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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON NUCLEAR WASTE

December 13, 2006

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)

175th MEETING

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WEDNESDAY,

DECEMBER 13, 2006

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T-2B3, 11545 Rockville Pike, Rockville, Maryland, at 8:30 a.m., Michael T. Ryan, Chairman, presiding.

MEMBERS PRESENT:

MICHAEL T. RYAN	Chairman
ALLEN G. CROFF	Vice Chairman
JAMES H. CLARKE	Member
WILLIAM J. HINZE	Member
RUTH F. WEINER	Member

NRC STAFF PRESENT:

JOHN T. LARKINS, Executive Director, ACRS/ACNW

LATIF HAMDAN

NEIL COLEMAN

ANTONIO DIAS

MICHAEL LEE

DEREK WIDMAYER

FRANK GILLESPIE

I-N-D-E-X

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

(8:30 a.m.)

CHAIRMAN RYAN: Good morning. The meeting will come to order.

This is the second day of the 175th meeting of the Advisory Committee on Nuclear Waste.

During today's meeting, the Committee will consider the following: the proposed revision to Standard Review Plan Chapter 11.2, "Liquid Waste Management System"; we'll hear about public comments to NRC staff on the NRC staff's low-level radioactive waste strategic planning initiative; we'll discuss conceptual licensing process for the Global Nuclear Energy Partnership Facilities; and we will hear the closure of Generic Safety Issue 196 on Boral Degradation; and discuss Committee letters and reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Derek Widmayer is the Designated Federal Official for today's initial session.

We have received no written comments or requests for time to make oral statements from members of the public regarding today's sessions. Should anyone wish to address the Committee, please make your

wishes known to one of the Committee staff.

It is requested that speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume, so they can be readily heard. It is also requested that if you have cell phones or pagers that you kindly turn them off.

Thank you very much.

And without further ado, we'll begin our opening session on the topic of proposed revisions to the Standard Review Plan Chapter 11.2, "Liquid Waste Management System." And I believe, Jean-Claude, you're our speaker this morning. Welcome. Jean-Claude Dehmel is here with us from NRR/NRO.

MR. DEHMEL: Yes, I'm in transit. I'm in transit. I'm a transient worker between NRR and NRO.

We're going to go over the proposed revision to Chapter 11.2 addressing liquid waste management system. Let me start -- this is kind of a quick overview of what I will be covering, the purpose and scope of Chapter 11.2. There's a lot of information there. I'm going to essentially not go over every item. I'm just going to gloss over it, because essentially it's -- all this information is well covered in the SRP.

I'm going to talk a little bit about the

approach in reviewing the chapter, the type -- and describe some of the type and the extent of the revisions, and obviously focus on some of the important revisions and address some of the changes in the primary and secondary area of responsibility from the 1996 version. And then, we'll go to the conclusions.

So with that, so essentially the focus is obviously on liquid waste generation and treatment. So there are four major sources of liquid waste -- equipment drains, flow drains, chemical drains, and detergent drains. Just for your information, sludge isn't a liquid slated for solidification or stabilization. It's dealt with in Chapter 11.4 of the SRP. It's not addressed here. It's addressed with the chapter dealing with radioactive waste management.

And the operation of the liquid waste management system relies on a combination of a two-type system -- permanently installed system -- that is, those systems that are designed as part of the plan.

Those are the components you would see, for example, described in the DCD application package, and are more and more now complemented with mobile systems, skid-mounted systems, that essentially are

procured, rented, leased, and brought on the side, into the building, connected to a permanently installed system, and operated for -- to support, for example, an outage which may be a few weeks, decontaminated, disconnected, and shipped back to the vendor or the contractor.

Some major components include, you know, for obvious reasons tanks, pumps, and so on. And so that's, again, somewhat described in the SRP. Obviously, the nature, the number of tanks, number of components, and so on, it's all related to the chosen design as it is proposed by the applicant or, you know, described in the DCD package.

The typical treatment method most often cited are filtration, reverse osmosis, ion change, charcoal absorption. But keep in mind that once the system is supplemented with a mobile system, more exotic liquid waste processing methods could be applied -- for example, ultra filtration and perhaps we see more and more now is radionuclide-specific ion exchange resins.

And the rest is self-explanatory regarding, you know, obviously the design as to be able to handle the expected volumes, as to provide sufficient storage capacities, anticipated flow rates,

and so on, and obviously the issue associated with the instrumentation addressing radiation monitoring, controlling the process and effluent releases, and obviously instrumentation or methods to determine the effectiveness of the overall system.

And the system operation addresses, obviously, safety of radioactive releases. And, again, this aspect is dealt with in greater detail in Chapter 11.5 of the SRP, which addresses the offsite dose calculation manual 11.4, which addresses the process control program. And 11.5, again, addresses the -- what used to be called the RETS, which is now the standard radiological effluent controls.

Radiological characterization -- so obviously there's a discussion as to, you know, what are expected -- not only the volumes of waste, the types of waste on these four different categories I mentioned earlier, but what is the characterization? So there are essentially two components to the characterization. One is, what is expected radionuclide concentration in the primary coolant, the primary steam?

And then, from that information, I'm not sure if that volume of liquid, for example, is processed and ultimately treated for

disposal/discharge. So, then, the source term essentially consists of two components. One is, you know, the concentration in the coolant and the concentration in the outflow?

But the concentration effluent essentially is modulated by the type of treatment system that is used -- filtration, reverse osmosis, ion exchange, and so on. So all of these types of treatment methods have their own respective decontamination factors or removal efficiencies, depending on the nature of the waste and the type of treatment processes that are used.

So the elements that I've identified with respect to obviously the effectiveness of the treatment method, taking into account the physical, chemical, and radiological properties of the liquid waste treatment system, capacity, and storage. And plus, in flow rates, the treatment system effectiveness, decontamination, or removal efficiencies.

And, obviously, the endpoint, what is that -- where is that material going? If it's going to be recycled, it's going to be -- it will be used, then you have to look at a treatment process differently than if you were going to process that and treat it

for ultimate disposal or a simple discharge. And, obviously, this is addressed not only in NRC requirements but also the requirements of the NPDS permit and as well as EPA and/or state regulations, even local regulations, on what you cannot discharge.

And this whole characterization effort essentially relies right now on some -- what some of you might say are outdated, but these are the only tools that the staff has -- the BWR and PWR, GALE code, and other method essentially using a modified ANSI 18.1 standard to essentially derive both the concentration of radionuclides in the coolant as well as estimating the amount of radioactivity that could be discharged in the environment or sent for disposal.

Some of the key acceptance criteria in the SRP are essentially -- this is virtually unchanged since the last one, except for the last two. The focus -- we've put a greater emphasis now on 10 CFR Part 20.1406 on the minimization of contamination and the programmatic elements of Part 52.47 and 52.97, ITAAC as they relate to the DCD and COL application packages to review, and so on. So those are essentially additional -- are inserted for programmatic reasons.

The key items regarding this -- again,

it's pretty what it used to be before, except now we have a new reg. guide, Reg. Guide 1.206, which is DG-1145, which essentially supplements or replaces Reg. Guide 1.70. As far as all the other guidance, it has been around for a long time, so this is nothing new there.

So the structure of Chapter 11.2 is essentially unchanged. You know, if you compare the 1996 version with the proposed 2006 version, you know, there are some minor changes in the substructure below those, but those are essentially non-substantial.

Here are some of the major changes that were inserted regarding, for example, in this case Part 20.1406, minimization of contamination. So it relies on different sources of information. Some of it is very current -- for example, the liquid release lessons learned and our task force report on titrium leaks. And later on, I'll give a specific ADAMS accession number, so you can go to it.

So there's a big emphasis on that, NUREG/CR-3587 on the evaluation of D&D techniques in the context of some of the elements of Part 20.1406. We did not have before -- I went and looked at some IE Bulletins, some Circulars, to provide some examples to the staff, some issues that have surfaced in the past,

and how -- what kind of recommendation the agency has issued to licensees, then, as illustrative examples.

They are not meant to be all-comprehensive. They essentially are enough to illustrate some issues. And they obviously don't capture all of the, you know, upsets or issues that were identified over the past 50 years or so of operational history.

And, finally, the above items are long-guidance, to be supplemented by a rulemaking in addressing the revision of Part 20.1406 and the issuance of a new reg. guide addressing just that. So these are essentially -- you can look at these as placeholders for now, you know.

