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

1:16 p.m.

CHAIRMAN POWERS: I think we've now moved on to the specific topics, beginning with radiological consequences, chemical safety and fire protection, and I'm going to turn to somebody. Am I turning to you?

MR. BROWN: Good afternoon. My name is Dave Brown. I'm the radiation safety and environmental protection reviewer for the MOX Review Team. I'm going to speak this afternoon specifically about the applicant's consequence assessment methodology, and the results, and even more specifically about radiological consequences that were devised as part of this assessment.

First slide please. Within this area, my review consisted of reviewing the applicant's source term calculations for events postulated in the hazards analysis. We also looked at for the facility worker some radiological consequences, even though the applicant's position here is that through the facility worker, if he's involved in an event that's determined to be unacceptable, therefore they're going to apply PSSCs to protect him or her.

There were some areas where the staff had questions about the PSSCs applied and we asked for

those calculations to show that those PSSCs were actually going to do the job.

MEMBER KRESS: Were these radiological doses or did they have any toxic?

MR. BROWN: There's certainly a chemical hazard present at the plant. Alex can speak best to that.

MEMBER KRESS: Oh, that's another presentation.

MR. BROWN: Chemical safety, next presentation. And then for the other receptors, namely the site worker, the public and the environment. They looked at how the applicant performed downwind consequence assessment and hopefully what we're looking at is once the PSSCs were applied, they reduced the risk from the event to acceptable levels, and acceptable being defined in the new Part 70.

CHAIRMAN POWERS: How do you judge risk? I mean you've got consequences, but you don't have frequencies.

MR. BROWN: Well, the way the Part 70 is written, specifically 70.61 is the high consequence event, which is defined as greater than 100 rem to the worker, 25 rem to the public, must be highly unlikely.

So, they can choose to reduce that consequence to acceptable levels, so therein it lies the –

CHAIRMAN POWERS: So you have risk in the sense of pretty unlikely, highly unlikely, very highly unlikely.

MR. BROWN: And the second one I should describe is what we call the intermediate consequence, which is 25 rem to the worker, 5 rem to the public. Those must be unlikely or be mitigated to acceptable levels. So that's our risk scheme as it were. Can I have the next slide please.

MEMBER SIEBER: Did you evaluate the equivalent ODCM type chronic releases?

MR. BROWN: I'm sorry, I'm not sure I understand you.

MEMBER SIEBER: Did you evaluate the issue of chronic releases, you know the things that happen every day to some extent and what impact that has on the environment?

MR. BROWN: What we focused on here in the safety assessment were events that are not what I would call the anticipated events, but less likely than that. So for routine emissions, we certainly are looking at that within the scope of the EIS.

MEMBER SIEBER: Okay.

MR. BROWN: So far we don't have any issues in that regard. I think they fall well within, for example, the 10 millirem constraint on air emissions.

I'll just briefly outline the applicant's approach here. They use our nuclear fuel cycle facility accident analysis handbook and the so-called five factors, which I'll talk a little bit more in a minute about.

For downwind consequences, using a 9th percentile atmospheric dispersion parameter of chi over Q (X/Q), using site specific date from the H-area met tower, and I'll just reiterate that the four receptors we're kind of looking at independently is the facility worker, the person say right next to the glove box, the site worker who's outside the plant's restricted area on DOE controlled property, a member of the public generally considered to be at least eight kilometers away, because this plant would be located pretty close to the center of the Savannah River Site. The west boundary is at least that far away.

CHAIRMAN POWERS: How about the highway that runs through it.

MR. BROWN: The highway runs through closer than that, and in the context of Part 70 and

performance requirements, we consider those folks a transient population. We disregard the Part 20 requirement is adequate protection for them. We will certainly get more into that as we look at the site's emergency plan later on, how they plan to control access to the site.

CHAIRMAN POWERS: They can control access. The fact is there's access. It's not like it's an abandoned highway. I mean there are people out on it.

MR. BROWN: Yes, and as I say for the sake of this assessment, we've accepted them as a transient population. They're not specifically say a member of the public for the purposes of the accident analysis.

CHAIRMAN POWERS: I mean why is that? I mean I don't understand. People are driving cars on the highway. They're going to be there if you have an accident because they'll be driving on the highway.

MR. BROWN: Well, I think it's a good question, and it was addressed as far as the rule making for this regulation, and it was the commission's position that this would be, that these folks would be adequately protected by Part 20 requirements.

I just want to spend a couple more seconds on that. You asked a question earlier about the

public and the site worker, and I think it's worth stating that the regulation does address the so-called site worker in a different way. The word that's used is non worker.

CHAIRMAN POWERS: Which might cause substantial resentment.

MR. BROWN: The purpose of defining the non worker is to say that if - to describe which performance requirements apply to that individual and would apply to your example of the secretary. The regulation has provisions for the training and posting requirements.

If the applicant meets those requirements, then they can treat these individuals as workers for the purpose of the safety assessment, and later in the ISA, and they've made that commitment to provide that training and to provide the posting.

MEMBER KRESS: Is there something in the Part 70 that requires them to use the 95th percentile chi over Q?

MR. BROWN: No, it's not required by regulation.

MEMBER KRESS: I'm just asking is that actually conservative?

MR. BROWN: This comes out of really a

handbook, I think.

MEMBER KRESS: A handbook?

MR. BROWN: We've got, the staff, any applicant using a nuclear fuel cycle facility accident analysis handbook, and it's supposed to -

MEMBER KRESS: And that recommends the 95th percentile?

MR. BROWN: Yes, it does. There's a section in the back that specifically, an appendix that describes meterology.

MEMBER KRESS: That's sort of doubling up on the highly-unlikely posture.

MR. BROWN: No. It's credited as part of reducing the likelihood of an event.

MEMBER KRESS: You have unlikely. This makes it even more unlikely. It seems like you're doubling up on it to some extent.

MR. BROWN: I think I understand. The regulation requires the event be provided, so and what you're kind of addressing is what's the likelihood of that consequence would occur, and we're treating it as really separate.

CHAIRMAN POWERS: Let me understand exactly the 95th percentile of what? This is a chi over Q and taking the 95th percentile of?

MR. BROWN: Hours, typically. In other words, for hourly observations in a year.

CHAIRMAN POWERS: So you're taking the 95^{th} percentile meteorological conditions?

MEMBER KRESS: The worst in terms of dose.

MEMBER ROSEN: It isn't the worst at all.

MR. BROWN: No, it's not the worst, no.

CHAIRMAN POWERS: What I'm interested in –

MEMBER ROSEN: It's stable right? I always assumed it was a Class F.

MR. BROWN: Which would be the one hour during that year, the basis for a year of observations, where the conditions were most favorable and the wind speed was lowest.

MEMBER KRESS: Ninety-five percent of that.

CHAIRMAN POWERS: Let me ask this question.

MEMBER KRESS: Ninety-five percentile is better than this chi over Q.

MEMBER ROSEN: Right, and I'm saying that a worst assumption than that could be made.

MEMBER KRESS: Yes, one could assume that it was stable, that everything that was released just stayed there.

CHAIRMAN POWERS: I'm not sure that that's the worst. I guess is this chi over Q methodology

that's used, the staff is engaged in an uncertainty of consequence analyses, and in that they of course were interested in more sophisticated modeling than just chi over Q methodologies. How does the chi over Q methodology compare to those more sophisticated techniques?

MR. BROWN: Which - can you describe the more sophisticated technique?

CHAIRMAN POWERS: Well, I mean the chi over Q is kind of a Gaussian plume sort of modeling and especially in Europe, they're going away from the Gaussian plume type models toward other kinds of processes that I don't even begin to understand, but far more sophisticated, and the objective, of course, was to understand what kind of actual dispersal you got at some distances away.

And so what I'm interested in is if I use chi over Q and I use a more sophisticated method, is the chi over Q bounding on that more sophisticated method, or in the case that they found for the max code, that's not the case, if I'm looking at things other than prompt fatalities.

MR. BROWN: I don't think I'm really prepared to talk about that. I think one of the issues you may be touching on is this issue of dose

reconstruction from an event where the meteorological conditions are recorded and known versus predictive assessments of this type, where you're just postulating future conditions.

CHAIRMAN POWERS: That's one way to lead you to more sophisticated methods all right. If you try to do that.

MR. GITTER: This is Joe Gitter. Let me just comment on that a little bit. We know in reality that Gaussian plume models aren't what you would see in reality following a release, but if you assume, you know, if you make conservative assumptions or you use a 95th percentile chi over Q data, you're going to be looking at and use that in conjunction with the Gaussian plume model, I would think that would tend to be conservative, relative to what you would see in reality.

You know, we know from experience from Three Mile Island that the wind can change directions, and if you're looking at dose projections to a receptor downwind and that direction doesn't change, I would think that would tend to be conservative.

But without knowing the details of the models that you're talking about, I think it would be difficult to answer that question.

CHAIRMAN POWERS: In general, what they found was that plumes, real plumes, tended to disperse more and what you get with the Gaussian plume model, you might think well, that's good and it's good if you only looked at prompt fatalities, but you probably aren't looking at any prompt fatalities. You're probably looking at cumulative dose, in which case that's bad to get more dispersal.

MR. BROWN: I'll bring this issue up in a subsequent slide. It's a quick overview of their methodologies.

CHAIRMAN POWERS: For the source do they use Machima's database?

MR. BROWN: Yes, that's right. That's what we were reviewing is their application of essentially Machima's database, making sure that for the approximated event category, say fire, and material, say a powder, that they used to look at release fractions and respirable fractions.

CHAIRMAN POWERS: Using the word appropriate and Jofu's database, it's a bit congruent, isn't it?

Well, I mean Jofu's got - I mean some of the source terms were creative to say the least. He burns things on a piece of filter paper, and from that and furs

which get out of a fire.

MR. BROWN: I think for this stage of review, for construction authorization, in many cases we don't have an advance concept of the design of the glove box where it is in a room and that sort of thing. Experimental data of that type is the best information we have, and it is the guidance that we've recommended that the applicant use.

MEMBER KRESS: How do you arrive at the DR, the damage ratio for the material at risk?

MR. BROWN: For the most part, the damage ratio is assumed to be one. All of the material in a given processing that's involved in the event is involved.

MEMBER KRESS: Okay.

MR. BROWN: And that's - I'll talk a little bit about that too. I'll just say quickly, we did verify by independent calculation that the chi over Q is reasonably conservative. In other words, we asked for the site specific data and ran the codes ourselves to verify that they were using correct values.

MEMBER KRESS: You used RASCAL?

MR. BROWN: In this case, ARCON 96 for close in, and MACCS for the site.

MEMBER KRESS: For the site boundary.

MR. BROWN: Total area boundary for the public eight kilometers away. And then using that information, the staff independently derived information, we would go on and assure ourselves that the accident risks were adequately reduced.

My next slide, please. Again with regard to those terms, we looked at each of the five factors. For material at risk, the applicant provided inventory for all of the rooms in the plant that are going to have material. There are more than 100 materials at risk or inventory units.

The damage ratio was conservatively assumed to be one, so if I had 60 kilograms in the glove box in that room, all 60 kilograms would have been involved, whether it was fire or load handling of that.

Atmospheric fractions and respirable fractions are the areas where we certainly had to make sure we were careful to get values that were chosen that were at least as consistent as possible with the types of phenomena that are provided in the handbook.

CHAIRMAN POWERS: You must clearly use a specified respirable. You've got some sort of a model in mind when you define respirable fractions?

MR. BROWN: In this case, respirable I

believe is defined as one micron.

CHAIRMAN POWERS: One micron?

MEMBER KRESS: I thought it was point four.

CHAIRMAN POWERS: No.

MEMBER KRESS: It's point two to something.

CHAIRMAN POWERS: It's virtually any number you want. It depends on what material you're using and things like that. But one is a pretty -

MEMBER KRESS: It's a pretty big particle, I think.

CHAIRMAN POWERS: I've seen people using as high as ten. Anything less than ten microns went to point 05 or something like that.

MR. BROWN: I'm not sure. I may have mispoken on that. We haven't made any assumptions with regard to particle size for specific areas to that process. It's, for example, for those conversation factors, the particle size is assumed to derives at those conversation factors, they would be in the federal guidance.

CHAIRMAN POWERS: The one conclusion I get on respirable fraction is you need to ask what it is because everybody seems to use a different set of numbers for that and they can defend it papers and literature, of which there are several hundred, and

people will - it depends on how you do the test.

MEMBER KRESS: It's too big to move by diffusion, too small to -

MEMBER LEVENSON: It also depends on what you mean by respirable, because CDC is a ten but they don't deem that that gets to the one. It gets to the nose. They take a fraction of about one as ending up in the gut. So respirable means different things to different people.

CHAIRMAN POWERS: To different people.

MR. BROWN: The last slide in the course is the leak path factors, and for this application, what we're talking about pretty much exclusively are HEPA filters, a factor to 10^{-4} production in the source term for two HEPA filters and series. You notice I have the words "open" next to the last two items.

The open issue with regard to respirable fractions has to do with taking that credit when you're deriving a source term for an environmental consequence. In other words, one of our performance requirements is not to contaminate the environment. Producing a source term by that value wouldn't be appropriate, because it's not a human health consequence.

MEMBER KRESS: But it's all constrained to

be back out on that filter. Are you figuring that's a problem? I mean it's not contaminating the land or the buildings like it says right there on that filter.

MR. BROWN: Well you're deriving an un-mitigating consequence and you haven't even applied the filter to the principal SSC, as it were. Using the filter isn't there. In some cases, for human health consequences, you would reduce the source term to include only the respirable fraction, per se, a downwind human health consequence. But production isn't appropriate for the environmental health calculation.

MEMBER KRESS: I agree with the respirable fraction part of it. I'm not sure about the HEPA filters.

MR. BROWN: That's open for another reason. I'm sorry.

MEMBER KRESS: Oh, I'm sorry. I was mistaken to your point.

MR. BROWN: I'm sorry. The second reason, the reason for the HEPA filter being open is, as I think we described before, for severe conditions, the staff haven't accepted the use of a leak factor of 10^{-4} which equates to an efficiency of 99.9 percent.

MEMBER KRESS: Why is it you're questioning

that efficiency? Aren't they required to go in and measure that after they install the filters?

MR. BROWN: Later on, certainly they'll - I imagine they'll have a commitment to a surveillance program for the filters, but at this stage, again referring to our handbook, and other regulatory guidance, for severe conditions, the staff would say that across the whole system, the efficiency of this credit, it shouldn't be any more than 99 percent. It is cited in our handbook, and I think they got 1.52.

MEMBER KRESS: That brings down the 10 to -2?

MR. BROWN: Yes, a leak factor of 10^{-2}.

MEMBER KRESS: Where is this active decay moving of the plutonium part of your thinking, part of the knock off?

MEMBER ROSEN: Knock along.

MEMBER KRESS: Knock along.

MR. BROWN: Not a consideration in this.

CHAIRMAN POWERS: I think in setting those things of people under severe conditions, people were worried about overloading and what -

MEMBER KRESS: Getting a delta P across it with some moisture and then actually failing the filter.

CHAIRMAN POWERS: Well, water even penetrate the filter. I mean it's not a hole, but it ends up on the other side of the filter.

MEMBER KRESS: The history that I'm familiar with on HEPA filters is not a bad number to use all the time, because the likelihood of misinstallation is high enough.

CHAIRMAN POWERS: Well, unless you use a DLP and check it after you install it.

MEMBER KRESS: Yes, and when you do that, I mean most of the time you find 10^{-2} is not a bad estimate.

MR. JOHNSON: My name is Tim Johnson. Maybe I can add a little bit more information on this. There have been cases in plutonium facilities and in fuel fabrication facilities where under severe conditions like fires, filters have been damaged, and that's a principal concern. You know, even though you have redundant filter banks, one of them could be damaged, and basically the efficiency of one of those banks, you know, may go to zero.

I mean that's one of the key reasons why we've asked DCS to provide additional justification to support their proposal to use that 10^{-4} leak path factor.

MEMBER ROSEN: Why do you say on one of the two factors in a series configuration, I guess you're talking about, would be damaged in the event of a fire. If a fire occurs, it could damage both of them, couldn't it?

MR. JOHNSON: Well, hopefully in a well-designed HEPA filter system, you've got additional protections. There are spark arresters that are going to be in place that would help remove larger pieces of material that may be very high temperature. You have pre filters that will also act to protect the HEPA.

You have in the final assemblies, you also have two banks of HEPA filters. The design strategy that DCS has proposed is to try to limit a fire to a specific fire area, and that way air from other areas could dilute the temperature. So when you put all of those together, I think we can conclude that a HEPA filter system design that they have, you know, can be effective.

The question is, how much credit do you give for it, but we're not proposing that the HEPA filters in the system that was proposed won't do the job. The question is what should the credit be for it?

MR. BROWN: The next slide, please. Okay

going back to chi over Q, we believe there was, using ARCON 96 and MACCS 2 and the site specific data, we've independently verified that those values were reasonably conservative.

Again, my last statement there is on the applicant's safety assessment for environmental protection, they incorrectly - I brought this up in November, incorrectly used the controlled area boundary as the boundary beyond which we're concerned about the environment, when it's really the restricted area boundary very close into the plant that is that boundary beyond which we're concerned about the environment. So, they had to revise their safety assessment for that one performance requirement.

MEMBER KRESS: That's a difference of six kilometers?

MR. BROWN: They went to eight kilometers, when it should have been more like, less than 100 meters.

MEMBER KRESS: One hundred meters.

MS. WESTON: Could you give us some of those specifics on ARCON 96.

MR. BROWN: Some of the specifics?

MS. WESTON: Yes.

MR. BROWN: This is a code which used as a

standard Gaussian model is used in other NRC codes. It includes two additional -

MEMBER KRESS: That's the one you used for control room habitability?

MR. BROWN: Right, and for control room habitability it does include taking a credit for building wake effects, and one item I'm sorry I didn't list here is low wind speed plume meander, is another correction that the code applies.

CHAIRMAN POWERS: Is there a document on this?

MR. BROWN: Is there documentation?

CHAIRMAN POWERS: Yes.

MR. BROWN: Yes.

CHAIRMAN POWERS: Can we get that?

MR. BROWN: You can get - it's a new reg published. I don't unfortunately have the number with me, but I can get the document number.

MS. WESTON: Would you?

MR. BROWN: Okay.

CHAIRMAN POWERS: Areyou going to ask them to do a wind tunnel test on their facility before this is all over?

MR. BROWN: That's not anticipated at this point. No.

CHAIRMAN POWERS: Truthfully, the only way you can get accurate wake effects.

MR. BROWN: I think it's certainly something we can look into, but I don't think it's anticipated now.

MEMBER KRESS: The ARCON 96 correlations are based on wind tunnels, and dual configurations.

CHAIRMAN POWERS: I know any time you try to do it on an actual facility, the only way to actually do it is to do the facility itself. I don't know anybody that can protect, even with fancy codes. They end up having to refine it based on the wind tunnel test.

MEMBER KRESS: I wouldn't be a bit surprised.

CHAIRMAN POWERS: It's not that difficult to do, a wind tunnel test. You just build a role model.

MEMBER KRESS: And blow out on it.

MR. BROWN: Okay. The last area of the staff's review, seeing how all that built up to show that the safety strategy that the occupant proposed would actually reduce the risk, again what we were looking at is the controlling events. There are event categories, you know, fires, flow drops, loss of

confinement events. There are about six of those.

Within each category, there are event groups and the total number of event groups as Rex mentioned earlier is about 50, and it's at that level that the applicant has identified a safety strategy for an event group, and it's at that level that the staff verified that that strategy was adequate, which is two issues.

