certain areas that you don't want to intrude upon, be covered elsewhere or that for whatever reason you think that might delay the report significantly to get into other areas, I will understand that.

We do have the benefit of the Rogers effort and so we're going to have no doubt some overlap and presumably some areas of nonoverlap between the two reports. So I am not asking you to redirect your report, but let me just say and repeat again what I had said earlier is that we are prepared to receive your recommendations in the research area wherever you choose to provide them and if you have views in areas relating to organization that you would like to provide us, then that's fair game. But I'm not asking you to redirect your effort.

MR. POWERS: Okay. We are trying to coordinate loosely with the Rogers committee in the sense of community with them over what they're doing and what we're doing and I think I can say with some confidence that the overlap is minimum.

MR. POWERS: Okay.

MR. SEALE: I think it's also true that there's not anything in those earlier research reports that we would disavow at this point.

MR. POWERS: Not a thing.

MR. SEALE: So to the extent that it's not addressed in this report, if you go back and find it in an earlier version, it's pretty much on mark as far as we're concerned.

CHAIRMAN MESERVE: You might want to say that in your report.

CHAIRMAN APOSTOLAKIS: Any other comments, questions?

MR. LEITCH: Chairman, it's a little off the topic, perhaps, but one of the things that concerns in the broad sense is the aging of the people in this industry and the technical skills that seem to be leaving, perhaps by retirement. Maybe it's Dr. Seale's retirement party that makes me think about these issues, but do you sense any difficulty in attracting the brightest and best people into this industry today?

CHAIRMAN MESERVE: I think this is, I didn't mention this as one of the issues to mention to you, but as an Agency, this is clearly a very serious issue for us. We have six times as many people over 60 in this Agency as we have people under 30. You can -- you go to some important parts of the organization, Research, NRR, there's an order of a quarter of the people who are fully eligible for retirement, could leave today, full retirement. And those numbers, of course, are growing as time goes on.

This is, in part, the consequence of the fact that our budget has been going down and allocation of full-time equivalents has gone down. Until the last year, we managed to get real growth in both, very slight real growth in both. And we managed that through attrition in that we have not had the opportunity to bring in as much as fresh blood as we would like to in terms of being able to strengthen our capacity.

I have talked to people in the industry and of course, they are confronting exactly the same problem and that we're drawing from the same pool of people. The data I've seen is that we're producing, this was nuclear engineers alone, I've realized we draw from broader communities, but the national production of nuclear engineers -- if I have the figures right, is in the order of about 240 a year and the jobs from the industry are in the order of 600. So that's without considering our demand. So we confront a very serious challenge, both at the NRC and the nuclear energy industry more broadly. It's a pipeline problem.

I think that time may correct that in some sense there's always a lag time is the problem in that there are economic signals that are going out that weren't there a year ago that if you go into this field there are going to be jobs. And there's a future with life extension of plants, as a possibility you can go to work for a given utility and you may have a career, rather than a plant that's going to be terminated early.

So I mean the context is different, but it's going to take a while until that builds into the system. To try to deal with our problem, I have asked for the EDO to provide basically a plan of attack for us on this issue which has just arrived on my desk. And it's going to start with trying to assess the areas in which we have a perceived need, have competency over the years and seeing where we are in each of those and how we backfill and try to generate a plan for being able to deal with that.

I am hopeful that we may be a beneficiary of the fact that as a country we're going to start looking seriously at energy issues again and that there will be concern about this issue at the political level that may make it possible for us and other agencies to be able to address serious manpower issues that we, as a society as a whole confronts in this area.

I hope that's the case, but we're clearly going to have a short term problem at the least.

MR. SHACK: Just in the context of our

research report, one of the issues that always arises as we go through this is when does the NRC need to do the work and when do we accept the data from industry? Our plants are basically built and licensed on designs and data from industry, but you mentioned, for example, embrittlement of pressure vessels. If a utility wants relief so it can go through a different pressure temperature start up or use a master curve approach, are you comfortable with them supplying the data? Do you feel that there's a need for the NRC to independently assess these issues? Do you have any feeling for when we ask for independent verification and when we don't, because it's always an issue in the research area.

CHAIRMAN MESERVE: I can't give you an informed view of that matter. It is clear that sort of fundamental things that are essential for safety, we need to have some independent capacity to be able to judge, things that are longer termed efforts, more generic than cooperative ventures with industry, for example, would be something we ought to encourage maybe more than we have in the past as it gets down to more specific licensing issue than perhaps a little more distance capacity to be able to look very carefully and be able to confirm that information is necessary.

I agree, it's a very tricky issue in it's not one that I can -- I feel capable to provide very much light to illuminate it for you. I think that -- I suspect that this is an area where you're going to have -- I hope you will have some insights for us in your report.

How's that for turning the table?

(Laughter.)

I'm sure we wouldn't let you get away with that.

(Laughter.)

To answer this real quickly, no, we don't need any more data on pressure vessel integrity.

(Laughter.)

CHAIRMAN APOSTOLAKIS: Robert Uhrig.

MR. UHRIG: You alluded a few minutes ago to anticipatory research and yet we are getting the signal, both directly through speeches and indirectly by word of mouth that other Commissioners have a less liberal view on this, specifically saying each research project should have a very defined end product, this type of thing. I wonder if you could address this a little bit.

CHAIRMAN MESERVE: Well, let me say that

the background for all of our activities and the thought process we have to follow is that for the most part our budget is one that is paid by our licensees and that puts pressure on us to make sure that above and beyond the pressure that every Agency feels to be efficient and effective in the expenditure of funds and the danger is that the more the research is anticipatory, the more vulnerable it is to being seen as not being related to a real industry need. That may not prove to be the case, of course.

