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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

November 16, 2001

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

REACTOR FUELS SUBCOMMITTEE

MIXED OXIDE (MOX) FUEL FABRICATION FACILITY (FFF)

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FRIDAY,

NOVEMBER 16, 2001

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ROCKVILLE, MARYLAND

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The subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Dana A. Powers, Chairman, presiding.

COMMITTEE MEMBERS PRESENT:

DANA A. POWERS	Chairman
MARIO V. BONACA	Member
THOMAS S. KRESS	Member
GRAHAM M. LEITCH	Member
WILLIAM J. SHACK	Member
JOHN D. SIEBER	Member

ACRS STAFF PRESENT:

MAGGALEAN W. WESTON, ACRS Staff Engineer

ALSO PRESENT:

DAVID BROWN

FRED BURROWS

JOHN CALVERT

NANCY FRAGOYANNIS

JOSEPH GIITTER

TIM JOHNSON

ED LYMAN

ALEX MURRAY

ANDREW PERSINKO

TOM PHAM

JOHN STAMATOKOS

SHARON STEELE

CHRISTOPHER TRIPP

REX WESCOTT

I N D E X

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

(8:38 a.m.)

CHAIRMAN POWERS: Let's bring the meeting to order. I apologize for delaying people. We have little administrative matters that have to be taken care of while we have a chance here.

This is a meeting of the ACRS Subcommittee on Reactor Fuels. I'm Dana Powers, Chairman of the subcommittee.

The ACRS members in attendance are: Dr. Bonaca, Dr. Kress will be with us after he does his little administrative chore this morning, Graham Leitch, Jack Sieber, and Bill Shack.

The purpose of the meeting is to discuss the mixed oxide fuel fabrication facility construction authorization. The subcommittee will be gathering information, analyzing relative end issues and facts, and formulating proposed positions and actions as appropriate for deliberation by the full committee.

Maggalean Weston is the cognizant staff engineer for this meeting and the person whose office will be overflowing with paper generated by this project.

(Laughter.)

The rules for participation in today's

meeting have been announced as part of the notice for the meeting previously published in the Federal Register on November 2, 2001.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice. It is requested that speakers first identify themselves and speak with sufficient clarity and volume so they can be readily heard. And I assure you our reporter, in her charming way, will let you know when you fail to comply with those requirements.

We have received a request from Mr. Ed Lyman from the Nuclear Control Institute to make an oral statement at today's meeting. We have also received written comments from Georgians Against Nuclear Energy, Atlanta, Georgia. These comments have been distributed to the ACRS members here today, and I encourage the members to examine it. They raise 13 issues. It's a fairly quick and interesting read.

If members look at the agenda, the statement by Mr. Lyman is not culled out on the agenda. My intention is to call a break at 3:00 and do his statement at the conclusion of that break. Mr. Lyman has spoken to us before, and I think we'll all agree he usually has interesting things to say.

We're embarking on looking at a plutonium process facility. This is not the first process facility that's ever been constructed in this country. My own involvement has been with three of them -- Rocky Flats, PUREX, and the plutonium finishing plant. I wish I could assure the members that the smooth, non-controversial functioning of these facilities should give us confidence in the ability to prepare a new facility.

There are some differences that we do need to recognize. This is going to be a new facility. Whereas the older facilities were designed with short lifetimes and the technology was evolving as they were being operated, this new facility is going to be designed with a 50-year lifetime and a fairly well-established technology.

Members are going to find that the safety analyses for facilities are substantially different than what we're familiar with in the reactor world. Members may want to reexamine Part 70 of Chapter 10 in the Code of Federal Regulations. They also might find it of interest to look at the Parts 800 and above that are the codification of some of the DOE orders that give you some insight on how facilities within the DOE world are operated.

The committee historically has been very comfortable with the quantification of risk -- going to enter into a less familiar world of safety analyses that are done for process facilities. And these are process facilities that are fairly unusual. It's located on a large government-controlled reservation.

That means that risks to the public, as we generally define them, are going to be low because -- just because of the distance. On the other hand, there are large populations of people on these government reservations. The last time I looked at the Savannah River site there were 25,000 people working on that site, most of whom will have only the vaguest familiarity with any hazards posed by the mixed oxide fuel fabrication facility.

And, consequently, the definition of what we mean by "public" in looking at this facility becomes interesting.

Well, with that brief introduction, I think we can proceed with the meeting, unless other members have opening comments they'd like to make. I will begin, and I believe Drew Persinko is going to start us off on this?

MR. PERSINKO: Yes.

CHAIRMAN POWERS: Drew, the floor is yours.

MR. PERSINKO: Thank you. My name is Drew Persinko. I am the MOX Project Manager at NRC. I will try -- I will give a brief introduction and will try to move through it quickly, so we can get on to more technical matters.

Today we will be speaking about many different topics as we were requested to do -- a little bit about many areas. We will not be speaking about any classified information, nor will we be speaking about any proprietary information. If a question is asked that contains proprietary information as an answer, we will decline to answer.

So we have a tight schedule today. We've tried to pack in a lot of information into this schedule. So if we extend in one area, we're going to steal from another area.

CHAIRMAN POWERS: Yes. I think you use your judgment on this. This is -- I mean, we're looking at this mostly as an introduction to the subject. One of the things that the committee is going to have to do at the end of the meeting is try to decide when we bring the -- what and how much material when we bring to the full committee.

You've got a substantial fraction of us here, so you can tell there's a lot of interest in this new activity.

MR. PERSINKO: Okay. Next slide, please.

Start off with a brief history. I'll go through it quickly. You've heard some of this before in an earlier presentation that we made, I think it was last February.

The reason for the facility is a U.S. agreement with Russia, whereby each party, each country has agreed to dispose of 34 metric tons of plutonium. The policy is being implemented through the Department of Energy. The Department of Energy has decided to convert some of the excess plutonium to MOX fuel; 25 metric tons will be converted to MOX fuel.

The DOE has contracted with Duke Cogema, Stone & Webster, whom we will -- we use the acronym DCS -- to build and construct and operate the facility located at the Savannah River site in Aiken.

I'd also like to state that at the current time the Bush administration is currently reviewing all of the plutonium disposition programs within the Department of Energy. And it's possible at the conclusion that some elements of the program may change. But at the current time, staff -- the NRC staff is continuing to review the project at the current schedule.

Next slide, please.

This is an overview, high-level depiction of the flow of material, weapons-grade plutonium coming into the Savannah River site, first coming to a pit disassembly and conversion facility, which will be under the jurisdiction of the Department of Energy and not NRC.

From there, the plutonium oxide powder goes to the MOX fuel fabrication facility, and then to the reactors. The plan is that the MOX fuel fab facility will process approximately -- assuming staff approval, will process approximately 70 metric tons of heavy metal per year.

Next slide, please.

This is an artist's depiction of the proposed facility from the applicant's construction authorization request. The main building is approximately -- the footprint is about 400 by 400 by about 65 feet above grade. The main building comprises of three areas within the building, one being the aqueous polishing area, one is the shipping/receiving area, and one is the MOX processing area, which we'll get into a little bit here.

CHAIRMAN POWERS: And this is all in F

area?

MR. PERSINKO: All in F area. Next slide, please.

This is a map of the Savannah River site. You can see that the MOX fuel fabrication facility is shown in F area. This is the -- the red line around the outside is what the applicant has proposed to be the controlled area boundary. You mentioned earlier about there is a significant amount of Department of Energy personnel on site, which there are.

The Part 70 regulation allows the applicant to choose the controlled area boundary at a location between the restricted area and the site boundary, and the applicant in this case has chosen Savannah River site boundary as its controlled area. The Part 70 regulation does have provisions in it you may have read about how the Department of Energy personnel should be treated with respect to the performance requirements in 70.61.

It has to do with training, so that they do become aware of the hazards associated with the MOX facility. But we can go into that in much more detail if you'd like at --

CHAIRMAN POWERS: It's quite a question to my mind how much this committee really wants to get into that argument. I have endured those arguments within the Department of Energy itself for worker protection. There's a real question in my mind, though, whether that's a useful use of this committee's time. I think it's an interpretation of the regulations.

I have my interpretation. It's undoubtedly different than the applicant's. But I'm not sure I have -- I'm not sure the Commission is looking to me to get advice in that area.

What you might want to point out is there's a public road going through this.

MR. PERSINKO: Yes. There are public roads running in that area, and I believe that area right there is a public road. There are public roads that transverse the site.

I guess I'll have to point out, too, that the MOX fuel fab facility is approximately five to six miles to the nearest controlled area boundary site.

Next slide, please.

This is a high-level view of the process. Alex Murray will get into the chemical process in more detail when he speaks, but this is a high-level view of it. This is the part known as the aqueous polishing part of the process. It's based on various processes that are in place at the LaHague facility in France. It's similar to the PUREX process in many ways.

It consists of a dissolution phase where the plutonium oxide is dissolved in nitric acid, a purification stage whereby Americium and gallium and other impurities are removed via pulse columns and solvent extraction. And then it's converted back to a plutonium oxide and transferred to the next phase of the process.

Next slide, please.

CHAIRMAN POWERS: I'll learn lots about red oil here.

(Laughter.)

MR. PERSINKO: And Alex will be happy to talk to you about that.

(Laughter.)

Okay. The next phase is the actual -- the fuel fabrication process. This is based on the process that's currently in use at the MELOX facility in Marcoule, France. Both, like I said, the aqueous polishing and this are based on processes in France. Some of the components will be exactly the same, some will be different, but the basic processes are involved -- are similar.

The applicant is doing what it has called Americanization, which means trying to take the designs that are in France and showing that it meets U.S. codes and standards.

CHAIRMAN POWERS: Excuse me. A couple of things here that pop immediately to mind is that there is an accumulation, it seems to me, at some point in the 20 percent blend here before we get into the blending to form the pellets. So there is -- I mean, there is more complexity in this step here.

The other thing is that some of the technology that's just recently come to the fore is being applied in this. It's the ultramicronization and things like that to get a little -- a better distribution in the fuel.

MR. PERSINKO: Yes. As you were saying, the first process is a blending. It's a two-step blending process. After each phase there is ball milling, homogenization of the material, and it uses what's known as -- you referred to the MIMAS process in France.

It's pressed into pellets, sintered in ovens, and assembled into rods and assemblies, similar to -- the process is -- that part of it is similar to the uranium processing facilities.

Next slide, please.

This is just an overview of all of the regulations that apply to the facility, just to let you know that there's more than just Part 70. But today we'll be speaking primarily about Part 70. We'll get into some others when we talk about safeguards and security, but --

CHAIRMAN POWERS: You've left Part 20 off.

MR. PERSINKO: You're absolutely right.

(Laughter.)

Part 20 should be added. It's a very important one.

Okay. Next slide, please.

Yes, we put a lot of pictures onto the slides. They didn't quite fit onto one floppy, so we had to split it up.

Okay. So the primary regulation that we will be discussing today is 10 CFR Part 70. Part 70 allows a two-step process to be -- a two-step licensing process, one for construction and one for operation. We are currently reviewing the construction application that was provided to us that was submitted by Duke Cogema, Stone & Webster, the applicant.

Next slide.

Concerning construction, Part 70 requires that the design -- that in order for the applicant to move forward with construction, the NRC must approve the design bases of the principal structures, systems, and components, the quality assurance plan, and also complete an environmental impact statement.

We are in the process of working on the environmental impact statement. We have issued a quality assurance -- a safety evaluation report concerning the quality assurance plan.

Next slide, please.

We are using the definition of design bases from 50.2, which consists of functions and values primarily.

Next slide.

With respect to operation, you had quite a presentation on this on Wednesday. But, once again, with respect to operation, the applicant will be required to submit an integrated safety analysis. Part 70 requires that an ISA be submitted, that the NRC approve the ISA summaries. It also has provisions to identify the items relied on for safety, and I think you're familiar with that term, commonly referred to as IROFS, and then management measures to assure that the IROFS are available and reliable.

Those are the three main ones, but there is a host of other items that must be also submitted with the operational application, such things as physical protection plan, material accounting plan.

One thing I'd like to say at this point, though, is for the construction phase the regulations talk about principal structures, systems, and components, and safety analysis. At the operations stage, it talks about integrated safety analysis and the IROFS, items relied on for safety.

There's an analogy there, but there are different terms that apply to it. We sometimes forget ourselves and use the terms interchangeably. But I would like to state that when we talk about construction we are really meaning principal structures, systems, and components.

CHAIRMAN POWERS: We will be equally sloppy.

(Laughter.)

MR. PERSINKO: Next slide, please.

This is a depiction of the performance requirements, which is the -- in 70.61. You heard about them on Wednesday. This is shown -- the performance requirements are shown in matrix form. Basically, if you have unmitigated doses to the public or the workers that fall into different consequence bins, you have to have associated likelihoods with it.

These areas -- for example, if an unmitigated consequence and a certain likelihood fall in this bin, you either have to provide -- the applicant must provide -- must identify items, principal SSCs or items relied on for safety, preventive IROFS, which would take it into this direction, or mitigative IROFS, which would lower it into this direction. But, basically, the regulations require that you -- after application of the IROFS, you do not exist in those bins.

CHAIRMAN POWERS: One of the challenges I'm sure we're going to come up with is understanding the role or the application of defense-in-depth philosophies to this, which may well be interpreted by at least some as a balance between preventive and mitigative activities. Can you comment on that?

MR. PERSINKO: Well, the applicant, for certain scenarios such as criticality, has committed to prevention rather -- as opposed to mitigation. In other cases, it has relied on mitigative features. Rex Wescott, when he speaks about the safety analysis part, will get into more of this.

What I'd just like to say also -- the

performance requirements that are shown up here really apply to the operations phase. When Part 70 was formulated, it was -- we were thinking operations phase at this point. So they really applied to operations. However, they are also being used by the applicant in identifying principal structures, systems, and components at the construction phase, although the regulations do not require that.

At the construction phase, the applicant is identifying the principal SSCs at a systems level, and then at the operations phase the applicant intends to identify IROFS at a component level.

Next slide, please.

This is a quick overview of the activities that the staff has done to date, has completed to date, or is in progress. Has completed to date -- we issued a standard review plan, NUREG-1718. We've established a website, although I don't think it is currently -- because of the -- I don't think it's currently usable right now, but it was a very good website.

(Laughter.)

And hopefully we'll have it back online at some point.

We've had numerous technical meetings on the subject, some of which were in Aiken, in South Carolina near the site. We have had also public meetings with members of the public, especially in the EIS -- in the environmental area, both in South Carolina and North Carolina. We had environmental scoping meetings down there in Charlotte as well as the Aiken area.

CHAIRMAN POWERS: None in Georgia.

MR. PERSINKO: We had them in -- well, we had them near Aiken, North Augusta, South Carolina, which is just across the border from Georgia.

MR. GIITTER: And one in Savannah.

MR. PERSINKO: Oh, one in Savannah. That's right. That's right. Thank you. We did have one in Savannah. That's right. Savannah being downstream of the plant along the Savannah River.

And we have issued a request for additional information. We issued that last June. The applicant has responded to our 239-question RAI, a very interesting number.

CHAIRMAN POWERS: That's why Mag is applying for a bigger office.

(Laughter.)

MR. PERSINKO: And the applicant has responded to that -- to those 239 questions. We are currently discussing some of those responses with the applicant because of additional or clarifications as well. We are currently in that process right now.

We've had public meetings on this -- on certain RAIs, and we have visited the offices to review certain in-house -- in-office supporting documents that the applicant has. That's where we currently are.

Next slide, please.

A high-level view of our schedule up through -- near-term schedule, I should say. The environmental report was received in December of 2000. The application for construction -- the construction authorization request -- was submitted in February of '01. We intend to issue a draft EIS in February of '02 and a draft construction SER in April of '02.

The applicant has indicated that it will submit an application for operation of the fuel fab facility in July of '02, and our plans are to issue a final EIS and construction SER in October of '02.

Next slide, please.

These are just some of the considerations that we are currently dealing with within the staff. We're using 10 CFR Part 70. It was revised fairly recently, about a year ago. And it's the first time it's being applied in total from start to finish for our new facility.

We also have -- since this is a two-step licensing process, we are working on design bases. So we have many interesting discussions concerning what is the appropriate level of detail with respect to design bases.

Another issue -- another consideration is that this is a plutonium facility. It's been quite some time, maybe about 25 years, since the staff has reviewed such an application. We are also -- let's not -- in addition to the technical safety analyses being performed, we are also in the process of writing an environmental impact statement. And there are also public hearing -- requests for public hearing, and the technical staff is supporting the Office of General Counsel in that respect.

And that completes my presentation. With that, I would like to turn it over to Rex Wescott, who will talk about the safety analysis portions.

CHAIRMAN POWERS: Well, I'll just interject we'll -- I think we could have an interesting discussion on this issue of design bases and design alternatives, because it's a -- it's remarkable how many of these processes I've actually seen before. I mean, these are fairly geriatric approaches to mark what little progress has been made in the last 20 years.

MR. WESCOTT: Good morning. My name is Rex Wescott, and I'm the safety analysis reviewer, and I'll be describing the safety analysis review which is primarily the review of Chapter 5 of the construction authorization request for the MOX fuel fabrication facility.

Next slide?

The purpose of this slide is to give you an idea of the scope and organization of my presentation. I want to note that the applicant refers to the safety analysis provided in Chapter 5 as the safety assessment of the design basis, which is also the terminology from our SRP. And this is the terminology which I will use in referring to the applicant's analysis.

I wish to note that the objectives of the safety assessment and the tasks listed to meet those objectives were developed by the applicant and are presented here to better describe what is being reviewed by the staff.

I will also talk about the NRC's safety analysis review responsibilities, which include a little bit more than just Chapter 5 review, an overview of the MOX safety assessment, a little bit of quantitative information about what it all entails, and the status of the MOX safety assessment review to date.

Next slide?

The major objectives of the safety assessment are as follows: to identify the hazards and events associated with the MOX fuel fabrication facility design and operations. That's the first step to figure out what the hazard and events are. The second objective is to identify the principal SSCs required to mitigate or prevent these events and their specific design bases.

MEMBER KRESS: Are those the same as IROFS?

MR. WESCOTT: At this point, no. This is at the systems level, and I'll get into IROFS a little bit later. Right now we're primarily dealing with principal structures, systems, and components. I guess that's consistent with Drew's explanation.

And the third objective is to provide reasonable assurance that the identified principal structures, systems, and components can reduce the risk to a level consistent with 10 CFR 70.61, through the adoption of a general design philosophy, design bases, system designs, and a commitment to appropriate management measures.

The significance of that is that the need to consider the design philosophy and commitment to management measures is a reflection of the early state of the design at the construction authorization stage. At this point, we really don't have the quantitative reliabilities or the procedures to assure them that could allow us to be more quantitative.

MEMBER SHACK: On 70.61, this matrix that we were shown earlier is from 70.61?

MR. WESCOTT: That is correct. That reflects the requirements of 70.61.

MEMBER SHACK: So that is the codified --

MR. PERSINKO: You won't see the matrix itself in 10 CFR --

MEMBER SHACK: No. But I will see the -- these numbers --

MR. PERSINKO: Yes.

MEMBER SHACK: -- the low consequence doses is --

MR. PERSINKO: Yes.

MEMBER SHACK: -- 25 rem for the worker.

CHAIRMAN POWERS: Yes. You can construct

the matrix from that.

MR. PERSINKO: Right.

MEMBER SHACK: Is there a numerical value associated with highly unlikely and likely?

MR. WESCOTT: At this point, what the applicant has done, basically, in response to one of our RAIs, has committed to an index as we've described indexes in Appendix A of the SRP, an index of minus five, which we -- and this is, incidentally, just for the public and the site workers. It is not for the facility workers.

He has committed to an index of minus five, which we take as approximately a probability of 10^{-5} per year, not exactly, you know, in a sharp regulatory sense, but kind of a neighborhood approximate goal.

MR. PERSINKO: The regulations themselves, though, Part 70, do not specify a numerical number with the likelihoods.

MR. WESCOTT: For the facility worker, the licensee has committed to more or less qualitative descriptions that should ensure a likelihood of -- we would estimate in that neighborhood, such as defense-in-depth and a commitment to quality assurance. I can't remember all the commitments, but they are basically qualitative commitments that followed in the nuclear industry that should provide for a very high level of protection.

MEMBER SHACK: It just seems like a worker dose of 25 rem is not being unlikely is acceptable just --

(Laughter.)

If I walked into a national lab and told them that I was going to, you know, give my hot cell worker a 25 rem dose --

CHAIRMAN POWERS: You'd walk right back out again.

(Laughter.)

MR. WESCOTT: Well, certainly, it's attempting to make it very -- you know, highly unlikely.

MEMBER SHACK: But it says not unlikely is acceptable.

MR. WESCOTT: Not unlikely is acceptable.

MEMBER SHACK: Yes. It says low consequence, worker dose --

MR. WESCOTT: Oh.

MEMBER SHACK: -- I guess he can have 24.9 --

MR. WESCOTT: I see what you're talking

about. Well --

MR. PERSINKO: One thing to remember I think is that those doses are with respect to the performance requirements in 70.61. They're not with respect to Part 20. The applicant still must meet the Part 20 dose requirements.