And so Research is addressing -- as you know, Research is addressing the development of a reg. guide. I believe there's a contractor -- and I've attended a couple of meetings -- that are essentially scouring the IE notices, and so on, the reg. guides, to identify and screen out information that could be brought forward into this new regulatory guide. So we have to see as to what this new reg. guide will say and propose.

Where there's a bit of emphasis now that wasn't there before is a focus on mobile liquid waste

processing equipment. There is an increasing trend to essentially say that, you know, we -- the plant is described as having, for example, this permanently installed system, and it impacts all of the major components that you have to put right now in a cubicle before you pour concrete over it.

So all the piping is there, the valves are there, and so on, but with respect to how the material, the liquid waste will be treated and processed, that's described essentially as black boxes. It simply says it's to be provided by the COL applicant, and there is a very simple description or schematic representation of what this is -- these black boxes may contain. There are several of them.

For example, one is to process and deal with spent resins. Another one to address reverse osmosis, another one for ultra filtration or charcoal absorption, and so on. So there's not a lot of detail.

So the focus is essentially on flagging, to obviously the applicant as well as the staff, that these are things that may have to be scrutinized, probably because essentially there is very little information or no information provided, no substantial information provided in the DCD or COL application.

So this is something that will have to be looked at.

There is also an interesting aspect if you look at Reg. Guide 1.143 addressing what is the definition of the radioactive waste processing system. This is a liquid waste management system. So the idea of the interface or where the input is to the system, as it is defined as a liquid waste management system, into the DCD or the COL application, and where is the release point.

So essentially those two extremes represent the liquid waste management system. So now we have this extension, which is a mobile system. So we have to make sure that the staff and the applicant understands that when we are going to look at a system essentially it's the entity of starting from the point of connection to where -- for example, the primary coolant, where this is the input to the liquid waste management system.

CHAIRMAN RYAN: Just a quick question, if I may, on this exact point. How do 50.59 reviews fit into the mobile equipment and the plants dealing with all of it? Because that's how they handle it now.

MR. DEHMEL: Yes.

CHAIRMAN RYAN: Or at least in part.

MR. DEHMEL: But we would not see that.

You know, we would not see this at this stage now. So if -- in the context of NRO where I receive -- I'm responsible for reviewing 11.2, 50.59 process is --

CHAIRMAN RYAN: Somewhere else.

MR. DEHMEL: -- is somewhere else.

CHAIRMAN RYAN: That's interesting, though, because it really is exactly that --

MR. DEHMEL: Yes.

CHAIRMAN RYAN: -- mobile system box that you were talking about.

MR. DEHMEL: Yes.

CHAIRMAN RYAN: Yes.

MR. DEHMEL: And obviously we are putting some emphasis in the previous slides about the -- on the emphasis on the Circulars, and so on, and prevention of contamination. You know, we essentially highlight some of the design features that could be used and applied to reduce leakages, spills, and the resulting non-monitoring releases, and so on.

Obviously, the focus is also on prevention of contaminating non-radioactive system, because these systems, these mobile systems have interfaces with existing plant systems -- surface water, compressed air, you know, and so on.

Then, there is also the issue of the

system interaction for a multi-unit station. So that depends on how the DCD package is described or the COL applicant describes this approach and how a system may service, you know, for example, two operating units.

And, again, the definition of a boundary between liquid waste management system and the interface, all the way to the point of storage, recycling, release, or disposal.

This requirement on compliance with EPA dose standard, 40 CFR Part 190, was embedded, but we felt that it should be teased out and provide much more greater detail, mainly for the purpose of integrating the information from Chapters 11.3 and .4, and essentially using this information to determine whether compliance with that requirement was met.

And that the offsite dose calculation manual would actually then -- that would be captured in Chapter 11.5, would address this aspect. Interestingly enough, the way the SRP is structured, the dose component -- meaning the external radiation component from buildings and from contained sources of radioactivity -- for example, you know, liquid storage tanks, radioactive waste storage buildings, nitrogen-16 from BWR turbine buildings -- that type of analysis is covered in Chapter 12, 12.3 and 12.4.

Yes, 12.3 and 12.4

So the idea is to essentially bring all of this information together into -- and capture that in Chapter 11.5 to make sure that the offsite dose calculation manual, in looking at all of the compliance requirements, captures this information from these other sources within the SRP, and that the applicant is aware of this.

So the consideration here again, just to make a long story short, is potential internal exposure because 40 CFR 190 addresses all sources of radiation and exposure. So it's inhalation, ingestion, external radiation exposure from onsite contained sources, offsite deposited radioactivity, and does due to the entire site -- all units, buildings, and facilities. And this is for -- as opposed to Appendix I requirements, which is on a per unit basis, the 40 CFR Part 190 requirements are for the entire site.

So, again, the difference also with 40 CFR 190 versus Appendix I for the maximally-exposed individual is that -- that the dose receptor under 40 CFR 190 is supposed to be kind of real member of the public, and the other elements that you, you know, covered. And, again, the focus on that is

confirmation for compliance is captured in the offsite dose calculation manual and the radiological and environmental monitoring program.

Some of the miscellaneous changes and updates -- again, the first two elements are programmatic issues which the Project Office -- and I think there is somebody here from -- Steve Koenick. If there are more questions, he can address those -- those elements addressing the ITAAC, the COL DCD applications, and the next one on the clarification on COL action item certification requirements and restrictions. Those were essentially added into this.

Update of internal cross-references within Chapter 11.2 and with SRP Chapters 11.3 and 11.5. Again, the main focus there has been to, for example, flag the fact that if you have a liquid waste management system or the gases can form because the tanks, for example, are vented. Well, that would be captured in Chapter 11.3 of the SRP.

But the offsite doses with effluent releases would be captured in the ODCM, which is covered in Chapter 11.5, and so on. So you see the cascading effect there.

We also reviewed and updated the interfaces with all of the other SRP chapters, because

even though I'm talking to you in the context of radiological consideration, there are obviously engineering considerations, emergency planning, instrumentation and control, balance of plant, civil engineering issues, and so on. So we made sure that the interfaces with all of the other SRP chapters, as well as the interdisciplinary support, is flagged and captured.

There was a change -- there's a change in the assignment of review responsibilities, because, as you may compare this to the 1996 version, it referred to the old organization by the higher designations. Those no longer exist.

So rather than be burdened having to identify an organization in a branch or a division by this acronym, the responsibilities were assigned with respect to the context of what -- you know, health physics, balance of plant, instrumentation and control, emergency planning, you know, and so on, quality assurance, and so on.

The other change was that my group, the Health Physics Group, is now as a lead on Chapters 11.2, .3, .4, and .5. And this was debated among the branches, and ultimately the decision was made because the focus of the acceptance criteria, all radiological

in nature, are in compliance with EPA, NRC, and dose calculations. So the thinking was that, well, because of that, there's so much weight on radiological compliance and dose assessment, and so on, therefore, it stands to reason that the Health Physics Group should have the lead.

But in that context, the other branches -- balance of plant, EP, QA, and so on -- still have a co-lead or a significant role. So in that context, we're not taking the lead in those technical areas. We are essentially acting as PMs. We're taking -- initiating the review, be responsible for our areas of review, at the same time making sure that emergency planning, QA, and so on, I&C, are responsible for their review, and they provide their technical input to us. And then, we will assemble all of the comments.

Okay. Again, we talked about the citations or the inclusion of citations in Part 20.1406 and Part 52. We also added some additional references and updated the existing ones, and then the rest of it essentially are kind of minor updates, clarifications, corrections, and so on.

So, in conclusion, the main structure of 11.2 remains the same. We felt it was important to

provide more detailed guidance to the staff and applicants. For example, now there is greater discussion on the compliance with the EPA requirements -- 40 CFR Part 190, as it is implemented under Part 20.

We include requirements addressing 20.1406, which provided some interim guidance, as described earlier.

The update now incorporates information on -- from recent staff studies, and, again, this is the groundwater contamination lessons learned task force report. And I'll give you the ML number, so you can look at it. The D&D lessons learned report -- and I believe those -- that report was also presented before you sometime in November as to the contents, so I'm not going to go over that.

So the next step essentially at this point is to address the public, staff, and stakeholder comments in early 2007, and then finalize the chapter for March publications.