For the facility worker, there was an event, a loss of confinement event. It was a sintering furnace seal leak, and the question that the staff had was pertaining to this PSSC training and procedures, which we now commonly understand to be worker action. The worker takes an action that's self protective, either to leave the room or to don a respirator.

It wasn't clear to staff how that worker would become aware of such an event. In many cases where the strategy's applied, the incident itself is self evident. Fuel assembly drops and makes a big noise.

But in this case, it wasn't clear how the workers would become aware, so we asked for additional information. And, of course, the revised AP assessment would be the consideration of the

environment being closer in, is something we're still looking at. The applicant submitted their summary in March, and we're still looking at it now.

MEMBER ROSEN: Before you get away from that slide, help me understand what you really mean with a bullet that says, staff independently valuated where the applicant's safety strategy would reduce the risk posed by controlling events. Let's take a case in point. The low drop.

MR. BROWN: Okay.

MEMBER ROSEN: How do you reduce the risk by controlling low drop? I mean you're either going to have a low drop or you're not. Maybe you could be sure you're not going to have a low drop by saying, we're not going to pick up any load, just not have any handling facilities. But a facility is typically needed to be able to lift heavy objects.

MR. BROWN: That's right.

MEMBER ROSEN: So you will have plants and rigging and all the accouterments that go with needing to move heavy objects from one place to another. So, how does one go about - now you're going to tell me, well we train our operators.

We make sure the slings are examined every two weeks and before and after each heavy lift, and we

use heavy loads, tests before each spring, and you're going to say we do that every time anyway and we still drop things.

I mean there's no way to ultimately be sure that you're not going to have such an event. Does the strategy rely on being sure you're not going to have, absolutely not going to have such an event?

MR. BROWN: No. The safety strategy is usually first determined on the basis of what are you going to do? Are you going to prevent this from happening, or are you going to mitigate the consequences so that the consequences are acceptable.

MEMBER ROSEN: Yes, but about mitigation for the moment. When you say prevent, that means none, right?

MR. BROWN: Well, it means unlikely or highly unlikely depending on the consequences of the event. That's the risk scheme that I talked about earlier.

So, for example, if the consequence to the worker was to be 35 rem from the event, that's an intermediate consequence event. It should be shown to be unlikely. The applicant defines that, but they need to give us assurance that, in fact, that event would be unlikely.

MEMBER ROSEN: They tell you what things they're going to do to make it unlikely?

MR. BROWN: That's right.

MEMBER ROSEN: And you said, okay. What would you do now to make it highly unlikely? They'd have to tell you a few more things?

MR. BROWN: Well, more robust principal SSC that achieves that goal in and of itself.

MEMBER ROSEN: I've been dying to ask this question all day and I guess I'll ask it now. What's the directional between likely and highly unlikely?

MR. BROWN: I think Wes would actually be willing to address that question.

CHAIRMAN POWERS: Pretty damned unlikely.

MR. WESCOTT: Yes, this is Rex Wescott. Our SRP defines the value of 10^{-5} for highly unlikely. I think we had something like four times 10^{-3} for unlikely. But actually in looking at most of these actions and whether the mitigation strategy, or prevention strategy is going to be highly unlikely, we didn't attempt to get tied up in numbers.

Basically, it was looking at the robustness of the type of procedure, whether surveillances could be performed and thus increase the availability, but we didn't try to get into worry

about whether that was four time 10^{-5} or, you know five times 10^{-6} or whatever like that. But I think actual numerical reliabilities we make, we're more likely to get into at the OL stage. I would remind you too that -

MEMBER ROSEN: You do have a number in mind as a threshold, but you don't calculate the actual circumstance, because you don't do a risk analysis. And so, I'm left, of course, with the question that one concludes. Are you above or below the threshold of quantitative analysis?

MR. WESTCOTT: Well, Part 70.61 doesn't specify a number in itself. The number comes out of our SRP, and in fact, 70.61 also allows a qualitative, as opposed to a quantitative approach.

MEMBER ROSEN: I'm aware of that. I'm just saying, leaving the regulation aside, and granting that you're within the regulation, it doesn't require a quality. I still don't know how you make a decision? Say okay, that's enough. It's highly unlikely, or that's not enough.

MEMBER KRESS: There's some criteria. You kind of missed it.

CHAIRMAN POWERS: Steve, you'd be amazed at how many of us make decisions without having

quantitative criteria.

MR. BROWN: Gary, would you like to say something in this regard.

MR. KAPLAN: Gary Kaplan. I have a couple comments. First, with regard specifically to the assembly drop. Of course, we can't make those highly unlikely because the likelihood of a drop is 10^{-5}. So for that specific case, we basically said, we'll do what we can to prevent that, but the strategy is for the operator to leave the area, and we've done consequence analysis that shows a low consequence of that basically.

So for that specific case, we're not attempting to say we prevent those events, 10 CFR 61. In general, for all the site and facility worker, and public cases, we did not take credit in any case for saying an event, the consequences were intermediate, and therefore we only have to make the event unlikely.

In all cases, if it exceeded the low consequence threshold, then we said we're going to make the event highly unlikely, because the range between 25 rem and 100 rem is too narrow. There are too many uncertainties in the questions you've been asking today, so we didn't want to credit that.

So, the only place where it makes a

difference is in the environmental compliance calculation, where that specifically is if you exceed that requirement, then you have to make the event unlikely. There's no requirement to make that event highly unlikely at that point.

MEMBER KRESS: And the other part of his question was, how do you know that it's highly unlikely? That's some deterministic rules that you go by.

MR. KAPLAN: That's right. Well, the rules we talked earlier were we meet single failure criteria to start with. We apply NQA 1 to all those IROFS. WE apply the code and standards that were describing and discussing with the staff to agree on to get a certain reliability of those IROFS, and also we are going to describe how to detect failure of those IROFS, so we'll know if we're surveiling them weekly, monthly. We'll be able to describe that.

From that, you can on simple systems, you can easily show that you meet a very high reliability for that system. For more complicated systems, such as like the HVAC system, those we've committed to doing additional quantitative analysis to support the deterministic analysis.

MEMBER KRESS: Using a fault-tree process?

MR. KAPLAN: Or something similar to that, that's correct, what's appropriate for the system.

MEMBER ROSEN: And you can detect the incipient testing a lot and you have high quality equipment because it's NQA 1, you said?

MR. KAPLAN: That's right.

MEMBER KRESS: And you have redundancy problems?

MR. KAPLAN: And we meet single failure.

MEMBER ROSEN: And you meet single failure, but that clearly, we know that all, almost all high consequence events are a result of multiple failures of varying kinds, human and equipment.

So just meeting a single failure criteria is not much comfort, because if you look at the history of events that we know about, that have been bad enough and people have written up and new LARs and that kind of thing, there are always things that had more than one thing happen that go wrong. So in meeting the single failure criteria is a very low threshold to serious events.

NQA 1, yes that's a quality standard, but in another venue of mine, I know from looking at a lot of data that high quality industrial equipment and safety-related equipment, equipment that's been bought

to the equivalent to NQA 1, has the same reliability. NQA 1 doesn't confer any special additional reliability. So that's also not of much value in terms of better. It's not any additional value beyond specifying and buying and properly maintaining good quality industrial grade equipment.

MR. HASTINGS: But don't exclude the applicant - this is Peter Hastings. Don't excude the applicability of reactor type engineering standards to the design and specifications of those systems that are then procured and maintained under NQA 1. It's the combination of those two that get you to the kind of reliability indices that are indicated in the standard review plan, Appendix A, as getting you to highly unlikely with the appropriate single failure treatment.

MR. KAPLAN: And again, I'll reiterate, for those events that have the opportunity to impact the public, we've also committed to an additional analysis to demonstrate that the event is highly unlikely and not just rely on qualitative measures.

MEMBER ROSEN: So the sanctions, what makes it highly unlikely is not a detailed look at the sequences, definition of split fractions and calculation of the various sequences for that

particular accident. That's not how it's done because that's PRA.

What's done here is simply looking at the defenses, and saying with the high quality equipment, it meets single failure criteria, and we test the stuff so we know it will work, and therefore it's highly unlikely.

MR. KAPLAN: This is Gary Kaplan again. For each event in the ISA, we are going to identify the event sequence, so we will spell that out.

MEMBER ROSEN: You're almost there. All you need to do is put a split fraction on it and calculate and run it through and you're there. But it's a religious persuasion on my part and not on your part. You won't do it, and I would insist that you do.

MR. KAPLAN: For most of our events, it's relatively simple, because they're simple events.

MEMBER ROSEN: No, you don't need a computer code for most of these events.

MR. KAPLAN: I could diagram for you right now split fractions. We could argue for a few minutes about the split fractions, and when we're done with that argument, we'd calculate it by hand and that would be the end of it. It seems like an easy thing to do, but I won't argue with Part 70. That's not my

job.

MR. WESCOTT: Next slide please.

MEMBER LEVENSON: I got told when I made that same statement a few weeks ago at a different meeting, Steve, I should have raised that question when Part 70 was being reviewed.

MEMBER KRESS: You weren't there when they reviewed it.

MR. BROWN: In conclusion, these are the open items we have for radiological consequences. Yes.

MEMBER LEITCH: A question. At our meeting in mid-November, it was indicated that there were 22, I think, accidents involving high enriched uranium facilities.

MR. BROWN: Criticality events are you referring to?

MEMBER LEITCH: Many of those results in personnel injuries, and I guess one or two fatalities. And, this facility is somewhat comparable to those facilities in terms of risk. I'm wondering, have we gone back over the available literature, and I think these numbers are worldwide, so maybe not all the literature is available. We could learn from these 22 episodes.

MR. BROWN: I just want to be clear. These are criticality episodes that you're -

MR. GITTER: They're all criticality.

MEMBER LEITCH: They were all criticality.

MR. GITTER: This is Joe Gitter. We commented on that in the November meeting when we talked to you. We don't have anybody here today to talk about criticality safety, but the answer to your question is yes, we are aware of those events, and I think all but one of those events occurred in an aqueous solution.

So we are aware of the concerns with criticality safety, especially with aqueous solutions, and we have tried to learn from those lessons in reviewing the safety of the facility.

MR. BROWN: Just in conclusion, these are the open items we have for the consequence assessment aspect of the safety assessment, though we've requested clarification from the applicant on how the facility worker becomes aware of a sintering furnace, loss of confinement event.

The staff has not accepted the applicant's use of 99.99 percent with HEPA filter system efficiency during severe conditions, and we're still reviewing the safety assessment for environmental

protection.

My last slide there is just the same thing in a different way. We're expecting at this point that the applicant provide some clarification on the first two items, and the staff continues its review on the third item. Any additional questions?

MEMBER KRESS: How do they justify the second bullet?

MR. BROWN: At this point, they haven't provided adequate justification for using that. I think Sharon may speak a little bit later about set loading analysis for fires and that sort of thing. Tim, do you have anything to add, how they will justify that?

MR. JOHNSON: Well, what DCS - I'm Tim Johnson. What DCS has indicated is they're going to try to justify the use of 10^{-4} leak path factor by trying to recalculate what the environment would be in the event of a fire at the HEPA filters, in terms of temperature, chemical effects, soot loading, et cetera. And what they've said they're going to try to do is indicate that that environment would be benign and therefore would justify the use of a higher removal efficiency.

MR. BROWN: Okay, thank you. Alex.

MR. MURRAY: Thank you very much. My name is Alex Murray. I'm going to give a quick discussion about some of the chemical safety findings at the facility.

Can I have the next slide, please. I'm going to discuss a little bit about the previous ACRS meeting and the basis and conduct of SER review. Most of my time, I'm going to be discussing some of our main findings, and some of the significant open items, including red oil.

Next slide please, when you're ready. At our previous meeting last November, we discussed the process of the proposed principal SSCs and design bases and status of the review. We had noticed some specific issues. I've listed them here, admin controls, the high alpha waste area, the electrolyzers, red oil again, and U assay isotopic dilution.

Just on the subject of the U assay dilution, that is now being followed via the criticality safety reviews.

MEMBER ROSEN: Could you assume I know nothing about red oil and bring me up to speed, because you'll be so close to being correct.

MR. MURRAY: I have a discussion further on

and if that discussion is not adequate, I'm more than willing to go to any breadth or any depth you all would desire.

CHAIRMAN POWERS: With that challenge, let's go into the details of the molecular structure of red oil, shall we?

MR. MURRAY: When we get there. If I could have the next slide please. This is just a very quick overview of how we have done our review, a basis. We have documentation from the applicant in the construction application request or CAR. We requested additional information RAIs. The applicant responded. There have been a number of rounds of communications on some of those. The applicant has submitted some information on the docket.

We also have looked at information that's being supplied and discussed in response to the environmental report and environment impact statement activities, and also issues and documentation provided at public meetings.

We have used the standard review plan NUREG-1718 as principal guidance for the chem safety review, 1718 does its best to fill in the blanks as to what is appropriate for both construction permit stage, which is what we're looking at now, and

subsequent operating license review.

We also have taken a look, if you will, outside the proverbial box. We've looked extensively at open literature, including experience from DOE and chemical process industry and other nuclear experience. We also have performed a number of independent calculations.

We also have looked at a number of the different codes, which have been proposed by the applicant in the CAR, as well as some other codes and standards which are out there, ASME obviously. Some of the NFPA codes have applicability or potential applicability.

CCPS is the Center for Chemical Process Safety and we have a number of guidance documents. They are from the American Institute of Chemical Engineers. Next slide please.

MEMBER LEITCH: Alex, just one more time so I'm sure I have it straight. What we're talking about here as far as chemical safety is the original one feedstock scenario?

MR. MURRAY: That is correct, yes. Yes, I do have a little comment later on about the change, yes. Okay. Now our main findings from chem safety, these are essentially the same as at our November

meeting. There are relatively few principal SSCs and design bases identified for chemical type or chemical initiate events.

WE have also found that in general there's a lack of specificity about some of these PSSCs and design bases. For example, we found things like prevent explosions, which we think is a very noble design goal, but as safety reviewers, the staff would like to see something prevent explosions by something, such as preventing hydrogen accumulation. There might be a maximum value associated with that hydrogen accumulation, et cetera.

As we have reviewed the applicant documents, the staff has come to the conclusion that more PSSCs and design bases may actually be needed. As I say, we have looked. We've seen failures such as limited by PH control, you know controlled by avoiding excessive voltage, and as we read into some of the functions, which are mentioned in the different documents, we've come to the conclusion, these potentially have safety implications.

And finally, a number in the chemical area, a number of admin controls, which assume a great deal of importance. Obviously, the chemicals do have a lot of sampling and laboratory analysis. The staff

is concerned that some of those could be implemented to give a more engineered approach.

Next slide, please. And I'm going to give a brief overview and discussion of each one of these on the following slides. These are the six issues, areas of issues which have percolated as being more significant. There are other open issues in the chemical area. I've listed these.

There's the obvious red oil issue, which is the tributyl phosphate organic compound, nitrate, nitrate media concern. There's the hydroxylamine nitrate hydrozine area. We have some questions about open items in the electrolyzers in dissolution area. Some of these include specific corrosion events. There's the waste area, particularly the high alpha waste area.

We have some open items concerning chemical releases and modeling of those chemical releases and then we have a number of open items in the sintering furnace.

Earlier on today, it was promised that I would give the where all and be all about corrosion, and potential corrosion are open items. The applicant in the CAR has identified a corrosion monitoring program as a principal SSC, okay.

The staff has reviewed the aspects of that corrosion monitoring program and from our review, we've come to the conclusion that that is a general corrosion monitoring type program in some specific process areas, such as the electrolyzers. The staff has some open items regarding specific corrosion items that lead to or initiate events.

If I could have the next slide please. Here we go, red oil. I should have worn my red sweater for this one. Red oil phenomena, the applicant has adopted a prevention strategy, and they have proposed a single design basis, based upon keeping the temperature below 135 Centigrade.

They have not proposed any direct measurements, control or cooling of the areas where red oil could occur or the phenomena could occur. The staff has requested additional information from the applicant via RAIs, and in office document reviews.

CHAIRMAN POWERS: How does this strategy compare with the strategies adopted within DOE for avoiding the problem of red oil?

MR. MURRAY: Well, I ws going to get to that, but I can discuss that right now.

CHAIRMAN POWERS: If you were going to get to it, that would be fine.

MEMBER ROSEN: I think for me, you need to step back to tell me what is red oil.

MR. MURRAY: I will do that.

CHAIRMAN POWERS: It's a question many, many of us have asked for several years. What exactly is red oil?

MR. MURRAY: Red oil is just a collective term that is given to nitrated organic compounds that can occur in Purex and other solvent extraction systems.

MEMBER ROSEN: Nitrated organic compounds.

MR. MURRAY: Yes. The catch is you have at least one nitrate functional group in a molecule that also is a fuel.

MEMBER ROSEN: I know what nitrate is. Now you said organic compounds. That covers a fairly wide range of -

MR. MURRAY: Typical organic compounds are things like tributyl phosphate. One of the degradation products of tributyl phosphate is actually butyl alcohol. It can become nitrated to butyl nitrate.

MEMBER ROSEN: So it's at least those two or three compounds.

MR. MURRAY: That's correct.

MEMBER ROSEN: Associated with the nitrate ions.

MR. MURRAY: Yes.

MEMBER ROSEN: Something called red oil, is it red in color?

MR. MURRAY: It's given the term red - it's named red oil because in a number of the events, which we'll get to momentarily, after the event, a red colored substance was found. It was found to be a mixture of various nitrated organic species. Those I mentioned, also some nitrated solvent products, some allyl cyclic nitrates.

CHAIRMAN POWERS: Let me just make sure Steve understands. It's not associated with the nitrate ion. It's the nitrate functional group.

MEMBER ROSEN: The nitrate functional.

MR. MURRAY: Which is within the molecule.

CHAIRMAN POWERS: It no longer -

MEMBER ROSEN: Well, it has the nitrate ion complex that's something else.

CHAIRMAN POWERS: No, it's actually chemically reacted. It no longer looks like an ion anymore.

MR. MURRAY: Yes. It can be within the compound, so as I just said, you have a fuel and an

oxidant within the same compound, within the same molecule.

CHAIRMAN POWERS: Usually we call that an explosive.

MR. MURRAY: Yes.

MEMBER ROSEN: It forms into blocks?

MR. MURRAY: Yes, but this is a liquid and it has been found many times it is also the red oil has been found in some of the laboratory experiments on the subject.

MEMBER SIEBER: Used to replace gasoline.

CHAIRMAN POWERS: So far so good.

MR. MURRAY: So far so good. Okay. The staff has reviewed this area extensively. We have found from the literature review and the experience from DOE and other nuclear facilities that red oil reactions essentially occur when you have organic compounds in contact with nitric acid or nitrate media such as sodium nitrate or other heavy metal nitrates. Yes, sir.

MEMBER ROSEN: Does this mean that the red oil reacts with some other organics, or is this statement meant to mean that's how you form the red oil?

CHAIRMAN POWERS: It's how you form it.

MR. MURRAY: That is how you form the red oil, yes. Okay, and again the organic compounds are those that are typically found in PUREX type processing systems. The proposed facility has a PUREX solvent extraction system in it, and this is in the aqueous polishing area. Okay.

Over the past 50 plus years of the nuclear industry, there have been several reported explosions that have occurred, and which have been attributed to red oil. I've listed some here that happened at Hanford, out in Washington State, at a DOE facility out there. I believe it was PUREX.