MR. WESCOTT: Right. But you're absolutely right. From the performance requirements that is the regulation. But Part 20 and ALARA we feel will come in to kind of make that particular --

MEMBER SHACK: Less acceptable.

(Laughter.)

MR. WESCOTT: Yes, less likely.

CHAIRMAN POWERS: There may be a question that has no answer right now, because of timing, but I'll ask it anyway just because it pops into my mind. Suppose the NRC indeed grants both the applicant's request for construction and operation. What kind of monitoring and enforcement regime would the NRC anticipate at this facility? Episodic or continuous?

MR. PERSINKO: That decision has not been made yet. It's very possible we would have a resident inspector on site, but that decision has not been made.

MR. WESCOTT: Okay. Slide 4, next slide.

Okay. Now here are the tasks which have been developed to meet these objectives. First is the identification of hazards and events which was accomplished in the applicant's primary hazard analysis, which is kept at his office. It wasn't supplied to this.

And in this he's gone through procedures like what-if checklists, hazard interaction, matrices, and similar basic tools to determine what the events are.

The determination of unmitigated consequences, of course, identifies events which will have to be prevented or mitigated. The identification of bounding events is part of our SRP guidance. In other words, we don't require that every event be dealt with in terms of principal SSCs, but the bounding events at this point.

And the formulation of a safety strategy and identification of principal SSCs and their associated design bases -- the last two elements there -- is directed toward getting the event to be in compliance with 10 CFR 70.61 performance requirements. We will --

CHAIRMAN POWERS: Looking and reviewing these things, how much access has the staff had to the historical record of the DOE facilities that in many cases have used similar SSCs to mitigate events?

MR. WESCOTT: Well, we have looked at some facilities. I mean, we were out at Los Alamos a couple of --

CHAIRMAN POWERS: EA-55.

MR. WESCOTT: -- ago and looking at their experience and what they did, and so on. Primarily, at this point, we are looking at trying to make sure we've got all of the events covered. And as I'll mention later, of course, in determining the strategies we are looking at the basic nuclear experience, including reactors.

If something is normally done to prevent an accident or prevent a dose in a reactor as a strategy, say, as a -- let's say, an entry control or interlock, you know, we -- we tend to accept that as probably an acceptable strategy here. And, yes, we are trying to base our review, to the extent possible, on historical precedent.

CHAIRMAN POWERS: Okay.

MEMBER KRESS: How will you decide what an SSC is? If they're not IROFS, what are they?

MR. WESCOTT: Well, right now, principal SSCs -- I'm trying to be consistent with Drew, because

I think that is generally the way we're going -- is primarily systems, the principal SSCs. We're up at the system level.

Now, in some places, a component can, of course, be a system. And that would be a principal SSC. But right now, we're at the systems level. The strategy is still in the conceptual design stage, I guess would be a proper way to characterize the design, and we're looking at systems as opposed to the actual design of these systems themselves.

Where we get into the IROFS, the components, would be -- be -- some components maybe IROFS, some components may not be, depending on the design of the system.

MEMBER KRESS: But you don't have the equivalent of an importance measure that you'd have with the PRA. So I'm not quite sure what the criteria is going to be for saying this is an SSC.

MR. WESCOTT: Do you mean this is a proper SSC?

MEMBER KRESS: Yes.

MR. WESCOTT: I'll get into that a little later.

MEMBER KRESS: Okay.

MR. WESCOTT: But I guess maybe to answer your question right now, as I said before to Dr. Powers, one of the criteria is, is it being used in the industry? I mean, is it a normally applied strategy?

The other thing we're using is we have a table in Appendix A, Table A-5, which is a description of various types of measures -- in other words, robust passive control or active control, that type of thing, and it assigns an approximate probability of unavailability.

And so we're kind of doing a semi-qualitative/quantitative approach at this stage to get an idea of whether this appears to be an appropriate strategy, whether it's going to work at the OL stage. That's what we're trying to do right now. We're trying to have reasonable assurance that they're going to have a design that when they actually design the components and determine the surveillance requirements and go into all of these different measures that narrow down what the exact reliability is, they are starting with something that will work, that they can get there from where they're starting. That's our concern at this point.

MR. GIITTER: Just to make it clear that the approach they're taking is deterministic at this point.

MR. WESCOTT: I'm sorry. I guess slide 5, next slide.

Okay. Determining the mitigated consequences checks for the actual quantitative compliance with the performance requirements. In other words, doing a calculation with mitigative measures; that is, for those that are not -- those events that are not prevented, we determine whether the dose to the public, the dose to the site worker, or the dose to the facility worker, and so on, has dropped below the threshold value and then is in compliance. You've got to do that check or you don't really know if your mitigative measure is proper yet.

Support systems, such as power supplies and other supporting systems have to be identified when you're looking at these principal SSCs. Natural phenomena hazards were treated as events whose consequences are normally prevented through the use of proper design of SSCs. Natural phenomena, of course, include things like tornadoes, earthquakes, floods, that type of thing.

And one of their last tasks here was provide a general description of the principal SSCs, and that's required so the reviewers can -- the other reviewers, the discipline reviewers, can determine whether the design bases for these principal SSCs has been properly reflected.

Next slide?

Now, to kind of show you where they are going, I thought it was also a good idea to show what is required at the operating license stage, so you can see how what's being done at this stage goes into what we'll be reviewing next.

First is the identification of items relied upon for safety will drop down from the systems level to the components level. That's when we start being concerned about pumps and valves and circuits and that type of thing in certain --

CHAIRMAN POWERS: HEPA filters.

MR. WESCOTT: -- yes, in certain systems. There will have to be a demonstration that those IROFS, items relied upon for safety, have the right characteristics to meet the regulatory performance requirements. In other words, do they have the right reliability, right pedigree, QA, that type of thing.

And often this is accomplished through a preparation of likelihood analyses, criticality analyses, shielding analyses, structural analyses, fire hazard analyses, etcetera. In other words, this is where we expect to be a lot more quantitative, to have a lot more quantitative information to base our review on.

And specific operating requirements will be identified with many of these operating requirements supporting the demonstration of regulatory compliance, such as, as I mentioned before, surveillance frequencies, testing frequencies, that type of thing, which really can't be developed at this point.

MEMBER BONACA: So at this stage, you would expect to have a more quantitative assessment of all these issues.

MR. WESCOTT: That is correct.

MEMBER BONACA: Do you expect those to have -- you know, the question that Dr. Shack posed before, a better or a quantitative classification of the categories here, what is acceptable, unacceptable, and so on, insofar as the categories of accidents?

MR. WESCOTT: I'm not sure exactly --

MR. PERSINKO: You're talking about the likelihoods, I guess? Is that what you're referring to?

MEMBER BONACA: Yes.

MR. PERSINKO: Yes. Well, I --

MEMBER BONACA: I'm trying to understand how you go from --

MR. PERSINKO: Yes.

MEMBER BONACA: I mean, for the construction, clearly, you cannot be overly quantitative.

MR. PERSINKO: Right.

MEMBER BONACA: Because -- but at some point you will have to become more quantitative. And I guess my point is, you know, what flexibility you have during the operation, the phase from construction to operation to adjust and modify, because you may discover that some systems that you now classify it as safety-related become safety-related or vice versa or --

MR. PERSINKO: Let me -- well, first of all, there is if you go look at the standard review plan -- to answer your last question, there is a flowchart in there about how the construction phase interfaces with the operations stage, and there are feedback loops in there so that if you learn something later you can feed it back into the process and properly characterize the SSCs.

As far as the quantitative/qualitative aspects on the highly -- on the likelihoods, the applicant has currently proposed qualitative terms for its likelihoods, which it intends to follow, and it still intends to follow that in a qualitative manner.

I'd like to point out that during the Part 70 rulemaking, too, the Commission did say that qualitative analyses were acceptable. PRAs are optional.

But, so anyway, but in our -- one of the responses to our request for additional information, it was response number 39, as Rex had said, the applicant has committed to doing an index approach as we propose in our standard review plan, and I think also the Part 70 standard review plan has the same option.

So in our -- in response to our question number 39, at the OL stage the applicant has committed to showing that for the site workers and the public that they will meet a certain index.

MR. WESCOTT: Next slide, please?

Okay. This slide --

MEMBER BONACA: I just would like to pose --

MR. WESCOTT: I'm sorry.

MEMBER BONACA: -- to you just one more question, just for clarification. You don't have to have a PRA to be somewhat quantitative. I mean, core powerplants had ranges which were based on projections even when, you know, at the beginning it was somewhat guesswork.

MR. PERSINKO: That's correct.

MEMBER BONACA: If you go back to the ANSI standards, you know, that's -- if you look at the 1970s, the 1960s, and so -- so, you know, that's not requiring such an effort. I mean, that's more like giving some ranges of classification. Would you expect that?

MR. WESCOTT: Well, I think we expect whatever is required to give us a good idea of what the reliability or availability is. If it really takes a PRA, then I guess we would expect a PRA. But we would expect this to be maybe for very few -- maybe the ventilation system, the C4 confinement system, for example, may be the only thing requiring a PRA. And maybe not. But we wouldn't expect to see a lot of PRAs, if any, I guess would be the best way to answer that question.

MR. PERSINKO: I think you will get some quantification when the index approach is performed at the next stage.

MR. WESCOTT: This slide is to show the

NRC review responsibilities at the construction authorization stage. The first one I think we've already gone through -- the necessity of evaluating completeness of the hazard evaluation. We're doing this as a team approach. We're doing this by going down and looking at their preliminary hazard evaluation onsite. We're doing onsite reviews.

We're reviewing the methodology that was actually used. And, of course, the detailed review of the CAR in-house we expect to have some questions regarding actual completeness of the hazard evaluation.

The appropriateness of the selected safety strategies is, in my opinion, primarily a safety analysis responsibility, along with team input. And that's where our evaluation is based on standard nuclear practices, an awareness and knowledge of what's gone on in similar facilities, and our somewhat of a reliance on the qualitative criteria from Appendix A of the SRP. That's where we're trying to make sure at least they're starting with the right approach.

Evaluation of the design basis. And the question here is: do the design bases support the strategy in terms of assuring compliance with the regulation? Some design bases at this point consists of commitments to standards. Some design bases actually will require numerical design bases. It depends on the SSC, and it depends on the standard. If it's a standard commitment -- if it's a commitment to a standard, how specific it is, that type of thing, as to what's an acceptable design bases.

And the final -- well, I shouldn't say the final, maybe one of the most important aspects of the safety analysis review is to coordinate the resolution of multidisciplinary conflicts. In other words, that's the integrated part of the integrated safety analysis, and that's when we'd look to -- the classic conflict is fire and criticality.

But we're also finding other conflicts in this particular project that also require a multidisciplinary approach, and the SA responsibility is to try to oversee this and make sure that it's being coordinated properly.

MEMBER BONACA: Now, one question I have again. I guess just coming from qualitative, one of the issues that you have when you look at defense-in-depth, you look at not excessive reliance on procedural requirements.

MR. WESCOTT: Right.

MEMBER BONACA: But if you have a qualitative -- you know, a heavily qualitative application, you know, like we saw in the early designs of powerplants, there is a lot of reliance on the operator action, who will take care of it at some point.

MR. WESCOTT: Well, right now, in the CAR, the licensee has an area entitled their hierarchy of controls, and that's where basically they've made a commitment to, wherever possible, use a robust passive engineered control first and then an active engineered control second, and then maybe enhanced administrative controls, and finally a simple administrative control.

So even though they haven't told us in all cases what the control might be, there is a commitment to start with the higher level of control.

Now, we have found some cases where there's a commitment to a standard and the standard maybe says, "Well, you can use almost any type of control," and then we might want, you know, a little more of a commitment there. But, yes, the applicant has provided a hierarchy, and our understanding is he is committed to that hierarchy and we expect it will be followed.

MEMBER BONACA: Would you want to set, for your review, a set of defense-in-depth criteria that you are going to consistently apply to your review? I think it would be appropriate.

MR. WESCOTT: Well, we've tried. Unfortunately, there are so many different types of events that what seems to work well in one event can't -- I think a facility worker's safety is an area -- is a problematic area right now, because, first of all, there's not a lot of history there, or, you know, other examples where we're actually designed to try to keep facility worker safety to within a certain probability and within a certain -- below a certain threshold. So --

MEMBER BONACA: But wouldn't that be a way to bring the, you know, 40 or 50 years of experience in operating reactors to better experience on what in defense-in-depth really paid off and what it didn't, into the review of a new application. That would help, I think. That would also help the review on your part and on our part.

MR. WESCOTT: Oh, yes. We are certainly not ignoring, you know, regular nuclear engineering practice. That weighs very highly in our review.

MR. PERSINKO: I'd like to say, while we're on this subject, it's a Part 70 regulation.

When it talks about items relied on for safety, the item itself can be an operator action, because it does -- human action is defined as also an item relied on for safety.

So an admin procedure, an admin control -- human action would be the item relied on for safety. The admin control or the procedure would be the management measure that supports the reliability of the human action. So it's analogous to a component and a procedure.

Also, the regulation does specify a preference for engineered controls over admin controls right in the regulation for new facilities.

MEMBER BONACA: Yes. The reason why I insisted on this point was because there is quite an amount of qualitative bases to this application evidently. And, you know, in the context, at least the experience of the past has been, you know, when we had early PSARs and FSARs there was heavy overreliance on operator actions without definition of what that will be and what it will accomplish.

And then later over time we found that we had to refine them or substitute, you know, equipment for those. So that was the reason why I brought up this issue.

MR. WESCOTT: One thing I'd like to mention is some places where we're really having doubts as to whether actions or administrative controls are sufficient -- at the strategy level, we are asking for calculations, so we'll have some numeric -- these are primarily in one aspect. Like in the load drop, we're asking for some dose calculations to see -- just to give us kind of a baseline or a -- let's say a data point so we can determine with some degree of confidence whether this is a -- whether this is a viable strategy or not.

MEMBER BONACA: Okay. Thank you.

MR. PERSINKO: One thing also, the process, if you've seen the MELOX process, it's a highly automated process. So it -- not to say there are no admin controls or operator actions, but it is a highly automated process.

The admin control is one of the areas they do come into play, like Rex has been saying, is -- is with respect to the worker safety and worker actions and that kind of thing.

MR. WESCOTT: Next slide?

Okay. I'm not going to go through these slides in detail. I just prepared them more or less for information for the committee and to give you an insight into the extent of the safety assessment at this stage.

And I'd like to mention that the applicants valuated natural phenomena, external manmade events, loss of confinement events, fire events, load handling events, explosion events, chemical events, and criticality events. And these seem to be pretty much similar to events that are the types of events evaluated at other --

MEMBER SHACK: When it says 19 hazards evaluated out of 32 considered, it means the others were somehow ruled out as being too unlikely or --

MR. WESCOTT: Yes, that's correct. In other words, you know, the -- yes, too unlikely. That would be -- actually, I think almost more in terms of credibility. I don't -- I think the ones that were ruled out were really considered incredible rather than just highly unlikely.

MEMBER KRESS: Was there a criterion for what was meant by "incredible"?

MR. WESCOTT: Well, the criteria for credible in our SRP is 10^{-6}. And from my review of what they did, that seemed to be quite similar to --

MEMBER KRESS: So they had some sort of a SIMAC quantitative --

MR. WESCOTT: Yes, they didn't state their criteria --

MEMBER KRESS: Yes.

MR. WESCOTT: -- for credible. But they did use a lot of existing NRC Reg. Guide criteria, which is in that neighborhood. So I would say --

MEMBER KRESS: Yes. You know, for example, in the past I have seen things like if you have two independent highly unlikely things that have to go wrong to get you any kind of consequence, that's -- that was sometimes viewed as incredible. I wondered if they did something like that or --

MR. WESCOTT: For the external events, I don't believe -- I'm not absolutely sure, but I don't recall any in that category.

MEMBER KRESS: Oh, the external -- seismic would be easy. You just pick the frequency above which you don't -- the 10^{-6} and above, you just forget about them I guess.

MR. WESCOTT: Well, it's -- I'm going to let --

CHAIRMAN POWERS: Seismic is not easy at this --

MEMBER KRESS: I know. The selection of which ones not to worry about is --

CHAIRMAN POWERS: I mean, I think you see -- I think the speakers characterize it correctly. What I see is a lot of things get screened out just on plausibility. For instance, you don't really have to worry about seepage as an external event, because there is no lake or body of water there.

(Laughter.)

And, interestingly enough, I think they're wrong about the tsunamis, because there is -- an authority has looked at the Sea Mount collapse at the Medeira Islands and concluded that once every 5,000 years there is a possibility of a tsunami that reaches that part.

I don't fault him for ruling it out, because I think a tsunami created by a Sea Mount collapse in the Medeira Islands would give us things to worry about other than the MOX facility.

MR. PERSINKO: The applicant's qualitative definitions of highly unlikely are essentially a single failure criterion.

CHAIRMAN POWERS: Yes. I think -- but, I mean, he's been encyclopedic in listing what are the possibilities, and most of them get ruled out just on plausibility grounds.

MR. PERSINKO: Yes.

CHAIRMAN POWERS: He includes meteorites in his external events list.

(Laughter.)

I'm going to apologize to you. Three of our members have had to go off and help former Commissioner Rogers with an activity, and they will be back as quickly as they can.

MR. WESCOTT: Okay. I think this is coming up to the last slide?

Okay. The status of the MOX review at this point, the safety analysis review. The staff is still reviewing the hazards analysis for completeness. I really can't give you a status on that -- in other words, how many potential open items there are. There is a couple of potentials, but we want to get more of a consensus in-house before we go down --

CHAIRMAN POWERS: Just for your information, I have already sent a note to our Fire Protection Subcommittee that we're going to ask for their assistance in reviewing this material. So as we progress forward, we'll probably have some focus on the fire protection issues here.

MR. WESCOTT: Okay.

CHAIRMAN POWERS: With people expert in that facility, in that area. Fortunately, you have most of the members of the Fire Protection Subcommittee already here, just not the chairman.

MR. WESCOTT: Right. Okay. We are going to be talking about fire protection later. We've got requests for additional information pending in areas of fire protection, load handling, confinement to define adequacy of proposed safety strategies.

I think I mentioned the load handling information request. We've also got some in fire protection where we're trying to determine whether combustible loading controls by themselves will be a sufficient strategy for preventing some type of fire events, and we're looking for some quantitative analyses there.

CHAIRMAN POWERS: The problem at the Savannah River site, as a whole, in the area of fire protection analyses has always been transient combustibles.

MR. WESCOTT: Right. That's exactly what we're concerned about.

CHAIRMAN POWERS: Yes.

MR. WESCOTT: But we think that other areas -- but certain areas we feel are going to have different transient combustibles than others. So rather than just having them pile up the combustibles until we know, you know, that there is going to be -- I think we'd want to have them to take a look at just exactly what they might possibly bring into a certain area, say with fuel rods or something, where there's no type of suppression, and, you know, what might likely be left there, try to get an idea just how good a combustible loading control by itself is.

CHAIRMAN POWERS: How do you -- well, this may be jumping ahead of even where you are in your review right now. But I think we're going to be real interested in electrical circuit damage in fire events. Have you given any thought to that?

MR. WESCOTT: Well, no, not specifically. I know there's a possibility of chloride damage, and so on, from, you know, burning of cable trays type of thing. Sharon may have. I think I'm going to pass on this. Incidentally, I'm a fire protection engineer, but Sharon is our expert on --

(Laughter.)

-- so I'm going to keep my mouth shut on fire protection stuff.

CHAIRMAN POWERS: I think we'll also be very interested in filtration strategies, because there is an awful lot of reliance on filters in this system.

MR. WESCOTT: Yes, there definitely is. And we are very concerned about aspects of the filtration system.

CHAIRMAN POWERS: And we're going to be interested in discussing knock along and knock through, and things like that.

MR. WESCOTT: Well, and, of course, design basis concerns are still being evaluated and may result in additional questions. So that's primarily -- that's my presentation.

CHAIRMAN POWERS: Sure.

MR. BROWN: Good morning. My name is David Brown. I'm the health physics or radiation safety reviewer for the MOX project. I'm going to talk specifically this morning about how the applicant derived radiological consequences for specific events.

Next slide, please.

And specifically, I'll talk about how source terms were derived, the major pathways for release from a plutonium facility, and specifically, once the material reaches its receptor, how we calculated doses or concentrations in the environment.

Next slide, please.

The approaches, you know, of what has come to be known as the five factor formula, it's described in the nuclear fuel cycle facility accident analysis handbook. It's a product of the five independent factors I've shown here. On the next slide I'll get into that a little more.

Next slide, please.

The first factor, of course, being the material at risk, the applicant has looked at the amount of material they may have in I think something more than 200 individual process units throughout the plant. That gives you a feel for the resolution of the safety assessment at this point.

The damage ratio or the fraction of that material at risk for any given process unit is generally one, just conservatively. They're assuming it all gets involved in the event. Both the atmospheric release fractions and respirable fraction, which are, of course, additional reduction factors on the material at risk, are from the handbook 6410.

And the final, of course, factor, another reduction factor, is the leak path factor, generally that which would be used for two HEPA filters in series. I'll talk about that a little bit more on the next slide.

With regard to that approach, the staff just has two issues. There is the -- what we call the intermediate consequence performance requirement to keep concentrations at the restricted area boundary below 5,000 times the values that appear in Appendix B to Part 20.