Before I conclude, the other thing I want to flag to you is that if I went to make a presentation to you about 11.3, 11.4, 11.5, it would be essentially identical, with some obvious differences.

For example, in 11.4, there is a much bigger emphasis and discussion about the programmatic element of the process control program for the purpose of treating waste. In 11.5, there is much greater emphasis on the elements addressing the content and format of the offsite dose calculation manual, the radiological environmental monitoring program, and the tech specs or the RETS. And so those are essentially teased out in greater detail with all of the major elements.

But essentially, as far as the discussion, this would be almost a carbon copy presentation. So I leave it up to you whether or not you want to see me again three more times.

(Laughter.)

CHAIRMAN RYAN: Well, you're always welcome. We always enjoy your updates, whether it's a repetitive thing or not, so you're welcome any time.

But there are some details, for example, the characterization for -- the detail characterization for waste is pretty interesting. You know, we, as you well know, wrestled in the '80s with overestimates on disposal manifests.

MR. DEHMEL: Yes.

CHAIRMAN RYAN: It's always okay to say we

had, you know, an MDA and we were below the MDA, but for the purpose of making sure we didn't have a violation at the disposal site, we reported the MDA. And Jean Vance and Associates, and others, looked at this in some detail and found that tech-99 and I-129 were grossly overestimated in what was disposed.

And, you know, that got sorted out, but I'm curious if some of those improvements in exact -- or a better prediction of what is in the disposed waste are going to be implemented, just as an example of, you know, how are things being updated.

MR. DEHMEL: Yes. We are -- if you look at Chapter 11.4 on waste disposal, there is some guidance that the staff has provided on radionuclide concentration averaging, stabilization of certain types of waste, and that guidance has not changed. We have not changed that guidance.

And so the process that the applicant -- well, in this case, the licensee would use for the purpose of calculating, first, the tritium concentrations and distributions in the waste, and then calculate concentrations and/or total inventories. That aspect has not been updated at all.

Basically, that -- one should be careful is that -- the methodology that will be used to

characterize radioactive waste for low-level waste disposal, in the context of Part 61, and whatever acceptance criteria a disposal site might impose, are different than characterizing radioactive material for liquid effluent discharges.

The concentration in waste, essentially that is packaged for disposal, reflects essentially the treatment, the solidification, whatever processes were used. That concentration and distributional relationship between cesium-137, for example, and strontium-90 and iodine-129, tech-99, barium, and strontium, is different than what you would find in liquid effluents, in primary coolant, in the input stream to the liquid waste processing system.

Those relationships essentially are not really alike, so you cannot use, for example, those infamous or famous scaling factors that you would use, for example, in -- traditionally used to characterize and prepare waste for disposal under Part 61, and apply that to characterizing the input stream to the liquid waste management system. They don't apply. They really don't apply.

The only telltale indicators you have, what is traditionally used for performance indicators for fuel, and those are typically characterized as

radio-iodines, the noble gases, and a few fission products, cesium-137, strontium-90, barium-140, and so on, and those are the ones that are used to essentially assess the performance of, you know, whether or not those fission products are contained within the pellet and what fraction of that essentially makes it for the cladding. That's a completely different relationship than what you would do for low-level waste characterization for the purpose of disposal.

CHAIRMAN RYAN: There's another interesting, I think, dimension to it, and that is that with the very high emphasis on water quality and coolants, that whole picture has also changed from that standpoint --

MR. DEHMEL: Yes.

CHAIRMAN RYAN: -- because there's a lot more emphasis of having, you know, much lower conductivities and much higher quality water in the coolant. So not only kind of the total picture of radioactive material that's in liquid effluents, or things that they want to take out of the liquid effluents. There is a little shift among fission products, activation products, and, you know, all of the other things we think about in that area.

And I wonder, is the guidance going to reflect any of that, or -- it sounds like not.

MR. DEHMEL: No.

CHAIRMAN RYAN: I wonder if it should. I mean, I don't know. I'm just asking a question. I'm not saying we're married to that idea. It's something to think about.

MR. DEHMEL: No. Because the way the liquid -- what you're addressing essentially is another part of the SRP which addresses, you know, plant chemistry.

CHAIRMAN RYAN: Yes.

MR. DEHMEL: And so what do you do to, you know, maintain the integrity of the fuel.

CHAIRMAN RYAN: Not exactly, though. I mean, that's certainly the feedstock, if you will, for the waste treatment side. But the waste treatment side is still dealing with, okay, well now, you know, how do I characterize the radioactive material content of the thing I'm treating? That's the front end. And, okay, what am I putting out to the low-level waste management people on the back end, whether it's resin, solidified concrete, or there's not much solidified anything anymore.

MR. DEHMEL: Right.

CHAIRMAN RYAN: But, you know, and there's really not as much resin as there used to be. It's all going to RO and, you know, other techniques.

MR. DEHMEL: Right.

CHAIRMAN RYAN: I wonder if that needs some detailed thinking before we just say, "Well, we'll just keep the guidance the same"? Ultimately, we end up with an overestimate of the low-level waste source term. That's a bad thing, particularly if it's I-129, tech-99, ruthenium, or any other ones that if we use -- or folks feel like they can still use traditional scaling factors, you know, which can be off a lot, that could perpetuate a problem.

MR. DEHMEL: This aspect is treated in those branch technical positions. It's not addressed in the SRP. In the SRP, we talk about -- for example, with respect to the process control program --

CHAIRMAN RYAN: Yes.

MR. DEHMEL: -- the process control program simply assumes that, you know, you have some type of material with radiological, physical, and chemical properties. You're the recipient of this material. And then, the question is: what do you do to stabilize this material, such that -- or ship it or prepare it for disposal such that it meets the

acceptance criteria and Part 61 requirements? So that's as far as it goes.

But the detail with respect to what you're addressing are really contained in the branch technical position, and that we would need to ensure that -- look at these documents and look at the specific guidance as to, you know, how the -- what kind of instructions are we giving to the licensees, and perhaps revise the scope of considerations, tease out some of these issues you're identifying right now, and kind of think about it and, you know, put together some chemists and health physicists together and essentially provide elaborate detail, and provide some markers that essentially the licensee would have to follow, and be more careful in not overexaggerating the radionuclide distribution and concentrations.

CHAIRMAN RYAN: Well, and again, I mean, it's an overexaggeration. It's done for an admirable reason. The last thing you want to do is underestimate what you're disposing. If you're saying, well, it's no more than this, and this is a conservative estimate, sometimes a bounding estimate, people satisfy themselves they've met the requirement for disposal, and that's true.

But it really creates kind of the

downstream problem of, well, now I've got -- I think, if I recall right, it was hundreds of times more inventory of tech-99, and maybe even a couple thousand for I-129 -- I may have that backwards -- but it was orders of magnitude higher inventories that came out. And, of course, that's problematic from a PA standpoint.

So I just -- you know, I don't know -- I'm -- you know, I appreciate your insights and ideas, but I think there's something there that needs to at least be, you know, run through and thought about a bit. Is there anything we can do at this stage to maybe at least heighten people's awareness that with a pretty big shift in waste processing and disposal requirement, you know, as a combination of issues, that that's something to think about. Is that off base, or am I, you know --

MR. DEHMEL: No.

CHAIRMAN RYAN: -- I know it's a lot of work, but --

MR. DEHMEL: You're highlighting some valid points. The only thing is that right now, the way the SRP is structured, it's not there. We simply refer to those branch technical positions. We treat that, you know --

CHAIRMAN RYAN: If it is the BTP that needs to be updated, fair enough. We accept that as maybe the right answer. But I think that's something that, if there's a string between this and the BTP, it still calls that question. But I appreciate the fact that this may not be the right document. It may need to be in the foundation document.

And just for clarity, it's the BTP on waste form and waste classification? That's where it would land?

MR. DEHMEL: Yes. Actually, you're catching me off mark here. There are three of them all together.

CHAIRMAN RYAN: Yes.

MR. DEHMEL: Yes, right.

CHAIRMAN RYAN: Okay. I see on slide 5 our old friend -- or our new friend, I guess -- the GALE code.

MR. DEHMEL: I knew this was going to come up.

(Laughter.)

CHAIRMAN RYAN: We'll talk about that when we get to the letter.

(Laughter.)

MR. DEHMEL: Yes, that's right.

CHAIRMAN RYAN: But I think we still see that as something that, you know, if that can -- and I know there's a tremendous time pressure, but that's one I think we've debated and thought about needs to be updated.