That's happened at the Savannah River Site. In fact, the Savannah River Site has had two explosions that have been attributed to red oil. Most recently, it happened at the Tomsk Reprocessing Plant in the former Soviet Union. All of the events have involved a rapid temperature and pressure rise, equipment damage in the case of Tomsk. There also was a significant contamination outside the building.

Because of all of these events, there has been extensive lab work, obviously after the event has happened in the 1950s, 1960s, and again in the early 1990s. The finding from all of this experimental activity has been that it is difficult to completely

replicate the phenomena in the laboratory.

Different aspects of it have been duplicated. The red oil itself has been made. Over-ressurization has occurred. The hardest part, I think has only been duplicated once has actually been the true explosion.

CHAIRMAN POWERS: It seems to me you have characterized the extensive work, and I'll admit there's a lot of work. But do you think they have really gone after this question.

If in the kind of way you would go after a real chemical problem, it seems to me most of the work has been a fairly empirical, put the stuff together, heat it up and see if you get the stuff to form and go bang and things like that.

I mean I have not seen high colored synthesis, chemical characterization techniques applied to this. Even in the stuff in the 1990s, it looked to me like it was, you know, fairly empirical kind of examination.

MR. MURRAY: Well, actually yes and a no, because the complete phenomena has not been duplicated in the lab, yes you know it is more empirical. The guidelines, which have been developed based upon the laboratory tests are empirically based.

On the other hand, there are some aspects of the phenomenon for which kinetic equations have been developed, which have been found to be appropriate in some regimes, operating conditions, and what have. Some of the intermediate species have been identified. Some are quite unusual, quite complex.

So I would say, if I look back at the data, the information that's being reported, I would say the work progressed so far, but did not come to a definitive conclusion, equation. You do this and you will avoid it period.

CHAIRMAN POWERS: May I? It seems to me you pretty well characterized it. Every time it happens, people run off and do a bunch of stuff, and then they come up and say, this is complicated. And they say, if we just put these operational controls in, we'll get away from it, so quite working on it. And then something else happens and then it starts all over again.

MR. MURRAY: Yes, that is correct. I will mention, there is some commonality. For example, the event that occurred at Tomsk was theorized by a researcher in the early 1960s, so you know there is.

CHAIRMAN POWERS: So, DOE sent a team out to Tomsk.

MR. MURRAY: That's correct.

CHAIRMAN POWERS: And looked at it closely and came back and said yes, we would have not done things this way is pretty much what they said.

MURRAY: yes, and they came out with some recommendations and guidance. The Russian team, which was reviewing the effects of the Tomsk explosion also came up with guidelines and recommendations, which were actually more restrictive than DOE recommendations.

MEMBER ROSEN: And how do these compare to the applicant's 130° C?

MR. MURRAY: Well, let me discuss that right now. The Russian recommendation is to have a temperature less than 70° Centigrade. At the accident at Tomsk, the highest measured temperature in the tank, which actually exploded, was approximately 50° Centigrade.

As part of the accident reconstruction analysis, the Russian and American team that reviewed the event concluded that maybe there was a portion of the tank, about 80° or 90° Centigrade. So there is a temperature difference.

CHAIRMAN POWERS: But it's also worth pointing out that Tomsk chemistry is different than

PUREX chemistry.

DR. MURRAY: Tomsk actually was using a PUREX process.

CHAIRMAN POWERS: And the pit chemistry is different.

MR. MURRAY: It was more of a true reprocessing plant. We did have fission products present and what have you. Now as part of the guidance, in addition to temperature, both DOE and the Russian teams were coming in with recommendations for monitoring and/or controlling other parameters, and these included such things as a separate organic phase, monitoring some of the organic concentration, some of the nitrate ratios and what have you.

So there are recommendations out there in the literature, which are different from what has been proposed by the applicant.

MEMBER ROSEN: And more restrictive. The applicant's proposal is less restrictive than what's in the literature in terms of standards?

MR. MURRAY: Yes.

MEMBER ROSEN: They would allow the process to go to much higher temperatures?

MR. MURRRAY: Yes, 135, 70 or 90 Centigrade.

CHAIRMAN POWERS: Let's turn - those are recommendations?

MR. MURRAY: Those are recommendations, yes.

CHAIRMAN POWERS: Let's turn to what's actually used at Hanford and Savannah River. Who do the applicants limit compared with what's actually in force at Hanford?

MEMBER ROSEN: It's kind of hard to say in force at Hanford, because they're not doing anything like this.

CHAIRMAN POWERS: They still have an evaporator that still can operate and what not. I mean isn't it just the same criterion there?

MR. MURRAY: The work that was performed in the early '90s basically was imposing additional criteria beyond what the applicant has to host. Now the actual bio for the Savannah River separations canyons where they use the PUREX process is actually UCNI.

MEMBER ROSEN: It's actually what?

MR. MURRAY: UCNI, Unclassified, controlled nuclear information by DOE.

CHAIRMAN POWERS: Well, my recommendation and I can not swear to it, and you never know what

gets changed at Hanford, is that Hanford was just a flat temperature limit on their evaporators.

MR. MURRAY: Initially, Hanford and Savannah River did just have a flat temperature limit, and this was actually repeated in some work, which was performed at Oak Ridge in the 1980s, but the recommendations in the 1990s were to impose these other requirements, monitoring variables.

CHAIRMAN POWERS: So the recommendations you speak of, is that the stuff that came out of Los Alamos work?

MR. MURRAY: Some of it by Los Alamos. Some of it was the Savannah River Site personnel. Some was by the people at Clemson.

CHAIRMAN POWERS: Okay.

MR. MURRAY: Next slide.

MR. KAPLAN: Alex, Gary Kaplan. Can I give a two-minute update?

MR. MURRAY: Sure.

MR. KAPLAN: On what we're doing at this point, so we don't leave red oil alone at this point. There's lots and lots of information about red oil out there, and I think Alex has given part of the picture, and we are working on trying to put the whole picture together before we present another part of the story.

We're gathering the DOE experts together and we've got dozens of documents, and in the '90s they've done lots of research actually at the Savannah River Site, and clearly what we're doing at our facility will be able to show clearly that it's highly unlikely to have a red oil event.

We're just going to put that documentation together. It should be ready within three or four months.

CHAIRMAN POWERS: The problem is everybody that's ever built a facility at any one of these periods of time has put together all the documents and sworn on a stack of Bibles that it's highly unlikely we'd get a red oil event until we did.

MR. KAPLAN: Right. The early events that Alex described, they didn't even know it existed, so the first few.

CHAIRMAN POWERS: That was in the '50s, '49.

MR. KAPLAN: Right, and the one in the '90s, people knew would be a problem, the one at Tomsk if they did what they did in Russia, and clearly we're not going to leave things in our tank for two years and then add other stuff to it, which is what basically happened in the Tomsk incident. So, we will

be providing a lot more information on this subject to the NRC.

MR. MURRAY: Okay. Let me just mention in the MFFF MOX facility, several areas which have the potential for red oil, I've listed them here. There are actually three evaporators in the proposed facility. OML stands for Oxalic Mother Liquor. There are the tanks associated with some of these evaporators. There's also a calciner, which could be impacted by the red oil phenomena. We have to see about that a little further, and there are the purification and solvent recovery areas as well. Next slide, please.

MEMBER SIEBER: I take it these evaporators are the type that use subatmospheric to keep the temperature in check, as opposed to steam type of evaporators, is that correct?

MR. MURRAY: They are actually stem type of evaporators.

MEMBER SIEBER: Oh, they are.

MR. MURRAY: There is some question, will they actually operate under subatmospheric conditions? Gary, do you want to comment?

MEMBER SIEBER: That keeps the temperature down if you -

MR. MURRAY: That's correct.

MR. KAPLAN: They run around 130, 140.

MEMBER SIEBER: Fahrenheit?

MR. KAPLAN: Centigrade.

MR. MURRAY: They will be under pressure. That will be above atmospheric pressure. Staff conclusions on red oil, single temperature control may not be adequate, okay. Additional principal SSCs and design bases may be needed, and we are waiting additional information and documentation from the applicant that Gary just mentioned. Anything else on red oil before I move on?

CHAIRMAN POWERS: A comment that has to be one of the most seductive problems around. I mean you could argue over this forever. You just get immersed into it. After about six weeks of debating over it, you begin to appreciate the people that just find an operational regime where it doesn't happen and work there.

MR. MURRAY: Yes, and those are essentially the recommendations from the DOE and Russian review teams in the early '90s.

CHAIRMAN POWERS: I think you don't want to discount the fact that we don't have a lot of gamma high intensity emitters in this system. I think that

has been a factor to consider in forming some of these compounds.

MR. MURRAY: Well, the Russians actually did a lot of work in their reconstruction up at the Tomsk incident, where they used active solutions and they defined some differences, compared to the radioactively cold test.

Okay, I'm moving on to hydroxamine nitrate and hydrazine now. This is another area. The applicant has identified HAN and azide hazards. They are proposing primarily admin controls to control some other concentrations of the species. Other PSSCs and design bases may be needed. As we have reviewed the documentation, the staff has found terms like we control the ph to avoid this or so that this doesn't happen.

We have looked at various areas of the facility that this could impact, and we've noted the purification solvent, recovery, and waste processing areas. Next slide please.

CHAIRMAN POWERS: Do you have some documentation that I probably have. Can you point to me where I should read and understand more on this ph control business?

MR. MURRAY: There has been extensive work

by DOE after the middle bullet here, the 1997 explosion, which discusses a number of the ph control parameters. It's also discussed in the accident analysis reports on Hanford proper, and there's a pretty detailed report on that.

CHAIRMAN POWERS: If you'd find those things for me, I'd like to understand that a little better.

MR. MURRAY: Okay, and if you can't find them, I'm sure we'd be happy to supply them.

CHAIRMAN POWERS: Okay.

MR. MURRAY: I want to point out as we go HAN and hydrazine, staff indicates that there have been several events at DOE facilities and manufacturers over the last ten, 20 years. I've noted the 1997 event, which happened at the plutonium finishing plant at Hanford.

This sort of caught everyone by surprise. This was a mixture which was left in a tank, and after about two years, it concentrated just by the breathing effect through the plant ventilation system.

It occurred during the warmup in May of 1997, and the event was sufficient to completely damage the tanks, the associated or nearby tanks in the room of the facility. It blew a hole in the wall

and also dented the roof. And pictures are available in the DOE documentation. Interestingly, perhaps 30 gallons of material involved.

CHAIRMAN POWERS: To say that it caught everyone by surprise is a little bit overstatement. The DOE suggested that they worry about that in 1986. They shut TFT down. They had problems with the storage of that materials.

MR. MURRAY: Yes.

CHAIRMAN POWERS: And it was going to decay their - the system was going to decay and they were going to be evaporation hazards developing.

MR. MURRAY: Yes. And I should add that the DOE investigation of the Hanford incident actually led to a comprehensive set of guidelines for handling Han, and this is actually accomplished at the DOE/EH report. Next slide please.

The staff concludes that the proposed admin controls by the applicant may not be adequate at this time. We conclude that additional SSCs and design bases may be needed, and we are awaiting additional information from the applicant. Next slide please.

Another area where we have some significant open items are the electrolyzers. It

turns out that there are two areas in the MFFF. Electrolyzers are used. They're used to generate a silver plus 2 ion, which assists with the plutonium dioxide dissolution and in a separate part of the facility, electrolyzers are used to recover and recycle the silver.

The applicant has identified an over temperature hazard potentially leading to a potential fire, and has proposed a single PSSC temperature control, using a 770° Centigrade design basis value.

The applicant also, in a separate part, has a hydrogen limit of one percent, based upon radiolysis from plutonium. On this slide, we get the staff conclusions. The staff has reviewed this area and concludes that other PSSC and design bases may be needed. These could include something related to plutonium feed specification, air purge, something to do with isolation.

Some of these items are mentioned in the applicant's documentation. Their functions appear to be safety related, but at the present time, the applicant has not identified or clearly identified that these truly are or are not safety related. And we essentially are looking for some assurance here that the system will shut down as planned, i.e., hit

a temperature of 70o C, shut down, and that the temperature actually goes down and the fire does not occur before the temperature increases, or you have some sparking because of shutdown or what have you.

We also are concerned about some other potential hazards associated with the electrolyer. These include generation of hydrogen electrolytically in the applicant documentation. There's a mention that the hydrogen generation rate is limited by voltage; however, that is not identified as a design basis or PSSC control that is not identified. We are waiting additional information from the applicant on that subject.

Next slide, please. Okay. The waste area. We're basically in the waste area. The staff has reviewed this and has identified some open items concerning the high alpha waste system. We conclude that some additional PSSCs and design bases may be needed. We note that inventories have not been identified at this time.

As discussed this morning, the waste management program is changing, due to the changes in the ultimate feedstock materials. We do not know what the impact will be on the waste area, and we will reevaluate this area after we receive additional

information from the applicant on the impact of the changes.

Next slide, please. Chemical release modeling. The NRC -

MEMBER LEITCH: Excuse me. This waste area you just referred to.

MR. MURRAY: Yes.

MEMBER LEITCH: Is this part of the MOXX facility or is this -

MR. MURRAY: This is the waste unit, which is within the MFFF.

MEMBER LEITCH: Okay.

MR. MURRAY: this is not the waste area or waste processing areas at the Savannah River site.

MEMBER LEITCH: Okay, thanks.

MR. MURRAY: Chemical release modeling. The NRC regulates chemical facts upon radiological safety. The impact of chemicals upon radiological safety is under review. At the present time, the applicant has identified the emergency control room and its air-conditioning or air treatment system as a PSSC, and that personnel in the emergency control room would be protected from chemical events.

However, the staff review indicates that there could be other operator safety actions related

to rad safety outside of the control room that may be needed and these have not been specified, and we are waiting additional responses from the applicant on the subject.

At the present time, the applicant has not identified under any principal SSCs or design bases for chemical releases and events, and the staff review has noted that there were several chemicals on site and I've listed these, which could exceed safe limits for the workers, and when I say safe limits, we are generally focusing on the emergency response planning guidelines type of limits, such as TEELs or ERPGs, usually at the TEEL 3 or ERPG 3.

Next slide, please. Sintering furnace. The staff review notes at the sintering furnace involves high temperature operations, typically above 1,500 Centigrade, with ARGON hydrogen gas mixture, with water cooling. The water cooling, as we understand it, will now be an external water jacket around the equipment. This has a general hazard of fires and explosions.

The applicant has identified several gas sensors as PSSCs. The staff found that the hydrogen flow was not terminated under all normal conditions, and this has raised some open items related to

potential explosions and that we also know that additional PSSCs and design bases may be needed to address steam explosions.

In the documentation provided by the applicant, there are a number of items which limit water ingress or control pressure rise in the water steam jacket system, which appear to have a safety function, which are not currently identified as PSSCs or with design bases barriers.

CHAIRMAN POWERS: Milt, do you want to ask your questions about the ARGON hydrogen mixtures that are going to be used?

MEMBER LEVENSON: In response to Question 1241. This is a prior paper. It says the ARGON hydrogen mixture will be controlled to less than or equal 91-9 ratio. Should that really be more than, because less than allows you to go to pure hydrogen, I think.

MR. MURRAY: That, I believe that was clarified by the applicant and we can ask them again. I believe that is nine percent or less hydrogen and ARGON. I see Gary of DCS behind you is nodding.

MR. KAPLAN: That was the intent. We don't intend to use pure hydrogen.

MEMBER LEVENSON: So, that's already done?

MR. KAPLAN: Yes, corrected.

CHAIRMAN POWERS: Mellencride supplies a common gas mixture that's ARGON four percent hydrogen. Why don't you just use that? It's unknown. Didn't have enough for a decent capacity for you.

MR. KAPLAN: Gary Kaplan. The nominal range, I believe, is five percent is what they use for the process, but they didn't want an operating range of one to nine percent. So for the process reasons, I'm not the process expert, they want to use about five percent.

CHAIRMAN POWERS: The nice thing about a four percent hydrogen ARGON mixture is you're absolutely guaranteed it will be in the combustion range. I mean it is -

MR. KAPLAN: That's correct.

CHAIRMAN POWERS: I mean, and it's usually plenty reduced for if you're just adjusting stachiometry a little bit. Why ask for problems.

MR. MURRAY: Yes, that is correct. If I could have the summary slide please, next one. And just summarizing, the staff issues and findings are similar to our previous meeting from last November. We have identified open items in the chemical safety area, and the staff will review additional responses

from the applicant as they are submitted. And that concludes my presentation. Any other questions?

MR. JOHNSON: I had a quick question from the I&C perspective.

MR. MURRAY: Certainly.

MR. JOHNSON: When you talk about PSSCs, are those implemented by safety controllers, PEP controllers, emergency controllers, or some other thing that's maybe not an active instrumentation and control system at all?

MR. MURRAY: In the documentation that we have, the parameters which have been proposed typically would be controlled via what is coded safety I&C system. And we had some questions on it which were brought up by Rex this morning. So we do have some open items on that, but they are in a different area, other than chemical safety. Yes.

MEMBER LEVENSON: I just have a quick question based on absolute ignorance of the system. What is the source, this is in connection with a response to question 123, what's the source of the scheme to the evaporators? The context of my question is, it says you guarantee that you don't exceed the temperature by having redundant relief valves, but if there's any potential for the steam to be super

heated, then the relief valves don't really give you control of temperature.

MR. MURRAY: I believe there's a general plan boiler, which provides the steam, but I would ask if the people behind you from DCS.

MR. TANNER: I can address that. Can you hear me?

CHAIRMAN POWERS: You have to come to the microphone, identify yourself. Go through the whole shooting match.

MR. TANNER: Are we working here?

MEMBER LEVENSON: I'll be glad to repeat the question. The response to Question 123, which had to do with controlling the temperature of the evaporator, it says there are relief valves, and therefore the temperature can not exceed what you're set at. But if there's any potential for the steam to be super heated, then the relief value per se is not enough to really control temperature.

MR. TANNER: This is Jon Tanner. You're correct, and we are aware of this, and the short answer is, the relief valves are not the safety items. The way that particular steam system works, we're buying Savannah River steam and running it through a reboiler. Coming off that reboiler, it enters into

the evaporator, and the original design concept, a long time ago, was to put the two relief valves out there.

You're correct in the statement that the super heating, if it happened, would not work. So what we're going to do, the next step was to put a couple of temperature sensors in there, separate, independent, redundant and isolated, which would cause the steam to - the steam supply from Savannah River to be turned off. In fact, there would be two stop valves installed.

MEMBER LEVENSON: What caught my attention is the statement here is the temperature control of the evaporator is accomplished by relief valves.

MR. TANNER: Well, again, that was in a very early state of affairs.

MR. HASTINGS: Yes, this is - Peter Hastings. This is an evolving issue and we haven't had the opportunity to close the loop on the documentation on this, the evolution of design to date.

MR. MURRAY: Any other questions?

CHAIRMAN POWERS: You're going away from us with the obligation of providing us a little more documentation on the Han issue?

MR. MURRAY: I'm sorry, repeat that?

CHAIRMAN POWERS: Some documentation on the ph control in Han? Is that the one we asked about?

MR. MURRAY: Yes.

MR. KAPLAN: We can provide that to you, yes.

CHAIRMAN POWERS: I appreciate that. Okay, if there are no further questions, Mr. Speaker, I propose that we take a break until three o'clock.

(Whereupon, the above-entitled matter went off the record.)

CHAIRMAN POWERS: Let's come back into session and discuss something that's really important, which is fire safety. This is an area that's of particular interest to the subcommittee, and what we'd really like to understand is the design bases for the fire safety program at the facility. So, Sharon, I'll turn it to you.