It's release of material to the environment, not intended to be a human dose, so the application of the respirable fraction to reduce emissions would not have been appropriate. We've pointed that out, and that will be resolved.

We've also questioned the use of 99 percent efficiency for two consecutive stages of HEPA filter for all events. I was particularly interested in how that might be degraded during a fire event or, say, an explosion event, that type of thing.

CHAIRMAN POWERS: It seems to me the issue of HEPA filters is on whether you can stack -- I mean, they are advertised as being 99 percent efficient devices, or sometimes 98 efficient devices. But the second stage is filtering material that was not filtered, and it's difficult -- it's challenging to believe that they retain that high level of efficiency for material that has already passed through.

The second one is that you have presumably some accumulation on these filtration devices during normal operation, and you have a phenomena colloquially known as knock along and knock through from the particles that in an accident maybe it makes more material available on the back side of the first stage than you thought.

MR. BROWN: I think in the Department of Energy, for example, I've heard that 99.9 percent may be credited for the first stage, 99.8 -- marginally lower efficiency -- for the second stage, perhaps to account for the phenomena you described first.

With regard to the second phenomena, I don't think that's a consideration at this point. You know, but the applicant has pointed out 99 percent, you know, is the efficiency they choose to use rather than 99.9, for example.

Tim Johnson will provide a presentation on the confinement system, including the ventilation system, later. And he may shed some more light on some of those questions.

CHAIRMAN POWERS: It's interesting, it seems to me, that some of the facilities at Savannah River have chosen to use sand filters rather than HEPAs for their operations.

MR. BROWN: Yes.

CHAIRMAN POWERS: And it's interesting they go back to the HEPAs here. Same filters, though.

MR. BROWN: It is something we have discussed with the applicant. It's a consideration in our current draft EIS as an alternative.

CHAIRMAN POWERS: Oh, okay.

MR. BROWN: Or what we call a technical option. My understanding is it's both a fire protection issue and, of course, a confinement ventilation issue. I think, again, Tim Johnson and Sharon may touch on that in their presentations.

CHAIRMAN POWERS: Good.

MR. BROWN: Next slide, please.

Again, as may be expected for a plutonium facility, the pathway of most concern to the in-facility worker would be the inhalation of plutonium oxide or other plutonium compounds resulting from a breach of confinement. Of course, the notable exception to that would be a criticality event involving direct radiation dose.

The strategy is to assume that the -- an event affecting a facility worker is unacceptable. We don't have, for example, quantitative unmitigated doses in the construction authorization request for facility workers. The safety strategies assume that they will be unacceptably exposed and that we'll apply principal SSCs to either prevent or mitigate the event.

The pathways are similar for SRS employees immediately offsite and members of the public off the Savannah River site. Inhalation is the predominant pathway for accidents, and immersion becomes the pathway for criticality. The staff will also take a quick look at whatever marginal increase may be attributable to Groundshine. We would expect that to be pretty small.

Listed up there are the two codes we've used for estimating the atmospheric dispersion of contaminants moving downwind -- MACCS2 for members of the public and ARCON96 for the worker.

Next slide, please.

Issues that were identified with respect to pathway analysis were the so-called intermediate consequence environmental performance requirement that -- 5,000 times the Appendix B values is intended to be calculated at the restricted area boundary, which for this plant is just a little over 100 meters away.

The applicant calculated it at the controlled area boundary, which they assume is five miles away, and they will correct that. The implication of that is that, as one might expect, that this -- really, this is the bounding intermediate consequence performance requirement. This is the toughest one to meet. And I'll give you the results at the end of my presentation for where they are in meeting that performance requirement.

The second issue is one you touched on earlier, and it's our resolution of the problem here. Certainly, Part 70 has provisions for allowing members of the public within the controlled area to be treated as workers for the purposes of meeting their performance requirements.

The applicant has decided to meet the provisions of the -- you know, the requirements of those provisions in the rule. But it doesn't change the status of these individuals with respect to Part 20, and that was a point we needed to clarify with the applicant. So --

CHAIRMAN POWERS: That's cute. Finesse that one right there. Nice.

(Laughter.)

MR. BROWN: Moving on to the final stage of the assessment, there are just some general, you know, what I'll call issues specific to the plutonium facility. We didn't identify any issues with the applicant's calculation. Just that we may -- when you're doing something like this, we will be looking at both soluble and insoluble forms of the plutonium compounds. That will have some bearing on how you would calculate inhalation doses.

We'll also be looking at material that's been purified and material that has not yet been purified, the impure material having a slightly higher dose consequence per gram.

CHAIRMAN POWERS: I am confused about the status of our database on dose effectiveness for the 239 Plutonium isotope and completely ignorant as far as the dose effectiveness for the Americium isotopes. Can you give me -- I mean, what is it that we know? What is it we don't know? And what is it we think we know?

MR. BROWN: Well, I think --

CHAIRMAN POWERS: A lot of the data comes from -- a lot of the data comes, it seems to me, comes from 238, which I wouldn't think would be directly applicable but maybe it works okay for like what the soluble fraction is. I don't know.

MR. BROWN: You're touching on an issue we looked at very early on, which had to do with, you know -- well, to do with some proposed research to study could there be, for example, a super Class Y plutonium compound, that type of thing. But for the most part, for the purpose of this application, we're using dose conversion factors that are provided in the Federal Guidance Report Number 11.

And, for example, a Plutonium 239 nitrate compound would be a Class W compound, and that is the dose conversion factor we would use.

I think I understand what you mean. Many of the earlier -- some of the studies were involving Plutonium 238 oxide, which has a tendency to fragment within the tissue of the lung and can actually lead to I'll say unpredictable dose consequences, plus you're doing bioassay and actually tracking how much is being retained.

CHAIRMAN POWERS: You got highly variable results as I recall.

MR. BROWN: Yes.

CHAIRMAN POWERS: I mean, in some cases no effect. I mean, literally no effect. And in some cases very severe effects.

MR. BROWN: I think we'll be dealing with oxides that are created and temperatures that are routinely encountered at other -- at similar plants worldwide and even in the history of the U.S. Nothing that should be really exceptional.

Next slide, please.

These are the applicant's calculations of mitigated doses to both the Savannah River site employee who is assumed to be 100 meters downwind and a member of the public who is five miles downwind. If you compare the -- this employee doses to the 25 millirem intermediate consequence criteria, you'll see that they've met that with some considerable margin. And the same is true for the public.

Next slide, please.

The other -- you know, and again, I've mentioned it a couple of times -- the intermediate consequence criterion of meeting the 5,000 times the Appendix B concentrations, these are their calculations.

I should point out that there's a footnote at the bottom of the screen. I hope most of you can see it. Once we've resolved the issue of making sure they've done this calculation at the correct compliance point, which is not at the Savannah River site boundary but at the -- essentially the protected area fence of the facility, that they've not used the respirable fraction to further reduce the source term.

Once we've resolved issues pertaining to the actual rated removal efficiency of HEPAs, it may be challenged by certain events. These numbers could go up considerably. It wouldn't be a stretch to say they could go up a factor of 1,000. So --

CHAIRMAN POWERS: The change in -- from respirable fraction to actual release fraction will be a big one.

MR. BROWN: It's typically about, I would say, a factor of 10, perhaps a factor of 100. Moving the boundary is about a factor of 100. Therein you have anywhere from 1,000 to 10,000. So the meaning of that, then, is that the -- they may come right up against this particular performance requirement, which, again, is an intermediate consequence event. They need only show that this event is unlikely or further mitigated. We're working on that now.

Last slide, please.

Now, this is just a summary of the issues that are identified in deriving radiological consequences. We talked about the fact that they use a respirable fraction when perhaps they shouldn't have. We may need to consider a leak path factor for degraded HEPA filters, the fact that the environmental performance requirement was calculated at the boundary and not the restricted area boundary, and that the so-called issue of the co-located worker I think we've satisfactorily resolved.

Are there any other questions?

CHAIRMAN POWERS: I come to the -- also to the airborne release fractions and took them out of 6410 -- I think they came from.

MR. BROWN: That's right.

CHAIRMAN POWERS: Is that the Meshima database essentially?

MR. BROWN: Essentially, yes.

CHAIRMAN POWERS: So the applicability is always going to be a question on that, isn't it?

MR. BROWN: Yes. I mean, given the P value may not specifically match the experiment.

CHAIRMAN POWERS: Yes. Yes. He put in that collection what he had, and he may not have the exact thing that -- that's really wanted there. It's like Perry's Handbook of Chemical Engineering. It will give you an answer. Doesn't tell you whether it's a good answer or not; it will give you an answer.

And so are we looking at -- with any care at the applicability of the airborne release fractions?

MR. BROWN: We will. At this time, we have not studied that in detail.

CHAIRMAN POWERS: I mean, I -- there may not be much you can do, but you can certainly see how bounding they were on those.

MR. BROWN: Certainly, we will look at -- you know, if it was for dropping an oxide powder, then we want to be sure that that was properly used for an event in which there is an oxide powder.

CHAIRMAN POWERS: Yes. I think you're not going to have too much trouble with that one. I think where it more likely is when you have the combustion events, aerosolizing things that just by the difficulty of doing the experiment they probably didn't do the kind of event you really would have liked to have seen. And that's the one where you've got to look and say carefully what -- how bounding of a value do they really pick.

MR. BROWN: I might just suggest, I suppose that in the event that we simply can't agree on a bounding consequence, the applicant has the option to simply show that the accident is prevented.

CHAIRMAN POWERS: Sure.

MR. BROWN: Which is unique to Part 70.

MEMBER LEITCH: Schematically, the aqueous processing unit that was shown I guess at the very first slide is at the front end of this whole process, and that portion of the activity is regulated by DOE. Is that --

MR. BROWN: No. The entire facility is regulated by the NRC.

MEMBER LEITCH: The entire facility is.

MR. BROWN: If I may just clarify that the -- the feedstock, the plutonium powder, will be prepared in a different DOE facility.

MEMBER LEITCH: Okay. And it comes in in the form of powder, then, is that --

MR. BROWN: Plutonium oxide powder.

CHAIRMAN POWERS: One would just really love to see the trade study that resulted in taking a metal tray into an oxide and redissolving the oxide to polish it and make it back into an oxide. Why that was chosen as the route, I would just love to see the trade study that gave that. That's not these gentlemen's problem.

(Laughter.)

MEMBER LEITCH: That process takes place elsewhere at Savannah River or elsewhere?

MR. BROWN: As it has been described, say, most recently in the DOE EIS for the project, it would be right next door.

MEMBER LEITCH: But the aqueous polishing process is an integral part of this facility. In other words, in the plot plan where you showed the 400 by 400 --

MR. BROWN: It was barely visible as is somewhat -- to a different square in that top plan.

MEMBER LEITCH: I guess I misunderstood perhaps at the very beginning. I thought there was a portion of this that was DOE regulated and a portion that was NRC regulated.

MR. BROWN: That's right. And it is -- the DOE activity will be at a physically separate plant, not -- and this will -- everything within the protected area fence here will -- you know, to the extent that it's licensed material, will be NRC regulated.

CHAIRMAN POWERS: The waste stream coming out of the facility will go back into the DOE complex?

MR. BROWN: Yes.

CHAIRMAN POWERS: And presumably in one of their tanks, and then eventually to the DWPF and things like that?

MR. BROWN: That's the plan. That's correct. Yes.

MEMBER LEITCH: Okay. Thanks. I understand.

MR. BROWN: Thank you.

CHAIRMAN POWERS: So we don't have an

issue of a long-term accumulation of a waste stream here?

MR. BROWN: We should not. No, the plan is to --

MEMBER LEITCH: We can discuss that a little bit.

MR. BROWN: Right. We can always talk about that.

MR. MURRAY: Okay. Good morning everybody. My name is Alex Murray. I am the chemical safety reviewer for the proposed MOX facility. I am also a supporting reviewer for ISA on issues related to chemical safety.

Next slide, please.

This is just a quick overview of my presentation. I'm going to just give you a very brief discussion of the main chemical process areas in this facility. Some of the details are considered proprietary by the applicant, so if you have questions which require detailed answers, we may have to get back to you in a different forum.

I'm also going to discuss some of the proposed design bases from the applicant. I'm going to give a quick overview of where the review stands right now. It is very much a work in progress, and

I'll give you some idea about current issues that we are discussing.

Next slide, please.

Just to -- as we have discussed, there are several main chemical process areas in this facility. There's the AP area, aqueous polishing. Its principal function/objective is to purify the plutonium and basically separate out gallium, uranium, and some other impurities.

There also is the MOX process, which is essentially a powder processing route that actually makes the fuel rods and assemblies. To support these areas there are some chemical reagents, storage, and mixing areas. Some are outside the actual MOX handling building and would be regulated under OSHA. Some are within the building and would be regulated by the NRC because of their potential effects upon the handling of licensed radioactive material.

And as we have with the chemical area, there are both chemical and radioactive radiochemical hazards.

Next slide, please.

Now, discussing aqueous polishing, it's important to note that there are some modifications to the standard PUREX process routes which have presented some hazards which might require some controls or principal SSCs in this facility.

First off, the plutonium dioxide which comes from DOE, a separate DOE facility proposed at Savannah River, is actually dissolved using an electrochemical process. And there are some issues with that.

The PUREX process itself is actually tweaked, adjusted, optimized, to improve the separation factors. Okay. There are some very fine oxidation state adjustments which I'll mention on the -- one of the next slides, and so forth.

I should add that at the very early stages of this project there were some discussions about, "Oh, why can't we use a dry process to purify the weapons grade plutonium?" And the reason is it didn't work. Okay. There are many other issues in addition to the fact that it was basically ineffective for purification.

Once the plutonium has been purified, the proposed facility would precipitate it as an oxalate, a very standard step. And I should add that in the aqueous polishing area many of these operations are very similar to operations that are performed in some portions of the LaHague facility in France. They also have been performed at some of the DOE facilities in this country.

Next slide, please.

Okay. Computers are wonderful. That is actually PuO2. Okay. For the dissolution step, okay, the plutonium dioxide powder would come from a DOE regulated facility. It was on one of Drew's slides. It is referred to as the pit disassembly and conversion facility. Okay. That is regulated by DOE.

The dissolution uses nitric acid principally as the dissolving medium. However, because of concerns about processing rates, kinetics if you will, they use -- the proposed process uses a silver(II) ion, a very strong oxidizing agent, to assist with the dissolution.

Because silver(II) is also extremely corrosive and has some other issues, the applicant has proposed means to reduce, in effect eliminate, the potential hazard associated with that reagent once the plutonium has been dissolved. Of course, the electrochemistry -- you have both heat, gases, and, you know, sort of like an interesting combination of potential hazards from the electrochemical operations.

And also in the dissolution step the applicant proposes to initiate isotopic dissolution of uranium 235. Now, you may wonder, gee, why if we're discussing weapons grade plutonium is there uranium 235. It turns out that there -- that about one percent of the heavy metal U235 from the alpha decay of plutonium 239.

Next slide, please.

Okay. In the actual purification step, it is a PUREX process. The PUREX process is optimized. There are some very fine valence adjustments to improve the extraction coefficients of plutonium. Most notably, most of the plutonium is reduced from the plus six state to the plus four state. This improves the separation factor.

After it has been separated, there is some other oxidation adjustments which basically allow the plutonium to recover by going to the plus three state. Then, there are some other adjustments made, so it precipitates better with oxalic acid, the oxalate precipitation steps. They take it back to the plus four state.

All of the reagents used for these operations do present some potential hazards which we are reviewing to see if any potential PSSCs are needed.

Finally, there are some solvent washing

and purification steps. These are actually done in mixer settlers, not the columns which are used for the actual plutonium purification. And this is primarily -- this is a PUREX process, but it is primarily in a Dodecane diluent as the actual solvent.

Next slide, please.

Okay. Once the plutonium has been purified, it is just recovered by an oxalic acid precipitation. There are some fine pH adjustments, again, to improve the recovery, get some additional decontamination factors from some of the potential impurities.

The oxalate is filtered and then fired in a calcined and oxygen atmosphere, and then this purified material is sent on to the actual MOX powder processing step.

Next slide, please.

As part of aqueous polishing, you do generate some liquid streams which require some processing for recovery of useful reagents before they are sent to waste management at the Savannah River site. It should be noted that the majority of these recovery operations for things such as silver, some of what they call the oxalic mother liquors in the proposed facility.

These have all performed on -- all of these operations are performed on high alpha contaminated streams. Okay? So we're looking at some of the potential issues and hazards associated with those to see if any principal SSCs are needed.

Nitric acid is recovered by evaporators and subsequently rectified, distilled, to get it back up to strength to be recycled within the process, and that step also has some potential hazards which we'll discuss shortly.

Next slide, please.

Okay. Just very quickly, the MOX powder area -- this is simply a powder processing line. It is based upon the advance MIMAS process from France, a lot of micronization of the powders. Ultimately, the powders are formed into pellets, sintered, and then placed into the fuel rods and the rods into assemblies.

From the chemical safety perspective in this area, the main areas of potential concern have to do with a lot of inert gas use and also around the sintering furnaces where there are hydrogen/oxygen -- I mean, hydrogen/argon mixtures used. And I should note for this area, this -- the processing steps are very similar to those at the operating MELOX facility in France.

Next slide, please.

CHAIRMAN POWERS: Do they do the sintering with just forming gas, or do they --

MR. MURRAY: I'm sorry?

CHAIRMAN POWERS: Do they do the sintering under an atmosphere of argon/hydrogen that --

MR. MURRAY: At MELOX?

CHAIRMAN POWERS: At four percent like hydrogen or something like that?

MR. MURRAY: In the proposed facility, there is actually a range.

CHAIRMAN POWERS: A range.

MR. MURRAY: Okay. And some of the details on the range are proprietary.

Okay. Just to give you a quick overview of some of the applicant's proposed principal structures, systems, and components, and their design bases and potential controls, for the public, a receptor in the chem safety area, the consequences were judged to be low and no PSSCs were proposed.

Similarly, for the Savannah River site worker, no PSSCs are proposed. For the facility worker, in the area of chemical safety, the applicant has proposed that the emergency control room HVAC system would be a PSSC, and the applicant has stated that they believe most of the radiological-related PSSCs will provide adequate protection for chemical safety type events. And, hence, no additional chem safety PSSCs are necessary.

Having said that, if you could go to the next slide, please.

Within the text of the construction authorization request, there are actually PSSCs proposed for chem safety, and I've listed these here. There are a lot of proposed administrative type controls for chemical makeup, for reagent concentrations, and so forth, the proposed controls, PSSCs, on some of the vents and offgases. Some of these are interrelated with radiological-related issues.

Also, the applicant has proposed PSSCs to ensure that there are non-explosive mixtures, and I've listed some here. However, as our review is continuing, we are finding that the specificity might need more definition.

MEMBER LEITCH: Just a question for understanding on the previous slide.

MR. MURRAY: Sure.

MEMBER LEITCH: It says emergency control room AC system. Is that for an emergency control room? Or should that say control room emergency AC system?

MR. MURRAY: That is actually for an emergency control room.

MEMBER LEITCH: Okay. That was my point.

MR. MURRAY: Yes.

MEMBER LEITCH: In other words, there is an emergency control room.

MR. MURRAY: Yes.

MEMBER LEITCH: And the thing that would be a PSSC is the air conditioning system for that control room.

MR. MURRAY: That's correct.

MEMBER LEITCH: Okay. I understand.

MR. MURRAY: That's correct. That's correct.

MEMBER LEITCH: But not for the main control room apparently?

MR. MURRAY: With the documentation and the discussions that we have had so far, not at this time, no. The review is still continuing. Okay?

MEMBER LEITCH: Thank you.

MR. MURRAY: Okay. Just to give you a quick overview of the status of the review and some of the activities, we are -- the review is continuing. It is a work in progress. We have looked at the construction authorization request, the RAI responses. We are looking at independent sources of information in the literature, including DOE peer reviewed documents and what have you.

We are having discussions with the applicant. Some of these are in public meetings. Some of these are documented phone calls. And also we plan additional meetings and reviews. We currently are working on a very preliminary -- very, very rough draft of the chem safety sections of the evaluation report.

Next slide, please.

Okay. Our main findings to date are, as I previously mentioned, we find a general lack of specificity for some of the chemical principal structures, systems, and components, and their associated design bases. As we read the documents, the responses from the applicant, and as we review the literature, we are finding that there are many implied or potentially implied PSSCs and design bases.

We also notice there is, particularly in the chemical area, a heavy reliance on operators and admin controls.

Next slide, please.

Okay. I've just listed some of the areas where we have some current issues under review and discussions. Once again, admin controls, how do you get to the highly unlikely regime and minimize the consequences, the high alpha waste streams, how they are controlled to basically do the recovery functions safely and appropriately, and then ultimately the waste going on to the Savannah River site.

The electrolyzers, the proposed facility has three electrolyzers. Right now, two are for dissolution, one is for recovery of the silver which is used in dissolution.

Evaporators, this is the red oil concern, the nitrated tributyl phosphate esters. The proposed facility has at least three areas where evaporators are used for reagent recovery, concentration, recycle, etcetera. And also, we have an issue we are reviewing in the area of the uranium 235 -- where it goes in the process, how it is diluted, where it is diluted, what the intermediate assay levels are, and so forth.