MR. DEHMEL: Yes. Just for your information, the staff and management is very well aware of this weakness. Staff has put together a punch list of the codes -- you know, for example, the computer codes that should be updated, and so on. So it's essentially -- at this point a decision has to be made that, you know, we're going to devote the time and effort, the resources, to update all these codes. And it's going to be costly, and it's going to take some time.

MR. WIDMAYER: And, Mike, could I ask a question on this?

CHAIRMAN RYAN: Sure.

MR. WIDMAYER: I just wondered, when Research gave their presentation last month, they didn't mention the ANSI standard. And I was wondering if --

MR. DEHMEL: I think they did.

MR. WIDMAYER: Did they?

MR. DEHMEL: Yes, they did.

MR. WIDMAYER: They did? Okay. I'm sorry. In your opinion, how much better is this ANSI standard methodology or --

MR. DEHMEL: Well, the ANSI standard -- the reason why it was inserted into the Reg. Guide 1.112 is that we felt that the reg. guide itself is tied to the code. It's tied to NUREG-0016. It's tied to NUREG-0017.

So for us to revise the reg. guide, and go into a lot of detail, essentially it was a futile effort because you really should update the computer codes first, and then -- but we said because of the applications coming in that people recognize the reg. guide is outdated. So they are drawing not on the 1976 version of the ANSI standard, but on the 1999 version. And the staff has found this to be acceptable.

So the idea was to actually at least leap forward in time to 1999, and essentially acknowledge the fact that the 1999 version of that standard is adequate.

Now, the standard does not do everything that the GALE code does. The only thing it does, it provides you with a basic set of input parameters in a series of simple equations to essentially calculate

radionuclide concentration in primary coolant, primary steam, radionuclide concentration in secondary coolant, secondary steam, based on some very simple plant parameters.

Essentially, it depends on how much the thermal power reactor, how much water you have in a reactor vessel, and so on. So it only -- it is only used to calculate, again, cooling concentration.

What the GALE code does, it takes that step further and then applies, depending on the kind of treatment techniques, ion exchange, infiltration, or whatever, and factors in decontamination factors -- storage time, processing time, and then it calculates released inventories, curies per year to the environment. And so it -- so --

CHAIRMAN RYAN: That's where the leap of faith happens.

MR. DEHMEL: Well --

CHAIRMAN RYAN: And, you know, that's hard-wired, as we discussed last time.

MR. DEHMEL: It's hard-wired.

CHAIRMAN RYAN: And it's very difficult I think for anybody, particularly the -- you know, the newer applicants. How do those old numbers really relate to a new plant? There's no string attached

there without really diving back into the memories of folks that made those selections, because the documentation doesn't tell you anything in that --

MR. DEHMEL: Well, I mean, you can look at -- in the back of the document, there's a detailed printout of the four --

CHAIRMAN RYAN: Yes.

MR. DEHMEL: -- you know, and I went through it. It's interesting, you know, what's in there. For example, you would find out that ultimately a code was set up with different type of reactors. So there's an option in there for high temperature gas-cooled reactor. There's an option in there for fast breeder reactor, but those options were turned off, because obviously the context is for a lightwater cool.

CHAIRMAN RYAN: And going through that printout, you must admit, is a challenge for anybody, but --

MR. DEHMEL: Yes. But, basically, there are about 60 or so input parameters. That's not a hard wire. You just cannot change it. That has to be changed.

CHAIRMAN RYAN: Right.

MR. DEHMEL: Okay? And then, all of the

treatment methodology or the treatment processes, the suite, and the options have to be expanded to reflect, you know, what is currently available on the market today -- ultra filtration, different type of radionuclide-specific ion exchange resins, and so on, you know, better reverse osmosis unit, and so on. So that has to be updated. That's correct.

CHAIRMAN RYAN: And, again, I mean, I don't know all the numbers, but it seems to me that the reflection that water quality, for lots of obvious reasons, of, you know, better performance, lower activation problems, and dose rate management, there's a dozen reasons why higher water quality or better water quality has become a real benchmark for the industry. And that would seem to have an impact, too, on all of this.

MR. DEHMEL: Yes. The operation -- the initial determination as to whether the cooling concentrations are as input into the liquid waste management system or as input into gaseous effluents, basically based on operational history of the plants up to the late '60s and early '70s. So we looked at a number of plants, and the basic section described all the plants, and from there they said, "Well, for cobalt-60, for so and so, and that radionuclide, here

is the ratio." And those ratios are hard-wired, again, into the code.

CHAIRMAN RYAN: That's a bad thing.

MR. DEHMEL: Yes. It does not reflect, you know, the fact that we have much better fuel now.

CHAIRMAN RYAN: Right.

MR. DEHMEL: And that also chemistry -- you know, the utilities are much more attentive now to chemistry, so those essentially would have a tendency to perhaps reduce cooling concentrations. And also --

CHAIRMAN RYAN: This shows the mix of radionuclides.

MR. DEHMEL: Absolutely.

CHAIRMAN RYAN: Yes. So from a health physics perspective --

MR. DEHMEL: Yes.

CHAIRMAN RYAN: -- that's a big shift.

MR. DEHMEL: Big shift, yes.

CHAIRMAN RYAN: One last point and I'll turn to my colleagues here. On slide 10, the last bullet, the definition of the boundary with the liquid waste management system from system interface to point of storage release, recycle, and disposal.

Led me to think about, have you had any interaction with any of that community of folks who

are in the waste management arena? Have they been a participant in any of this?

MR. DEHMEL: Waste management arena, what do you mean?

CHAIRMAN RYAN: The companies that do processing or liquid waste systems or mobile systems or any of that?

MR. DEHMEL: No.

CHAIRMAN RYAN: Are they aware of this update, do you think, or -- I mean, I just wonder if they might have some interesting --

MR. DEHMEL: Yes. I think they are aware, because they realize there's a big emphasis on their mobile processing system, and especially in light of this wave of new reactor applications. I'm sure they're keeping abreast, because they see this as a, you know, kind of significant business opportunity. So I'm sure they're keeping abreast, but we haven't contacted anybody.

My understanding, in talking to some representative from the utilities, and as well as NEI, is that each plant develops a set specification for their plant for what they expect to achieve. And that specification takes into account whatever system is permanently installed, and then what they want --

essentially the output from that permanently installed system to be treated.

And those specs are especially sent in to Chem Nuclear, GTI's director, whomever, and then actually design and build a system and -- for the plant. So it's true that there are some -- you can go to a catalog, you can go to somebody's website, and look at some of these systems. But, essentially, they are a generic system, and whether or not there will be a representative or a mobile processing system that will be installed, an operating plant, or seem to be operating powerplants, you know, I can't tell.

CHAIRMAN RYAN: I guess, just on the process side of things here, this will go out for comment, public comment, at some point after the drafting is --

MR. DEHMEL: Well, I think it's going to be -- Steve?

MR. KOENICK: The way we're going --

MR. WIDMAYER: Steve, come up to the microphone and identify yourself.

MR. KOENICK: Sure. This is Steve Koenick. I'm with New Reactor Office, and I'm charge of the standard review plan update. What we're doing is we're issuing the standard review plan revision as

a final product in March. This and all our guidance documents are available for comment, and we can consider those comments after issuance of the documents.

We went with this approach because to be considered in effect by regulations they have to be issued six months prior to the docket date of an anticipated application. So if we would have issued these in draft and waited for public comment, and disposition of those public comments, they would not be considered in effect. So this establishes our review guidance.

Let me take a step back and say that the standard review plan is staff guidance in how to conducts its review. So we felt that this was the best way to establish our baseline, to be considered in effect in support of these applications.

CHAIRMAN RYAN: Okay. Thanks. That's good information. Appreciate it.

MR. LARKINS: Just a point of clarification, though, the reg. guides are going out for comment.

MR. DEHMEL: Yes, that's correct. The regulatory guides, which are license -- applicant guidance documents, which establish acceptable

approaches to satisfying regulations, we did -- we went through and we did issue all of those regulatory guides. They are being updated for public comment.

MR. LARKINS: Okay, great. Thanks.

CHAIRMAN RYAN: Just one last comment, and that's on 11. I really appreciate and think the fact that you're looking for connectivity with everything else is a big job, but one that's very admirable to do, so -- all the easy stuff has been done already, right?