MS. STEELE: Okay, thank you. Good afternoon. My name is Sharon Steele, and I'm the Fire Safety Reviewer for the MOX Project. Today, I will discuss the MOX 550 strategy, the basis and conduct in performing the 550 review, and I will present the main fire safety findings, along with the unresolved issues.

The event categories for - or event

groupings are identified in the preliminary event hazards, and I think Rex went through that earlier. Fire safety develops for each event category and the even categories are based on potential, common, prevention and mitigation features for radiation protection, such as fire areas, confinement zones and confinement stereotypes.

There are six main fire event categories and they're listed here. I don't know if you can see the ones, but you have your printouts. Basically, we have the DCS looks at fires originating in the AP process cells, the aqueous polishing process cells, the size in glove boxes and the C2 area of the aqueous polishing MOX processing areas, and it looked at fires in the C2 areas, which is a part of the tertiary confinement level, where there's little contamination risk.

Just for background, I said what the C2 area was. C3 is the secondary, provides secondary confinement and that's where you'd have like your process rooms and so on. And C4 is the primary consignment, where the spaces and codes like glove boxes and vessels would be involved.

CHAIRMAN POWERS: So this nomenclature is to help us out. C2 is the tertiary confine and C3 is

the secondary confinement.

MS. STEELE: I guess I probably should have stuck with just one set of nomenclature.

CHAIRMAN POWERS: That's okay.

MS. STEELE: But the one that we normally use is not very clear, so you get the benefit of both.

MEMBER SIEBER: I take it each of these confinement areas is a separate fire area with fire barriers?

MS. STEELE: Yes, they could be.

MEMBER SIEBER: But not always?

MS. STEELE: Right. You could have fire areas within a confinement, a particular confinement zone.

MEMBER SIEBER: Okay.

MS. STEELE: And the confinement zone, confinement area should be bounded by fire barriers.

MEMBER SIEBER: Okay.

MS. STEELE: And it could include the HB, the -

MEMBER SIEBER: The ventilation systems.

MS. STEELE: Right, as well.

MEMBER SIEBER: So the glove boxes themselves are three-hour barriers?

MS. STEELE: No, but the globe boxes

themselves are -

MEMBER SIEBER: They're a confinement.

MS. STEELE: Primary consignments for radioactive material purposes. Did I say that correctly or does someone want to?

MEMBER SIEBER: So they aren't in themselves fire areas with barriers? So if you got a glove box fire, it could spread?

MS. STEELE: It could spread to the next area.

MEMBER SIEBER: To another glove box.

MS. STEELE: Well, there are features that would mitigate that. For example, glove boxes have process doors that are rated. It depends, if they're going through another fire barrier to be rated at the rating of the barrier.

But if you had a breach of the glove box, you would have the materials being released to the C3 or the secondary confinement area. But that would be confined within a fire area, which is bounded by fire barriers.

MEMBER SIEBER: Okay.

MS. STEELE: Then there would be another set of - another event category. The fires that occur external to the facility itself. And then we have

facility-wide systems, a facility wide system event category, which involves fires - for example, fires propagate through dumatic sampling tubes that will be on fire barriers, and it could involve portions of the facility that contain radioactive materials.

And then you have, the last event category is the one where a fire would begin in a particular fire area and spread to the next successive fire area and potentially involve the entire facility.

Oh, okay, now I get to my table. Let me set this up. The table, you have a copy of it in your set. The attempt here is to give a bird's eye view of all the primary, principal SSCs that could be applied to each of the six main event categories.

One thing I didn't mention previously. In the C2 area, divided into subcategories, depending on what confinement areas are there, and so you have canisters and fuel rods, transport casts and so on having, being a subcategory or a subcategory within that confinement area.

Once the strategy - to implement the safety strategy for each event group, the principal SSCs are identified. First of all, if you'll notice, the fire barriers are proposed as a principal SSC for all event categories.

The fire barriers themselves are a minimum rated at two hours. They're composed of non-combustible reinforced concrete, and it's really a fire barrier system, which involves self closing doors, fire dampers, and these things and penetration seals, which would have to be maintained during the course of the facility.

To protect a lot of the confinement barriers that are found in the C2 area, DCS is proposing a combustible loading control as a PSSC, and the combustible loading controls basically limit the amount of transient and even fixed materials that could be found in the fire area.

While fire barriers themselves confine the fire to an area and also prevent it from going into another area, combustible loading controls limit the potential of the fire within the fire area. Then automatic depression, detection and suppression is proposed as a PSSC for areas that could involve dispersible fissile material, and so it's proposed with the PSSC for the glove boxes, for the C3 areas outside the glove boxes to protect a fire that could breach the glove box and vice versa.

Process cell fire prevention features is proposed as a PSSC for process cell areas, and cell

prevention features, cell fire prevention features include combustible controls and elimination of ignition sources, so that this is DCS' way to propose preventing a fire inside the process cell.

MEMBER LEITCH: That particular nomenclature, the PSSC doesn't have a yellow background there?

MS. STEELE: Right.

MEMBER LEITCH: What's the significance of that?

MS. STEELE: That's probably more artistic license than anything else. It should just be PSSC. There's no -

MEMBER LEITCH: That's significance to, like down on the right there, same thing. Okay thanks.

MS. STEELE: Where were we? With the confinement barriers in particular the MOX transport cask and the 1313 transport casks themselves are proposed as PSSCs to prevent any credible fires in the areas where there are transport casks from being, from progressing.

The C4 confinement system. We had a change to briefly discuss that in a previous presentation, but that's proposed as a method to, as

a PSSC to prevent fires that could affect the C4 final filter.

And the C4 confinement system is - the safety function of it is to remain operable while there's a fire in a glove box for example. This is achieved by - one of the ways it's achieved is by diluting air from areas that are not affected by the fire with hot gases from the areas that are affected by the fire, and with other design features, such as pre filters and spark arrestors. This assures that the final C4 filter is not impacted.

The C3 confinement system has similar design features, and its stated function is to remain operable during a fire and still effectively filter any release.

Then you have the structures of the MOX field fabrication building itself, and the emergency diesel generating building performing as PSSCs to protect from fires external to the facility. These buildings are designed to meet and exceed Type 1 type structures, which would have at least a three-hour rating on the outside for the walls, the columns, girders, and ceiling or roof area, and so their function is to withstand any potential external fires at the MFFF.

The waste transfer line itself, that structure - its function is to prevent - to be able to expand any potential external events and it is, I believe, double lined and buried in a concrete trench, and so it appears to be fairly robust.

The final PSSC that's listed here is that worker action, which would require the facility worker to take protective actions to prevent, to not be impacted by a dose.

CHAIRMAN POWERS: What you've listed there is what they're doing, and I'm struggling with is what they're design bases for fire protection are. I distill from this that there are at least two and maybe three, one they want fires not to result in the release of radioactivity outside of the system.

MS. STEELE: Okay.

DR. PARKS: Two, they want the building not to fall down during a fire. And three, I think they want the ventilation and control system to function even if there's a fire.

MS. STEELE: Right.

DR. PARKS: Are those your design bases for your fire protection?

MR. KAPLAN: Gary Kaplan. Fairly close. There is one area, for instance in the process cells.

We claim we are going to prevent fires, and we'll demonstrate that.

CHAIRMAN POWERS: You'll demonstrate that it is impossible for fires to occur in a -

MR. KAPLAN: Highly unlikely.

CHAIRMAN POWERS: Highly unlikely that fires will occur in a process cell?

MR. KAPLAN: Right. That's correct, by control of ignition source and the fact that there's no combustibles in there, except for in the welded process systems, there's some solvent. But other than that, there's no combustibles.

In addition to these in those areas for defense and depth, the ventilation systems we'll demonstrate will survive a fire also, and our design basis is to prevent them in those areas.

CHAIRMAN POWERS: Okay, I guess I would almost call those a how you're doing this, rather than what you're trying to accomplish. But okay, we'll accept that there are four design bases for this facility.

MEMBER ROSEN: As I'm sure you're aware, in power plants one of the main lines of defense is the fire brigade.

MS. STEELE: Right.

MEMBER ROSEN: And its training qualification and retraining on and on and on. Is this similar sort of strict protocol and regimen for fire brigades going to be applied here?

MS. STEELE: Yes, DCS is committed to evaluate the staffing, do a baseline design - baseline staffing criteria for fire brigade. I think they're trying to have a fire brigade in addition to having Savannah Riverside Fire Department respond, and they'll be following FPA 600 requirements for that, which is what reactor facilities follow for their fire brigade. Rex, did you have something to add to that?

MR. WESCOTT: No.

MS. STEELE: Okay.

MEMBER ROSEN: Is that what is meant by the PSSCs on the bottom line there? Is that how it's to be carried out, facility worker action through fire brigade?

MS. STEELE: Oh, no. These are all the SSCs that are required to meet the performance criteria of Part 70.61. There will be additional health protection features, which I didn't go into as yet, that would complement the fire protection strategy, and that would include, what you don't see on here would be suppression in many of the or most of

the fire areas, suppression detection system, a fire brigade and the fire department as well, and that's separate from this.

They're saying those things are not credited in the ISA or will not be credited in the ISA as needing to meet the performance requirement goals.

MEMBER ROSEN: The fire brigade, they're not taking credit for the fire brigade?

MS. STEELE: They're not taking credit for it for the idea that they're able to accomplish their goals without them. They're able to reduce the likelihood.

MR. KAPLAN: Sharon, this is Gary Kaplan. You're completely accurate. I think that answer to your question on the bottom line. That was our -

MS. STEELE: Oh.

MR. KAPLAN: Yes, do you want to answer that next. The facility worker is in the area of the fire. We take credit for it and evacuate in that area just to protect themselves.

MS. STEELE: Just to don maybe a mask and leave. There's also, there will also be a fire protection program, which includes training of staff in moments of emergency evacuation.

MEMBER ROSEN: It is exactly the opposite,

I think of the philosophy in power plants. In fact, in power plants, the first responder's job absolutely of course is to make sure he doesn't get killed, or he or she doesn't get killed. And then the second job is to inform the control room. The third job is, if possible, begin fighting the fire. What you've done here is say, just get out.

MR. HASTINGS: Peter Hastings. Well, I'm not sure it's exactly opposite, because as you just said, is to make sure the operator doesn't hurt himself. When we've got fire involving volatile plutonium, that means run away, and that's the fundamental action for worker self-protection.

If it's something that he can clearly fight himself, then he will do that. But let me make something else clear. What Sharon said is exactly right, and the discussion is framed in the context of meeting 70.61 requirements. There is an entirely separate set of fire protection obligations that we've committed to that have nothing to do with 70.61. It's an entire chapter of the application.

We also control our fire protection program under an augmented QA program under Appendix B. It's an entire classification itself in our QA Program. So it's not unimportant, it's just that we

don't want to have to credit, for example, a specific response time from a fire protection team in meeting the performance requirements.

Clearly, if that's the only choice we have, we'll do that, but we think it's a lot more conservative to assume that that doesn't occur, prevent or mitigate the event anyway, and then you have defense and depth, the additional protection features of its entire set of fire protection commitments that is not at all unimportant. It's simply not credited in the ISA to meet the performance requirements. So it doesn't mean it doesn't occur.

MEMBER ROSEN: if you were to make a guess in terms of the absolute risk, if you had a risk analysis of this facility, what would be in your view the contribution to undesirable results of fire? Is it one percent, ten percent, 50 percent? How important is fire to the risk to the workers and public health and safety?

MR. HASTINGS: In terms of unmitigated consequences, it's very important. That's why we've taken so many steps.

CHAIRMAN POWERS: What's the inventory of normal paraffinic hydrocarbon you have in this facility?

MS. STEELE: Alex, could you answer some of that? What would be some of the largest, do you know, hydrocarbon?

MR. MURRAY: Solvent, I would assume. Hi there, this is Alex Murray again. If I recall, correct me if I'm wrong, Gary, it's on the order of several hundred gallons. Within the cells proper, it might be lower. You might be talking under 100 gallons within an individual cell.

CHAIRMAN POWERS: Otherwise known as kerosene,
by the way.

MR. MURRAY: Right, that's decking.

MEMBER ROSEN: What's the point?

CHAIRMAN POWERS: The point is there's a huge combustible load in here relative to what you're used to in nuclear power plants.

MEMBER ROSEN: So, the answer to my question is that a lot of the risk, if we had a risk analysis, we would say a lot of the risk to the worker and public health and safety and site worker, meaning other people at the Savannah River Site comes from the possibility of a fire at this facility, correct? Yes?

MS. STEELE: I would say so.

MEMBER ROSEN: I'm just asking for a

judgment. I know you don't have the calculations.

MR. HASTINGS: Clearly, it's a significant contribution to risk for unmitigated events, which is why we pay so much attention to fire protection systems.

MEMBER ROSEN: I'm going someplace with this.

MR. HASTINGS: I gathered that.

MEMBER LEVENSON: Do you have - you mentioned Savannah River response, do you have the turf political set of problems which sometimes exist? I'm thinking of the INEEL test site,w here Argonne is an island within the site.

They weren't allowed to have their own fire department because the INEEL has one, but pretty clearly response from somebody outside a fence is not a very satisfactory thing. And how that was finally negotiated was that, I know I did it, we built a fire station and put the equipment in it, inside the fence, and then the site people staffed it with firemen, so that in case of a fire, you really got response.

Because if people have to come from afar through gates and a security system, I'm not sure how much you can depend on them.

MS. STEELE: There are a couple of things.

For the CAR, the purpose of the review is really the system, the features and so on. DCS has committed to providing information about manual firefighting, the details of which are not expected until the operation license stage.

So, the assumption is a lot of those things would be worked out, at least the information on it would be provided to us.

MEMBER ROSEN: I have consulted with the chairman of the ACRS' fire protection subcommittee, and he says -

CHAIRMAN POWERS: And he disagrees strongly with you, right?

MEMBER ROSEN: Which is me, and he says that the fire protection subcommittee has a role to play.

CHAIRMAN POWERS: That's why you think you've been specifically invited to this. Your role was identified from our first meeting.

MEMBER ROSEN: But in seriousness, we're going to have to look in some detail at fire protection provisions, not just the hardware, but the whole fire protection prevention.

MS. STEELE: Yes, we're going to have to look at the whole thing, and when we get to the

operation licensing, we have to look at the physical features again to make sure that, you know, some operation procedure is not impacting those features.

I know that DCS has also committed to evaluate whether they would need a separate fire brigade, so that would be just responding to MFFF fires, and so that could alleviate some of those concerns about coordination.

Another item I thought of was that for this facility worker action, this is not necessarily the operator, like you'd expect at a nuclear power plant. These are the people who are right there with the glove boxes and so on, and they have specific procedures when responding to fires, probably don a respirator or leave.

The operators would probably remain in the emergency control rooms, which somehow I skipped, and that air-conditioning system is listed as a PSSC. I think in the chem safety portion, there was a - it was probably considered the basis for it was inadequate, but the idea is that the emergency control room would remain habitable for the operator.

MEMBER ROSEN: But it doesn't help in putting out the fire.

MS. STEELE: No, it doesn't.

MEMBER ROSEN: It certainly helps protect the people in the room.

MS. STEELE: Right.

MEMBER ROSEN: Which is a good thing, but to fight the fires, you're going to have to go out where the fire is, and in doing that in a plutonium facility, frankly is a whole new game.

MS. STEELE: There will be procedures that will be developed for -

CHAIRMAN POWERS: No, come on. Buck up. Let me ask a question you frequently cited, three-hour, two-hour barriers here. That's all well and good if the fire lasts less than three hours, two hours. With this kind of flammable loading, is that reasonable to think that fires only last -

MS. STEELE: That's an open item for us, and I'll get into more details.

CHAIRMAN POWERS: Okay.

MS. STEELE: You're on the right track. Any more questions.

MEMBER LEVENSON: We talked about the solvent from the process, but he fuel for the various diesels and so forth is probably comparable, if not a greater supply. Is that treated and isolated and separated so that it can't contribute to an internal

fire?

MS. STEELE: You mean for the diesel generators and so on?

MEMBER LEVENSON: Yes.

MS. STEELE: The diesel generators are provided in their own separate fire areas as well.

MEMBER LEVENSON: I'm more concerned about where is the fuel in the day tanks and so forth.

MS. STEELE: Those are separated by -

MR. PERSINKO: They are separate buildings.

MS. STEELE: Right, in the generator building. Okay, well I'll move back to the slides.

This next slide will just go over how we perform the review and the basis of the review was the construction of the authorization request. DCS responses to some of our RAIs, the polycarbon report and a summary of the preliminary fire hazards analysis.

We followed guidance from the standard review plan and from the NRC regulatory guides. We looked in the open literature and noted protection concepts from DOE, in particular the fire protection design criteria standard that they have. We obtained a lot of guidance from NFPA codes, in particular NFPA 801, which is the one that deals with facilities

handling radioactive materials. And again, the focus reviewed for the CAR was the fire protection features and systems, the PSSCs and design indices.

Next. This slide just discusses the main findings that we had. Basically, the staff determined that the fire safety strategy for this stage was generally acceptable, because the PSSCs could provide a reasonable assurance that radioactive material was protected from fire. There are many additional protective features, some of which I -

CHAIRMAN POWERS: When you said that, it seems to me that you've now taken three or four design bases and condensed it down to one.

MS. STEELE: I was trying to get back to the Part 70.61 design basis criteria, which is to protect the facility from explosions and fires, and that's basically what it boils down to for fires.

CHAIRMAN POWERS: Well, be careful about boiling down because we're really interested in the design bases. And, it's fine to protect the radioactive materials from fire, but if the building falls down, I'm not sure you've accomplished what the regulations really wanted you to accomplish.

MS. STEELE: That's true.

CHAIRMAN POWERS: I think we need to be

very careful about this fire protection design bases here because this is an area where you can get into an awful lot of money and an awful lot of squabbles if you don't agree on what you're trying to do here.

For instance, in one of the discussions on fire, we asked about computer equipment exposed to smoke, and they said, well we've handled that very simply. If the computer equipment gets exposed to smoke, it's gone or fixed. Something happens to it. It's not just ignored, which is excellent. I really congratulate you for taking that step. You got out of a real mess by doing that.

But that has to show up in some of these strategies as part of the design bases here, so we don't get into any squabbles over these things. I'd be very careful about this.

MS. STEELE: We felt that the additional protective features that I mentioned before provided some defense in depth and complemented the overall fire safety strategy. The fire barriers are relied on to protect redundant PSSCs and DCS discussed areas today, for example, the electrical independence and separation.

MR. JOHNSON: Yes, excuse me. I'd like to ask about that. In the nuclear power plant world, for

systems that are necessary to assure safety in the presence of a fire, response to a fire, the regulations don't consider 384 to be sufficient separation, and you get into the 20-feet separation, no intervening combustibles, all the Appendix R stuff and safe shutdown analysis requirements.

What applicability do those kinds of design criteria have in this environment?

MS. STEELE: Well, I might be going out on a limb here, but I believe that for Part 70, we're not required to follow the Appendix R requirements to demonstrate that you can achieve the independence of separation.

MR. JOHNSON: Yes, I understand that Part 50 doesn't apply here, but I guess I'm asking about the technical question. If it's a technically appropriate set of design basis in the reactor world, is it also a technically appropriate set of design bases in this environment, especially since I guess my impression is the fire loadings in this kind of facility tend to be a lot higher. You got stuff that can burn a lot hotter.

MS. STEELE: Maybe it could be that we should require something more restrictive?