CHAIRMAN POWERS: In the issue of red oil, I got the impression that the principal safety control on that was to control the temperature.

MR. MURRAY: That is what the applicant

has proposed, yes.

CHAIRMAN POWERS: And my initial reaction to that was -- I've probably gotten out of date on where we stand on oil, red oil issues. But my recollection is --

MR. MURRAY: I'm sure you're quite current, Dana.

(Laughter.)

CHAIRMAN POWERS: My recollection is that we had a poor understanding of the formation of this material, that when we have tried to form it it's a hit and miss sort of thing, that we have never been able to convince everyone that what we form in the laboratory is exactly what we seem to form in the accidents, and that we couldn't say that there was a temperature threshold for the formation of red oil.

MR. MURRAY: Well, this is an area that we are reviewing and discussing with the applicant. There are concerns that we have in this area. There have been at least five events within the DOE complex over the years, some as recently as the 1970s. Okay? In the late 1980s, DOE did issue a summary report which basically was based upon the temperature control.

However, there have been a couple of

incidents since then, most notably overseas, the Tomsk-Sevin area in the former Soviet Union. That appears to involve some other factors beyond temperature. DOE has done a lot of work in the mid and late 1990s looking into this issue some more. And all I can say is right now we are continuing, obviously, to --

CHAIRMAN POWERS: Stay tuned, huh?

MR. MURRAY: Stay tuned, yes.

CHAIRMAN POWERS: Good.

MR. MURRAY: Yes.

MEMBER LEITCH: Has there been any discussion at this point of staffing levels or operator qualifications or training, or is that all premature to ask those kinds of questions?

MR. MURRAY: At this stage, yes. Okay. In the area of admin controls, we have been in discussions with the applicant about how -- how do you show independence, how do you show redundancy, how do you ultimately attain the highly unlikely threshold for, if you will, chem safety events which could have high consequences.

MEMBER LEITCH: Does this generally tend to be a batch process or a stream process? In other words, is this the kind of thing that once this process is up and running it runs for -- on a continuous basis around the clock, or is it a batch kind of an operation?

MR. MURRAY: The majority of the plant, of the proposed design, would run in what I would call a more continuous manner. Some steps within it, notably the dissolution area, is a batch, a semi-batch sort of processing area. Some of the evaporators function in what I would call a semi-batch mode. But it is predominantly a continuous process.

MEMBER LEITCH: Okay.

MR. MURRAY: And the applicant, in their description of the process, have proposed sort of like idle modes, particularly in the solvent extraction area, where it can sort of keep running but it doesn't have to be fed fresh materials.

MEMBER LEITCH: Thank you.

MR. MURRAY: You're welcome.

Any other questions? I know earlier on you had a question on the waste streams. In the proposed design, the applicant is proposing to batch the waste, the high alpha waste, to the Savannah River site via a double-contained underground pipeline.

And the batches would be, oh, about a weekly sort of operation with on the order of a few thousand gallons. They think it'll be between one and two thousand gallons.

MEMBER LEITCH: And in order of magnitude, how long is this pipeline?

MR. MURRAY: We do not have any specifics on that at this time. We are discussing this with the applicant.

CHAIRMAN POWERS: Okay. Well, at this point, we're scheduled to take a break, which is a little longer because members have to do some interviewing I think.

MR. MURRAY: Okay.

CHAIRMAN POWERS: So we will recess until a quarter of the hour.

(Whereupon, the proceedings in the foregoing matter went off the record at 10:17 a.m. and went back on the record at 10:45 a.m.)

CHAIRMAN POWERS: I think we can come into session now.

My agenda says that Margaret Chatterton is going to talk to us next. Maybe I'm in error. Nope?

(Laughter.)

Well, in that case, here's Margaret.

(Laughter.)

MR. TRIPP: How are you doing? My name is Chris Tripp, and I'll be talking about the criticality safety design for the MOX facility for the construction application.

Next slide, please?

Criticality safety is one of the dominant risks at the facility, along with fire safety. And part of the reason for that is because of the type of processes and types and forms of materials that are going on -- are going to be used at the facility.

The criticality risk associated with this plant is similar, in our view, to several other NRC-regulated facilities; specifically, the high enriched uranium facilities, NFS and BWXT. Those facilities involve high enriched uranium. Here we're dealing with plutonium.

And the reason for that is out of the 22 criticality accidents that have occurred at processing plants in the United States, Russia, Japan, and the United Kingdom, all but three have involved either plutonium or iron-enriched uranium, and they have all involved solution forms because of the small critical masses, the difficulty in controlling these types of material configurations, and so forth. And we have similar types of processes here.

The MOX plant is, as has been stated previously, based on the MELOX and LaHague facilities. And from the standpoint of criticality safety, the LaHague type processes, the aqueous polishing process, has the majority of the criticality risk because we're dealing with solutions.

There are some differences between the French plants and the proposed American plant, and some of the equipment dimensions are different and has criticality implications, because of two things, because of Americanization where they have to make the plant conform to American standards, and also the more significant factor is that this plant is using weapons grade as opposed to reactor grade plutonium as is in the French plant.

The areas of greatest risk are where you have material configurations that are difficult to control, particularly Plutonium 239 solution, but also in the MOX process where you're dealing with uncontained powder. And that is -- the majority of the criticality issues are at the front end before the material is isotopically diluted with depleted uranium.

Next slide?

At this point, specific controls, items

relied on for safety, have not been defined for criticality hazards, being a worker safety issue -- and we'll go into that in more detail. But the basic parameters of interest are the aqueous polishing phase would rely mostly on favorable geometry for plutonium nitrate solutions as well as spacing between the components.

CHAIRMAN POWERS: I guess I am surprised that you don't also cite acidity control and avoiding the plutonium hydroxide precipitations.

MR. TRIPP: Well, the concentration is not credited for criticality purposes.

CHAIRMAN POWERS: No. What I'm talking about is the tendency of plutonium nitrate, if you drop too low in acidity, to drop out this amorphous precipitate. That's an oxydroxide material. It's been responsible for at least one criticality event.

MR. TRIPP: Yes, that's true. But in this case, the -- they're not taking credit for the concentration, so it's being assumed it's at an optimal concentration. So, therefore, if it would precipitate out, you'd tend to have an undermoderated solution. It would probably be less reactive than the optimally moderated case.

Now, the chemical form is credited because the nitrate acts as a neutron poison, a mild neutron poison.

CHAIRMAN POWERS: Well, I'm going to have to think about that a little bit, because I get very nervous when we don't have good acidity control on nitrate solutions.

MR. TRIPP: Yes. Well, that's certainly a concern, and the chemical balancing of the process is important to keeping the solution out of -- keeping the uranium -- plutonium in this case -- out of the raffinate stream, which is another criticality hazard that I should mention.

In the MOX process, we have -- the main controls/modes are the isotopic control, where you're mixing it with depleted uranium after the blending stage. That's being credited for criticality safety -- and also moderation, keeping the powder dry.

The master blend is to take the plutonium oxide powder and to blend it down to about 20 weight percent in Pu, with the depleted uranium, and then later on it's further diluted to between two and six weight percent plutonium. And the blending, as I said, is crucial to ensuring the right isotopic mix.

So that's some information about the inherent risk of the facility. It should be pointed out that the majority of the facility is going to rely on passive engineered controls, particularly safe geometry, and probably to a greater extent than being based on a more modern design -- a greater extent relying on favorable geometry than a lot of U.S. plants. So that will -- should significantly reduce the risk associated with the facility.

CHAIRMAN POWERS: I'm just surprised my distinguished colleague from Tennessee didn't salute the advice to keep your powder dry.

(Laughter.)

MR. TRIPP: Very important for criticality and --

CHAIRMAN POWERS: Not going to volunteer anything, huh?

(Laughter.)

MR. TRIPP: Now, I'm just going to quickly summarize the regulatory requirements from Part 70. As for most of the safety disciplines, it's very non-prescriptive. They are free to choose pretty much any high dose relied on for safety as long as they meet the performance requirements of the rule. In fact, the only specific SSC that's mentioned for safety is the criticality alarm.

They have to make high consequence events highly unlikely, and that's -- typically, criticality is considered highly unlikely by default. At least in this case, it is, so when we're talking about the risk we're talking basically about likelihood associated with preventing criticality.

They're required to maintain subcriticality, and that includes using an approved margin of subcriticality, which is based on code validations that we'll talk about in a little bit.

And, finally, in 70.64, they're required to adhere to the double contingency principle, such that two -- at least two unlikely and independent changes have to occur before criticality is possible. And that is really only applicable for new plants or new processes at existing plants. The reason for that is a lot of -- some of the older plants have historically not been able to meet double contingency, because you're dealing with bulk quantities of powder and other things. And then, of course, the SRP goes into a lot more detail on this.

Next slide, please?

Required to ensure that the design basis of the principal SSCs provide reasonable assurance of safety. I'll quickly go over this, since I know you heard this in more detail on the 14th.

At this point, there have really been no principal SSCs or IROFS identified for criticality safety. That will come more during the review of the ISA summary, along with the license application. So what do we have to rely on for safety?

Most of the assurance is based on having an adequate NCS program, and that follows the typical DOE model and also the model we adopted for the gaseous diffusion plants, where most of the details referred to the program, and the regulator is mainly overseeing the structure of the program.

And that will be relied on in the construction stage, and then the component-level review, as with the other Part 70 facilities, will be more in the operating phase.

So I'd like now to turn to the open issues, of which there are three. There were several RAI questions asked. About 40 in all I think pertain to criticality issues. And we've reached resolution on all but three issues, and they are the NCS staff qualifications, the -- what's an acceptable subcritical margin, and an issue related to how we meet the performance requirements.

And on these two issues on this slide we have provided them with a summary of industry experience, industry licensing precedent I should say, on what we've accepted for other plants, understanding that this plant has some unique issues associated with it.

For the staff qualifications, we are only interested in the construction phase, because part of having a reasonable assurance that the plant could be designed safely is our assurance in the qualifications of the people doing the safety design. So we're only interested in the roles and responsibilities associated with design activities, not operation. And primarily we're looking at the education and experience levels associated with these individuals.

And what has been accepted at the different plants varies across the spectrum. But in this case, a couple of the unique issues are that this is a brand-new facility. There really is no facility-specific experience, which is often credited in saying, for instance, you have to have two years of industry or facility experience.

The other is the fact that most of the industry experience is drawn from uranium plants, and criticality safety depends a lot on the judgment of the analyst. And so the staff has -- believes that it's necessary that NCS staff have some specific plutonium or MOX experience.

So it's a question of, what would be the -- how transferable would be experience at other plants? And some of that experience they can get. There is experience on the DOE side, of course, with plutonium. But that's one thing that we are in the process of discussing.

The other secondary issue is, what's an acceptable subcritical margin? And I'll quickly go through this. This is the standard equation for calculated multiplication factor plus uncertainties -- has to be less than what's known as the upper subcritical limit, which is one minus the calculational bias minus the uncertainty in the bias minus -- delta Km is an arbitrary or administrative margin.

And the bias is the difference between the experimental value, typically 1.0 for K effective of a critical experiment and the calculated value. And all the statistical effects are taken up in the bias and the uncertainty in the bias. And this administrative margin is meant to account for unquantified or unknown uncertainties, such as the fact that what you're actually modeling differs from any of the benchmarks. Well, how important is that kind of effect?

And so what the applicant has proposed is -- and this actually goes beyond what most of our licensees do in practice -- is to split the types of processes at the plant into five main areas and perform a separate validation, which could result in a separate bias and administrative margin for each area.

And whereas the techniques for determining the bias are well understood, the techniques -- there is no real applicable guidance on the administrative margin and what is acceptable. So, again, we provided them with precedent on what was accepted at other facilities, with the understanding that there are some differences because you have -- plutonium physics is slightly different, significantly different in some cases.

The administrative margin of .05 has typically been accepted at most uranium plants. That's based on a rule of thumb, but there has still always been a requirement that the licensee or applicant justify it on a case-by-case basis. And that's particularly true in -- for a plutonium or MOX plant where we have different neutron physics.

The other complicating factor in the

validation, which we're looking at as a significant part of the design basis, because it tells to what maximum K effective you can design the plant to, is the fact that for a lot of these systems, particularly the three types of systems listed in Part 2, there is not really a lot of critical benchmark experiment data available.

So a typical statistical technique may need to be augmented, and there are some techniques such as sensitivity uncertainty methodology, which is currently being developed at Oak Ridge National Laboratory, that may be applicable. It's just different from what the staff has had to review in the past.

Finally, I turn to the -- what's probably the most significant of the open issues, and that is, what's the relationship between the two regulatory requirements to be doubly contingent and to assure that high consequence events are highly unlikely?

Well, I know you heard some of this the other day on the index likelihood method. So I won't go into the details of what that is associated with. The MOX SRP, standard review plan, Appendix A, is based on the Part 70 standard review plan and has a safe technique proposed.

Since the SRP has come out, we have approved ISA plans for BWXT and NFS on the Part 70 side, and so there are plants that have proposed methods that are acceptable to the staff that have been approved.

Now, for hazards other than criticality, DCS has proposed meeting the index likelihood method. The reason for excluding criticality, as we understand it, is criticality is viewed as a facility worker hazard. So, therefore, there are many -- the approach is one of prevention.

There are many different -- sometimes dozens of accident sequences that have to be prevented against. Unlike a site worker or a public type of consequence, you can't simply mitigate the bounding accident. So there's a great deal of analysis involved.

And I believe on the ISAs that we've seen, about probably more than half of the accident sequences involve criticality hazards for that reason. And so what DCS has proposed was to meet -- use the commitment to double contingency and say that was sufficient to ensure that criticality is highly unlikely.

The industry has traditionally used a

deterministic approach that relies on the judgment of the analyst, rather than any kind of quantitative or qualitative assessment of reliability of the barriers relied on. So, therefore, there's a lot of subjectivity associated with that kind of approach.

And the other thing that has been proposed is what DCS calls robust double contingency, and that would be a commitment to meet double contingency plus a generic commitment to meet management measures and the applicable criticality ANSI standards, of which there are probably about 20 in total.

And, again, on an accident sequence basis, that does -- it simply is too vague to give assurance that in all cases they will beat the standard of being highly unlikely. The wording of the double contingency principle is taken from an ANSI standard, and it's not defined in terms of a performance requirement.

And the last bullet, let me say that what the staff has determined is that the robust double contingency defined above as double contingency principle plus management measures and ANSI standards is what we have said is not sufficient. We are still discussing what would a possible form of a robust double contingency be that would be sufficient to meet the performance requirements of the rule. And those discussions are ongoing.

So that is basically where the status of the review is now. If you have any further questions --

MEMBER BONACA: I have a question.

MEMBER LEITCH: I have a question. It seems to me that criticality prevention is -- if I understand what you said correctly, is primarily the geometry. There are passive things in the way the facility is built, particularly the geometry for prevention of criticality, supplemented perhaps by operator actions and administrative procedures.

But are there no engineered systems to mitigate criticality? In other words, it seems like everything is geared towards preventing the initiating event. But what about mitigative strategies?

MR. TRIPP: Okay. And you're quite right in that the fact they're relying on geometry and other passive controls, that all comes out of this hierarchy of controls that was talked about during the ISA presentation.

But the approach taken at -- by the NRC is that criticality is something that is to be prevented. It's undesirable to have a criticality, regardless of the actual dose consequences. At a minimum, it involves a lot of cleanup activities, and so forth.

The only real mitigation is from 70.23, which is requirement to have a criticality alarm system. And, of course, that won't mitigate the dose to the person that's there when the initial burst of the criticality goes off, but it could mitigate dose to further individuals. And also, there is -- there are requirements to have emergency procedures and protocols in place.

In DOE, there are some -- DOE facilities, some of them are shielded, and they do take credit for that in allowing criticality to be less than highly unlikely. But the NRC has never taken the approach that you can substitute mitigation for prevention for a criticality accident.

MEMBER BONACA: Okay. I had --

MEMBER LEITCH: Go ahead.

MEMBER BONACA: I had a question on the -- you made a reference to 22 process accidents that have occurred worldwide, and at the highly enriched uranium facilities. And I was curious to know, first of all, is there a dominant sequence that has occurred? I mean, what is the dominant cause for these accidents? And, second, could you comment on the consequences?

MR. TRIPP: Certainly, yes. As I've said, all of these have occurred in process tanks or vessels of some type. Typically, columns relied on for favorable geometry, and so the typical sequence a lot of the time is you have something that has an inadvertent transfer to unfavorable geometry, such as to a wastewater tank or some other large geometry vessel. There are variations on that, but I think several fall under that category.

MEMBER BONACA: Right.

MR. TRIPP: As far as the consequences have been, there have been -- most of them have not involved fatalities. Some of them have. I think two or three is the maximum number, and that's just -- that's from the worker that's in the immediate area.

MEMBER BONACA: So to the personnel.

MR. TRIPP: Right.

MEMBER BONACA: The release is outside the -- it's at the site.

MR. TRIPP: Right. And that's typically because it's usually operators involved in the initiating event.

MEMBER BONACA: Okay. Thank you.

MR. TRIPP: Okay. I'd like --

MEMBER LEITCH: I asked the question of an earlier presenter about operator training, and I guess the answer I got was we were a little too far premature to discuss that. But you alluded to the fact that you have given at least some thought to how these operators might be qualified.

MR. TRIPP: Yes. We were -- actually, I was talking about the criticality safety staff who were involved in the design of the facility and what their experience and qualifications are. I would agree it's a little early to be talking about the operator training, although that would be one of the management measures that we would expect to be --

MEMBER LEITCH: Yes.

MR. TRIPP: -- applied in the next stage.

MEMBER LEITCH: And there again, as you indicate here, that there's precious little experience to draw on. I guess the same would be the case with the operators.

MR. TRIPP: That would probably be the case, unless you go to the DOE complex.

MEMBER LEITCH: Yes. Okay. But, again, I'm hearing that it's just premature to talk about that, but it's a topic that I'm very interested in.

MR. TRIPP: Yes. That was something that will be very important later on.

MEMBER LEITCH: Yes, right. Thank you.

MR. PERSINKO: I'd like to make a comment. You asked about engineered features with respect to criticality control. As I mentioned earlier, the system is a highly automated system. There is an instrumentation and control system referred to as the MMIS system, which material is not allowed to move from one station to another station unless the permissive is given by the MMIS system.

The system keeps track of material inventory at various posts, and then before material can move from post A to post B the computer system -- the instrumentation and control system checks to see whether it's permissive, whether the material can move to this area or not, with respect to criticality controls.

We will get into that particular system more when John Calvert talks about the digital I&C control systems.

MEMBER LEITCH: Thank you.

CHAIRMAN POWERS: Any other questions about the criticality safety? I think we can move on.

MS. STEELE: Good morning. Can you hear me clearly?

My name is Sharon Steele, and I'll be

presenting the fire safety portion of the briefing. I will begin with a brief discussion of guidance in the standard review plan and the applicant's proposals for the facility couched in terms of the major aspects of fire safety. I will discuss some of the open items and then follow up with a summary.

In developing the standard review plan, we relied on NRC guidance for fuel cycle facilities and reactors, where appropriate. We also drew heavily from DOE standards, particularly the one -- the fire protection criteria, and also required conformance to National Fire Protection Association codes and standards.

Based on the elements of a standard review plan and on accepted engineering practice, there are some major aspects of fire safety that I'd like to briefly touch on, and they are administrative controls or -- and development of a fire protection program which helps to prevent a fire from occurring. Also, automatic detection and suppression systems provide the capacity to extinguish a fire if they occur.

Manual firefighting capabilities are important as well as --

CHAIRMAN POWERS: Do you really give credit for automatic systems extinguishing a fire?

MS. STEELE: Sometimes -- in some places, automatic suppression systems are considered principal structures, systems, and components. But for the most part, they're used as defense-in-depth strategy.

CHAIRMAN POWERS: The suppression -- you know, I can imagine giving credit, but giving credit for an automatic system to actually extinguish the fire.

MS. STEELE: You're referring to the detection, then, automatic detection concerning --

CHAIRMAN POWERS: Detection you can do and suppression from an automatic system. But to extinguish the fire with an automatic system seems to be optimistic.

MS. STEELE: Right. Normally, when you use fire -- water-based sprinkler systems, I think the probability of success is 96 percent. Other systems are a little bit lower.

Also, one of the major aspects of fire safety is compartmentation, which would help prevent the spread of fires to other parts of the building. And, finally, the fire hazards analysis is an important part because it's a common thread throughout the various aspects of fire safety. So I'll discuss that next.

The fire hazards analysis, or FHA, isa systematic analysis of the fire hazards inside and outside of the facility, and it is used to determine the adequacy of plant fire safety. When performing a fire hazards analysis, the facility is divided into discrete fire areas, and the risk or the consequences of ignition and combustion scenarios are evaluated.

The fire hazards analysis is used to develop design basis fire scenarios from which principal structures, systems, and components are developed. The applicant has provided a preliminary fire hazards analysis, which we were able to review onsite, and they are continuing to develop the fire hazards analysis in conjunction with the integrated safety analysis.

The applicant has committed to develop administrative controls in the license possession stage, and these controls will include procedures for the storage and control of ignition sources and combustible items. It will include periodic surveillances of the physical fire protection features to ensure that these systems are operational, and also periodic surveillances of the transient combustibles to ensure that limits are not exceeded.