The whole reason you're doing anticipatory research is because you believe it's going to be an important need that the Agency is going to have to confront to deal with things that our licensees present to us in the future, but the reason it's not a present demand from NRR and NMSS is because it's not one that's being currently presented to them. So there is a vulnerability to the fact that why in the world is the NRC involved in that area? We don't have any requests to you in that area.

I think that this is an issue which I talked to my colleagues about and I think that -- I think there is a recognition of the need for anticipatory research. There may be varying degrees of enthusiasm for how far you get into it, depending on the fiscal situation and let me say that this is an area that one possible solution might be to try to get at least some of the research that's funded out of general revenues, rather than from fees. And I can't speculate as to whether that's like, but that is one way out of the impasse.

MR. UHRIG: Another related issue, we have heated debates at times about who should do the research. There's an argument that the utilities benefit from it, they should do the work themselves versus this is something that's important to the NRC, therefore NRC should support it and then there's the middle ground in between that's -- sometimes it gets lost because nobody picks it up.

CHAIRMAN MESERVE: I think this relates to the matter we were just talking about a moment ago about the degree to which the NRC can rely on on industry data that's very into that is who should be the performer of the research. And I think it has a lot to do with the extent to which the data is critical to an individual license application and obviously we need to have -- that's a cost that should be born by the licensee initially.

We need to have a capacity to be able to verify its accuracy and have to have a sufficient knowledge of the field and of the data to be able to do that, as opposed to something that's a much more generic issue in which there is, that maybe no one was prepared to pick it up. It's sort of a commons issue in which there may be a -- might be appropriate for the NRC, recognizing that the work has to be done to play a role.

I don't -- there's a separable question there as to who the performer is. They decide that the NRC should support it, but then there's the question of where the work should be done. I think that with a wide variety of possible sources and obviously, to my mind that depends very much on where we can get the work done most effectively and the most reliably. We should obviously use international efforts to the extent we can. I believe, just because of the cost savings that we can and they have facilities abroad that we may not be able to replicate here. So it's a complicated set of parameters you need to consider in making a decision.

CHAIRMAN APOSTOLAKIS: I have a couple of comments, too. We discussed earlier the issue of PRA quality and the need to do PRAs for modes of operation other than power. I think another related subject that perhaps has not attracted as much attention is the use of codes and tools that have been developed by various industrial groups, consulting firms which are being used and the agency really hasn't to my knowledge reviewed them or used them in some way to do make sure that what they do is reasonable.

The measure seems to be that if this code is used by a lot of people it must be good and I think it's important to have some mechanism to make sure that what these codes produce is reasonable.

Now to go all the way and say that these codes, the PRA codes should be blessed by the NRC the way thermohydraulics codes have been in the past, maybe that's not the answer either because then to change something is a major headache, but I think we need to find a way and of course, most of these are proprietary, you really have to buy them to -- although some companies are wiling to give them to you for free, but even then it takes some effort and resources to run them and find problems.

I think that tools that we as an industry, as a community are using to assess risks have to be subjected to some scrutiny so that as a community we will feel that yes, this particular computer program produced something reasonable that can be used under certain conditions. And right now we don't do that.

We just rely on reputation and number of users and so on, so I think that's an important consideration and the committee, I think, will say something about it, at least in the research report and maybe in other forms as just information.

CHAIRMAN MESERVE: George, on that point, are there some specific areas for codes that you're talking about? Obviously, we heard from you on the thermohydraulic codes.

CHAIRMAN APOSTOLAKIS: Yes.

CHAIRMAN MESERVE: He have effort development in PRAs.

CHAIRMAN APOSTOLAKIS: I think they do a lousy job calculating importance measures and this is the central part of option 2. And the utilities are caught in the middle. They go out, they buy one of the best according to reputation and so on and now here comes the ACRS and says no, you have problems with the code and they have invested a lot of resources doing various things that are required by the regulations and I think somehow we have to avoid that in the future and make sure that the tools that are out there are doing what they're claiming they're doing.

CHAIRMAN MESERVE: You have something

coming to us in this area?

CHAIRMAN APOSTOLAKIS: If I convince my colleagues at some point.

(Laughter.)

MR. POWERS: George, we may go on from this to even build upon this, not only do we have these peculiar importance measures that are somewhat historic in their generation, we have alternatives proposed by licensees that no one seems to take seriously.

CHAIRMAN APOSTOLAKIS: That's correct.

MR. POWERS: And we have academic papers which seem to make a fairly logical expansion type argument that seem to get ignored. It's a real problem here when we have set down in writing what the division --

CHAIRMAN APOSTOLAKIS: You are putting me in a situation of conflict of interest.

(Laughter.)

MR. POWERS: I happened to have read the paper and liked it.

CHAIRMAN APOSTOLAKIS: Mr. Chairman, I had another thing to say and I must have forgot it.

(Laughter.)

Any other comments from my colleagues?

CHAIRMAN MESERVE: Thank you very much. I appreciated the opportunity to meet with you and let me say that as issues arise that you'd like to talk to me about, I am available to you. Please call and I've sent -- George, in particular, please stop by and let me know what's going on.

CHAIRMAN APOSTOLAKIS: I'd like to finish by repeating something I told you the other day, that this committee does know what an engineering approach measure is. Don't believe it when people tell you we don't. We really appreciate your willingness to come here and spend some time with us. Thank you very much.

CHAIRMAN MESERVE: My pleasure. Thank you very much.

CHAIRMAN APOSTOLAKIS: We will recess until 2:15.

(Off the record.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on Reactor Safeguards 479th Meeting

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Location: Rockville, Maryland

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.

John Mongoven

John Mongoven
Official Reporter
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