MR. JOHNSON: Well, I'm asking a question.

I'm not making a suggestion.

MS. STEELE: Is Fred here? Okay, Fred.

MR. BURROWS: Yes, I'm Fred Burrows. I'm the electrical reviewer. I'm not sure I can - do you know what this question is. As she said we do not have Appendix R requirements in Part 70, and I'm not sure -

CHAIRMAN POWERS: Well, I think the real question is if in Appendix R they've decided that the separations quoted in IEEE 384 insufficient, why do you think that they're sufficient? I mean the bases for them deciding those were insufficient were experiments. They burn cables. Am I roughly correct?

MR. JOHNSON: Yes, well I think the basis was as much the experience of Brown's Ferry as here. Again, consider I think 384 is considered perfectly fine for everything except for those systems necessary to in the power plant provide safe shutdown under fire conditions.

CHAIRMAN POWERS: Yes, but providing safe shutdown under fire conditions, is there a design basis?

MEMBER ROSEN: You have to recognize that's a different task. In a power plant, the task is to provide safe shutdown, which requires typically active

components to function, pumps, pipes, valves, pumps to check to turn it on, valves to change state, be powered and change state and stay in one or more different configurations.

Now in this facility, what I understand is that it's okay to just shut everything off, and then that's from the earlier briefing this morning. And the only thing that you have to keep running is the ventilation, certain ventilation fans. So with that single exception, which looks a lot like a pump running or a valve in position, most of the facility doesn't need the kind of protection for the safe shutdown function.

It needs protection so you don't get release to the workers and the environment. But that is mainly accomplished by the IROFs that have to do with the ventilation program. Am I correct in that?

MR. KAPLAN: This is Gary Kaplan. That's correct and the paths to the fire barriers that keep the fire contained in one fire area.

MEMBER ROSEN: So you have the same problem, but it's a much limited scope?

MR. KAPLAN: That's correct, yes. And we will be looking at specifically, if they're not in separate fire areas or separated for the HVAC, we'll

take additional precautions, but right now as far as we know, the systems are completely independent.

MR. JOHNSON: I guess I was primarily thinking about vent systems, but also remember that in Appendix R that just removing power at the breaker isn't necessarily considered adequate to shut down a process either.

MEMBER ROSEN: I think you're referring to the evolving understanding of hot shorts?

MR. JOHNSON: Yes.

MEMBER ROSEN: And how that's going to be handled. That hasn't been fully resolved, even in the reactor plant side, but I would suspect that when it is resolved, then it certainly will be resolved, I think before this facility is finally licensed.

I hope that this facility will take that resolution of hot shorts into consideration for the ventilation systems that are important to achieving the design basis. Is that, Mr. Johnson, a satisfactory resolution? I didn't mean to shut you off.

MR. JOHNSON: No. I'm not sure what the resolution is here, but I guess my only question was, if you have these design criteria in a reactor plant and there are functions that in this facility are

expected to work under the same kind of conditions, why are the criteria different here?

MEMBER LEVENSON: I think the answer to that is Part 70 was developed as recognition that these are completely different type facilities. Now whether they did it right when they did Part 70 is a different question. The facilities are so different, the risks are so different, questions like stored energy, I mean there's a magnitude of difference in consequences, but you need different criteria.

MEMBER ROSEN: And yet operationally for some parts of the plant, it boils down to the same kinds of things.

MEMBER LEVENSON: It might be worse, it might be less. It's different.

MEMBER ROSEN: Yes, you have to keep certain things running, even if you have a fire. You have to achieve the same functions. Not as much stuff, and the consequences are probably well limited, but still you have to keep certain things running and certain components have to change state in a predictable way. So some of the same tasks are needed to be accomplished by the same systems here in this facility as in a power plant.

MR. WESCOTT: Gentlemen, my name is Rex

Wescott and I wrote the SRP section on fire protection, and one of the reasons Appendix R requirements were specifically left out was, for one thing, Appendix R was kind of a back fit really to nuclear power plants. It was plants that really weren't built with proper separation of shutdown trains in mind at the time they were put together, and Appendix R was a way of fixing these older plants.

So my feeling at the time when I put in criteria like two-hour fire barriers and stuff like that, was that proper separation from a design point of view could eliminate a lot of the problems that Appendix R had to fix.

In other words, if you thought about separation and you made your fire barriers, your fire area boundaries sufficient in the first place, you wouldn't get into these problems as a back fit, and I think a lot of that has for the most part been followed, both by the applicant and our review.

So I think 384 is a criteria, but I suspect and I was kind of waiting for Fred to verify this, that a lot of reality where your separate power supplies are actually needed, like for the ventilation system, for example, you probably have a separation that goes far beyond the 384 requirements. That's my

suspicion. I'm just kind of waiting for verification of that.

CHAIRMAN POWERS: Well, I guess the question that comes to mind is this 384 separation. I'm not sure. I can assure you I've never read 384 in my life. I'm dedicated never having to go into another EEE standard. Having done that once is more than enough for me.

But what I do know is that the separations that you find in Appendix R are - have been the subject of experimental investigations. The interpretation of those experiments is not whether those are too much, but whether they're not enough. And they're more than what's in the EEE standards.

MR. WESTCOTT: Yes, that's correct. The EEE separation, I mean I think that when I reviewed things for plans in Appendix R, I'd much rather see a three-foot fire barrier. Now the 20-foot separation was kind of the last fall back. I'd like to see fire suppression between the trains, but based on experiments that were done at Oak Ridge or maybe it was Sandia I believe is where the 20-foot separation came up using, you know, what they thought was reasonably appropriate fire loads from cable trays and so on, and of course there's a lot of question about

that. If you double the size of the cable tray, you have the required distance.

MR. BURROWS: Let me go back. The intent of 384 is to insure that a redundant train is not affected by a cable fire in the other train, and so the distances are much smaller. Appendix R is way beyond that, and I don't believe that the MOX facility, you know addresses separation beyond 384.

CHAIRMAN POWERS: Just to be clear, let's not get hung up over Appendix R. The question is, are the separations being adequate here, appealing to 384, are they adequate?

MR. JOHNSON: This is Ron Johnson. I didn't bring a diagram of the routing of our power and controls for the PHD fans. Let me describe it for you. The power supplies come in from outside in underground duct banks. Train A is roughly, when it comes up into the MOX building on the first level, there's roughly 150 feet away from the Train B. Train A proceeds up to the second floor, goes into a separat fire room. Train B goes all the way up to the third floor and comes around to another separate fire room, so in essence the trains are kept completely separated and we made a conscious attempt to keep them in separate fire areas so we wouldn't get into this

problem.

Not only that, we also have them in enclosed conduit. We don't have the power supply cables routed in an open tray. We put them in enclosed conduit. So we try to alleviate that.

CHAIRMAN POWERS: Very helpful. The best answer is don't get the problem.

MS. STEELE: We felt that - I was down to the fourth bullet stating that we followed guidance in NFPA 801 for fire separation to be sure that, for example, process areas are not comingled with storage areas and so on. When I said we, I meant DCS.

And although the preliminary fire hazards analysis is not a basis for the review, it gives us a little bit more confidence that, and when DCS is performing their analysis, that it would be able to identify all the hazards, all the major hazards and identify protective schemes to mitigate those hazards as well.

We identified about four unresolved issues. The first one has to do with glove box window panels. DCS does not sufficiently provide design basis criteria for the glove box window panels. We want to assure that the stated mechanical, seismic and fire properties were valid, and bound for the

environment that the glove boxes would be in.

One of the areas that you may have seen in another slide might have been, for example, the issue of creep in the window panels. That a creep at high temperature.

CHAIRMAN POWERS: Vexing, creep.

MS. STEELE: Right. The next area -

CHAIRMAN POWERS: I expect it's very high.

MS. STEELE: We feel that we identified some inaccurate and incomplete analyses for the soot loading on to the final filters and that remains an unresolved issue for the CAR.

For the fire barriers, you were right that there are some areas where you're going to have high concentrations of not ordinary combustibles. Even though DCS identified or evaluated what the average combustible loading would be for each fire area, we felt that we needed to get a better hold on what the margin of safety was that was actually being afforded.

For example, we wanted to know where the flash over could occur in some of these cases, and so we're requesting more information there.

We were also concerned about the idea of facility-wide fires, as I mentioned before, and in one case there's a potential - well not necessarily fires

but for the hot gases from a fire being transported through the pneumatic transfer tubes. In summary -

MEMBER ROSEN: Hold on for a minute. The pneumatic transfer tubes, could you tell me more about those?

MS. STEELE: We have a mechanical engineer that could give some details. I know it transfers radioactive materials through the facilities, possibly in cans and so on.

MR. GLEAVES: Hi, my name is Bill Gleaves. I'm a mechanical engineering reviewer. These pneumatic transfer systems are designed to transfer material through from one glove box to another, using air and would have breakpots that would break the system so that you wouldn't have carryover or material leaving the systems, but apparently they're stainless steel or some similar material, that in and of themselves would have very little fire worth.

But the concern here was how these isolation valves or some kind of valve on that system, prevent hot gases from flowing from one gas box to another and then therefore being a common way to propagate fire between fire areas.

MEMBER ROSEN: How extensive is this pneumatic tube system? Is it the way materials are

typically transported in the main process systems that are already fluidized? It can't be pumped, that's what I'm saying?

CHAIRMAN POWERS: It's like a bank.

MR. GLEAVES: I think if you're looking at it on a program basis and I'm looking to DCS to correct me if I'm wrong, if you're looking at it on total material transport basis, I would assume that at one point all the material is going to go through one of these tubes.

But in general, most of the equipment is located in the glove box and is transported by different kinds of belts, conveyors, et cetera. But the rate at which it's transported through these pneumatic transfer tubes would be relatively low, and I believe it's a batch process.

MR. KAPLAN: This is Gary Kaplan. I can add a little bit more. There's two main pneumatic tubes used, one to go from the AP process over to a storage area, where the plutonium is put in sealed cans and it's sent. It's like a bank, almost like your bank, what you use in a bank, and it moves from one on the AP area to the MP area and it goes to a storage area. That's one.

The other one is mainly to send material

to the lab. Small samples go from glove boxes to a laboratory glove box, and they'll also be in closed containers also.

MEMBER ROSEN: I don't get a sense of whether I should think of this facility as one with almost everything interconnected by these pneumatic tubes, or one that's only very limited in a very limited sense.

MR. KAPLAN: Limited. I would say a limited sense. Just to give you an idea, there's 350 fire areas in the facility approximately, so almost every room is its own fire area, just to give you an idea. So there's a few glove boxes in each fire area, and you wouldn't have the pneumatic tube attached from one glove box to the next globe box to the next glove box.

Where you take samples in the facility, where there are places you do that, that would be connected to the laboratory area.

MR. TANNER: I can address the specific route.

MR. KAPLAN: Okay.

MR. TANNER: This is Jon Tanner again. The two areas we moved in the pneumatic transfer system are taking the plutonium that comes out of the

furnace, the calciner furnace in the AP area. It's dried and it goes into a can and the can is sealed and that can is put in this, as Gary said, like when you go up to your drive-in bank vault. You put your check request in it. It sucks into the bank.

It's exactly the same concept, and it goes to the storage vault. The other place we use it is we take a smaller quantity and off the top of my head, I can't tell you how big these transfer tubes are, but one's 28 millimeters or something like that. I don't remember. It comes from a small sample into the laboratory.

The first system runs kilogram, small numbers of kilograms of cans into the storage vault and those are the only two places we use them, from the canning area to the storage vault, and then from, and I forget the source of it into the laboratory, and that's it. So the answer to the question is it's a small limited number of usages.

MS. STEELE: Just to summarize, the staff found that the PSSCs and the design bases are generally acceptable. The applicant will provide more information on glove box design criteria and subloading analysis for the - I should say before the final safety analysis is due.

We are expecting methodology on how they will demonstrate the margin of safety, including any models and input assumptions, and we're also expecting methodology for the methodology description and input assumptions for the propagation of hot gas through the pneumatic transfer system.

CHAIRMAN POWERS: Any other questions on fire protection? Thank you, Sharon. We come now to the section of the agenda entitled "discussion" and one I know everybody's hoping for, "adjournment."

MR. JOHNSON: I have a couple of things. First, I would like to - the commission's asked us specifically to, as they said, weigh in on this, on the MOX facility, and we're going to have a meeting in I think July. What I would like everyone here to think of are the points that I should bring up.

I think that when we schedule that meeting with the commission that we assumed things would be progressing along a little faster than they are now, that because of the design changes, things are still in a preliminary state, and basically that's all I want to tell them is things are in a preliminary state and we're looking at things. But if you can give me points that I should bring up with Chairman Meserve on this subject, in addition to the fact that we're

looking at stuff, I would appreciate it.

One thing I should make clear to everyone is that in giving this job to the committee, one of the questions they very much had in their mind is Part 70 adequate for this facility, and so several times we've asked questions that seemed to go beyond the structures inherited in Part 70 and people have been puzzled by that. It is because one of the questions we have to look at is what the adequacy of Part 70 is.

And in that context, a question that was raised by Mr. Rosen that I think clearly caught my mind was, we have a system here designed to meet the single failure criteria, but in the history of significant accidents, I think generally you see that the really severe accidents are multiple failures, and is this an issue that we need to wrestle with in thinking about Part 70?

I think Mr. Rosen has also brought up the clear cut point that fire is an important aspect and that the fire subcommittee, either as a membership of this committee, or on its own, needs to look carefully at the issues of fire protection here.

And in particular, I would be interested in knowing their view on the standards that are being adopted here and applied to his facility, which of

course are different as they should be than reactor standards. These are much more industrial standards, and whether they think they're adequate.

With that, I'll ask are there any other comments that you'd like to make. Gary, I know that we're in a preliminary stage, but at some point, I'd like to get a written report from you if I could. But if you have any opening comments, or things off the top of your head, I'd appreciate hearing them right away.

MR. JOHNSON: Well, I guess I don't know that I see anything that's of such earth shattering significance to bring up the commission. There's clearly a lot of work in this area that DCS is still doing, and there will be a lot of developments over the course of time that I'm sure the staff will be interested in and that they're going to want to look at carefully.

I think some of the ones that come to my mind is that the application makes commitments to certain standards in the electrical and instrumentation and control area, but these are reactor standards and they've said they're going to do a - they're going to use - putting words in their mouth - going to use the part that makes sense.

Well, I'm sure that they'll do their best, but we don't know exactly what that means at this point, and exactly what the commitments are with respect to those standards. I'm sure they'll be evolving as well they should.

I think another one that I think is going to involve some looking at is the specifics of the priority management within the I&C system. That could evolve to be a very simple relay based system that ensures that the safety control always has priority and ensures that when you have multiple controls rooms trained to take control, that the right one always gets control.

But in other places - well even in places where it's that simple, sometimes it becomes an issue of some contention and study. But the tendency in the reactor industry in the last few years has been to make it more complicated than that, and if you look at redundancy management systems, and for example, Timaline or Creon next generation reactor, they're fairly complicated systems that need a lot of looking at.

So there's a wide range of possibilities that could occur there. And, I'm sure also that they're going to want to be interested in what really

are the functions allocated to which of the different I&C systems, and specifically what's happening.

We heard discussions about clinical safety and principal safe system structures and components to respond to that, but exactly what's happening in the I&C system. Where are those things. Where's the implementation of those things, I think is still evolving and is going to be of interest. I guess those really are the main ones I have.

CHAIRMAN POWERS: Well, I think the message of evolving is the primary message that I'll try to give the commission. You know, things are evolving and stay tuned. I mean I think that's true particularly in the I&C but it's true of everything else.

I think I will definitely highlight I&C as one of the areas we're giving focused review. Obviously we are.

MR. JOHNSON: Well, and as the processes themselves, I think maybe are evolving, that it's hard for the I&C system to settle down until -

CHAIRMAN POWERS: Sure. You wouldn't want it to settle down.

MEMBER ROSEN: Dana, I have some thoughts I've been scribbling here that might be useful. This

is a facility where there are some extraordinary hazards in the sense that we heard about red oil, but that's not the only one.

We've got electrolytic composition creating hydrogen. We've got high fire loads from the organic solutions that are prevalent in the systems. You've got the potential for fire, which could lead to plutonium release, which is sort of an extraordinary situation.

So then in the fire protection area, I think we need to be concentrating heavily, review heavily, and there again, they have two areas that are not well described in this discussion. Milt brought one of them up and that's the institutional issues on the Savannah River Site.

Clearly that can be addressed, but it must be ultimately in some clear cut way. The other one that I think it also very important is the human performance issue of the staff itself. You know, we talk about the importance of the fire brigade, and the fire brigade would be trained in a manner, qualified in a manner similar to ones we see in power plants, nuclear power plants.

But there's very little or no discussion about it at this stage. Maybe that's appropriate, but

we need to keep our attention riveted to the fact that it's what the institutions do and what the people do after the designers and the builders have done everything they can, which ultimately determines the course and the consequences from the inevitable fires that you're going to have or off-normal situations.

You're going to have off-normal situations and you probably will have fires. That's a given. It's what happens after that that counts. So the fires just get put out by the first responder and it's a no-never-mind. When you have an off-normal situation, that ultimately degrades to a more serious off-normal situation because of other latent defects that haven't been addressed.

So institutional and human performance are critical ultimately in the fire protection area and I think we need to keep it in mind.

CHAIRMAN POWERS: I think it's a normal question than human performance will finally be important, but I encourage you not to get too far afield when we're looking at design bases here. You know, you just can't ask for too much at this stage.

MEMBER ROSEN: I grant that. I'm not asking for it. I'm just saying we need to be aware of the ultimate importance of the institutional and the

human performance barriers in the ultimate fire safety of the plant.

CHAIRMAN POWERS: Sure. It would surprise me if anybody disagreed with you, but at this point, that's not where my questions come up on the fire safety. I'm still going with what we're asking the fire protection program to do.

MR. JOHNSON: I've got a pretty good idea on how we're doing it. I just don't understand exactly everything we're asking it to do.

CHAIRMAN POWERS: And I would not overplay the level of hazard at this facility either, and I remind you that when we do max calculations on reactor accidents, the plutonium release is interesting but not very serious compared to releases of other radionucleides. This is not to my mind the most hazardous facility I've ever dealt with.

MEMBER KRESS: Some other thoughts. The look at sequence by sequence acceptance criteria seems to me beg for an overall facility, acceptance criteria that adds them up. I don't see any of that thinking in this.

CHAIRMAN POWERS: In that regard, certainly don't blame the applicant for that. That's the way the ground rules are.

MEMBER KRESS: But we're asking if the rule is adequate, and I'm questioning that. Some other things, when you talk about source terms for some of these things, the fires, just taking the values out of the handbook seems to be like flatly inadequate. You could develop facility specific source terms on a fairly easy basis, given their processes and their known materials they have.

I think with a little effort, you could come up with a much better idea, particularly on the termination of the particle size distribution and what fraction that might be considered respirable. I hat to say this again, but this would be a great opportunity to do a full PRA and see how it compares with the ISA results. It certainly would be nice to see how that spells out.

When you have HEPA filters, and you have specific areas where you may have say fires that are not going to spread to other areas, you can have different amounts of material, a hazard at risk, and the HEPA filter efficiency, you assume, not to depend on somehow on the maximum loading that it can get from those particular things.

So just having one HEPA filter efficiency doesn't seem right to me. It seems like it ought to

be specific for a given sequence, and I think more looking in that area would be useful. I guess those are just the comments I had in addition to these others people are making.