The applicant has proposed administrative controls as a principal structure, system, and component in some cases. They have also committed to develop a fire protection program which will describe the policy with regard to protecting items relied on for safety.

The fire protection program will also describe personnel and lines of management for the development of procedures for training for combustion controls and procedures for maintenance, testing, and inspection of fire protection features. It will also address the development of controls for design changes, recordkeeping, and fire prevention activities such as fire emergency planning.

The applicant --

MEMBER LEITCH: Can you talk about --

MS. STEELE: Sorry.

MEMBER LEITCH: -- the transient combustibles? I'm used to thinking of transient combustibles as trash, basically, that could be stored in the facility. Are some of these process streams combustible?

MS. STEELE: Yes.

MEMBER LEITCH: In other words --

MS. STEELE: Yes, they are. But in some cases --

MEMBER LEITCH: So is that what you mean by transient combustibles, stuff that's flowing through the process or --

MS. STEELE: I think in some cases that could be the combustible, the transient combustible. But largely within the process rooms there might be cases where it is assumed that there could be leftover pieces of polycarbonate window materials left over from maintenance activities as well.

CHAIRMAN POWERS: It's moving drums of Dodecane around.

MS. STEELE: The applicant has provided a strategy for automatic detection and alarm systems, and these include smoke and heat detectors and manual pull stations throughout the facility. The systems will be able to provide audible and visual alarm in the affected areas, and it will indicate and transmit these alarms to central alarm panels which would be located in the polish and control room and at the Savannah River site fire department.

They have also proposed various types of suppression --

CHAIRMAN POWERS: Not to the control room?

MS. STEELE: I'm sorry? Polish and control room.

CHAIRMAN POWERS: Oh, to the control room.

MS. STEELE: Yes. They have also provided various suppression agents. For example, sprinklers will be provided in the hallways and offices, and basically in areas where an inadvertent actuation of the sprinkler system does not affect -- cannot affect the operation.

Also, clean agent suppression will be used where fissile materials are present, and in those areas the suppression systems will be considered a principal structure, system, and component.

They are also proposing the use of standpipe and hose systems and portable extinguishers for manual firefighting.

A baseline needs assessment for the manual firefighting and the license to possess stage will be provided. This assessment will evaluate the minimum staffing needs of the firefighting force. It will describe organization and coordination of onsite and offsite firefighting resources. It will describe personnel protective and firefighting equipment, also training of the fire brigade, and fire emergency planning.

The FHA will determine a need for a separate emergency response team.

CHAIRMAN POWERS: Remind me what FHA stands for.

MS. STEELE: The fire hazards analysis. I apologize.

CHAIRMAN POWERS: Okay.

MS. STEELE: Will determine the need for a separate emergency response team which -- in addition to what's already provided at the Savannah River site fire department.

MEMBER BONACA: So this is the Savannah River site fire department.

MS. STEELE: Yes. They will look at the --

MEMBER BONACA: Because you mentioned before that you will have alarms in the Savannah fire department that --

MS. STEELE: There will be a -- there's a plan to send an alarm to the Savannah River site fire department as well, and in the baseline needs assessment they will, during that stage, analyze the firefighting forces to determine whether the Savannah River site fire department would be sufficient to meet the needs at the MOX facility or whether they would need a separate emergency response team.

CHAIRMAN POWERS: It would stun me if they weren't.

MS. STEELE: I'm sorry?

CHAIRMAN POWERS: It would surprise me if they weren't adequate.

MS. STEELE: Right. Exactly. But yes.

MEMBER SIEBER: Well, part of this is the response time.

MS. STEELE: Right.

CHAIRMAN POWERS: Well, considering where they are, that's not going to be a real problem.

MEMBER SIEBER: Right.

MEMBER BONACA: I guess my question was more in the sense that, are they trained to deal with a facility where you may have a fire situation and, you know, radioactive release at the same time?

MS. STEELE: That should be part of the --

MEMBER BONACA: That's part of it. Okay. I mean, I'm not talking about the fire brigade there. I'm talking about the one in Savannah.

MS. STEELE: Yes.

CHAIRMAN POWERS: Well, I mean, at Savannah River site they have lots of places where you can have fires and radioactive material at the same time. No question that they would have to have training for the particular site.

MEMBER BONACA: Okay. And then, how you integrate these forces I guess.

MS. STEELE: Right. Integration and the training for specific hazards that could be encountered at the MOX facility.

For operational purposes and as provided by the fire hazards analysis, the MOX facility -- the buildings at the MOX facilities are subdivided into several fire areas. The fire area boundaries are typically provided to separate manufacturing operations, radioactive material storage, control rooms, electrical equipment rooms, offices, and redundant TRANEs of principal structures, systems, and components.

The primary structural members surrounding each fire area will have a minimum of two-hour fire rating. The openings in the barriers, including fire doors and dampers and penetration seals, would be appropriately rated.

There was a question earlier regarding electrical circuits and cable trays. Right now, what I've been able to establish is that for the most part qualified cable would be used in the facility, and they could be contained in non-metallic cable trays.

CHAIRMAN POWERS: Qualified cable --

MS. STEELE: Right.

CHAIRMAN POWERS: -- just a little harder to ignite than --

MS. STEELE: Right.

CHAIRMAN POWERS: -- unqualified cable. I mean --

MS. STEELE: That's right.

CHAIRMAN POWERS: -- it's not going to stop anything.

MS. STEELE: That's right.

CHAIRMAN POWERS: I mean, I'm a little surprised, and maybe it's premature. But it seems to me that you've got people coming in here saying, "Okay. We're going to have this facility. It's going to have this elaborate electronic computerized system to make sure we don't have a lot of inadvertent transfers," which has been the bane of most chemical processes involving plutonium.

MS. STEELE: Right.

CHAIRMAN POWERS: They're going to try to get around this with a computerized quasi-automatic system. It seems to me that if I was defining the fire strategy, I would say, "Okay. You must have a TRANE that allows you to shut this system down and is protected against fire."

MS. STEELE: Yes. Right.

CHAIRMAN POWERS: And that doesn't seem to be emerging from this.

MS. STEELE: I believe that could be addressed later in the electrical portion. But there would be redundant TRANEs of -- I'm sorry.

MR. GIITTER: As you'll see in the I&C presentation, there are redundant systems that could shut the system down.

CHAIRMAN POWERS: Well, you know, I just don't think you can separate that from the fire. I mean, I think you have to sit here and say, "Well, you've got to have enough separation here and enough protection, so that you always have one of those TRANEs available." You're protected from -- I mean, it's a lot like Appendix R. You have a shutdown TRANE that you protect from fire.

And so there is some sort of a design. I mean, most of this stuff is kind of routine fire protection for a car body company. And, I mean, it seems like there should be a strategy here that I'm not seeing emerging.

MS. STEELE: Okay. You are not seeing the integrated effort that perhaps we should -- well, that we are currently doing in our review. And that will be addressed. Also --

CHAIRMAN POWERS: I had also noticed -- I jumped and noticed that you -- they are going to have separate electrical equipment rooms, but you did not cite sprinklers for the electrical equipment rooms.

MS. STEELE: I believe clean agent suppression systems will be employed there.

CHAIRMAN POWERS: Oh, yes?

MS. STEELE: And it's --

CHAIRMAN POWERS: We're just never going to learn that you've got to put these fires out with water, are we?

MS. STEELE: In addition, fire barriers are considered to be principal structures, systems, and components. I will cover a couple of open items that remain, and then I will summarize.

But, again, DCS is proposing the use of polycarbonate material for the windows and the gloveboxes. This is against or -- against what National Fire Protection Association Code 801 requires, because it prohibits the use of non-combustible material in the glovebox construction.

And even though polycarbonate is not non-combustible, DCS has tried to demonstrate that an equivalent level of fire safety could be still achieved, and they've done so by using -- providing various test results that indicate that the polycarbonate is difficult to ignite and difficult to sustain combustion.

Also, where gloveboxes are used, they will be providing additional administrative and physical fire protective features. However, we feel that the scenarios that DCS provided does not adequately address areas where polycarbonate could be -- could be combusted or could be involved in the combustion, and we're asking them to develop or provide analyses to indicate a better -- that the margin of safety is maintained.

And we're requesting additional analyses, such as determination of when flashover would occur if these gloveboxes were involved.

An additional open item is that of the combustible loading controls. The applicant is proposing combustible loading controls only as items relied on for safety to protect various forms of plutonium that are not in fire qualified containers, and some of these containers would be canisters, fuel rods, and the final HEPA filter.

We have requested details on additional surveillances to augment the controls, and we are asking them to provide a fire safety analysis to look at critical transient loads beyond the imposed or established limits. We are also trying to get more information on what the role of detectors would be, the role of detectors which are not credited in the ISA would be.

Finally, to summarize, I'd like to say that DCS has addressed the major aspects of fire safety. They have provided the commitments to develop administrative controls, a fire protection program, and a baseline needs assessment for manual firefighting.

They have described the planned suppression and detection features and currently have a preliminary fire hazards analysis. I identified a few of the open items in the fire safety, and NRC will continue to review additional information in order to complete the safety evaluation report.

Any questions?

CHAIRMAN POWERS: One question that pops immediately into mind is in a facility everything gets through and eventually they put these pellets down into some zircaloid-clad tubes. Do they do any work with the zirconium that would result in the accumulation of scrap zirconium and turnings and things like that?

MS. STEELE: Yes, that's a potential hazard that has been identified, and I believe they have ways to remove the scarse, and they are providing -- the principal SSC there would be combustible -- would be controls, staff training, administrative controls I should say, and the use of manual extinguishers, Class D portable extinguishers, in those areas.

Those areas -- currently there is no suppression -- no automatic suppression provided in those areas because of -- because the space is so large, and they're not sure whether they could achieve the desired atmosphere using a clean agent.

CHAIRMAN POWERS: Do you have any familiarity with the available base of incidents that have occurred on spontaneous combustion of zirconium fines?

MS. STEELE: Yes. There is some information that's available that I will be looking at.

CHAIRMAN POWERS: I'm aware of two incidents --

MS. STEELE: Right.

CHAIRMAN POWERS: -- myself.

MS. STEELE: One occurred at MELOX in France where I believe they use a vacuum, for example, to remove some of the scarse, and there was a fire that occurred. I believe they were able to extinguish that with a Class D extinguisher.

CHAIRMAN POWERS: Okay. Looks like the Fire Protection Committee has got a lot here.

MEMBER SIEBER: I think so.

CHAIRMAN POWERS: Yes.

MS. STEELE: Uh-oh. Thank you.

CHAIRMAN POWERS: We'll tell Mr. Rosen his work is cut out for him here. Lots to read.

(Laughter.)

MR. JOHNSON: The next presentation will be on confinement systems. My name is Tim Johnson, and I'll discuss with you some of our issues that we've identified in this system.

The objectives of this presentation is to briefly discuss the proposed confinement system that Duke Cogema, Stone & Webster presented in their construction application. I'd like also to discuss an issue that we've raised regarding the high efficiency particulate air filter removal efficiencies, and also discuss an issue involving whether HEPAs or sand filters should be used.

Our review is in process. We have raised some issues with DCS on these, but we're not at the point where we've made any decisions on the acceptability of the proposed system.

Ultimately, when we make our decision on the acceptability of the system, we're going to have to evaluate whether or not the safety features presented can adequately protect public health and safety. And in DCS's proposed design, the ventilation and confinement systems are important features for doing this.

As part of the construction authorization, DCS needs to provide a safety assessment of the design bases to demonstrate that the safety features can perform their safety function under anticipated accident conditions and conditions of natural phenomena hazards. And since DCS is relying on the confinement system as one of the safety features, it's an important area for our review.

Another aspect of this is we are looking to -- at the defense-in-depth features of the proposed system.

MEMBER KRESS: Tim, what exactly does that mean?

MR. JOHNSON: Defense-in-depth would be

the use of as proposed -- what they refer to as static and dynamic systems. Confinement would be by things like gloveboxes, room walls, as well as a ventilation system. So these are diverse systems that help to confine the material and prevent releases.

MEMBER KRESS: So the defense-in-depth is -- relates to how diversities are or --

MR. JOHNSON: Diversity and redundancy.

MEMBER KRESS: In this instance, you're talking about diversity and redundancy as being --

MR. JOHNSON: Right.

MEMBER KRESS: -- defense-in-depth.

MR. JOHNSON: Yes.

MEMBER KRESS: Okay.

CHAIRMAN POWERS: It sounds like multiple barriers as well.

MR. JOHNSON: Yes. We have some guidance that we've published dealing with confinement systems, the standard review plan. We have the fuel cycle facility accident analysis handbook, and there is also a regulatory guide on design of ventilation facilities for plutonium processes.

And, of course, these guidance documents provide acceptable methods for meeting our regulatory requirements. They don't restrict DCS. DCS can propose alternatives, but those alternative approaches would need to be provided with adequate justification.

The proposed confinement system of DCS involves what they refer to as both static and dynamic barriers. A static barrier would be a thing like a glovebox, a process cell, process piping, process tanks. A dynamic barrier would be the ventilation system.

And I have a very simplified figure that may help to explain the approach that's used.

Is that okay?

The confinement system is basically oriented by the formation of four confinement zones. These zones are oriented where leakage would go from a zone of lesser hazard to a zone of higher hazard, and the most hazardous zone is what they refer to as C4. These would be the gloveboxes containing the plutonium pellets or powder, etcetera.

The confinement system is the glovebox, and it also has a separate ventilation system. The ventilation system has HEPA filters right at the glovebox, on the inside and outside of the glovebox. There's another HEPA filter. This is -- this would be located at the boundary of the room, and there is also a separate final filtration assembly.

This is a very simplified figure. It only shows the HEPA filters, but there are also spark arresters and a set of pre-filters here as well.

The next zone is what is referred to as a C3 zone, and this is in the process room and airlocks. It has -- its static confinement is the room boundary itself, the walls. There's an airlock system. It has its own ventilation system that has a HEPA filter right at the boundary and a separate filter assembly that has spark arresters, a set of pre-filters, and HEPA filters here.

The areas surrounding the C3 process rooms also have a separate ventilation system. It has, again, spark arresters, a pre-filter, two sets of HEPA filters that run to the stack.

Another example of a confinement system would be the control rod itself. After it's finished, it's been sealed and appropriately tested, it comes out of the glovebox arrangement. That also provides a confinement boundary.

This figure here is for the mixed oxide processing areas. There's a similar figure here for the aqueous polishing areas, and it has some of the -- a lot of the same concepts -- you know, the glovebox confinement, the process room confinement, and so on.

But in addition to that, DCS also has areas called process cells where there are welded tanks that contain aqueous polishing liquids, and so on, and equipment.

This would be equivalent to a C4 zone. It has an offgas system with filtration as part of that, and the process cells also have their own separate ventilation system, again with double HEPA filters, pre-filter, and spark arresters.

CHAIRMAN POWERS: I keep coming back to the fire protection. It seems to me that in the events of glovebox fires you cannot credit the first filters, HEPA filters.

MR. JOHNSON: Right.

CHAIRMAN POWERS: Do you have problems crediting the second batch of filters in the event of a fire?

MR. JOHNSON: DCS is not taking credit for the HEPA filters right at the glovebox. There is one inside and outside immediately on the glovebox. There is also another one at the room boundary that they're not taking credit for. The only ones they're taking credit for are the final filtration assembly ones.

MEMBER KRESS: What is the criteria for whether you take credit for it or not?

MR. JOHNSON: Well, I think it has a lot to do with the fire hazard itself. In the immediate vicinity of the fire, the HEPA filter could degrade and be ineffective.

MEMBER KRESS: Temperature or pressure or loading, excess loading or excess temperature or excess pressure? What is the --

MR. JOHNSON: Right. Right.

MEMBER KRESS: Are all those --

CHAIRMAN POWERS: I think the answer is yes on those.

MEMBER KRESS: Okay. And where in that line do you draw the line and say, "Okay. Now the loading or the temperature or the pressure is down far enough that my HEPA filter can survive"? Do you have criteria for that?

MR. JOHNSON: Well, that's kind of the key question that we have. What DCS's approach is is they've set up specific fire areas, basically their process rooms or -- individual process rooms would be considered a separate fire area. And they're saying that they can confine the fire to one fire area, and the effluent exhaust from that fire area would be basically diluted in temperature, and so on, by exhaust from other areas as it goes into the final system.

So they are taking credit for dilution from areas where the fire has not spread to. And that's, of course, one of the things that we're -- where we're looking at. And it goes back to one of the things that Sharon indicated was, you know, what's the margin of safety of their fire barriers? And, you know, will the fire spread to other areas?

What I'd like to talk kind of briefly about is some of the key design features of the ventilation system. This indicates here the design base pressure areas and vacuums for each of the zones. You can see there is a gradient here where leakage would go from lower pressure areas to higher -- to higher vacuum areas as the hazard increases.

There's also a supply air system. The supply air into the C4 and C3 zones do get filtered by HEPA filters. There is also redundant fans in that system. The C4 confinement system includes gloveboxes. Also, the exhaust system has redundant final filter assemblies. Each of the filter assemblies has two banks of HEPA filters.

There are four redundant fans as part of this exhaust system, and other parts of the system are gloveboxes and the C3 boundary wall.

MEMBER SIEBER: I presume there are dampers in the ductwork.

MR. JOHNSON: There are fire dampers in each of the fire areas just to confine it.

MEMBER SIEBER: Would the action of a glovebox fire be accompanied by shutting down the ventilation system?

MR. JOHNSON: Yes, into that zone.

MEMBER SIEBER: And closing the damper.

MR. JOHNSON: Into that zone, yes.

MEMBER SIEBER: All right.

MR. JOHNSON: The C3 confinement system -- this would include process rooms and cells. It has redundant filter assemblies. Each of the filter assemblies has two banks of HEPA filters and two redundant fans for each of those systems.

One of the issues that we've identified in our review is the amount of credit that DCS is taking for the release fraction for their accident analyses. And as Dave Brown mentioned, they were basically crediting each bank of the final HEPA filters -- of the HEPA filters in the final filter assembly at 99 percent for basically a release fraction of 10^{-4}. And we have some concern with that.

There have been fires in a number of

facilities which have resulted in filter damage. We're very concerned about that. There are uncertainties in the fire analysis, and we requested further justification for those removal fractions.

Our guidance says we will accept a 99 percent removal efficiency for a ventilation assembly, and we asked DCS to provide additional justification for their removal efficiencies. Their response to us was basically to use a calculational approach to calculate what the efficiency might be, and their approach addressed soot analysis and projected temperatures, but it didn't include other aging effects, you know, chemical effects, and so on, that left us still concerned.

And after some discussion with them, they have decided that they will try to refine their environmental conditions and send us additional information on that. Again, this is an issue that we have not made a decision on.

The other issue I wanted to talk about is an issue that fell out of our environmental impact statement scoping meetings where a number of people talked about the Savannah River site and the fact that historically they've used sand filters in their plutonium processing areas. And there are other facilities. At DOE Hanford, they use some sand filters as well, but it's not universal within the DOE system.

And what we decided to do in our EIS was to include this as an option in terms of our impact analysis. And we had a preliminary analysis performed for us, and, you know, what we found is that both systems have advantages and disadvantages. Both of them have similar particulate removal efficiencies. They have similar life cycle costs.

And by life cycle costs we included the installation costs, maintenance, replacement of filters, in-place testing. Waste disposal and decommissioning costs are in there, and our analysis was that overall they are pretty similar.

There are some advantages to the HEPA filters in terms of lower installation costs, lower decommissioning costs. Sand filters -- we're talking about a system here that may be, you know, a couple hundred feet by a couple hundred feet by, you know, eight to 10 feet deep. We're talking -- this is a fairly large piece of equipment. It would have some significant decommissioning costs if it was required eventually to totally dismantle that facility and dispose of the sand in a waste disposal area.

The sand filters do have lower maintenance costs because the sand filter is there for the life of the plant. You don't need to keep replacing and testing the individual filter units. And sand filters can withstand severe events like fires.

MEMBER KRESS: The particulate removal efficiency, does that apply to the most respirable size of the particulates?

MR. JOHNSON: There have been -- yes, there have been some tests on sand filters with the dioctyl phalate, DOP, tests. And they come out 99.8 percent in a sand filter. A HEPA filter bank, when it's DOP tested in the field, would generate 99.95 percent.

MEMBER KRESS: Yes. But my understanding was that for sand filters the part that went through was the respirable size, whereas the HEPA filters took out the relative percentage of all of the sizes. Is that not true?

MR. JOHNSON: Well, I think the bottom line is is that there -- the differences are slight between them in terms of, you know, all sizes of particles.

MEMBER KRESS: Okay.

CHAIRMAN POWERS: Yes. These are big sand

-- these are serious sand filters.

MEMBER KRESS: Huge.

CHAIRMAN POWERS: And so you just -- just the interception component gets rid of that respirable fraction pretty well. I mean, I've always been impressed by them. And having endured the headaches of misaligned --

MEMBER KRESS: HEPAs?

CHAIRMAN POWERS: -- HEPA filters and testing and things like that --

MEMBER KRESS: It's hard to misalign a sand filter.

CHAIRMAN POWERS: Once you've got her built, she's good forever.