MR. DEHMEL: Right.

CHAIRMAN RYAN: Yes. That's great.

Professor Hinze.

MEMBER HINZE: No questions.

CHAIRMAN RYAN: Allen?

VICE CHAIRMAN CROFF: I know you've probably maybe heard enough on your slide 5, but you're going to hear a little more. I wanted to get slightly more specific. This slides addresses a -- basically, a prediction of what will happen from a plan, as a basis for licensing I guess. Has anybody gone and compared the prediction to what actually occurred at some plants, and how do they compare?

MR. DEHMEL: No, not recently. I'm not aware of any work that was done. We -- you know, we

get an annual effluent release report submitted by utilities. I can tell you there's an effort, a recent effort. When I was in Research, we started to compile some of this information. And it's part of developing the database for -- that Research put together and looking at some of the information.

I did look at a few powerplants, but it was just for professional curiosity as opposed to trying to do a detailed analysis. And I can tell you that all the liquid and gaseous effluent releases and doses are a fraction of what's estimated in the final safety analysis reports, and as-yet-to-be-seen COL application packages.

So the operational history shows -- I'm not sure about this plant upset, for example, so -- what we heard about, for example, at Braidwood, and so on. You know, I'm not talking about those. But routine effluent releases, the concentrations are typically, you know, lower than what's stated in the FSARs.

VICE CHAIRMAN CROFF: Thanks.

CHAIRMAN RYAN: Ruth?

MEMBER WEINER: Thank you for your presentation. I don't have a great deal of comment on the presentation itself. I wanted to just make a

comment about your updating codes, and that is you want to make sure that when you do update everything is backwards compatible. We have a great deal of problem with that with various codes, so that people can use old inputs and old calculations and then compare them with new ones.

MR. DEHMEL: Yes. One of the things that has been discussed internally in NRR, as well as with Research, is that we are going to update the IDA code for BWR/PWR-GALE code. The thinking is that we would essentially keep the existing version intact, kind of a Legacy version of the code.

And then, there will be additional options, so when a program would open up you would have essentially the option. You click -- one would be -- to use the current version of the code. That would remain intact. Eventually, the aspect is because we have 104 powerplants licensed under that already.

And then, there would be another one where, for example, you could invoke the provisions of the ANSI standard as being an option. The other one could be that you would have a provision to essentially start with a blank slate. Essentially, all of the input parameters will be left to the user.

And that would essentially address, you know, you would input the radionuclide concentration, primary coolant, primary steam, input all of these in. You select the radionuclide, put the respective concentration in, identify the kind of liquid processing system you might have, and so on.

So there will be at least three versions or three options under the same code that you could select to operate. That's conceptually what we're thinking about right now.

MEMBER WEINER: That's a very good approach, I think.

CHAIRMAN RYAN: Jim?

MEMBER CLARKE: Michelle, could you take us to the last slide? Slide 13, I think. Oh, he did. Okay. Thank you.

As you know, the Committee is very interested in decommissioning lessons learned, and we did have a working group meeting at our last meeting in November. You are updating the standard review plan to factor in the liquid radioactive release task force information and the lessons learned from decommissioning. That will be included in the update. I'm just, you know --

MR. DEHMEL: Right now, referring to the

task force report for the purpose -- for illustrating the kind of issues. For example, I believe that Sections 2.2 and 3.2.2 in the task force report are -- that identify specific events that have occurred at specific powerplants, and some of the issues and problems that were associated with those offsets.

So, for example, if you think about Braidwood, the question was for all these vacuum breaker valves, right? So if you see an application package with vacuum breaker valves, well, you may say, well, you know, what kind of maintenance, you know, let's -- do you intend to do on those valves? Are those valves a second-generation design or whatever? So --

MEMBER CLARKE: What you've learned from those studies will be incorporated in the plan. I guess where I'm going is that, but that won't be available until March. In other words, we will not be able to see what you've done until March of '07. Is that --

MR. DEHMEL: Well, I think maybe my supervisor, Tim Frye, can talk about where the task force report is going and how the recommendation of the task force has been treated and how ultimately they may find themselves into guidance --

MEMBER CLARKE: I'm really asking about both, the lessons learned as well.

MR. FRYE: Tim Frye, NRR, Health Physics Branch Chief. And I think actually you've heard the presentation before, and I don't think I could add too much. But the staff is working on the task force recommendations, and it's, you know, probably a year down the road for updating other reg. guides to get them -- the recommendations in. And, you know, I think giving them those reg. guides reflected in Jean-Claude's --

MR. WIDMAYER: Hey, Jim?

MEMBER CLARKE: Yes.

MR. WIDMAYER: The memo that FSME put together that has specific decommissioning lessons learned --

MEMBER CLARKE: Right.

MR. WIDMAYER: -- they've incorporated that into this revision of the standard review plan. That's in this -- it's available now for you to review. But the tritium task force report -- as Tim said, they still have to work more on that.

MEMBER CLARKE: Okay. Thanks. That's helpful. I'm just trying to determine when we can see the result of what you've done to take this

information and incorporate it into your review plan and --

MR. FRYE: I think one of the major products which Jean-Claude has referenced is a new reg. guide that is being developed to provide guidance for 20.1406, which is --

MEMBER CLARKE: Yes, that's the interest.

MR. FRYE: Right.

MEMBER CLARKE: Well, that's one of the interests.

MR. FRYE: Right.

MEMBER CLARKE: Certainly, the --

MR. FRYE: That's one of the big products that are, you know, coming out of this that -- as we get that new reg. guide, we'll have that guidance.

MR. WIDMAYER: And that is scheduled for March.

MEMBER CLARKE: Okay.

MR. FRYE: The draft for public comment is scheduled.

MEMBER CLARKE: Okay. Thank you.

MR. DIAS: Okay. There is one more chapter of the SRP that the ACRS suggested the ACNW for review, and I think that's the 11.5. What's the one that --

MR. DEHMEL: Yes, 11.5.

MR. DIAS: Yes.

MR. DEHMEL: But also, I think the --

MR. DIAS: It's the one related to outside dose. You mentioned that it's very much the same, but do we -- I just wanted to know, when would it be available for -- if the members choose to look at it, when, what's the date that it would be available?

MR. DEHMEL: Well, we're finished with it. It's essentially going through the technical editor now, and then it's -- you know, when it will land on your desk I have no idea.

MR. DIAS: Because of all the, let's say, 11.X series, the two ones that were assigned to the ACNW were the 11.2 and 11.5.

MR. KOENICK: This is Steve Koenick with NRO. The process which we have been doing is after the SRP section goes through the appropriate concurrences, what we're doing is directing -- what we've done with ACRS is directing the ACRS members as NRC users to where they are located in ADAMS as -- and these are still draft products, but they have been pretty much essentially technically complete.

And then, following the rest of the concurrence process, we've been formally transmitting,

like we did with 11.2, you -- this was I guess formally issued yesterday or the day before, but you had seen the technical content associated with it well in advance. So I would think that we could probably do something very similar before the end of the year.

MR. DIAS: Okay. Thank you. We'll have to see how that fits into --

CHAIRMAN RYAN: Any other questions? Latif?

MR. HAMDAN: Yes. On Slide 6, where you list some of the criteria that are cited in the SRP, you do not mention 20.2002, which essentially allows the licensee or the applicant to give you a disposal or discharge alternative to the methods that are included in Part 20. And I think that's significant.

MR. DEHMEL: In Chapter 11.4 addressing waste disposal, we did not identify 20.2002, because it's a licensing action. In other words, the applicant -- the utility in this case, I should say, not the applicant -- the utility would have to actually petition the NRC to essentially apply a disposal method that is not described in a rule.

MR. HAMDAN: But that's significant, isn't it? I mean, that would be used for the licensee to have their -- it could be very useful for them.

MR. DEHMEL: Well, it's an operational issue at that point. Essentially, it's an operational issue, in the sense that they have generated some type of waste, and for whatever reason there is no routine outlet for that type of waste. And then, they have to invoke -- to put that special provision in Part 20. So it's not addressed in here, because -- in 11.4, although we know we should include it, and, you know, we think about it. But it's not currently cited in 11.4, no.

MR. HAMDAN: But why not?

MR. WIDMAYER: Well, wouldn't you -- you would only use 20.2002 after you've got your license is what he's saying. You don't need that as an acceptable criteria at the application stage.