CHAIRMAN POWERS: You know, on the probabilistic versus ISA concept, I guess I'm perfectly content to let the ACNW carry that torch.

MEMBER KRESS: Well, yes.

MEMBER LEVENSON: Let me say, I have a problem with the way the words were used.

CHAIRMAN POWERS: Part of the problem with the words you're about to use is the recorder can't hear you.

MEMBER LEVENSON: I'm sorry.

CHAIRMAN POWERS: We get into the other problems with the recorders.

MEMBER LEVENSON: My other problem, Tom, is perception, and when people like the ACRS members say full PRA, it scares the hell out of everybody because that implies something as extensive and complicated as a reactor system. I'd much prefer if you'd use the word simplified PRA.

MEMBER KRESS: I would be very happy with those words, yes.

CHAIRMAN POWERS: Some of us believe all

PRAs are highly simplified.

MEMBER ROSEN: Some of us who have done them have found them quite complicated.

MEMBER LEVENSON: And you're both right.

CHAIRMAN POWERS: Some of us are much more comfortable with ISA methodology. Milt, do you have any other comments you'd like to make. I'm sorry Tom.

MEMBER KRESS: I just wanted the PRA to complement the ISA.

CHAIRMAN POWERS: You just want to compare us and see how good they are.

MEMBER KRESS: Yes.

CHAIRMAN POWERS: And we'll do a PSA on your garage or something like that, do that with the ISA. Do you have any other comments?

MEMBER LEVENSON: No, I've raised them.

CHAIRMAN POWERS: Doctor Shack? Graham?

MEMBER LEITCH: No, I guess this again is something that hasn't been developed yet, but my concern is still staffing levels, training, qualifications of the operators and the other staff that will be associated with it.

CHAIRMAN POWERS: I think that's our 2003 tour.

MEMBER LEITCH: I agree. You know it seems

as though we have made this facility somewhat more complex than the last time that we heard about, and it's going to be a fairly complex system for the operators, because we're not just dealing with one process. We're dealing with perhaps as many as four processes, although some may be quite similar to one another.

But yet, that introduces another variable and I guess at an early on stage, it seems to me that we need to be more than just an issue of staffing, but rather what positions are going to be manned by the operators. Has anybody thought that through? In other words, where are we going to have operators? We have a control room. Is there one operator there, two operators? Are there other fixed positions? How does that relate to the people that are in the on-site fire brigade? If there's a fire, we still have to be able to maintain some positions, staffed from an operating viewpoint.

CHAIRMAN POWERS: Well, I think, I get the impression that we'll have operators and whatnot. That has been given some thought. I mean at least they have identified these remote areas, separated areas where they're going to have terminals and whatnot like that in rough levels.

Now I think this fire brigade issue is still up in the air a little bit. Is that roughly correct?

MR. HASTINGS: That's correct.

CHAIRMAN POWERS: But the rough staffing levels, I think they know. The details on training and maybe even the numbers and things like that, I think we have to wait until they get to the operating license stage before we ask too many questions on that.

MEMBER LEITCH: I just want to be sure that the design doesn't get so frozen before we've really factored in the operator input.

CHAIRMAN POWERS: Sure.

MEMBER LEITCH: That it's possible -

CHAIRMAN POWERS: You'll get an un-operable configuration.

MEMBER LEITCH: Yes, right.

DR. PARKS: You know one of the advantages I'm always reminded is we are copying another system, so I don't think they're going to get those tied in a knot here, unless we help them tie themselves.

MEMBER ROSEN: Or unless the facility they're copying has knots in it already.

DR. PARKS: It's not what?

MEMBER ROSEN: Or unless the facility they're copying has knots in it already.

MR. HASTINGS: Let me address that briefly. This is Peter Hastings, and this will probably do nothing more than tease you for more information.

DR. PARKS: Sure.

MR. HASTINGS: The MOX facility, is that actually counted as the fourth or fifth generation of the MELOX process because of improvements they've made throughout the evolution of MELOX. We also have full-time representation on the design staff of real contemporary operations staff from both MELOX and La Hague facilities whose job it is to keep us from making those kinds of mistakes.

MEMBER ROSEN: Rather than emulating the mistakes, knowing about them and avoiding them.

MR. HASTINGS: That's exactly right, and in fact, a good bit of our work involving the operation staff from the existing facility has been in the area of lessons learned, from previous evolutions of the current designs of MELOX and LaHague.

DR. PARKS: Good.

MEMBER SIEBER: Well, it seems to me that you know my vision of how this plant will work is that the bulk of it is going to be batch processes

controlled from local workstations. In the large control room, the emergency control room is designed to be able to take over control in the event that some event of consequence occurs.

So it seems to me, number one, that it should be relatively easy to do some kind of PRA, because there's a lot of little separate modules that don't have these long event trees associated with them. Secondly, I'd like to assure myself that when you shut everything off, everything settles down and just sits there like it's supposed to, as opposed to being some explosive mixture or otherwise deteriorating.

I guess the third thing that I am impressed with is my vision of how high the fire loading is and how complex it is and the fact that using HEPA filters as the confinement mechanism to isolate the environment to what goes on in this plant, particularly during a fire, deserves an awful lot of consideration from the standpoint of filter plugging, filter failure, how much redundancy do you really need, and with 350 fire trees in a relatively small building, it seems to me everything is very compartmentalized that could possibly be joined together by the ventilation system, which is another

way to spread fire.

And so I think our attention should be directed to the fire protection number one, because I have an intuitive feeling it's probably the biggest risk factor and also there's a potential for spontaneous events to occur, as opposed to events that are actually caused by an operator or the failure of a peace of equipment, for example, a red oil situation.

In addition to that, I think that we almost have to wait for the operating license stage to know enough about the process and the process control features. The setting of trip set points for various parameters and how they physically intend to control the process to maintain its safety.

Right now, I don't think I could make a judgment whether the list of accident sequence is as comprehensive or that the protection actions or protective features is sufficient, and until we get that far along in the process, I think it's difficult to make a comprehensive -

CHAIRMAN POWERS: Just being asked can they make good.

MEMBER SIEBER: That's right.

CHAIRMAN POWERS: And not whether they

have.

MEMBER SIEBER: Right. So I just guess as far as setting the standards, which is what is being done right now, I think the standards are probably adequate even though I know that IEEE 384, when you talk about separation of table that are in conduit, the separation requirement is one inch, and the separation is the criteria.

CHAIRMAN POWERS: And the cables and conduits very seldom burn.

MEMBER SIEBER: Well they burn all by themselves, one at a time. But in any event, I think it's an interesting project, and I will feel more comfortable when I know more about it.

CHAIRMAN POWERS: Mag.

MS. WESTON: No.

CHAIRMAN POWERS: We've already handled all your problems, right Steve?

MEMBER ROSEN: Absolutely.

CHAIRMAN POWERS: Tom?

MEMBER KRESS: I have no other questions.

CHAIRMAN POWERS: Mario? Peter?

MEMBER KRESS: No, no questions. There's no material with nitric acid going around in the pipes.

MEMBER FORD: They got input from the chemical process industry.

CHAIRMAN POWERS: Drew, let me turn to you now.

Is there any question that I should have asked that I haven't asked?

MR. PERSINKO: None that I can think of. I think you've covered the bases quite well.

MEMBER SIEBER: I have a question that I probably should have asked. To me this thing looks analogous to an oil refinery.

CHAIRMAN POWERS: I'm fascinated to hear this.

MEMBER SIEBER: I noticed another little reference to CPI codes of standards or some of the things that the chemical industry uses in their protection systems.

CHAIRMAN POWERS: There are a lot of CPI standards.

MEMBER FORD: There are CPI standards.

MEMBER LEVENSON: It's more like the lab within an oil refinery.

CHAIRMAN POWERS: That's a little closer.

MEMBER SIEBER: It's a small oil refinery. It just makes motor oil.

MEMBER ROSEN: Yesterday, it was boric acid on carbon seal and I'd certainly worry under certain circumstances. Here we've got nitric acid.

CHAIRMAN POWERS: Now we're worried about real acid. Let me go to the people from Duke and ask you the question. Is there any question I should have asked that I didn't ask?

MR. HASTINGS: Of course not. You know, I think you have done well in terms of being able to digest the information that's been put in front of you in the course of a couple meetings. I do want to make sure that one perception that may be generated here, that we have an opportunity to make sure it's clear.

We've heard a couple times in discussions among the committee that there's a very high combustible load for this facility, and with no intent to diminish the magnitude of that hazard, I certainly don't want to do that. I want to remind everybody that the vast majority of our process fluid that's combustible is inside sealed, welded tanks that are designed to withstand the design basis earthquake, so I don't think that's unimportant. I just want to make that clear.

CHAIRMAN POWERS: That's a good point and we shouldn't diminish that. I still think that when

you think about this facility, starting from the top down, it's not long before you say what really is the problem here?

MR. HASTINGS: It's clearly important.

CHAIRMAN POWERS: And putting your combustible loading into sealed tanks is one of the mitigation features to look at. Well, as a final point, I want to bring up again this issue of visiting the log facility. I'll remind members that you're going to be wandering around aimlessly in Europe in October, and I'd appreciate over the course of the next couple of days thoughts about whether you would like to tack ona visit to La Hague.

If we want to do that, we need to institute things promptly. So I'd appreciate your opinion on that informally over the next two or three days, so that if it looks like it's reasonable to do that, we can get back to DCS on this and try to arrange something here.

MEMBER LEVENSON: How broad is the inquiry?

CHAIRMAN POWERS: Oh, it includes you Milt.

MEMBER LEVENSON: You're talking about October because of the meeting in Berlin?

CHAIRMAN POWERS: Right.

MEMBER LEVENSON: I'm going to be there

also.

CHAIRMAN POWERS: Yes, it would include you.

MR. HASTINGS: Let me suggest, just for clarification, as people are considering that, and I'll ask Drew to weigh in on this as well if he has an opinion.

You're certainly welcome and invited to do that. I think it would be helpful to the members of the staff that have seen the facilities would echo that. You should plan on two days at least. One for a full day at MELOX, which is in the South of France, and one day at LaHague, which is in the northwest.

MEMBER ROSEN: So we are going to take a circuitous route.

MR. PERSKINO: I was going to say the same thing. You just said LaHague. I strongly recommend that you visit both facilities as well. I think it's a very informative meeting.

MR. HASTINGS: LaHague is north of Marseilles, near Lyon.

CHAIRMAN POWERS: Near Markul.

MR. HASTINGS: It's at the Markul side.

CHAIRMAN POWERS: Well, I mean we just need to wrestle with it. You may also want to go to Rocky

Flats. Rocky is the place to go for the comparison. You want to go to Rocky. Milt.

MEMBER LEVENSON: Is there anyone from DOE here in the audience today? I have what might be an unfair questions, but it rises from what was said earlier. With the cancellation of the mobilization program, we've heard a fair amount about the impact on this.

How does that impact salt processing process at Savannah River with which I've had some involvement, because one of the main functions of that was to provide concentrated cesium for denaturing the plutonium. If it's not going to be mobilized is that billion dollar effort now going the wrong direction? Has that also been reevaluated? I don't want it answered, I just wondered if it's been looked at?

MR. RHOADS: I can honestly say it's not by us. I can't speak for anyone.

CHAIRMAN POWERS: That might be an issue for you to take up offline.

MEMBER LEVENSON: I just wondered if they would happen to know.

CHAIRMAN POWERS: Well, gentlemen, at that point I will first of all thank everybody for excellent presentations. Staff, really good

presentations, appreciate it. DCS, excellent presentation. And, as I say because we've got one of the few times I've had a commissioner tell me to weigh in on this, I expect we'll see you more often, and appreciate the efforts that you make in this direction. And with that, I will close this subcommittee.

(Whereupon, the above-entitled matter was adjourned at 4:28 p.m.)

CERTIFICATE

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

Name of Proceeding: Advisory Committee on Reactor Safeguards Reactor Fuels Subcommittee

Docket Number: N/A

Location: Rockville

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.

/s/ Rebecca Davis
Rebecca Davis
Official Reporter
Neal R. Gross & Co., Inc.

Impact of DOE-Announced Changes on Staff Review of MOX Fuel Fabrication Facility

Andrew Persinko
MOX Project Manager

Schedule

- Issue draft SER for construction 4/30/02
- Receive supplemental Environmental Report 7/15/02
- Receive supplemental Construction Authorization Request 10/02

Schedule

Continued

- Issue draft EIS for public comment 2/03
- Issue revised draft SER 4/03
- Issue final EIS 8/03
- Issue final SER and construction licensing decision 9/03

Summary of Impacts of DOE-Announced Changes

- Staff did not issue draft EIS in 2/02 as planned
- Delay issuance of final EIS and SER by approximately one year
- Staff will issue a revised draft SER
- Areas mostly affected - safety analysis, chemical safety

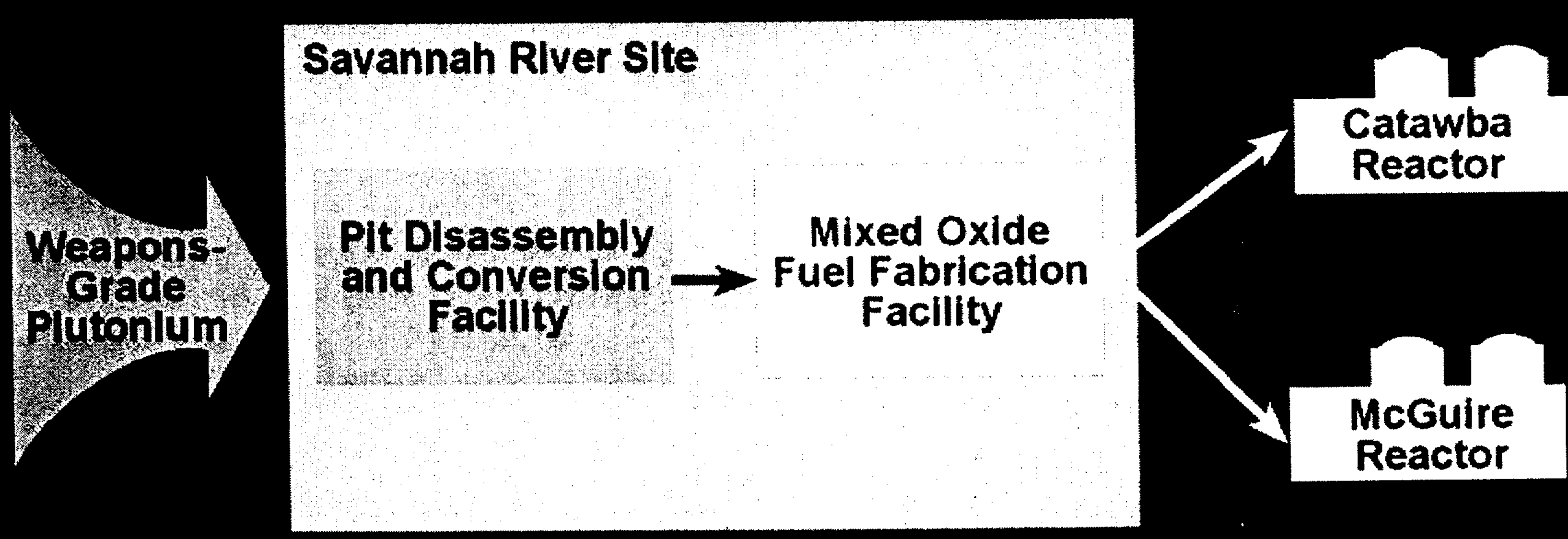
Summary of Staff Review

Andrew Persinko
MOX Project Manager

Overview

- Two step licensing
- Construction: Approve "Design Basis" of principal structures, systems, and components, Quality Assurance Program(10 CFR 70.23(b)) / Baseline Design Criteria (10 CFR 70.64)
- QA Program SER issued 10/1/01
- Open Items (other than safety analysis, radiological consequences, chemical safety, fire protection)
- More detailed presentations