(Laughter.)

MR. JOHNSON: So as part of our environmental impact analysis, we are including a discussion of the use of sand filters as an alternative.

In summary, I've talked about the proposed confinement design. I talked about the issue regarding HEPA filter removal efficiency and also about how we're considering in the EIS the sand filter use. If you have any questions, I'll be happy to try to answer them.

CHAIRMAN POWERS: One of the questions that comes up is we have a lot of redundancy on the fans for maintaining the pressure differentials. Redundancy and diversity are two different things, and so what -- I mean, how do we view this?

MR. JOHNSON: Well, I think we -- we view it in terms of the confinement systems as a whole, that it includes both physical barriers like gloveboxes, cell walls, confinement zones, as well as ventilation filtration. And, you know, the redundancy built into the ventilation system, you know, is a part of that. But diversity I think is achieved through the use of both static and dynamic confinement areas.

CHAIRMAN POWERS: So you're really putting ventilation and barriers on an equal footing here and saying, "Yes, there's diversity."

MR. JOHNSON: Right.

CHAIRMAN POWERS: Okay. Thank you.

MEMBER KRESS: The other issue that usually comes up about barriers is, how independent are they and how independent do they need to be? And the independence depends on the -- on things like bypass and loads and how well the fire can spread from one to the other. Have you looked at that part of it?

MR. JOHNSON: Well, I think the fire

spread is a key area of the fire analysis, and it is something that Sharon is focusing on. And that's a basic assumption in the use of the HEPA filters here, and its overall integrity in the event of a fire event, because they are making the assumption that they can confine a fire to a specific fire area.

MEMBER BONACA: You characterize the four ventilation zones as independent. But it seems to me that the C4 and the C3, for example, were depending on the same intakes and exhausts. Are there still independences maintained there somehow?

MR. JOHNSON: Well, I guess I would look at them as somewhat independent in that they can be segregated, they can -- through damper systems, so that the -- the design goal here is that they will have fire dampers that would activate and seal off a fire area.

So in that situation, the rest of the system would still remain operational in the other areas where the fire doesn't spread to. But, again, the question of, can you adequately contain the fire into a fire area is a question that we're still looking at.

MEMBER BONACA: Yes.

CHAIRMAN POWERS: Any other questions?

Well, thank you.

MR. JOHNSON: Okay. Thank you very much.

CHAIRMAN POWERS: We are scheduled to take a lunch break and to resume at 1:15, and I can't change that resumption schedule.

I'd like to, at this intermediate stage, congratulate all the presenters on what I think have been so far outstanding presentations and hope that those after lunch can maintain this high standard here.

And with that, I'll recess this until 1:15.

(Whereupon, at 11:53 a.m., the proceedings in the foregoing matter went off the record for a lunch break.)

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

(1:16 p.m.)

CHAIRMAN POWERS: Let's go back into session and continue our discussions of the MOX fuel fabrication facility. And I guess we're moving on to the electrical stuff.

MR. BURROWS: I'm Fred Burrows. I'm the electrical reviewer for MOX. I'm going to give a general overview of the electrical systems. It'll be using the viewgraph and also the slide projector, so bear with me.

CHAIRMAN POWERS: A multimedia presentation here.

MR. BURROWS: Yes, that's true.

This is a simplified one-line diagram of the MOX facility. It has two feeds from the Savannah River site. They are 13.8KV feeds. There are two transformers, one for each feed. They're 100 percent capacity. That is, they are capable of carrying all of the loads in the facility.

There are two 4KV buses. There are two 4KV emergency buses. There are also 480-volt load center buses. There are more than one; I've only shown one to make this slide simple. There is an automatic transfer scheme. If an offsite source should be lost, all of the loads or this bus will shift over to the opposite source following a time delay.

Also, the 480-volt buses here have cross-ties. They are manually controlled. They are used for maintenance.

If I could go back to the overhead.

MEMBER LEITCH: Just before you leave that, we have talked about the diesels a little bit. The standby diesels --

MR. BURROWS: Yes.

MEMBER LEITCH: -- normally supply the standby bus. In other words, can you tie the emergency diesel to the standby bus?

MR. BURROWS: No. I'll be working my way down to --

MEMBER LEITCH: Okay. Okay. I'll just hang on --

MR. BURROWS: I'm starting at the top.

MEMBER LEITCH: -- for a second. Okay. Good.

MR. BURROWS: All right. All right. I'm down to the last bullet. The normal AC system that I describe is designed to IEEE Standard 785 -- or 765. And it is a non-principal structure system component.

And I should say this is similar to what you'd find in a nuclear powerplant.

MEMBER KRESS: Is non-principal a category?

MR. BURROWS: Yes.

MEMBER KRESS: Or is that just a word?

MR. BURROWS: No, it's non-principal SSC.

MEMBER KRESS: There's different kinds of SSCs, principal and non-principal? Did I miss that earlier?

MR. BURROWS: Yes. If it's not a principal, it's a non-principal.

MEMBER KRESS: But it's still an SSC.

MR. BURROWS: No, it is --

MEMBER SHACK: I think it's like saying it's non-safety-related, if we were going to put it in -- you know, in reactor terms.

MR. BURROWS: It's non-Class 1E.

MEMBER SHACK: Yes, it's non-Class 1.

MEMBER KRESS: Non -- okay. That's the basic analog.

MEMBER SHACK: Okay. And principal is just what you think it is.

MEMBER KRESS: Okay.

MR. BURROWS: Okay. The next -- and I

want to talk about the standby AC system. It has two diesel generators. These each have redundant batteries for starting. Also, they are not shown in this diagram, but there are two 120-volt, 208-volt uninterruptable power supplies, which provide power for the control of the process.

These generators will start on the loss of a feed and the failure of the transfer to the other offsite source. And their purpose is to provide for safe shutdown of the facility and also a quick restart of production. And they are sized to carry one emergency bus that corresponds to their switch gear bus, and they are also sized to carry the shutdown loads associated with this bus. Not all of the loads; some of the loads are shed.

MEMBER SIEBER: What's the kilowatt output of the diesels?

MR. BURROWS: I'm not sure of that yet. I don't think that's been established. But I believe they are the same size as the emergency diesel generators, but that doesn't answer your question.

MEMBER SIEBER: No, it didn't.

(Laughter.)

It can't be too big if you use batteries to start it.

MR. BURROWS: Yes. Okay. Let's see, I'm now down to the last bullet on this slide. The standby AC system is designed to IEEE Standard 446, and, again, it is not a principal SSC. It is not Class 1E.

Now, moving on to the important stuff, the emergency AC system. That's this area down here. There are two separate redundant diesel generators. They also have redundant batteries for starting. They are, if I can use the term, Class 1E.

And there are also two 480-volt uninterruptable power supplies. Those are for the glovebox extraction fans. You saw a little bit of that with the ventilation system. There are two 120-volt uninterruptable power supplies, and they provide power for the principal SSCs in the I&C area. That is instrumentation and controls.

Now the diesel generators and these power supplies are there for the loss of all other sources. And they power -- the diesel generators provide power mainly to the principal SSCs, such as the depressurization exhaust fans. That's part of the ventilation system also.

As I said, they are Class 1E, so the whole emergency AC system is designed to Class 1E IEEE standards such as 308, 387, and they are a principal SSC.

Are there any questions?

Okay. Next slide.

Now we have the normal DC power system, two separate 125-volt batteries. Each has a charger. They provide breaker control and some DC loads in the plant. As a normal system, it's designed to 485 for battery sizing and 484 for the installation of the batteries. And they are designed as non-principal SSCs. That is, they are not Class 1E.

Then we get to the emergency DC system. This also has two separate redundant 125-volt batteries. They each have a charger, and they provide power for the emergency breakers. That is, the breakers that are needed for the emergency buses. They also provide emergency lighting, and they are also principal SSCs. They provide power to the loads that are principal SSCs.

They are designed as Class 1E DC systems to such standards as 946, 450, and 485. And they are designed as principal SSCs. That is, they are Class 1E.

Now, in summary, the whole electrical system is a robust design, as I showed. They have multiple AC sources, multiple systems. I believe that provides defense-in-depth -- multiple layers.

Specifically, the emergency AC and DC power systems are designed for redundancy and independence. No single failure vulnerability, have sufficient capacity and capability to carry the emergency loads. They will have quality assurance applied. Also, some of the IEEE standards provide for maintenance, and there will be an environmental qualification program to ensure they perform their function when required.

Now, the only issues I have are related to the specific standards and the associated Division I reg guides. As you know, the staff endorses IEEE standards. It's usually specific versions, a specific year. So DCS, the applicant, has used the latest standards, and the staff is somewhat behind in their endorsement.

So I am reviewing the differences with the help of DCS. We are having ongoing dialogue. They have also agreed to look at the Division I reg guides, and in some cases they are committing to the Division I reg guides.

Are there any questions?

MEMBER LEITCH: Could you get back to your single line again, please, Fred? I was just --

MR. BURROWS: Yes.

MEMBER LEITCH: I was just a little confused about the answer to the diesels. The emergency diesels can't backfeed through and pick up the main -- the normal bus?

MR. BURROWS: Oh, no. That's going to be separated from the switchgear, just carry the emergency loads.

MEMBER LEITCH: All right. So, in other words, if the emergency diesel breaker is closed, you won't be able to close one of those tiebreakers to the other bus?

MR. BURROWS: No. I mean, just these breakers.

MEMBER LEITCH: I'm just curious how that -- and maybe you don't have the details yet on how that interlock works.

MR. BURROWS: Yes. You wouldn't want to do that. There was a question when I was out of the room this morning about separation, electrical separation. You don't want to tie your emergency Class 1E stuff back to the non-1E stuff.

MEMBER LEITCH: Yes, I agree. I was just wondering how -- how that interlock is achieved. I guess you can't have those two breakers closed at the same time is about what it amounts to.

MR. BURROWS: Yes. I don't -- I don't know if they want -- they could do that, but I don't think they want to do that. I'm not sure they'll have interlocks to prevent it, but there may -- they may be designed with interlocks. I haven't seen that level of detail at this point. It's just --

MEMBER LEITCH: Yes. I mean, I think it should be interlocked so that it's impossible to do that, really. Otherwise, you compromise the independence of the two systems.

MR. BURROWS: Well, you know, yes. You know, sometimes, you know, for testing you have to parallel them to the offsite sources, and so there might be occasions when you want to do that to develop load and --

MEMBER LEITCH: But at any rate, that level of detail is not worked out yet.

MR. BURROWS: Yes. At this point, the review is focusing on the standards that they're using, not -- the applicant graciously used the IEEE standards from nuclear powerplants, which made my review very simple, somewhat simple. But, so it's pedigreed as -- similar to what you find in a nuclear powerplant.

Actually, I personally believe it's better than the powerplant, but -- than a nuclear powerplant, with certain features like standby diesel generators that start automatically and -- before you end up on your emergency diesels.

MEMBER LEITCH: Okay. Do you know anything about the nature of those two 13KV lines? Are they aerial? How long are they? Those kinds of things.

MR. BURROWS: No. I don't know that at this point. I do know they are committing to be somewhat independent of each other, but I don't -- the independence is, you know, not to the point that they're going to commit to using separate right-of-ways. They're going to make sure one line, if it falls over, doesn't fall into the other. So you're going to get that type of limited separation.

MEMBER LEITCH: So it would not be on the same pole set.

MR. BURROWS: No. That's all discussed in IEEE 765. I won't go into GDC 17, but it's in that area.

I believe this morning there was a question about separation. Somebody had a question.

CHAIRMAN POWERS: Right.

MR. BURROWS: One of the standards they are committed to was 384, along with we're looking at Reg. Guide 175. That's part of the ongoing dialogue, to home in on, what are the issues? Where do they get closer? Where do the cables get closer than what's permitted by the version of 384 that's endorsed by Reg. Guide 175?

Are there other questions?

MEMBER SIEBER: Could you give us examples of some of the emergency loads that might be carried by the emergency bus? What is the equipment that you're operating?

MR. BURROWS: Yes. From this morning's presentation by Tim Johnson, it's mostly the ventilation system, the fans.

MEMBER SIEBER: What about the pumps and things like that? Nothing?

MR. BURROWS: No, just mostly fans for the ventilation system.

MEMBER SIEBER: And what are the consequences if the fans don't operate?

MR. BURROWS: Well --

MEMBER SIEBER: A release? It looks like everything --

MR. JOHNSON: Do you want me to try to answer that? If the fans don't operate, there's a chance the confinement systems won't work properly and you could get a release.

MEMBER SIEBER: Okay.

MR. BURROWS: You're going to lose that vacuum in your gloveboxes or your different confinement zones.

MR. GIITTER: Something that was kind of interesting, we were out at -- a group of us were out at Los Alamos last week, and about a year ago when they had the fire that threatened the facility they actually walked away. They shut the entire facility down, no power to the facility, and they walked away from it for two weeks.

They came back into it expecting, you know, some at least minor contamination, but they really didn't see any. So in that particular instance of just shutting down the facility, walking away from it, did not lead to widespread contamination at all.

MR. BURROWS: But, of course, this is -- this is designed for spills, you know, event-type scenarios, upsets of things, you know, activities that could cause problems, releases, not just normal operation but emergency situations where you need that filtration system to work.

MEMBER SIEBER: Thank you.

CHAIRMAN POWERS: And the throughput through TA-55 is substantially smaller than this facility, I think.

MR. GIITTER: Yes, that's true.

CHAIRMAN POWERS: John, you're going to discuss I&C, huh?

MR. CALVERT: Yes, sir. My name is John Calvert. Fred and I work together actually on instrumentation and controls.

Next slide, please?

Today I want to give you an overview of the I&C systems and talk about the principal structures, systems, and components that we've been calling the PSSCs. They are the -- if you will, the safety-related systems. A little bit about the system architecture, the design bases, and then a summary.

Next slide, please?

This is -- shows you in a nutshell the four major systems in the MOX facility. MOX or -- yes, MOX process control, AP control, utility control, and emergency control. Each one of those has a subsystem that's entitled normal, protective, and safe. And then the Xs show which is allocated to those systems.

The PSSC is shown here as the -- in these two systems here, but there is also -- in the nomenclature that's used presently by the applicant, there are safety controllers that aren't necessarily PSSCs. The emergency control is a hard-wired system. It's all PSSC. And then I showed the various control rooms, which are manned according to the process.

There are six control rooms associated with MOX, one major control room associated with AP, and then there is -- utility control normally is in this control room in AP, and then there's an alternate control room.

Then, emergency control has two control rooms separate and redundant. And then there is one more control room for reagent processing, which I don't show. But the important thing here is that we've identified the PSSCs.

Next slide, please.

This is an overview of the system architecture for both the process -- it could be in the AP or MOX, but it will have this architecture. What it centers around is there is a normal controller that's programmed with the modular processing algorithm, and it is -- this is the main controller for that production step if you will.

Then, separate and independent is a safety controller that's looking at limits, and then we'll take action to mitigate any safety problem, or these safety problems.

In addition, there is a protection -- personnel and equipment protection that's inside this MCC that is used for equipment, motors, and so forth, and for industrial safety of personnel.

CHAIRMAN POWERS: And what is an MCC again?

MR. CALVERT: Motor control center. Sorry.

CHAIRMAN POWERS: Motor control center.

MR. CALVERT: The normal process has its normal complement of sensors. Then, the normal controller controls to -- the motor control center controls the process actuator. This could be, you know, a motor, a valve, or whatever.

In addition, connected across this bus called the immediate control network are work stations. These work stations at this time are usually in the associated control room that this step -- this production step is associated with.

And this monitors the action of what's

happening down here, and the normal control center also sends and receives messages from the MMIS computer, which is the manufacturing, management, and information system. So that in some cases, for example, you -- they want to start a particular product module. The normal controller can't stand until it receives permissive information from MMIS.

Then, when it stops, it sends messages back to MMIS which says, "I'm done. You can proceed to the next step." The MMIS keeps track of the material inventory and the steps in performance. This little section in here in the MMIS concerns one part of the safety controller, and that is we are trying to find out from the licensee in detail how this will fit in with the IEEE standards that he has chosen. And we are -- so that's why that's there.

The manufacturing status computer is actually a mirror image of the MMIS, and this is where production sorts and production information and everything are taken out of. The MMIS, like I say, is taking information from the normal controllers, and it serves as a server for the terminals that are spaced at the various control rooms.

This is a diagnostic computer that receives information over the local -- local industrial network this is called. And it has an independent program that figures out that the normal controller is in trouble or it's not performing the way it should.

And it's used as a diagnostic aid only for the operation staff. And this was added from the -- the foreign facilities added this, which was an interesting choice.

So what happens is for each production step you can have a normal controller by itself or a normal safety controller by itself, depending on the -- what the process engineers desire. So these little dots here indicate different configurations, and this is one of the configurations showing just a normal controller by itself.

So this is designed such that these ethernet buses here -- ICN, LEN, and XTN -- are really not needed. This can control by itself. It's independent and almost autonomous. The safety controller is autonomous. Nobody touches it.

So that's the idea. Each production step, then, is broken up. And if one section fails, it will only be that one section, not the whole -- like sometimes they put in a whole massive computer, it fails, everything goes. So this is -- is designed for availability.

CHAIRMAN POWERS: You indicated that the manufacturing status device and the manufacturing -- the MMIS were mirror images of each other. Can they send conflicting signals?

MR. CALVERT: At this time, we don't know that because we don't know the details. But if it's a non-primary or non-principal SSC, we'll ask those questions. But if they come up with conflicting answers, we'll have to solve it. It's not a safety situation. That's why we tried to identify the PSSCs.

But there are the interactions where the normal controlling -- there are interactions there which will -- that we look for that may cause a safety action to occur.

MEMBER SIEBER: Will the depth of your review include a line-by-line review of the software?

MR. CALVERT: For the primary -- for the principal SSCs.

MEMBER SIEBER: Okay.

MR. CALVERT: And the rest of the --

MEMBER SIEBER: Are they all the same? You know, all of these controllers and computers.

MR. CALVERT: Yes. Well, I'm not sure of the entire details. But the design is that the normal controllers are PLCs. They have a history of operation in the plants overseas. And also, the software -- the requirements for the software will have a background of actual operation.

And safety controllers will get a pretty thorough review. Normal controllers we'll be looking for -- that they satisfy the algorithms, that there's no chemical safety problems, and so forth, and that a normal failure will not cause one of these things to come into existence.

MEMBER SIEBER: Okay.

MR. CALVERT: Any other questions?

MEMBER LEITCH: Is there some kind of a manual override on the safety controller? Or once it intervenes, you can't do anything about it? I was a little confused. You said it was autonomous and I --

MR. CALVERT: It's autonomous in that it's -- it's looking at a set of parameters all by itself. When it senses the condition to take action, it overrides anything that's coming from the normal controller down to the process actuator and actually causes the process to stop.

If that doesn't work, the administrative control -- they go to -- the operators go to the emergency control center and actually shut off the power either to that module or whatever, like what happened in what Joe was talking about. You shutdown and leave.

MEMBER LEITCH: All right.

MEMBER SIEBER: Are the process sensors and the protection sensors two different sensors, or do you have --

MR. CALVERT: At this time, I --

MEMBER SIEBER: -- cases where one sensor would serve both functions?

MR. CALVERT: No. They are supposed to be separate and independent. Everything here that's cross-hatched, with the exception of MMIS, which we're investigating, is supposed to be separate and independent.

MEMBER SIEBER: Okay.

MR. CALVERT: Any other questions?

Okay. So that's the main architecture that will be used.

The second architecture is for utility control.

Next slide. Oh, there we are.

It has the same structure, except this one has two data communication networks. Here again, we have the normal safety controller arrangement. But now the safety controller, which is also independent, has independent, manual, and actually from safety work station. This is in a control room, and this is in a different location than this.

But, again, this is a non-principal SSC. But it has a redundant design. And so this is for utilities, you know, the gas, and so forth.

Next slide, please.

The emergency control is actually what we're used to looking at -- is separate, redundant, control centers, actually in separate rooms. And this has no -- these have no software involved at all. And their main -- this is where the operators will go to manually control the process, essentially to turn it off. So it has the same kind of structure, but it is separate and redundant.

Okay. The design bases at this time -- the function of -- these are the safety control subsystems. These are the PSSCs. Again, here is the safety limits, can't be exceeded, and they are used to prevent or mitigate the undesirable conditions or events.

The design is -- what they've done since they've modularized everything -- this is the applicant -- they've chosen standards for the system design, the programmable electronic system, and then, for software -- these are usually all the things for software. They've chosen IEEE specs. These are IEEE specs, the set points, independent separation, isolation, EMI, follow pretty much what we have in the reactor arena. The only tricky part in this is we have to check their application as applied to this kind of facility.

Again, here's the safety controller, single, separate, independent. And all of its interfaces with non-SSCs are isolated.

Here is the emergency control center or system. Again, its function -- and its design, again, is redundant, primarily manual control. This we have to work out with the applicant what that means. I think it comes in in the design phase where they might find something different.

And, again, they use appropriate standards from the reactor arena that are applied to this type of facility.

CHAIRMAN POWERS: They don't have standards of an appropriate nature coming out of the chemical process industry?

MR. CALVERT: The applicant has chosen to apply reactors. There are some in the chemical industry, yes, and I'm familiar with them and so is the applicant. But they've chosen the route of reactor -- actually, for us it's a better deal because we're quite familiar with those.