MR. DEHMEL: It's an operational consideration.

MR. HAMDAN: Well, you can use it in that application if you want. It says applicant, and that --

MR. WIDMAYER: They wouldn't allow it.

CHAIRMAN RYAN: It's case-specific, 2002.

MR. HAMDAN: That's true.

CHAIRMAN RYAN: So it's not a design or, you know, or up-front criteria.

MR. HAMDAN: It's case-specific, but it's useful.

CHAIRMAN RYAN: And I think Jean-Claude is saying the applicant still has access to it through a petition.

MR. DEHMEL: Right.

MR. HAMDAN: All I'm saying is I'm surprised it's not in the SRP. That's --

CHAIRMAN RYAN: Okay. Well, surprise --

MR. DEHMEL: No, it's not in the SRP. Whether or not we include it, you know, we can brainstorm this, you know, internally and figure out whether or not it should be there.

CHAIRMAN RYAN: Okay. Any other questions or comments?

MR. WIDMAYER: Mike, just -- it sounded to me like the ACNW might be interested in reviewing 11.3 and 11.4 in addition to 11.5.

CHAIRMAN RYAN: I think what we ought to do is take that under advisement.

MR. WIDMAYER: Sure.

CHAIRMAN RYAN: At least study that question a little bit, and then give a more thoughtful answer to staff, if we do or not.

MR. WIDMAYER: Okay.

CHAIRMAN RYAN: So let's --

MR. LARKINS: I think you can get the document, get a chance to look at it, and then you can decide.

CHAIRMAN RYAN: And then we can see. But I think you've certainly given us a roadmap, Jean-Claude, today of how they fit together a little bit. We are very interested in, of course, the topics. The ACRS has asked us to take a look. But we clearly don't want to overburden you with, you know, fabulous presentations --

MR. DEHMEL: Thank you.

CHAIRMAN RYAN: -- with us hour after hour. So we're sensitive to the fact we don't want to abuse too much of your time, but we appreciate the insights you've shared with us today.

MR. DEHMEL: Thank you.

CHAIRMAN RYAN: Thank you very much.

With that, we are scheduled for our next briefing from Jim Shaffner, who is with us for the Low-Level Waste Strategic Planning Initiative, and we'll hear about public comments that the staff has received up to this point.

(Pause.)

Well, why don't we go ahead. Let me

introduce Jim Shaffner from the Environmental Protection and Performance Assessment Directorate of the U.S. NRC. Jim, welcome. We look forward to your presentation.

MR. SHAFFNER: Thank you very much, Dr. Ryan, and Committee members, staff, and other folks who decided to participate this morning.

I was just looking at my first slide, and I noted that I put after my name PE, which is true but totally irrelevant to the presentation that I'm going to give this morning.

This morning I'm here to discuss and dissect public comments in response to a Federal Register notice that we issued back in July as part of our ongoing strategic assessment process that I know you're aware of.

The primary sources of input for our strategic assessment, in addition to our own expertise, direction from the Commission and a larger -- somewhat larger effort back in 1996, and the ACNW white paper that we saw in draft, and I'm told we're about to see in final pretty soon.

We also were informed by input from a workshop that was conducted by the ACNW with input from us back in May of this year, which was very well

attended, responses to the Federal Register notice that is the subject of today's focus, your letter to Chairman Klein on August 16th of this year, as well as a number of independent position statements from organizations such as the Health Physics Society, the American Nuclear Society, the Southeast Compact Commission, and others.

Just a reminder -- the Federal Register notice, if you -- in case you want to look it up, is in Volume 71 of the Federal Register published July 7th. And it was a request for comments, and there were some specific questions posed, which I'll get to in a little bit. There was --

CHAIRMAN RYAN: Jim, if I may, I'd like to add a real positive comment to this introductory information about the outreach and the communications. The Committee really has enjoyed excellent communications with the staff from our even early planning steps on the white paper, and so forth, and the communication we've had with the staff all the way along the way is appreciated and welcomed and an important part of the program.

MR. SHAFFNER: Well, on behalf of my colleagues, we'll reciprocate that.

In response to the FRN, we received 46

sets of comments. Some, as you might imagine, were representing the viewpoints of numerous individuals. There is significant variance in both the length and detail of the comments.

For instance, some comments were one sentence long and said things like, "Stop nuclear power," and, you know, "Don't make any more nuclear waste," and that sort of thing. And then, others, of course, went on for -- you know, for dozens of pages with very detailed descriptions or expressions of a point of view or a concern or an opinion, or whatever.

A lot of the comments represented a broad industry point of view, such as the point of view of the nuclear industry from NEI, the point of view of the radiopharmaceutical industry from CORAR, etcetera.

And as you might imagine, and we'll get to in a minute, there was a wide range of viewpoints on certain topics, and not all of them were aligned.

The categories of stakeholders that were responding to the FRN included state agencies, four states responded, and we're still in the process of collecting information from the state agencies. After this meeting, we've got a discussion with the State of Utah, radioactive materials users such as CALRAD and CORAR, private industry such as Energy Solutions,

government and military entities.

The U.S. Army and the U.S. Air Force, that really have a dog in this fight, had some very extensive and well-informed comments. Some users advocacy groups, compact commissions, public interest and environmental groups such as NERS and the Sierra Club commented extensively, and public policy groups such as the National Academy of Sciences, which was essentially reaffirming some comments that it had made in an earlier position statement.

So what to do with these comments when they came in the door. It was the task of the staff to prepare summaries of the comments in a couple of different ways. First, because we asked specific questions of the commenters, and not all the commenters chose to respond to those questions, we decided to look at the comments with respect to specific responses to the questions that we asked.

But we were dealing with a larger universe, so we also wanted to go back and summarize the individual responses that we received from all commenters. And I'll go through the process in a minute.

And the comments were assessed for common themes and topics, general opinions and concerns about

the nature of the low-level waste program in this country, in the U.S., and in some cases some other concerns, and suggestions for improvement, some general, some specific.

And one of the things that we decided would be useful to apply was the hierarchy that was presented by the National Academy of Sciences' study on low activity waste, and that is the rather pragmatic approach of, you know, starting locally and working out globally for problem-solving from license conditions to guidance to regulations to legislation, recognizing, of course, that as we moved, you know, out that spectrum the staff itself had -- you know, had limited -- you know, limited control and limited input to that process.

I'll turn now to the specific responses to the FRN questions. As I said, we received -- 17 of our 46 total respondents responded specifically to the questions that were asked, and these were primarily users, users groups, industry advocates, regulators. There was one environmental group that responded specifically to the questions.

The first question had to do with key safety and cost drivers. And as I go through -- because of the nature of this presentation, I'm just

trying to provide somewhat of a snapshot of the types of comments that we got. This is by no means all inclusive. You know, if we want to get into that, we can -- we certainly can, but, you know, I'm just -- at this stage, I'm trying to give you a sense of the types of comments that we got from a broad spectrum of commenters.

So a couple of observations that -- in some cases, while folks are responding to a specific comment, they were also in the process of espousing a point of view, and so the responses aren't necessarily completely aligned with the -- you know, with the question that was asked in all cases.

And in some cases, folks were looking for an opportunity to, you know, communicate on a broader plane than just the low-level waste area. So some of the comments, you know, go beyond specifically low-level waste.

But we received comments -- and I don't think any of these are any great surprises -- concerns about the lack of assured disposal capacity as we move into the future, the lack of economic incentives to develop new disposal facilities or new aspects of low-level waste management, the fact that the limited competition in low-level waste disposal, you know, is

resulting in a high cost of disposal, and then the corollary, the fact that the high cost of disposal in some cases has led to the reduced use of radioactive material for beneficial uses in this country.

And because of the possibility that the long-term storage is on the horizon, some -- you know, some folks commented on the fact that there is some limited capability to -- you know, to store waste and some of the problems associated with that. And I'll touch more on that later.

And on the -- sort of a little different perspective, there was a concern about the limited opportunity for citizen evaluation of some safety and security adjustments that the NRC made in response to 9/11 -- again, a little bit out of the -- specifically out of the low-level waste arena.

Next question had to do with vulnerabilities in the current regulation of low-level waste. People referred to some of the challenging regulatory requirement and some -- what they perceived as systemic delays in some of the processes. Those of you who are familiar with some of the -- you know, some of the efforts to develop new low-level waste facilities a decade or so ago certainly are familiar with some of those systemic delays.