NRC Role in Regulating Mixed Oxide Fuel

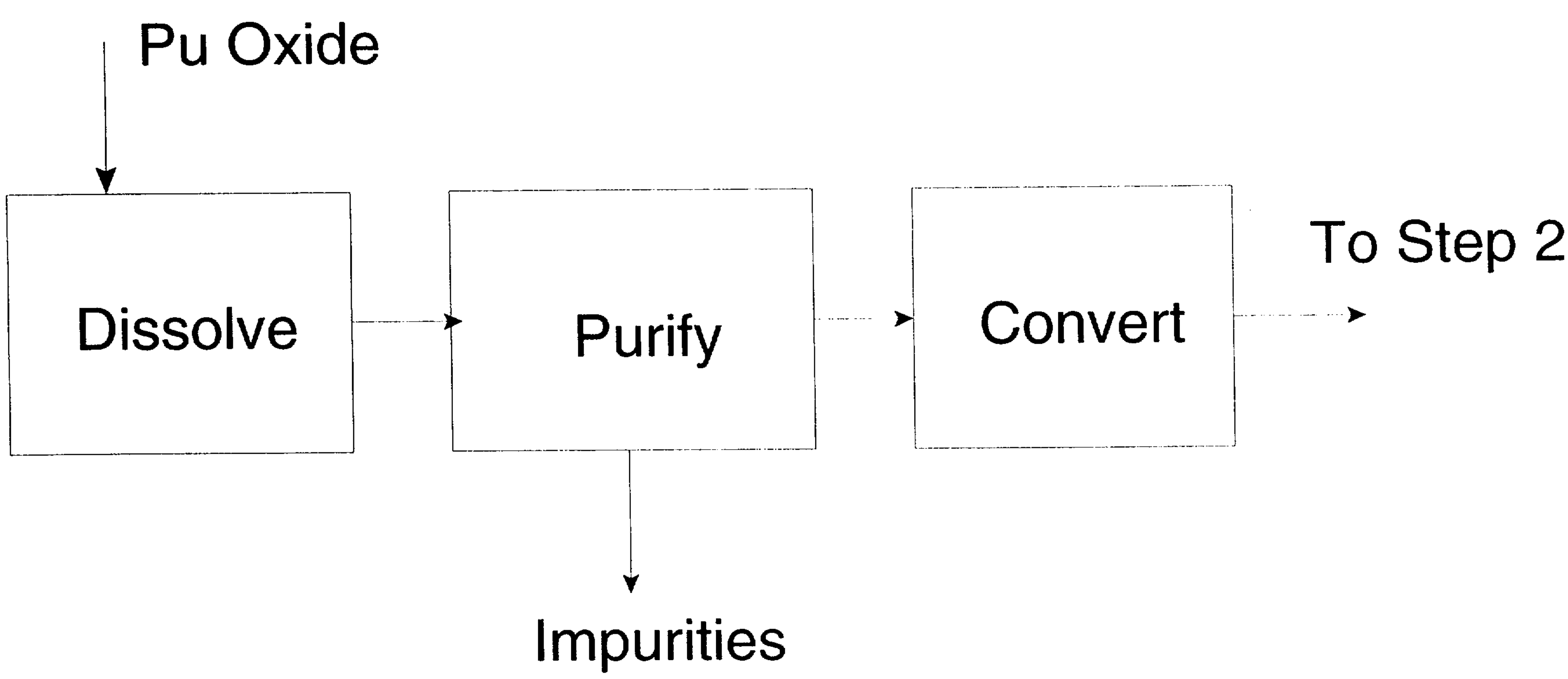


Yellow = NRC regulated

Blue = DOE regulated

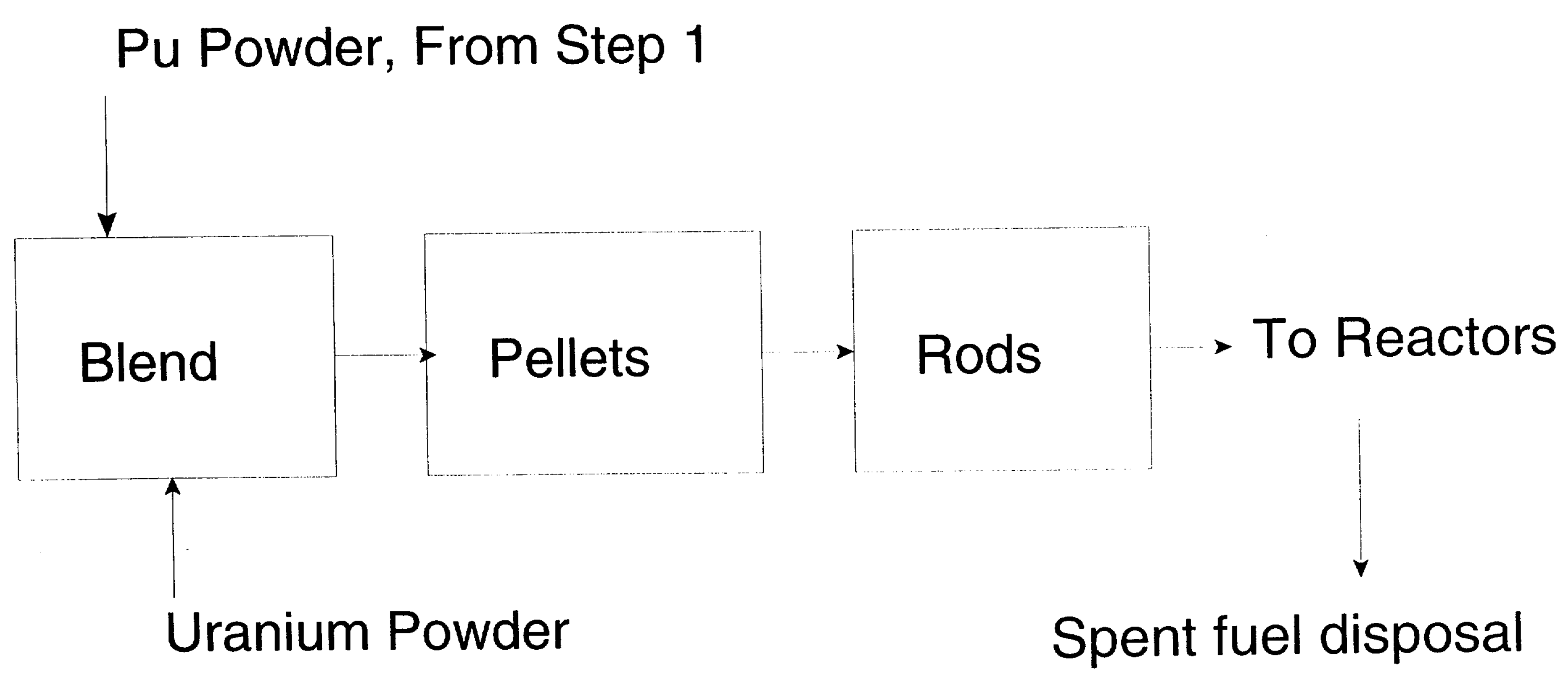
THE MOX PROCESS

STEP 1: Purify Plutonium
(Aqueous Polishing)



THE MOX PROCESS

STEP 2: Fuel Fabrication



Summary of Open Items

Excluding Safety Analysis, Radiological Consequences, Chemical Safety, Fire Protection

- Site description
- Nuclear criticality safety
- Confinement
- Fluid systems

DUKE COGEMA
STONE & WEBSTER

Mixed Oxide Fuel Fabrication Facility (MFFF)

ACRS Briefing on Surplus Plutonium Disposition Program Changes

Duke Cogema Stone & Webster
10 April 2002

DUKE COGEMA
STONE & WEBSTER

Agenda

- Introduction
- Changes to SPD Program
  - Processing of "alternate feedstock" (material previously slated for immobilization)
  - Waste solidification
  - Changes to ER and CAR

DUKE COGEMA
STONE & WEBSTER

Introduction

- Program changes
  - Process some materials previously slated for immobilization
  - Solidification of waste in lieu of processing through SRS waste tanks
- Changes to facility necessitates delay in completion of design, but licensing basis not significantly impacted
  - Design addition to facility to insert new AP process step
  - Remainder of facility largely unaffected
  - Minimal environmental and safety impacts anticipated

DUKE COGEMA
STONE & WEBSTER

Changes to Surplus Plutonium Disposition Program

DUKE COGEMA
STONE & WEBSTER

Summary of Program Changes

- Processing of some materials previously slated for immobilization
  - Total resulting quantities
    - 25.6 MT Pu through Pit Disassembly and Conversion Facility
    - ~6.4 MT Pu originally slated for immobilization
    - ~2 MT Pu future allocation
    - Total 34 MT Pu (consistent with Russian agreement)
  - Material originally slated for immobilization includes impurities that require additional processing
- Waste processing of high-α and uranium waste streams
  - Processing & solidification at SRS facility off the MFFF site
  - In lieu of processing through SRS HLW waste tanks
  - Responsive to concerns about adding to SRS HLW waste tank volumes
- Overall net reduction in environmental impact of MFFF and connected/related activities

DUKE COGEMA
STONE & WEBSTER

"Alternate Feedstock" General Material Characteristics

- Material will be unclassified when received at MFFF
- Feed material will be PuO_2 provided in DOE-STD-3013 containers
- Pu isotopics in same range as material described in existing design (i.e., Pu-240 < 9%)
- Weapons grade Pu isotopics and uranium content well characterized prior to delivery and consistent with PDCF specs
- Accurate impurity characterization may not be available

DUKE COGEMA
STONE & WEBSTER

"Alternate Feedstock" Impurity Characteristics

- Current baseline impurities
  - Characterized by americium, gallium, uranium ("PDCF spec")
- Alternate Feed Type 1: similar to current baseline PDCF feed
- Alternate Feed Type 2: feed with salts, without chlorides
  - Main impurities : aluminum, calcium, chrome, copper, iron, tantalum, magnesium, silver, manganese, potassium, silicon
- Alternate Feed Type 3: feed with salts and chlorides (~half of material)
- Alternate Feed Type U: Limited DU or EU content

Total Pu weight ~ 6,000 kg

DUKE COGEMA
STONE & WEBSTER

"Alternate Feedstock" Process and Equipment Modifications

Powder Pretreatment (MP)
Purification (AP)

Changes to MP Powder Pretreatment

DUKE COGEMA
STONE & WEBSTER

- Receiving/storage of 3013 containers unchanged
- Powder pretreatment process (all powders)
  - Ball milling to reduce grain size (2 units)
  - Powder density measurement unit
  - Chemical characterization (verify impurities)
  - Pretreatment buffer storage
    - Store reusable cans before and after milling, waiting for laboratory results
    - Maintain capacity with similar design to buffer storage between AP and MP
- Addition of re-canning function (packaging analyzed PuO_2 in 3013 containers)
- Additional laboratory equipment
  - Sampling glove box after ball milling step
  - Gloveboxes for sample dissolution and preparation
  - Gloveboxes for analysis of impurities

DUKE COGEMA
STONE & WEBSTER

Changes to AP Purification Process

- PDCF Powder type and Powders with Salts
  Type 1 and 2 Feedstock
  - Process and Equipment : no change vs normal Feedstock (PDCF Feedstock)
  - Impact on the Process Design : limited
- **Type 3 Feedstock**
  - Remove chloride to achieve plutonium nitrate solution in agreement with process requirements and polished PuO_2 in agreement with fuel specification; also precludes corrosion problems in downstream equipment

DUKE COGEMA
STONE & WEBSTER

Changes to AP Purification Process (continued)

- Process changes to remove chloride
  - For process material and fuel specification purposes and to limit corrosion
  - Feedstock solution electrolyzed in two steps (dissolution after Cl removal)
  - Filter off-gas, wash to convert Chlorine into NaCl
  - Process developed/implemented in La Hague UCD plant to treat scrap material with chloride content and extract Pu
- Additional equipment
  - Two dissolution lines (same type equipment as existing processes)
    - One feeding hopper and one electrolyzer each
    - Two filters each with appropriate slab tanks
  - Washing column with soda, chloride salts liquid waste storage tanks
  - U stripping column

DUKE COGEMA
STONE & WEBSTER

Changes to AP Purification Process (continued)

- Changes to AP area
  - Footprint increase in the AP area
  - Reconfiguration of interior spaces and equipment
  - HVAC changes to accommodate room changes and new gloveboxes
- Changes to waste characteristics
  - Additional salts
  - Increase in raffinates volume (by a factor of ~1.5) resulting in increase of ~10% of overall volume of high-α liquid waste
  - Increase of ~10% in low-level liquid waste volume (rinsing)
  - Increase in silver content due to the impurity impact on the efficiency of the silver recovery unit

DUKE COGEMA
STONE & WEBSTER

Licensing Impacts

DUKE COGEMA
STONE & WEBSTER

Changes to Environmental Report

- Revise to address "Alternate Feedstock"
  - No immobilization
  - MFFF will receive ~6 MT feed material not matching original PDCF specification
  - MFFF expects to process 34 MT Pu
- Revise to reflect changes in SRS waste processing
  - High-α waste and stripped uranium waste will be solidified by SRS instead of transfer to F-Area Tank Farm
  - New waste processing building (not on MOX site but within F-Area) for MOX and PDCF wastes
- Also revise to incorporate ER RAI responses and clarifications

DUKE COGEMA
STONE & WEBSTER

Changes to ER: "Alternate Feedstock"

- Describe processing changes
  - Powder processing equipment to prepare the feedstock for chemical processing
  - Minor chemical processing changes to add chloride removal
  - Storage for resulting waste (mainly chlorides, other salts)
  - Building footprint increases <10% to accommodate additional equipment
- Effluents
  - Airborne effluents will contain trace amounts of chlorine, well below regulatory levels
  - Clean condensate and storm water effluents remain unchanged

DUKE COGEMA
STONE & WEBSTER

Changes to ER "Alternate Feedstock" (continued)

- Continue to transfer waste to SRS for processing and disposition
  - Liquid waste volumes anticipated to increase ~10% overall
  - Solid waste volumes should not change
- Impacts of changes expected to be bounded by existing analyses for public and worker dose calculations for normal and accident analyses

DUKE COGEMA
STONE & WEBSTER

Changes to ER Waste Processing

- Change to SRS waste processing strategy for high-α and uranium waste streams from MFFF
  - Processing and solidification at SRS facility off the MFFF site
  - Replaces SRS F-Area Outside Facility and use of HLW waste tanks
  - Responsive to concerns about adding to SRS HLW waste tank volumes
- Conceptual design underway (by DOE)
  - Receive waste from MFFF and PDCF
  - MFFF piping of waste streams largely unaffected (no substantive impact on CAR)
- MFFF and PDCF waste stream characteristics
  - MFFF raffinate and PDCF sources
  - Stripped uranium

DUKE COGEMA
STONE & WEBSTER

Changes to ER
Waste Processing (continued)

- Environmental impacts
  - Construction of waste processing building
  - Normal and accident releases (airborne and liquid effluents)
  - Transportation impacts for waste
  - Disposal impacts

DUKE COGEMA
STONE & WEBSTER

ER Conclusion

Changes to ER from "alternate feedstock" and waste solidification result in insignificant:

- changes in the types and amounts of any effluents that may be released offsite
- increase in individual or cumulative occupational radiation exposure
- increase in the potential for or consequences from radiological accidents
- MFFF construction impact and minimal impact from construction of new waste processing building

DUKE COGEMA
STONE & WEBSTER

Changes to CAR and Safety Assessment

- Revise to address "Alternate Feedstock"
  - Update facility, processes, system descriptions:
    - MOX Receiving and Decanning
    - AP Dissolution and other small changes
    - Facility layout
    - Waste stream(s)
  - Confirm safety analyses are bounding for new processes
- Only minor revision to overall description anticipated for waste changes
- Also revise to incorporate CAR RAI responses and clarifications

DUKE COGEMA
STONE & WEBSTER

Changes to CAR and Safety Assessment (continued)

- Anticipated impacts on existing operations
  - CAR safety assessment made conservative bounding assumptions
  - Consequences of changes expected to be bounded by existing analyses
    - Existing events identified in the CAR expected to be representative of any new events identified as a result of new process
- New PSSCs (if any) will be identified

DUKE COGEMA
STONE & WEBSTER

Mixed Oxide Fuel Fabrication Facility (MFFF)

ACRS Briefing

Electrical and Instrument & Control Systems Overview

Duke Cogema Stone & Webster
10 April 2002

DUKE COGEMA
STONE & WEBSTER

Electrical System Overview

Ron Jackson

Electrical System Introduction

- Electrical Distribution
  - 13.8kV/4.16kV
  - 480V
  - 120 V AC UPS
  - 125 V DC
- Design Basis - IROFS (summarized from NUREG-1718)
  - Sufficient capacity and capability
  - No single failure vulnerability
  - Electrical and physical separation
  - Adequate protective relaying and breaker control
  - Status monitoring capability
  - Test, calibration, and in-service surveillance capability
  - Proper equipment qualification, quality assurance, and reliability
  - Adequate design for natural phenomena

DUKE COGEMA
STONE & WEBSTER

Capacity and Capability

- Two physically independent 100% capacity feeders from SRS
- Medium voltage distribution sized for 100% capacity
- Three potential power sources
  - Normal Off site source (redundant 100%)
  - Standby diesel generators (two 50%)
  - Emergency diesel generators (redundant 100%)
- High resistance grounded Wye 480 V system
  - Allows continued operation with single ground fault
  - Limits ground fault current magnitude
  - Limits transient overvoltages

DUKE COGEMA
STONE & WEBSTER

Capacity and Capability (continued)

- Standby diesel generators
  - Non-IROFS critical electrical loads: sintering furnace, C2 ventilation, life safety loads
  - All emergency loads
  - 24-hour storage tank capacity
  - Automatic start on loss of voltage
- Emergency diesel generators
  - Loading: IROFS loads, vital UPS, HD fans
  - Automatic start after time delay on loss of voltage or degraded voltage
  - 7 day storage tank capacity

DUKE COGEMA
STONE & WEBSTER

Capacity and Capability (continued)

- Dedicated 480 V VHD Fan UPS
- Vital UPS
- Normal UPS
- 125 VDC Normal Batteries
- 125 VDC Emergency Batteries

DUKE COGEMA
STONE & WEBSTER

Single Failure Criteria (IROFS)

- Emergency systems are redundant
- Physical separation
- Electrical independence
- Support systems redundant and separate

Electrical and Physical Separation (IROFS)

DUKE COGEMA
STONE & WEBSTER

- Separation criteria
  - Minimum criteria IEEE 384-92 outside gloveboxes
    - Separation distance determined by area hazards
    - Barriers used where < minimum separation
  - Redundant electrical equipment in separate rooms and areas
- Minimum separation distance
  - Non-hazard area
    - Open tray - 1ft. Horizontal and 3ft. Vertical
    - Enclosed raceway - 1 inch
  - Limited hazard area
    - Open tray - 3 ft. Horizontal and 5ft. Vertical
    - Enclosed raceway - 1 inch
  - Hazard area
    - Only a single division of class 1E circuits allowed in the area

Adequate Protective Relaying and Breaker Control

DUKE COGEMA
STONE & WEBSTER

- Protective philosophy
  - Remove faulted equipment
  - Automatic supervision of manual/automatic operations
  - Initiate automatic operations or switching for shutdown or continued safe operation
- Local and remote distribution system control and monitoring

DUKE COGEMA
STONE & WEBSTER

Test, Calibration, and In-Service Surveillance

- Diesel generators
  - Synchronized to source and fully loaded
  - Redundant emergency diesels
  - Two standby diesels, one in service during maintenance
- Switchgear/MCCs
  - Drawout construction
  - Redundant loads divided between buses
  - Alternate feeds for non-emergency buses
- UPS
  - Manual bypass for maintenance

DUKE COGEMA
STONE & WEBSTER

Equipment Qualification and Natural Phenomena

- Equipment qualification
  - IROFS equipment provided under 10 CFR 50 Appendix B QA program
  - Seismic qualification per IEEE 344-87
  - Environmental qualification per IEEE 323-83 (mild environment)
- Natural phenomena
  - Emergency system
    - Qualified to design basis earthquake per IEEE standards
    - Installed in seismically designed building
    - Protected from tornado and missile damage
  - Standby diesel generator
    - Designed for UBC seismic requirements

DUKE COGEMA
STONE & WEBSTER

Instrumentation & Control System Overview

Jon Tanner

DUKE COGEMA
STONE & WEBSTER

Design Basis

- Regulatory requirements
  - Performance requirements and IROFS concept of 10CFR70.61
  - Design requirements of 10CFR70.64(a)(10)
    - Design must provide for inclusion of instrumentation and control systems to monitor and control behavior of IROFS
  - Defense in Depth 10 CFR 70.64(b)
- Industrial safety requirements, standards, and practices
  - IEEE nuclear power standards
  - 29CFR1910

DUKE COGEMA
STONE & WEBSTER

Design Basis (continued)

- General criteria
  - Fully automated
    - Modern technology and industrial practice
    - Ensure minimal product variability
    - Minimal personnel exposure to process
  - Minimal manual intervention
- Criteria summarized from NUREG 1718 (SRP)
  - I&C system components can be tested periodically
  - Electrical, physical, and control/protection separation
  - No single failure vulnerability
  - Provisions so that components fail in a safe failure mode
  - Status monitoring of the behavior of IROFS SSCs
  - Maintain functionality when subjected to natural phenomena

DUKE COGEMA
STONE & WEBSTER

IROFS Control Systems

- Applicable standards
  - IEEE 603 *IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations*
  - IEEE 7-4.3.2 *IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations*
  - IEEE 379 *IEEE Standard Application of the Single-Failure Criterion to Nuclear Power Generating Safety Systems*
- Example criteria
  - Safety systems maintain plant parameters within acceptable limits. The control portions of each safety system are comprised of more than one safety group, any one of which can accomplish the safety function.
  - Application of single-failure criterion