CHAIRMAN POWERS: Sure. Sure. But I'm just anxious that we're not missing something.

MR. CALVERT: That's been discussed, but, as I say, I and some of the other fellows have a little bit of background in that. We don't apply them in our industry, of course. But I have looked at them for -- part of my job is to look at other industries and see what's good.

CHAIRMAN POWERS: We have -- I mean, we have -- I think what you said, looking at the applicability issues, because you've got other -- a different environment here.

MR. CALVERT: Yes.

CHAIRMAN POWERS: You have a lot more chemical vapors that you have to worry about, and things like that.

MR. CALVERT: And that's -- I didn't mention that part of the -- in the I&C review, I have to work with the chemical process, the ventilation, everybody. And this comes in in the design stage, because actually the requirements that will hopefully be firmed up in the ISA actually become requirements of the design for those controllers.

So I have to make sure that those hazards and the mitigation of those hazards are actually in the software requirements and actually get done.

In summary, again, the appropriate standards are used. It's really the application trickiness of it. We have discussed this with the licensee and we're working that out.

The design basis commitments -- at this time, they are appropriate for a construction application. And then the allocation of safety controllers to the process modules for the PSSCs, what we would like -- and discussing it now -- is what PSSC goes with what process module, or what module of the process. So we can -- you know, we've got eight of these or four of them, or whatever. And then we can check back through the various other reviewers to see that that's correct.

So that ends my presentation. Are there any questions?

CHAIRMAN POWERS: Questions from the members? My off-hand reaction to this system is it's sufficiently complex that we may need some consulting help on this, examining this system. And I am writing a note to that effect to the able cognizant engineer.

Thanks, John.

MR. CALVERT: Yes, sir.

CHAIRMAN POWERS: I guess we're moving now to the seismic discussion, a non-controversial area on the southern -- South Carolina area. We'll all become familiar with sand vents, and I think we ought to have a subcommittee meeting in Charleston, just so we get familiarity with the seismic issue.

MEMBER KRESS: I second that. I second that.

MR. STAMATOKOS: What's the easiest for me? Do you want me to sit and talk or --

CHAIRMAN POWERS: Whatever is easiest with you. You have the option of sitting or standing. It's just you have to be next to a microphone. That's the one requirement or our extremely competent and charming reporter will be on your case. And you don't want that to happen to you.

MR. STAMATOKOS: Well, my name is John Stamatokos. I work at the Center for Nuclear Waste Regulatory Analysis in San Antonio. And our task is to evaluate the seismic hazards among other parts of this particular project.

The bottom line I think of the applicant's approach to the seismic, as you'll see, is that they have chosen to use Reg. Guide 160 design spectrum anchored at .2G, which is similar to a nearby nuclear facility. And their whole analysis in their construction authorization request is developed to try to support that as an appropriate and safe level ground motion.

So what we're evaluating is sort of their technical basis for choosing the design spectrum that they have. So what I'm going to walk you through in this talk is just some of the things that they've done in support of that and some of the things that we've talked about with them in our preliminary part of the review.

Go to the next slide.

So the history of the seismic evaluation at Savannah River has gone on for a long time. There's a long history of the evaluation. The approach that was taken by the applicant was to first develop a probabilistic seismic hazard assessment, generic for the entire Savannah River site.

The way that that was done was by using existing probabilistic seismic hazard results from Lawrence Livermore and EPRI. They've averaged those two to develop a better hazard spectrum. They established, then, a design basis earthquake, and in doing so they were implementing Standard -- DOE Standard 1023, which is quite similar to NRC guidance Reg. Guide 1.165.

DOE uses -- also uses a standard now in their probabilistic seismic assessments of DOE Standard 1020, which sets -- it's a graded approach. It sets five performance goals, PC0 through PC4, and in this particular instance we are -- they are most interested in the highest levels, PC3 and PC4.

PC3 standards are essentially for nuclear fuel-type storage facilities, those kinds of facilities. PC4, which is the highest, are established for reactor-type facilities. And the input return periods for those are 2,000 and 10,000 years.

Okay. Next slide.

MEMBER KRESS: Did you say you averaged the LL -- the Lawrence Livermore and the EPRI?

MR. STAMATOKOS: Yes, they averaged them together to get a composite.

MEMBER KRESS: To come up with a new composite?

MR. STAMATOKOS: Right. Yes. It's sort of intermediate between the end member --

MEMBER KRESS: That was very interesting.

MR. STAMATOKOS: Diplomatic. The other thing they did, and they've -- they performed a lot of checks along the way. One of the things they did was what they called their historical earthquake check. In this case, they are using the Charleston 1886 earthquake, which is a magnitude 7.2 earthquake, at a distance of approximately 120 kilometers from the site.

So there was the -- the approximate location of the Charleston earthquake, an approximate surface magnitude of 7.2. We don't, obviously, know the exact magnitude of that.

So they then filtered this information in to make sure that the design spectrum they were going to ultimately use will envelope that ground motion from the Charleston earthquake.

Next slide?

The other half, once they've developed these input rock ground motion, probabilistic seismic ground motions, is that they did a study of the site response. And, again, like the other one, this is sort of a two-part approach.

They used the ground motion attenuation models to generate what they call the site-specific

PSHA, and then they used the extensive soil data they had to develop the soil profiles in order to bring those ground motions from the bedrock up to the soil surface.

And the way that they did that was to develop some amplification functions which would scale the uniform hazard spectrum bedrock to the soil surface. But they also developed an alternative methodology, looking at amplification functions as a way to test to make sure that their approach was conservative. This is an approach developed by Cornell, and I can't remember the other author's names, but it's basically to perform a check of the scaling they used for the amplifications.

And then they said in their soil stability analysis what they're going to do is use their bedrock PC3 ground motions and scale those to the surface, so that the PGA is at .2G.

Next slide, please.

MEMBER SIEBER: Do you use actual borings from the actual location of the plant?

MR. STAMATOKOS: Yes, they have both a site-wide soil response model, and they have some site-specific information which they used to show that the site-wide model is appropriate.

MEMBER SIEBER: So you are comfortable that there won't be a soil liquification --

MR. STAMATOKOS: Well, I haven't talked about liquefaction in this particular topic. Yes, but we're pretty confident that that is also handled in the application.

So this is the -- this diagram, which didn't come out as clear as I had hoped on the slide, but anyway, this is the design spectrum that they're going to use. What they're showing you here is that PC4 and PC3 spectrum, so this would be the 10,000 year, this is the 2,000 year. Theirs is -- this is the 160 spectrum anchored at .2G.

And as I said, they tied this to Reg. Guide 160. The resulting spectrum that they're using they say is quite comparable to what's used at the nearby nuclear powerplant. The only differences are at the -- there are some very low frequencies. The frequencies of interest in the facility are probably in this range, but I'll let the engineers address that.

And then the final point is that the -- these were all done for the horizontal spectrum, and for the vertical spectrum they originally started with using the sort of traditional two-thirds horizontal, but they decided that wasn't conservative enough, and so they went back and they're using the vertical spectrum also from Reg. Guide 160 anchored at .2G PGA.

CHAIRMAN POWERS: That's interesting.

MR. STAMATOKOS: Next slide.

So our evaluations, which have been talked about with -- in our preliminary RAI and in the meeting with them in South Carolina -- have to do with the use simply of the Lawrence Livermore and EPRI hazards and whether or not there is any need to consider updating those or modifying those slightly to consider a closer source for the Charleston earthquake.

There are some differences between what has been produced for this site and what the USGS -- that's the national earthquake hazard reduction program has predicted, and that -- those differences, the USGS -- the NEHRP results are a little bit higher has to do with just how some of the attenuation models are scaled. And that was a question that was raised at that meeting, and we're looking forward to seeing how they might modify to incorporate the additional attenuation models.

And, of course, we're looking at the site response information and, in particular, the sort of interesting way that they're checking their site response with the alternative method that was proposed by Cornell.

So that's a very quick summary of the seismic assessment, and I'll be glad to take some questions.

CHAIRMAN POWERS: Any other questions on this particular area? I bet we get to visit this again.

(Laughter.)

MR. STAMATOKOS: I think so, too. Yes.

CHAIRMAN POWERS: I mean, this issue of closer sources is one that's been around for as long as I've been going to Savannah River. And it would be interesting to see how that gets resolved. The other question, of course, is the bedrock to soil transfers and how they do that.

Fine. Fair enough.

MEMBER SIEBER: Just are there differences when they do the two amplification models?

MR. STAMATOKOS: There are some slight differences, and they show that the one that they're using is a higher motion than the --

MEMBER SIEBER: The Cornell model.

MR. STAMATOKOS: That's right. So they

justify it by saying, "We did this check, and we still feel that by anchoring at .2 and using the 160 that we essentially envelope what a specific hazard would tell us."

MEMBER SIEBER: Did they compute the G-forces using separately EPRI and Lawrence Livermore data?

MR. STAMATOKOS: No.

MEMBER SIEBER: Okay. So this means that that choice of averaging is -- makes it non-bounding.

MR. STAMATOKOS: In that sense, yes. If you would just use -- certainly, if you'd use the Lawrence Livermore, you'd get higher values.

MEMBER SIEBER: That's right.

MR. STAMATOKOS: But I --

MEMBER SIEBER: I'm just wondering if that's significant or not because --

MR. STAMATOKOS: I don't think so. I think that -- I think that the choice of giving them equal weight actually is -- is -- you know, at least it gives deference to all of the information that's out there.

MEMBER SIEBER: Both of them are just opinions anyway.

MR. STAMATOKOS: That's right. That's

right. I think that the proof comes in this historical check. I mean, you know, if you take -- you know, and that's where this controversy about where you place the Charleston earthquake is important.

MEMBER SIEBER: Okay. Thank you.

CHAIRMAN POWERS: On my agenda, I have physical security. Is -- oh, no, I'm sorry. Material control and accountability.

MR. PHAM: Good afternoon. My name is Tom Pham. I am the reviewer in the material control and accounting, MC&A, area. As you know, complementary to the physical protection aspect, MC&A is a part of the overall safeguard program for the applicant.

The basic regulatory requirements for the MOX MC&A program consists of the MC&A regulation contained in 10 CFR Part 74, subpart A, paragraphs 51 through 59. This put the applicant into what we call a Category 1 facility, which requires the most stringent requirements in MC&A.

Along with the regulations, the applicant needs to submit a so-called fundamental nuclear material control plan, FNMCP, following the guideline for how NUREG guidance document 1280. And this plan is being prepared by DCS following our NUREG guideline, and it will be submitted to us with the operation license application stage.

In the construction authorization application, and also in two different meetings in December 1999 and March 2001, DCS staff presented to the NRC and -- in the CAR application DCS committed to provide to us the FNMC plan consistent with the NUREG-1280 and also provide us the overall approach and different physical aspects of various MC&A elements, including the process monitoring, the program item monitoring, the receipt measurement, measurement system, and how to control the measurement, and also about the annual inventory, physical inventory.

And the overall aspect is it depends on the current expected highly automated control process and manufacturing features.

CHAIRMAN POWERS: Do they give you a feeling for the kind of MOF that they're going to have, the materials that they just miss in this -- in their monitoring process? I mean, do they have a target for that or anything that --

MR. PHAM: Yes. They -- it's -- I can give you an overall description. I cannot give you into detail a description they provide to us. For the process monitoring, the program is designed to detect some material in case they -- if that happened. That's the main idea for the NRC to ask to require that process monitoring.

And in two different stages, process stages, the first one, the aqueous polishing, they want to divide that process in some subdivisions, some subunit. And in those subunits, they are going to set up a certain control limit and monitor that through different material control tests to detect any potential material lost during three-day or seven-day tests, depending on the characteristic of the time of the material getting involved.

And after that process goes through the material -- the MOX process, the fuel process, they also divide, depending on the type of material and the stages, into more subdivisions. And its subunits that -- they have to set up also the same thing, different control, material control limits and material control tests, three-day or seven-day, and also those things combine to trigger in case they have some kind of alarm or material loss. So it's in there.

MEMBER SHACK: Well, I think Dana was asking whether it was some sort of specific kind of tolerance that they would -- you know, they would track the -- to plus or minus X grams.

MR. PHAM: Right now, they do not provide to us those specific numbers. Like, for example, we don't know exactly right now the applicant wants to put in one batch -- for example, a batch of material, 10 kilograms or five kilograms or 20 kilograms. It depends on -- later on, during the operations stage, depending on that quantity of material, that's what you need to use your statistical calculation to come up with the control limit.

At that stage, the staff had to look at that -- how much is the input and what is -- if the control limit is appropriate for that material quantity. And what is the input? What is the output? What is the process different to calculate it to see that it is okay?

And even after setting those control limits, the applicant is still allowed to -- to do that for a certain period of time to get some experience and modify their control limit to make sure everything is running smoothly, how many alarms, how many -- yes, how many alarms has happened during a certain period of time. And you have to adjust that and control that.

But right now, at this stage, they come up with some information about the design basis to do that, but not a specific number or even more detail how they do that in the future.

MEMBER KRESS: Is this different than the way it's been done in the past?

MR. PHAM: No. This is the normal operation process the other NRC licensed facilities are doing, like we have -- right now, we have two Category 1 facilities, nuclear fuel -- BWXT down in Lynchburg doing that. And my understanding is the contractor for writing the fundamental nuclear material control for the DCS, they are using the licensee, the NRC licensee people from NFS and other consultants working in the past have experience in Cat. 1 facilities.

So we feel like they use the right people, they use the knowledgeable people, experienced people, to do that. And how Cat. 2 facilities -- they run that for many years in 1980s when we first proposed or when we first put into the regulations for a Cat. 1 facility like the process monitoring program. We put that back in 1985, and those people have experience to do that.

MEMBER KRESS: Yes. But I thought that part of that experience was that the plus or minus that Dana is talking about, if you integrated it over a number of years, it would come out to be a substantial quantity. And that's what I think Dana was getting at.

I don't know what that quantity is, but I just wondered if they are doing better here or not. Just a comment for you to think about.

CHAIRMAN POWERS: I mean, it's -- this is a highly visible program internationally. And losing, you know, 80 kilograms of material is probably not a real good idea.

MEMBER KRESS: Not a good idea.

(Laughter.)

And your system has to be set up to be sensitive at that level.

CHAIRMAN POWERS: I mean, it seems like it's a particularly challenging design element, that you'd want some -- I mean, it seems to me that you'd want some pretty specific considerations of it at the design stage, because it's -- it's been a problem in all of our facilities.

MEMBER KRESS: It's basically a measurement error and statistics problem that can be dealt with.

CHAIRMAN POWERS: Well, there is also the -- I mean, most of the wayward material is actually just holed up in the system.

MEMBER KRESS: Yes, that's the other part of it. Where does it get --

CHAIRMAN POWERS: You've got to convince people that that's the case, and trying to do it after the fact, after the system has been designed and what not, is a chore.

MEMBER KRESS: Yes, particularly when you're dealing with powder and liquified systems you get that problem.

CHAIRMAN POWERS: And these, of course, are powders that are particularly obnoxious because they tend to distribute themselves uniformly over any surface that they encounter.

MEMBER KRESS: They get electrified.

CHAIRMAN POWERS: Yes.

MEMBER KRESS: Anyway, that's --

MEMBER SHACK: The good news is you can make the measurements of what goes in and what comes out precisely.

MEMBER KRESS: Yes. You can do that --

CHAIRMAN POWERS: Yes. But the trouble is, they're not going to be the same number.

(Laughter.)

MEMBER KRESS: You can do that for --

CHAIRMAN POWERS: Well, you don't want to be too glib about that. It becomes increasingly difficult as you move down this processing line. What comes in you'll know pretty well.

MR. PHAM: At this stage, the staff found that the overall approach and the physical aspects of the DCS MC&A design basis, that they are adequate. And we have no outstanding issue in this stage, and we expect to conduct further review when DCS submits the MC&A plan at the operations stage.

And that concludes my presentation on the MC&A.

CHAIRMAN POWERS: Any other questions on this? Okay. I think now we can move to physical security.

MEMBER KRESS: Is this in closed session or not?

CHAIRMAN POWERS: No. I think this is general.

Are they different from these?

MS. FRAGOYANNIS: Yes.

CHAIRMAN POWERS: Now, this is Mike Warren, who has metamorphosed some.

(Laughter.)

MS. FRAGOYANNIS: You've got new slides

that are coming around.

MEMBER KRESS: These are different than the ones we have?

MS. FRAGOYANNIS: Yes. Disregard the one that you have in your packet, since we have one coming through.

CHAIRMAN POWERS: We've got lots of slides.

MS. FRAGOYANNIS: Okay.

CHAIRMAN POWERS: We're up to date here.

MS. FRAGOYANNIS: Okay. You're up to date. All right.

CHAIRMAN POWERS: You can't get ahead of us.

MEMBER KRESS: One package has not arrived I guess.

MS. FRAGOYANNIS: Oh, okay. Well, we'll start. My name is Nancy Fragoyannis. I'm a physical protection specialist here at the NRC, and I do want to mention before I get into my presentation that discussions and reviews of physical protection were made prior to September 11th.

As a result of the events of September 11th, the NRC is conducting a top to bottom review of physical protection regulations, including the design basis threat. That is an ongoing process, and we're communicating frequently with other agencies throughout the government.

So what we'll be discussing today is pre-9/11, and many of these may change. So what I'm going to do is I'm just going to give you a quick overview of the process that we went through and just some of the security measures that we would have implemented at the time.

What we're doing in the physical protection is -- the goal is to protect nuclear material or facilities from unauthorized removal of nuclear material and sabotage. The safeguards approach that we use in order to protect our facilities is, first, a graded approach, and that's dependent on the type of material, the significance of the material.

Then we incorporate a defense-in-depth strategy, which will include multiple barriers which could be physical barriers such as fences, reinforced walls, or even protective forces. Various alarms, whether they're internal or external.

Can you hear me okay when I back up? Okay.

Communications, onsite and offsite, and

response. And regarding response, you will have immediate response by your licensees and then reinforced response through local law enforcement and the Federal Bureau of Investigations.

NRC provided DCS with a detailed SRP and other documents to help in their -- to assist, excuse me, in the physical protection design. DCS, in turn, provided us a comprehensive briefing on protection strategies and designs that they would incorporate in the facility. That included defensive strategies, location of their guards, wall structure, types of walls, thicknesses of their MMAs in vault areas, and they also discuss the modeling tools they use for vulnerability assessment, which will help in worst-case scenario and as well as response force.

The NRC will review a physical protection training and qualifications and contingency plan -- will review that to make sure that they do meet the intent of our regulations, as well as do an onsite review.

MEMBER KRESS: Will these measures be tested routinely by --

MS. FRAGOYANNIS: Well, there are requirements to test measures, yes. Your protective force will be tested routinely through various force-on-force exercises throughout the course of the year. There are a certain number that you have to do, yes.

I'm just going to go over a number of measures. This is not all inclusive. And this first group is more physical protection measures that you would incorporate at the site. First, is your dual perimeter fences that have an isolation zone. And there is where our PIDAS -- our perimeter intrusion detection and assessment system is incorporated, where we will have alarms, CCTV coverage, adequate illumination to provide detection and assessment for the protective force.

MEMBER KRESS: Are there specifications on what the fence has to be?

MS. FRAGOYANNIS: There are certain specifications at this time, and we don't know if that will change. But there are specifications, and the type of alarm system that has to be tested, routinely tested for operational and effectiveness testing. So there are a number of those that will be incorporated.

We have a hardened central alarm station that will be manned 24 hours a day with another independent, secondary alarm station in the event of an emergency. Volumetric alarms in unoccupied areas for quick type of detection and then an assessment.

On the next --

MEMBER SIEBER: I presume the CAS will have its own emergency diesel generator?

MS. FRAGOYANNIS: It will have -- if I'm correct, I believe it does. Yes, it does. It will be independent, yes. So it will be a stand-alone redundant system at the SAS also.

MEMBER SIEBER: All right.

MS. FRAGOYANNIS: These are some other measures, not physical in itself, but more operational measures. There will be access control points in which contraband will be screened, firearms, explosives, and other contraband deemed at the site.

There will be also exit searches for special nuclear material coming out of the facility. The MAAs will be locked and alarmed, and there will be access control in those areas, limited control areas also, so they won't allow anybody into the material access area. HEU and PU will be stored in vaults.

Here we talk quickly about protective local police response force, but on the next page I get into a little more about the armed response. There will be armed security force onsite provided by the Savannah River site. They will have qualifications and training for site members. They're going to have a special tactical response team, special response team for DOE, who are more like their SWAT members, and they will have special training and qualifications.

There will be performance evaluations conducted on the protective force. It could be in writing. It could be test-taking as well as firearms training and other response training. And then we'll have multiple offsite communications, actually onsite and offsite, but in that case --

And then these are some other measures that we're going to also incorporate, and we want to protect against internal conspiracies, possibly put CCTVs at locations, two-man rule, MC&A controls, additional searches, maybe a -- I believe it was a two-guard search or two searches going out, so no nuclear material will be removed.

They will have a personal screening program, the fitness for duty and access authorization, and full-field background investigations will be conducted if the government --

MEMBER KRESS: Does that include drug testing?