Transportation distance and transcompact shipping -- the fact that, you know, in some cases material has to move a long distance to get disposed of and cross various compacts, and, again, the lack of free market opportunities to solve the low-level waste disposal dilemma.

The next question had to do with the future of low-level waste disposal. And I think that for the most part -- how do I make this little thing go away?

MR. WIDMAYER: Move off of it and just click, I think.

MR. SHAFFNER: Okay, good. Thanks. For the near term, folks seem to perceive a fairly steady waste volume, you know, consistent with the operation waste that we're seeing now. In the longer term, there was a perception of significant increases in particularly low activity and very low-level waste associated with decommissioning.

There was a perception that cost increases in waste management were going to be, you know, basically a given, and I -- I got the sense that there was -- not the sense, there was -- there seemed to be more pessimism than optimism about -- regarding disposal capacity as we move into the future. And

there was a -- in a lot of cases an urge or a -- you know, I guess a plea for a federal solution to -- you know, that the Fed should ride in on a white horse and basically solve this -- you know, solve this problem.

On the I guess I would call optimistic side, there was a perception that, you know, we -- you know, we do live in a country that has risen to a lot of challenges, and there was a perception that, you know, as -- as we go along, there will be a flexible risk-informed solution, you know, to the disposal situation in the U.S.

And then, given that we looked at several scenarios, future scenarios, we asked folks how these may impact the disposal and storage situation, and looked at them from the perspective of the regulatory system reliability and adaptability, the regulatory burden that would be imposed on folks, and the aspects of safety, security, and environmental protection, and these are some of the things that popped up.

The fact that the economic drivers for disposal and centralized storage are the same, and I think this lesson may have come out of the attempt a number of years ago to look at assured isolation facilities. And, you know, the folks that are -- they're finding that some of the same challenges that

faced -- you know, that came along with the idea of disposal waste, you know, are associated with centralized storage.

The fact that the lack of disposal capacity creates different regulatory issues that we have to deal with. For example, if long-term storage is going to be a fact of life, you have to deal with the fact that, you know, folks might have to be licensed for increased quantities of material onsite, which -- you know, which could kick in the increased control requirements for security purposes.

Back to what appeared to be a favorite theme, the fact that the Federal Government intervention is perceived as necessary for a broader spectrum of waste, a lot of folks commented that DOE should not only be responsible for greater than Class C, but they also should be responsible for B and C waste, and particularly with regard to B and C sealed sources. On the other hand, as you might expect, utilities saw very little problem with the fact that B and C waste was going to have to be stored.

And then, we asked, what specific actions might yield benefits, you know, in future management scenarios? And, once again, we're back to DOE opening

sites to disposal of commercial waste. And I'd say there's lot of variations on this theme throughout the comments.

Align NRC/EPA regulations, and this is particularly with response to low activity waste and the allowance of low activity mixed waste to move in both directions, to low-level waste sites, which there's already a regulation in the book that allows that, and to move low activity waste to RCRA facilities.

There was the perceived need for a graded regulatory structure, such that the -- you know, the regulatory rigor was consistent with the risk associated with particular material.

Maximization of existing flexibility that's inherent in Part 61, taking full advantage of 61.58, which would allow, you know, alternate paths forward, you know, by looking at other ways of meeting performance objectives other than just the tables that are contained in Part 61.

From folks that maybe have a different viewpoint as far as the use of radioactive material, we were told that perhaps a switch to alternative energy sources was the way to go.

And a caution that, of course, any changes

that are implemented can affect ongoing processes, such as the successful operation of the Northwest compact site and efforts to license a facility in the State of Texas.

And then, to ask the question a little differently, asked, what specific actions should take place? And I'm not sure that the answers are all that different, but in one case it was suggested that we separate facility design from siting, you know, similar to the -- you know, to some of the models in the reactor world, the idea being -- you know, getting some of the designs taken care of so they don't become an issue in the -- you know, in the actual siting of a facility.

Updating storage guidance, particularly with regard to sealed sources and particularly with regard to materials licensees, allowing greater packaging credit for disposal of sealed sources. As you know, it's -- sealed sources, because of their small size, even though they have relatively low total activity, often fall in a Class B or C or higher category just because of that. And in some cases, packaging credit is given. And in other cases, it's not, depending on the facility.

Align the controls of uranium-bearing

waste. There was lots of concerns about the fact that there is -- seems to be different management schemes, again based on -- you know, based on origin as opposed to risk associated with uranium waste streams.

There was an observation that public education equals improved acceptance. I think a lot of us have, you know, looked at that particular aspect for a long time, and that proper disposal equals enhanced security. I don't think there's too many folks that are in this business that would argue with that.

What are some of the unintended consequences that may result? Alternative disposal hinders low-level waste economics. The suggestion there was that if we allow alternate paths forward for large volumes of low-level waste that the unit cost of disposal of the remaining low-level waste, you know, can be affected. And there were other aspects of that as well.

Long-term storage issues with folks that are ill-prepared to store on a long-term basis, concerns about security, worker exposure, environmental contamination, and, of course, cost. There is some public resistance to alternative disposal technologies, that notwithstanding the

appropriateness from a regulatory standpoint of some types -- these types of disposal that, you know, there is some public concern.

There is some concern about the possible disruption of ongoing compact activities and uneven adoption of regulations by states. And this was particularly with respect to the EPA's conditional exemption rule.

What works and what doesn't as far as waste management? Certainly, communication is recognized as something that is a good thing, and keeping with, you know, Dr. Ryan's comment earlier in this presentation.

Community goodwill programs -- an example that was given was, you know, industry effecting some radon reduction mitigation activities in -- you know, in public facilities such as schools and things like that. And NRC's participation in national organizations, which of course has been ongoing and will continue.

What doesn't work and needs improvement? Certainly, there was a concern about the complexity of some mixed waste regulations and the -- you know, the fact that NRC and EPA have, you know, in some cases different regulatory approaches.

The communication among agencies that really need to get together to -- you know, in order to effect solutions for -- you know, for common problems. And knowledge transfer -- and this isn't a case of one that doesn't work. It's just a recognition of the fact that as the waste -- as the folks that have some knowledge and skills in the waste management arena get older that there's a lot of knowledge and allure that -- you know, that is available to them that won't necessarily be available to the generation that's following. And there needs to be an effective mechanism to make sure that that occurs.

And there was a question regarding improving federal coordination, and here suggestions included the need for integrated strategies for low activity waste regulation. Foster multi-agency cooperation -- not too different from the earlier slide.

Interagency task force to identify and resolve low-level waste issues. The need for risk-based standards for cleanup and decommissioning, and the need to, you know, work with stakeholders to identify confusing issues and to figure out a way to, you know, improve the transparency of how those issues

might be addressed.

Now I'm going to turn briefly to the other aspect of our review of these comments, and that was the binning of them by topic. And as I said, this now included all 46 respondents to the questions, and we went through and we identified the -- and summarized the individual comments of all the commenters, and then we tried to identify broad topics that were included and look at the opinions that were offered on those topics.

Certainly, the opinions and concerns that were offered by folks that attended the workshop were completely consistent with the opinions that were offered in the workshop. But we got, again, a broader representation, no real surprises, but certainly some nuance.

For example, risk-informing, comments such as revising Part 61 to incorporate risk insights, rather than revising the regulation, better use the inherent flexibility by employing guidance as to how that flexibility may be used. And then, on the other side of the spectrum, the fact that risk-informing was tantamount to deregulation.

In the area of clearance, there was a need for -- suggestion of the need for a transparent,

harmonized, clearance rule, and then all the way over to -- the fact that -- again, on one hand the need for a transparent, harmonized rule, all the way to the other end of the spectrum, where we should abandon the idea of clearance altogether.

Greater than Class C, we were offered the comment that the path forward should be disposal at Yucca Mountain, and that DOE should get on with the EIS. And once again, I want to remind you, these are just a Whitman Sampler of the comments we received. The actual comments were a lot more numerous than this.

On the category of B/C waste, there was a recommendation that this material needed to be disposed of on federal or tribal land. That we needed -- that, in fact, stability requirements for B and C waste were discouraging the licensing of such material. That Congress should ensure disposal capacity for B and C waste.

And I pointed this out earlier in another context, the lack of B/C disposal represents no emergency, and, again, DOE should dispose of B and C sealed sources.