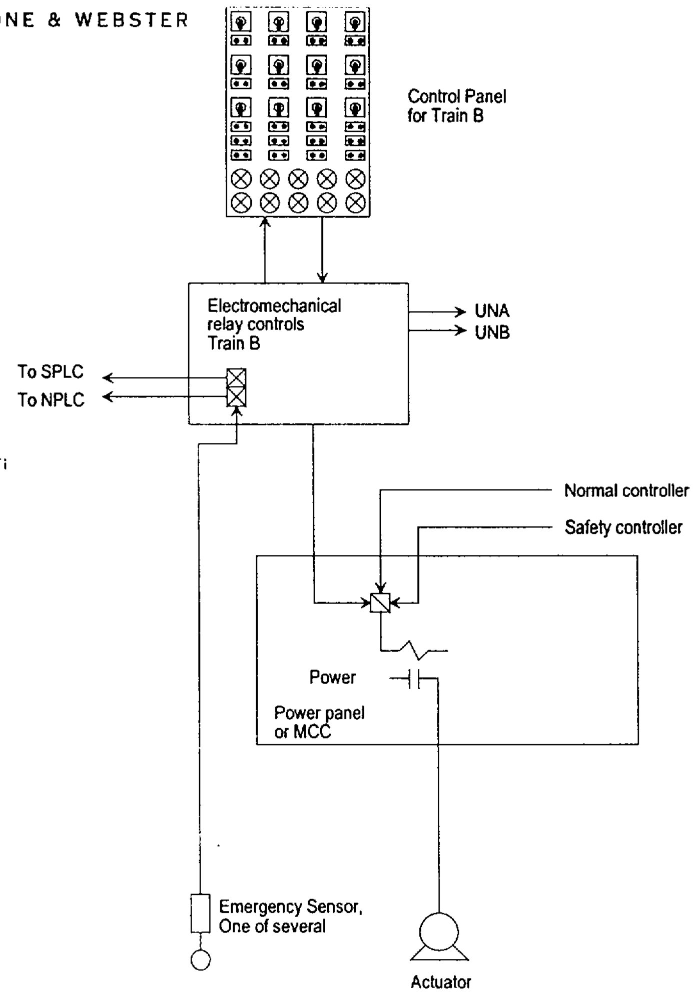
DUKE COGEMA
STONE & WEBSTER

Instrumentation

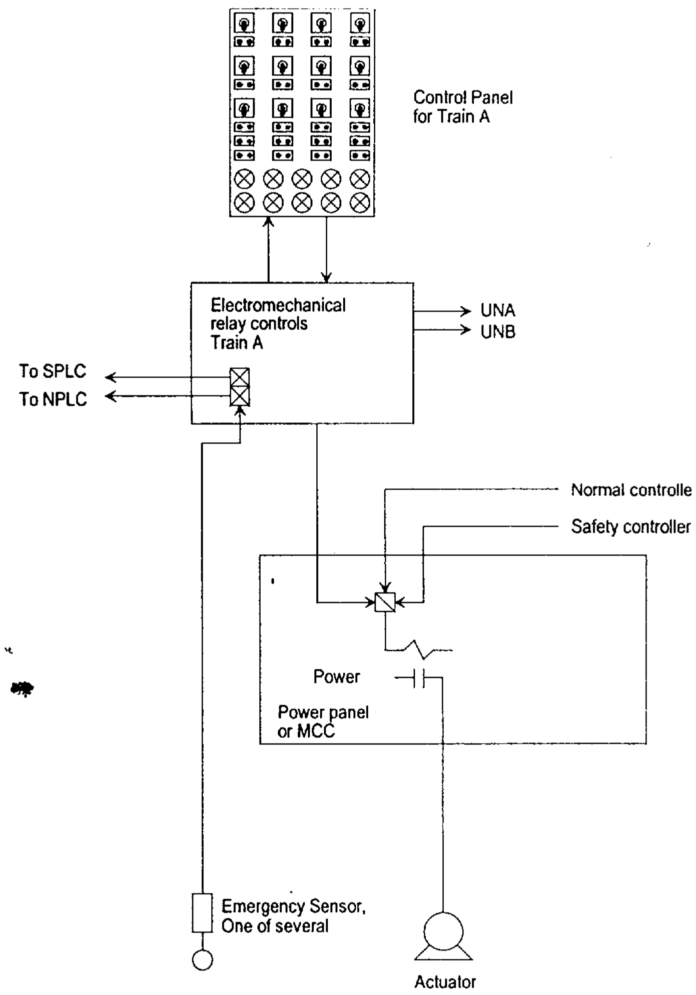
- Monitor variables and systems over anticipated ranges for normal operation, anticipated operational occurrences, and accident conditions
- Display instrumentation provides accurate, complete, and timely information pertinent to safety system status
- Displays represent process equipment schematically
- Displays current equipment status and provides the choice of allowable control actions

DUKE COGEMA
STONE & WEBSTER

Emergency Control System Configuration



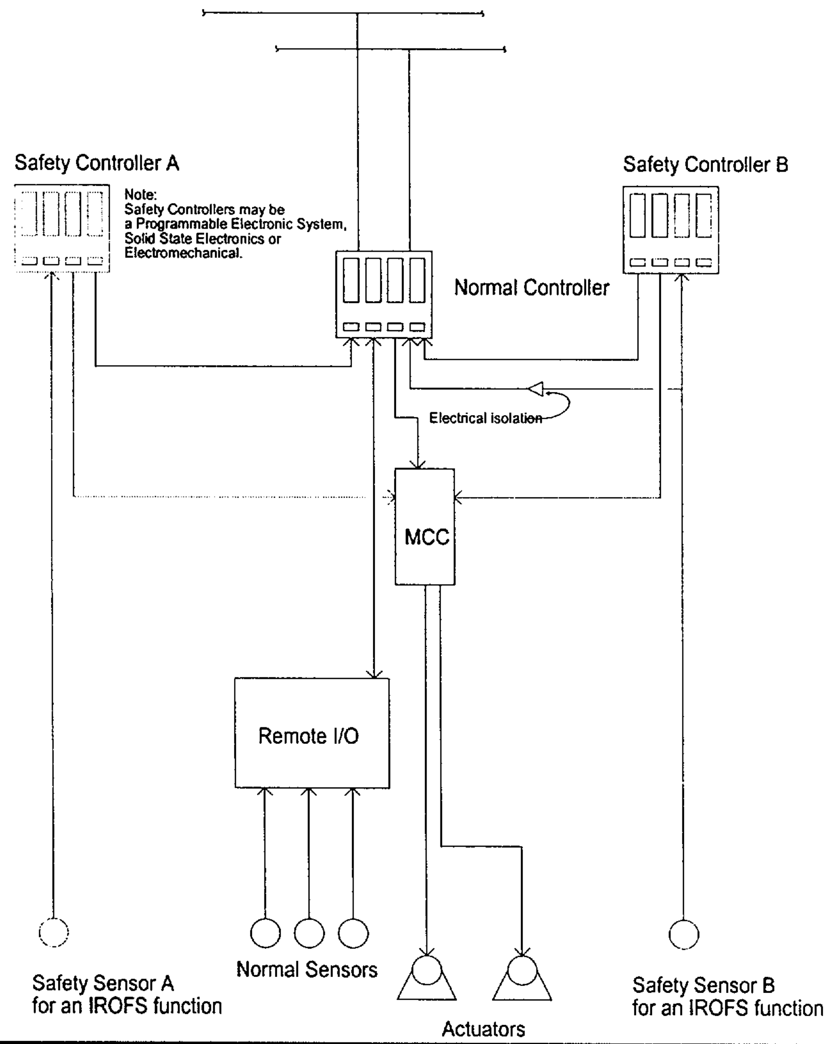
Emergency Control for Train B



Emergency Control for Train A

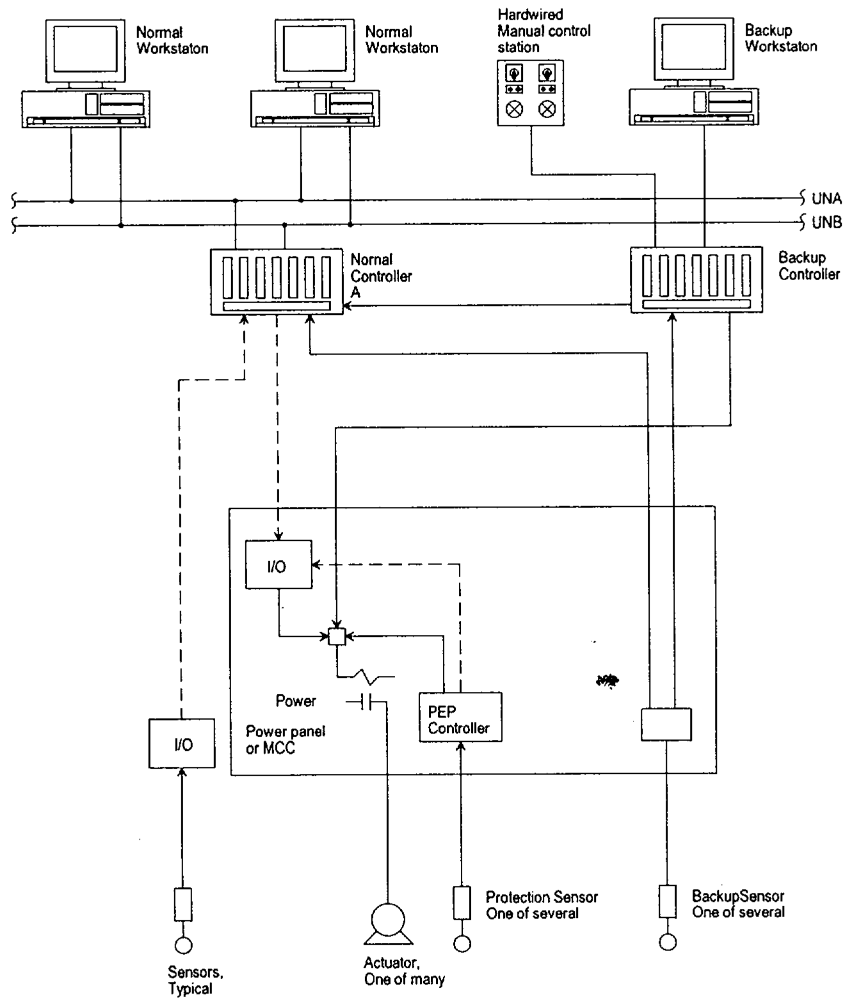
DUKE COGEMA
STONE & WEBSTER

Process & Manufacturing Unit Controller Configuration



DUKE COGEMA
STONE & WEBSTER

Utility Functional Unit Controller Configuration



Functional utility unit - Typical

Fire Safety

Sharon Steele

Overview

- MOX Strategy for Fire Safety
- SER Review: Basis and Conduct
- Main Findings
- Unresolved Issues

MOX Strategy for Fire Safety
Six Event Categories for Fire:

- Aqueous Polishing Process cells
- Aqueous Polishing / MOX processing glovebox areas
- C2 areas (tertiary confinement - low contamination risk)
- External facility fires
- Facility wide systems
- Facility (beyond fire areas)

MOX Strategy for Fire Safety

MOX Fuel Fabrication Building Fire Protection Strategy by Event Categories

Fire Protection Strategy (Principal SSC)	AP Process cells	AP/MP C3 areas w/ glove-boxes	C2 Area				Outside the Fuel Fab. Building	Facility wide systems	Facility Fire Areas
			Canister, fuel rod, transfer container	Transport casks	Waste Container	Final C4 HEPA filter			
Fire Barriers	PSSC	PSSC	PSSC	PSSC	PSSC	PSSC	PSSC	PSSC	PSSC
Combustible loading controls			PSSC	PSSC		PSSC			
Automatic Detection/ Suppression		PSSC							
Process cell Fire Prevention Features	PSSC								
Confinement barriers (3013, MOX)				PSSC					
C4 confinement system						PSSC			
C3 confinement system		PSSC							
MOX Fuel Fabrication Building							PSSC		
Emergency Diesel Generator Building							PSSC		
Emergency Control Room Air Conditioning							PSSC		
Waste Transfer line							PSSC		
Facility Worker Action		PSSC			PSSC			PSSC	PSSC

SER Review: Basis and Conduct

- Basis: CAR, RAI, Polycarbonate report, Preliminary Fire Hazards Analysis.
- Conduct: 10 CFR 70, NUREG-1718 (SRP), RGs.
- Review: Open literature, DOE "Fire Protection Design Criteria."
- Codes/guidance: NFPA 801, "Facilities Handling Radioactive Materials."
- Focus: Fire protection features and systems, PSSCs, design basis.

Main Findings

Fire Safety

- Fire safety strategy is generally acceptable, because:
  - PSSCs - protect radioactive materials
  - Additional protective features
  - Protection of redundant PSSCs (electrical independence and separation per IEEE 384)
  - Fire area separation (NFPA 801)
  - Preliminary Fire Hazards Analysis (not a basis of review)

Unresolved Issues

Fire Safety

- Design basis criteria for gloveboxes window panels (to assure stated mechanical, fire and seismic properties are valid).
- Soot loading analysis for the final filters (primary and secondary confinement).
- Margin of safety for fire barriers.
- Propagation of hot gas through pneumatic transfer tubes.

Summary

Fire Safety

- PSSCs and design bases generally acceptable
- Applicant will provide more information on:
  - Glovebox design basis criteria.
  - Soot loading analyses
  - Methodology: margin of safety for fire barrier
  - Methodology: propagation of hot gas

Chemical Safety

Alex Murray

Overview

- Previous ACRS Meeting
- SER Review: Basis and Conduct
- Main Findings
- Significant Open Items

Previous ACRS Meeting

- Discussed process, proposed PSSCs/DBs, and status of review.
- Specific Issues: administrative controls, high alpha wastes, electrolyzers, red oil, U assay.

SER Review: Basis and Conduct

- Basis: CAR, RAIs, info on docket, ER/EIS activities, Public Meetings/Summaries.
- Conduct: 10 CFR 70, NUREG-1718 (SRP), other RGs, NUREGs.
- Review: open literature, DOE, independent calculations, CPI/nuclear practice.
- Codes/guidance: ASME, NFPA, CCPS.

Main Findings
(Chem safety)

Essentially the same as November Meeting

- Few chemical PSSCs, DBs identified.
- General lack of specificity for PSSCs, DBs.
- Applicant documents: More PSSCs, DBs may be needed.
- Administrative controls.

Summary of Significant Open Items

- Red Oil Issues (TBP-Nitrate).
- HAN/Hydrazine.
- Electrolyzers/Dissolution.
- Waste Area.
- Chemical Release Modeling.
- Sintering Furnace.

Red Oil

- Applicant: Single DB of temp. < 135°C.
- No direct measurement, control, or cooling.
- Staff requested additional information from applicant.

Red Oil

Staff Review

- Red oil reactions occur with organics in nitrate media.
- Several reported explosions over 50 years.
- Hanford, SRS, Tomsk; tens of gallons involved.
- Extensive work - 1950s, 1960s, 1990s.
- Hard to duplicate complete phenomena in lab tests.

MFFF Areas With Potential for Red Oil

- 3 Evaporators (OML and Acid Recovery).
- Associated Tankage.
- Purification Area.
- Solvent Recovery.

Red Oil

Staff Conclusion

- Single temperature control may not be adequate.
- Additional PSSCs, DBs may be needed.
- Awaiting additional information from applicant.

HAN/Hydrazine

- Applicant: Identified HAN and azide hazards.
- Primarily admin. controls on concentration.
- Other PSSCs, DBs may be needed.
- Potentially affects Purification, Solvent Recovery, and Waste areas.

HAN/Hydrazine

Staff Review

- Several events at DOE facilities and manufacturers.
- 1997 - Hanford Event at PFP.
- DOE investigation led to HAN guidelines.

HAN/Hydrazine

Staff Conclusions

- Proposed administrative controls may not be adequate.
- Additional PSSCs, DBs may be needed.
- Awaiting additional information from applicant.

Electrolyzers

Proposed by Applicant

- Important - generates silver to dissolve PuO_2, recycles silver (2 MFFF areas).
- Overtemperature/fire hazard identified.
- Single PSSC of temp control (< 70°C).
- Hydrogen limit (Pu Radiolysis).

Electrolyzers

Staff Review and Conclusions

- Other PSSCs, DBs may be needed.
- Assurances needed.
  - System will shutdown as planned.
  - Other hazards: e.g., electrolytic hydrogen, metal fires.
- Awaiting additional information from applicant.

Waste Area

- High alpha waste system
  - Additional PSSCs and DBs may be needed.
  - Inventories not identified.
- Waste Management Program Changes.
- Staff will re-evaluate after receiving information on impacts of changes.

Chemical Release Modeling

NRC regulates chemical effects on radiological safety

- Impact on radiological safety under review.
  - ‣ - Emergency control room protected.
  - ‣ - Other operator safety actions not specified.
  - ‣ - Awaiting additional response from applicant.
- Applicant has not identified PSSCs or DBs for chemical releases/events.
- Several chemicals (N2H4, N2O4, HNO3, NH2OH) could exceed safe limits.

Sintering Furnace

Staff Review

- High temperature operation with Ar/H2 and water cooling.
- General hazards are fires and explosions.
- Several gas sensors identified as PSSCs.
- Hydrogen flow not terminated under all off-normal conditions.
- Additional PSSCs and DBs may be needed for steam explosions.
- Discussions continuing with applicant.

Summary

- Staff issues similar to previous ACRS meeting.
- Staff has identified open items in the chemical safety area.
- Staff will review additional responses from the applicant as they are submitted.

Background Slide

Red Oil

Tomsk Event

- Most recent - 1993.
- Involved a tank, nominally at 45-50°C.
- Immiscible layers stratified.
- Thermally isolated, became reactive.
- Two explosions: liquid and gas phases.
- Significant damage, contamination; no injuries.

Safety Assessment: Radiological Consequences

David Brown

Safety Assessment: Radiological Consequences

Overview

- The staff's review of the applicant's radiological consequence calculations includes evaluation of:
  - Source term calculations.
  - Facility worker dose estimates.
  - Downwind consequence calculations.
  - How the applicant's safety strategy reduces the risk to each receptor.

Safety Assessment: Radiological Consequences

Applicant's Proposed Methodology

- Applicant's accident source terms are based on NUREG/CR-6410, "Nuclear Fuel Cycle Facility Accident Analysis Handbook" (5-Factor Formula).

- The downwind consequences are based on using a 95th percentile χ/Q using data from the Savannah River Site H- area meterological tower.

- Receptors include the facility worker, site worker (100m), public (8 km) and the environment outside the restricted area.

Safety Assessment: Radiological Consequences

Staff's Review: Summary

- Staff verified by comparison to NUREG/CR-6410 that the methodology for accident source term calculations is acceptable.

- Staff verified by independent calculation that the applicant used reasonably conservative values for χ/Q.

- Staff verified by independent calculation that the risks from controlling accident sequences are reduced by the applicant's safety strategy.

Safety Assessment: Radiological Consequences

Staff's Review: Source Terms

- The staff reviewed the applicant's derivation of accident source terms, including values for:
  - Material-at-risk (MAR)
  - Damage ratio (DR)
  - Atmospheric release fractions (ARFs)
  - Respirable fractions (RFs) (OPEN)
  - Leak path factors (LPFs) (HEPA filters) (OPEN)

Safety Assessment: Radiological Consequences

Staff's Review: Atmospheric Dispersion

- The staff evaluated values for χ/Q:
  - ARCON96 for the site worker and the environment, with credit for building wake effects.
  - MACCS2 for the public.
  - The staff accepts the applicant's χ/Q values for the site worker and the public. However, the safety assessment for environmental protection was not acceptable to the staff.

Safety Assessment: Radiological Consequences

Staff's Review: Safety Strategy

- The staff independently evaluated whether the applicant's safety strategy would reduce the risk posed by controlling events:

  - For the facility worker, the staff requested clarification of the PSSC "Training & Procedures" (or Worker Action) as it pertains to loss-of-confinement events. (OPEN)

  - The staff's review of the safety strategy for environmental protection is ongoing. (OPEN)

Safety Assessment: Radiological Consequences

Staff's Review Conclusions: OPEN ITEMS

- The staff requested clarification of how the facility worker would become aware of a sintering furnace loss-of-confinement event.

- The staff have not accepted the applicant's use of 99.99% for HEPA filter efficiency during severe conditions.

- The staff have not completed review of the applicant's revised safety assessment for environmental protection.

Summary

Safety Assessment: Radiological Consequences

- The staff expects the applicant to provide clarification of the facility worker safety strategy for certain loss-of-confinement events.

- The applicant must justify the 99.99% HEPA filter efficiency for severe conditions.

- The staff will continue its review of the safety assessment for environmental protection.