MS. FRAGOYANNIS: I'm sorry. Drug testing -- I believe fitness for duty is drug testing.

And just a quick overall summary. It is on the Savannah River site, the DOE reservation, the MOX facility will be located. They will be protected by the Savannah River site guard force.

In January of this year, NRC traveled to Savannah River site to meet with DOE security management and discuss onsite security. At that time, they had the opportunity to observe two force-on-force exercises conducted by the protective force. NRC staff was very pleased with the results, which help reinforce that we think that the Savannah River site and DCS will be able to provide the level of protection needed for the MOX facility. And as we indicated, they had two force-on-force exercises there.

I must add that the MOX facility, in addition to meeting NRC regulations, will also have to meet certain DOE landlord requirements. Thus, it may go over the NRC regulations and requirements.

And we feel that the security prior to 9/11 and the discussions we had and some of the documents we reviewed will protect the public health and safety. And, again, after 9/11, that will all have to be reviewed again.

CHAIRMAN POWERS: Stay tuned.

MS. FRAGOYANNIS: Yes.

(Laughter.)

CHAIRMAN POWERS: None of us know exactly what that one will be.

MS. FRAGOYANNIS: Well, time will tell on that.

MEMBER SIEBER: Your personnel screening program, I presume that the screening that's done will be at a higher level than it would be for powerplant workers.

MS. FRAGOYANNIS: Well, it would be for the Category 1 facilities.

MEMBER SIEBER: Okay.

MS. FRAGOYANNIS: Yes. Yes.

MEMBER SIEBER: So it's equivalent to the TQ?

MS. FRAGOYANNIS: It's different than your power reactors, yes. They will get background investigations where they have access to classified material, yes.

MEMBER KRESS: What do you do about offsite contractors that come in occasionally to do maintenance and things? Are they --

MS. FRAGOYANNIS: We haven't really gotten to that point yet where we've discussed -- do you mean escort requirements?

MEMBER KRESS: Yes.

MS. FRAGOYANNIS: I don't think we've gotten to that point where there's like one to five or one to three. I don't know. We haven't gotten there yet. I can't answer that.

MEMBER SIEBER: But they will be escorted just like in a powerplant.

MEMBER KRESS: Oh, yes.

MS. FRAGOYANNIS: They will be escorted, but I can't tell you the number of escorts per onsite contractor, independent --

MEMBER SIEBER: I take it there is not yet a physical security plan by the applicant nor a TQ plan?

MS. FRAGOYANNIS: I can't answer that. I'm sorry. I don't know that.

MEMBER SIEBER: Oh, okay.

MS. FRAGOYANNIS: We had a very thorough briefing provided to us because it's a classified briefing, and they went through what they plan on doing for physical protection. And that was provided to us. I apologize. I'm not the main person on the MOX project, so I -- I've been involved in it, but I don't know if there's a specific plan that has come in.

MEMBER SIEBER: But NRC approval is usually based on --

MS. FRAGOYANNIS: Oh, yes, I'm sorry. It will be based on a plan, and we will review that plan and then do an onsite verification, yes.

MEMBER SIEBER: Okay.

MS. FRAGOYANNIS: Sorry.

Any other questions? I'm sure you'll have more for me --

CHAIRMAN POWERS: Well, I guess -- you know, I sit here saying -- I'm picturing the site.

MS. FRAGOYANNIS: Okay.

CHAIRMAN POWERS: And I'm saying, okay, I've got Savannah River, and then I have this new operational entity operating in there. And at the gates, and what not, it has its own people. And then -- but then there's this other layer out there, and I'm saying, what goes wrong in the interface between the two?

MS. FRAGOYANNIS: Well, the goal -- it's going to be the -- are you talking about the protective force itself? The protective force will be from Savannah River. They will augment their current forces in order to be able to protect the new facility, and there will definitely be coordination between the sites out there, because you've got the -- it's a very large reservation. I don't know the exact size of the reservation, but they've got a number of buildings. This will be a separate protected area.

MEMBER KRESS: It had design basis threats that you've already identified prior to --

MS. FRAGOYANNIS: Pre-9/11, yes. We had the design basis threat pre-9/11, and -- but we don't know what changes will be made. And, of course, we'll have to incorporate that in the security plan. But those were discussed prior to.

MEMBER SIEBER: If you want a description of that, that's in the first set of slides you got.

(Laughter.)

MS. FRAGOYANNIS: I wanted to avoid that.

(Laughter.)

That's an unclassified version which -- what you have there, it just gives you a -- just a quick synopsis of what the DBT was prior to 9/11.

CHAIRMAN POWERS: Okay. Any other questions? Thank you.

MS. FRAGOYANNIS: Thank you.

CHAIRMAN POWERS: We'll come now to a summation.

MR. PERSINKO: Thank you. At the outset, we said we were here to tell you a little bit of information about a lot of areas, and I think we did that. And, in fact, in some areas we --

CHAIRMAN POWERS: You did very well, too, by the way. I am very --

MR. PERSINKO: Well, thank you.

CHAIRMAN POWERS: -- impressed with the amount of information you were able to pack in.

MR. PERSINKO: And I was going to say, and maybe in some cases we gave you a lot of information. But even though we did that, there are still areas we did not discuss with you, for example, quality assurance, human factors, wind and tornadoes, structural criteria, heavy load, control of heavy loads, material handling, fluid systems.

So there are still a number of areas that we have not discussed, primarily due to time limitations. We'd be happy to discuss any of these areas with the committee. We'd also be happy to come back and talk to you about any of the areas we spoke today about in more detail.

And one thing we would seek from the committee is feedback. We are in the process of doing our review. We're well along in our review, and we would appreciate feedback from the committee, preferably in the form of a letter, so that we know whether we are moving in the right direction or whether there are areas that we should be doing differently or items we should be considering differently.

But this is a good stage that we get the feedback, because our schedule, as I showed you at the outset, was to issue a draft SER in April. So we can make mid-course corrections right now.

And with that, that concludes the staff's presentation.

CHAIRMAN POWERS: Now, your schedule is for April. What I want to do is try to schedule things with the full committee. I know right now that they will shoot me dead if I try to get something in on the February meeting. So it strikes me as March is the earliest we can.

What I would propose doing, then, is sometime after the first of the year getting together with you and discussing the areas that I think you should bring up in a meeting to the full committee, because it's only the full committee that can produce a letter. And it will be the areas -- it's going to be difficult.

I'm going to pick the areas that I think we have the most questions about, so that you're not going to get to put your best foot forward. Okay?

(Laughter.)

Because I want to concentrate on that, because I want to get feedback on the areas that -- where we might have comments about what you're doing. And I will do that with you sometime after the first of the year, once I can get us a slot on the schedule, which is a bit jammed right now with power uprates and license renewals coming in at prodigious rates. We're just getting booked. That's the problem.

But I -- we'll have to strategize exactly how we want to present that. And some of the materials I think can be presented in a summary fashion, and some areas we will want to go into detail. In the meantime, I am going to ask that the Fire Protection Subcommittee take over looking at the fire protection aspects of this rather than the Fuel Subcommittee. I think that's just efficient and it's -- it's an area that can be broken out fairly efficiently on that.

And I'm sure fire protection will be one of the issues that we'll want to bring up with the full committee, and what not. And so I propose we'll just get back after the first of the year on those things. And before then, I can assure you that you put on an impressive show here. This was --

MR. PERSINKO: Thank you very much.

CHAIRMAN POWERS: -- extremely well done presentations, extremely well organized, and if nothing else you persuaded at least the Chairman of this committee that you guys have got your act together. So, but I think we will try to get you before the committee, but I think it -- I think the earliest we can do that is the first week of March.

MR. PERSINKO: Okay. Thank you very much. Any feedback we can have would be appreciated.

CHAIRMAN POWERS: Okay. Well, and, of course, the comments that came around here, you have heard those.

MR. PERSINKO: We've taken note of those.

CHAIRMAN POWERS: And if you -- and I think the members are always willing to follow up with you if you just want some elaboration on, you know, what were you talking about, and what not. In the meantime, the members are getting this several pounds of documentation to get themselves all up to speed on this, and more is coming. I know that, indeed. Thank you very much.

MR. PERSINKO: Thank you.

CHAIRMAN POWERS: Let's see, the next scheduled -- we're a little ahead of schedule. I wondered if -- Dr. Lyman, are you prepared to make your presentation? Why don't you go ahead and do that. I think most of the members are -- have met Dr. Lyman. If you have a written copy of your presentation, can we get one for the record, or --

MR. LYMAN: I actually don't. But I can maybe supply one afterwards.

CHAIRMAN POWERS: Oh, sure. Whatever is easiest. Well --

MR. LYMAN: I'm going by the seat of my pants here. Things are changing very rapidly. And I don't have much time today, but since, Dana, you've anticipated a lot of what I was going to say, as usual, it makes my job easier.

The Nuclear Control Institute has had a long-standing concern with the U.S. MOX program, in particular issues of safeguards and physical protection. And to cut to the chase, I think in this context the question we have to ask right now -- is the approach that the staff and DCS are taking for safeguards and physical protection at this facility -- the question is: are those approaches adequate to the task?

We had concerns about that pre-September 11th, and now that it's post-September 11th our concerns are even greater. For that reason, I did assist Georgians Against Nuclear Energy, or GANE, in preparing a couple of the contentions which they've submitted in the current licensing proceeding on the construction authorization request. And I guess I'd just like to summarize some of my concerns in that context.

I think the overarching concern we have is that the inertia of NRC and its whole regulatory bureaucracy may interfere with the ability to make changes swiftly enough so that this proceeding can be more credible in light of post-September 11th events. And to illustrate that, I'd just like to point out that The Washington Post, in a front-page story on November 3rd, used an NRC staff legal brief in this proceeding to illustrate the sluggishness of the bureaucracy.

It was a brief dated September 12th, and it was responding to GANE's contention that sabotage issues should be considered in the MOX plan environmental impact assessment. The staff's response on September 12th was, "That's not necessary because it doesn't meet the legal tests that a terrorist act is a reasonably foreseeable occurrence."

Now, I think NRC has to be extremely careful now about avoiding stories like that in the future, because I think it may affect its credibility and public confidence that it's dealing with these issues in a timely way.

And I'd just like to recap some of the issues that GANE has raised in this proceeding. I think the -- one of the overarching concerns we have is the fact that the license application under Part 70 has been bifurcated effectively into two pieces. One is the construction authorization request, which is not a document defined in Part 70 in any way. It's an invention of DCS and the staff.

And the impact of this is that the CAR itself contains a fairly limited amount of information, and, in fact, does not contain significant bodies or significant categories of information which one may argue is something that should be available at the design stage and be part of the review.

The fact that a number of issues have been segregated and deferred to the actual application for the license to possess and use SNM means that there is certain information not available now to the staff that may actually be very relevant at the design stage. And in my mind, one of the primary areas where this is true is what was just discussed before in the material control and accounting area.

It seems to be accepted wisdom in other quarters that -- that material control and accounting should be an important feature at the design stage, and that issues of making sure that the systems are adequate to the task at hand is something that should be built into the design. Both the International Atomic Energy Agency has emphasized that, and so has DOE.

In fact, a report from 1997 with co-authors from Los Alamos and Sandia made exactly this point, that there are design considerations that have to be taken into account at the design stage to make sure that the material control and accountancy and physical protection systems will work as billed when the plant is built.

And if those aren't considered at the design stage in enough detail, there's a risk that there may have to be expensive backfitting to modify those systems to make sure that they actually can meet the regulations. One good example -- I'm sorry.

CHAIRMAN POWERS: Let me interject here. You know, you could argue that NRC's job is to set the standard, and it's the licensee's job to meet that standard. And if he wants to blow this off at the design stage, that's his business. NRC just says when the thing is up and running, it's got to meet the standard.

Certainly, the designers might be foolish not to recognize what IAEA has said about this. But if they want to ignore that, shouldn't they have -- shouldn't it be left up to them?

MR. LYMAN: Well, that actually was the argument that DCS made in responding to this contention. They said, "Well, we're willing to assume the risk." You know, you say, "Well, we may have to backfit later. We're willing to take that risk." But the fact is DCS is doing the public's job and, in fact, they're not assuming any risk at all. The public is going to end up with the bill.

So I think it's really the public's -- it should be in the public interest to determine whether or not DCS should be allowed to risk their money or not. So that was a pretty disingenuous comment on the part of DCS.

A second part is that this is a program of larger implications, as Dr. Powers mentioned. The International Atomic Energy Agency theoretically should play a role or even apply verification to this facility, because this program is not in isolation. It is a bilateral program, hopefully with an international component. And we have to lead the way by example.

And to that end, I still haven't seen -- I know -- if there is a response to a letter sent to DOE in December 1999 by NRC saying it is their operating assumption that IA safeguards would be applied to this facility, and if they could get an answer, a clarification of that as soon as possible, it would assist in their review of the design.

And I have not found a response to that. Maybe Pat Rhodes would be able to supply that response. But to my knowledge, DOE ignored this request. So it right now is not known to the extent to which IAEA will be allowed access to this facility. And that would be an important component, especially at the design stage, because it -- for instance, the Los Alamos report in 1997 indicates that if international safeguards are going to be applied there are space considerations and other things which may be important in the design.

So I do think that the inappropriate limitation of what we should look at at the design stage and what information is necessary to make the -- to approve construction, that limitation is inappropriate, especially now. I think that the applicant should be willing, well, to exceed what may be the appropriate requirements.

After September 11th, I think they should step to the plate and say, "Well, we're going to take this issue -- issues of both safeguard and physical protection as seriously as possible. And we're not going to be bound by this very strict legal -- what we're required to do and no further." I think that doesn't show good faith on their part in this threat environment.

I just wanted to get in one more illustration of the importance of design considerations in safeguarding, and that's the experience of the plutonium fuel fabrication facility in Japan or plutonium fuel production facility, PFPF, where this plant operated for a few years, accumulated at least 70 kilograms of plutonium in the ductwork, necessitating a shutdown for many years, including a cleanout and a complete redesign of the internal measurement systems, redesign of the gloveboxes to improve the ability to measure in-process materials, all to the tune of over $100 million.

So this issue of backfitting is a significant cost, and, really, I think there has to be additional attention now and additional information about details of the material control and accounting system and how problems like holdup will be mitigated by the design.

The second issue I'd like to raise is, again, in the post-September 11th context. I am encouraged by the letter that NRC sent to DCS only a few days ago reminding DCS that the design basis threat, as well as all other physical protection regulations, are under review.

But this letter wasn't very helpful. It said that NRC couldn't say right now what was going to happen, if anything, but DCS should be aware of it. But certainly there needs to be a better sense right now of whether there's going to be a major change in the design basis threat and other aspects that might affect the design of the facility.

And to that end, GANE and NCI did file, on October 13th, a motion to postpone the existing proceeding pending the results of the top to bottom security review, and we maintain that that's prudent because staff resources are being wasted right now in a review of the design which may be obsolete in the post-September 11th era.

And one aspect which I think deserves particular attention is the aspect of resistance of a plant to a deliberate air crash. The facility, as designed now, screened out even accidental air crashes as part of the design basis on the basis of low probability. So there is no -- not even any consideration of an air crash as an external event threatening the plant.

Therefore, the design basis missiles used to establish the missile resistance of the building are those generated by tornados and high winds, which are considerably less penetrating than the jet engine of a 767 plowing into the facility at full speed. I calculate the penetration of the design basis missile to be something like a factor of 10 lower than what the jet engine in the 767 would be at full speed.

So whether the appropriate new design basis threat should include an intentional plane crash I think has to be considered. And for all we know, the whole way that nuclear facilities are going to be built in this country or elsewhere is going to have to be rethought in the context of this kind of threat.

It may be that facilities will have to go underground in the future. That may be a significant constraint that would lead to a substantial redesign of this facility. So these questions have to be asked, and obviously they are appropriate for the design phase.

So, you know, we do feel that there needs to be a pause in the review until questions are clarified. And, again, this is because the public is paying the bill for this facility.

One last issue is something we're concerned about, and that's the control area boundary definition, which is cross-cutting and impacts the whole safety basis for the facility. I missed the discussion this morning, but I'd just like to reiterate our position that it only makes sense to define the controlled area boundary as one which is reasonably -- reasonably includes only the facility that we're talking about and not the entire Savannah River site.

I think that such a definition simply does not pass the red face test, and to imply that the licensee, DCS, can by any definition have authority, sole authority to exclude anyone from the entire Savannah River site, which is what the regulations require, that kind of authority should not be granted to a private entity. And it clearly seems to violate the intent of Part 70 as written to have such an extensive definition for the controlled area. And we believe that a legal review will show that our position is right.

So I think I'll stop there. Thank you.

CHAIRMAN POWERS: Will you entertain questions if members have any?

MR. LYMAN: I'll try.

CHAIRMAN POWERS: Any people have questions?

Mr. Lyman, I will recall for you that I think in one of your packages you have a recently published paper on use of MOX as a disposal means. And it's -- I can attest to be a good read. So I'd recommend it to the members to read.

Any questions for Mr. Lyman?

Thanks, Ed.

MR. LYMAN: Thank you. Appreciate the opportunity.

CHAIRMAN POWERS: Let's chat just a minute or two before we adjourn about strategy. I suggest that we have something of an oral summary on this meeting and acquaint the full membership with this coming along the pike at our December meeting, just mostly to say that -- to summarize the fact that we have met and the kinds of things that we forecast.

I see some challenges for us in the instrumentation area, just because of the dilution of membership. Mr. Persinko mentioned to us several areas we have not gone into which includes flow systems, and what not. I am sure that if I bring up flow systems for our Thermal Hydraulics Committee they will throw large, heavy objects at me. So we may have some challenges there.

I think we should ask the Fire Protection Subcommittee to look at this in addition to us, because it's an issue up their alley, and it -- it can be split out kind of easily, I think.

Are there any other suggestions on strategy here?

MEMBER KRESS: I think your thought of narrowing the presentations down to items where we may have additional questions or concerns is a good one. We'll have to define what those area, so --

CHAIRMAN POWERS: Yes. If members could send me notes on the areas that they think those presentations should be concentrated in for the -- it will probably be the March meeting.

My thinking is if we're going to prepare a letter that has feedback, we've got to bring up those items where we're going to have feedback. And this covers a host of things, and I don't see any convenient way to cut it down, because they were pretty synoptic presentations they made to begin with. So it's a little hard to tell them what to leave out on any one of them. So I'd like to focus on those areas where I think we'll have comments on.

I am -- I have a sense that we'll have comments on the fire protection area for sure, the MC&A area for sure. I think --

MEMBER KRESS: And there may be some defense-in-depth questions.

CHAIRMAN POWERS: We're going to have some questions about the philosophical approach overall here, including the bifurcations issues.

MEMBER KRESS: And I suspect we may have some safeguards issues.

CHAIRMAN POWERS: Well, you know, I'm reluctant to bring that one up because I think it's -- I think it's still too much up in the air, and I'd rather do it as part of our more integrated view. You know, we're going to have -- we're going to have to go back and understand better what the results are of what the NRC is doing now. There is no point in going back immediately on that because they are still fixing to do it.

And then, I mean, once they're in a position there, then I think this is one of several areas that this comes up in. And I wouldn't leave them out of this.

I do see a distinction between this facility and commercial facilities. I mean, you know, commercial nuclear powerplants and a facility doing a government job on a government reservation. I see distinctions here.

MEMBER KRESS: It's two completely separate missions, too.

CHAIRMAN POWERS: Yes.

MEMBER KRESS: And that needs to be considered.

CHAIRMAN POWERS: Right.

MEMBER SIEBER: Well, the philosophical approach to safety is different, too. Our plants use PRAs, and these kinds of plants are integrated safety assessments, and I think people need to understand what that really means and how they're done.

CHAIRMAN POWERS: Yes. That's the other thing we should think about. In the presentation to the full committee, they really need our Wednesday morning presentation as well as this presentation. I mean, they have to have both of them. We'll have to figure out how to do that exactly. So I think I'm going to --

MEMBER KRESS: Just more time on the agenda.

MEMBER SIEBER: I think we ought to have --

CHAIRMAN POWERS: Yes, that's --

MEMBER SIEBER: -- to the meeting. That would do.

CHAIRMAN POWERS: That would make people real happy with me, wouldn't it?

(Laughter.)

Okay. So we've got some challenges to deal with the planning and procedures folks. Any other comments?

Well, again, I want to thank the speakers and presenters. I think seldom have I seen such terrifically organized and well-presented material for a one-day meeting. It was an outstanding job. I think it does reflect well on the kind of work that's being done at this stage, and it was very useful to the subcommittee. I think it will be useful to the full committee.

MEMBER KRESS: And I think we should thank Mr. Lyman for his input.

CHAIRMAN POWERS: He always has something useful to tell us, and I encourage the members, if they have a chance, to take time to look at the GANE submission here. They didn't have a chance to present, but I found it interesting reading.

And with that, I will adjourn the meeting.

(Whereupon, at 2:56 p.m., the proceedings in the foregoing matter were adjourned.)

CERTIFICATE

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

Name of Proceeding: ACRS Reactor Fuels Subcommittee - MOX Fuel Fabrication Facility

Docket Number: (Not Applicable)

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.

Pippa Antonio

Pippa Antonio
Official Reporter
Neal R. Gross & Co., Inc.