Waste classification -- recommendation that the classification system be modeled, you know,

after the NCRP recommendations, 2002, which would, you know, sort of align similar risks similarly. And a recommendation not to reclassify high-level waste to low-level waste, a reference to the waste incidental to reprocessing process.

Long-term low-level waste storage -- all the way from no new guidance is necessary to update guidance before Barnwell closes.

Some other topics that were raised -- there were a myriad of ideas for federal solutions, such as allowing the use of DOE facilities absent any NRC regulation to commercial disposal on federal land with NRC regulations.

There were lots of suggestions for the increased use of uranium mill tailings empanelments for disposal of -- you know, of depleted uranium as well as, you know, other material, and a suggestion in some cases for the conversion of DU for a more -- to a more disposal -- a suitable disposal forum, and the idea of the possibility of making a site-specific safety case for broadening the use of certain uranium mill tailings facilities.

There were expressions of concern about the state and compact process and how that was going, and the fact that -- again, that things that we do

should -- you know, moving forward should not impede the progress of the state and compact process.

There were lots of concerns about the economics of waste management, both, you know, the cost of disposal and also the economic drivers toward solutions, and the lack thereof in some cases.

There were certainly comments and concerns about NRC's process for doing business. There was a concern that -- you know, that we don't -- we don't make enough allowance for a more even representation at meetings such as this -- in other words, the folks on one side are not equally represented with the folks on perhaps the other side.

And then, there were just some other general concerns and opinions. Asked -- a reminder that we need to consider the synergistic impacts of all pollutants. In one case, an observation that NRC has lost its public trust, a need for interregional agreements for waste processing.

Now, with caution, I'm going to just try to end with a few themes that we saw throughout this. And, again, I say with extreme caution, because these by no means represent a consensus of all viewpoints or -- you know, and there are certainly commenters that would disagree with these points of view. But there

seemed to be a theme of a need for a path forward for low activity waste, you know, in a -- perhaps a more transparent and more easily flowing one than we have now.

The need to align regulatory rigor with risk -- you know, the concern that oftentimes there seems to be more rigor applied than is appropriate for the risk that's associated with certain material. And the need to treat similar risks similarly, to not -- to apply the same type of standards, you know, to low activity radioactive material as would be applied to, you know, hazardous material with similar risk.

And the cost of disposal of radioactive material, radioactive waste, should not drive the beneficial use of radioactive material. And this seems to be a concern, particularly in the medical and the research community, that there is a lot of -- and I know you heard this at the workshop back in May, the fact that -- you know, that there is -- you know, in some cases, the diminution of the use of radioactive material or switching to less desirable material for research because of the high cost of disposal.

And then, again, the seeking of the Federal Government solution to -- you know, to the disposal problem. And then, finally, a reminder that

we -- you know, when we are aware that things are working, that we want to make sure that we don't -- we don't inadvertently implement something that's going to mess that up.

And I think the observation there was particularly in regard, again, to the Northwest compact where there was some concern that there might be some things that could be done that would affect the working of that compact.

Now, as I said earlier in the presentation, this was all done as part of our strategic assessment, and, in fact, these comments will be very helpful to inform the strategic assessment.

In so doing, however, the staff must keep in mind and temper our response with the -- by being mindful of the overall NRC mission, the resource limitations that are very real to us, and the Commission's 1997 guidance where they essentially put some fairly severe -- well, strict constraints, you know, on where the staff should be going with what their mission is.

And we need to remind ourselves to view the volume of opinion cautiously in dealing with these comments, that, you know, even though in some cases we

get, you know, an overwhelming number of comments expressing a certain point of view, that that doesn't necessarily make that point of view, you know, more valid than another point of view.

And I'll just end by, you know, saying that if you're interested in looking at the actual responses, there are several ways you can go about it. You can go into ADAMS and do a Boolean search with that inscription. They are also available on web-based ADAMS. I have a few paper copies laying around in my desk, if anybody is interested, and certainly we can provide the accession numbers for -- you know, for the specific responses, if you would be interested in looking at them.

And with that, I will say thank you and open it up to questions.

CHAIRMAN RYAN: Jim, thanks for a very informative rundown on the information that you've gathered and analyzed. I know you realize this, but just for everybody's benefit, we need to always be mindful of the fact that cost involves many components. And there's the actual cost of disposal, and then one significant driver is tax, particularly in South Carolina where the tax is the tail wagging the dog. The taxes are much higher than the cost.

So it's a driver that's kind of outside of the realm of what does it actually take to dispose of low-level waste in terms of financial resources. There is a big tax issue.

MR. SHAFFNER: Right. And I know you've often made the point of the distinction between cost and price and --

CHAIRMAN RYAN: Cost and price is a big difference.

MR. SHAFFNER: Right.

CHAIRMAN RYAN: And, of course, during the period of compact development there was a nationwide surcharge that dwarfed the cost.

MR. SHAFFNER: Yes.

CHAIRMAN RYAN: You know, the actual cost part of the --

MR. SHAFFNER: That would be an interesting discussion in and of itself, how that all --

CHAIRMAN RYAN: No. I just wanted to add that little dimension to the idea that sometimes people think that cost is, you know, kind of like the price of a can of soup. You really -- you know, you're really paying a lot of different things, including, you know, a whopping tax in the case of

some low-level waste disposal facilities.

I guess, as you mentioned, we have finished our low-level waste white paper. It's now a NUREG document, I assume to hit the streets soon. We are reporting our current status to the Commission tomorrow, and, you know, which will involve just reporting on our letter on the white paper and, you know, recognizing that you've reported to us on the stakeholder information.

And I guess sort of a general question is: what's the path forward from here? Not necessarily for us, but for all of us on the low-level waste question.

MR. SHAFFNER: Are you asking specific, or in general?

CHAIRMAN RYAN: No, in general. You know, what do you see as the next steps? I mean, I -- my own view is that, you know, NEI has come in and also talked to staff about some of their interests and initiatives that they're thinking about just last week, so --

MR. SHAFFNER: Right.

CHAIRMAN RYAN: -- the dialogue is open with a large segment of the industry, the largest disposing site in the industry, of --

MR. SHAFFNER: Well, as you know, from our point of view, we're moving ahead with our strategic assessment. And I -- you know, I'm --

CHAIRMAN RYAN: What's your schedule for that, I guess is a better question.

MR. SHAFFNER: Well, I guess I'm going to defer to my supervisor --

CHAIRMAN RYAN: Okay, sure.

MR. SHAFFNER: -- Ryan White to address that.

CHAIRMAN RYAN: Hi, Ryan. Welcome.

MR. WHITE: Hi. Ryan White, Chief of the Low-Level Waste Branch, Division of Waste Management and Environmental Protection.

We're in the process right now of drafting the Commission paper. We've got a few more interactions to have with some states. As Jim mentioned, we're going to talk to the State of Utah today, the State of Tennessee I think in the next week.

Then, you know, we're in the middle of the process of actually now doing an analysis, looking at, you know, based on all the information we gathered, not just from the Federal Register notice, but from our own insights, from discussions with you, and other

folks, what potential activities we'd be looking at over the next few years.

And, you know, I think really the crux of the Commission paper is going to be a binning of potential things we could do, probably high, medium, and low priority. I mean, we're not going to try to say from 1 to 25, this is -- these are the things we want to work on in the next five years.

Those will be the more, you know, proactive activities, things like guidance for 20.2002, guidance for 61.58, working on the DU question that the Commission asked us relative to the LES hearing.

Of course, you know, a big part of our program right now given the resources we have is just simply reactive work. So we want to be very careful in what we commit to. You know, another thing that's weighing at the present time, really, is some of the discussions you're probably aware of on the passback for '08 and the budget question that is looming out there. That's going to really play into what kinds of things we can tackle over the next few years.

Nonetheless, I mean, you know, this is going to be summarized in the Commission paper. We'll lay out some priorities and send it to the Commission

for information. It's not going to be a vote paper.

CHAIRMAN RYAN: Is it of benefit for us to -- when you have a -- you know, a solid draft, for us to maybe have a chance to offer review and comment at that point, or --

MR. WHITE: I think we discussed this a month or two ago. I believe -- I didn't mention the schedule. It's probably going to be early February of next year that we'll have a pretty clean draft going through our management concurrence. I thought when we discussed this a while ago that it would be after it gets through EDO review, that we would provide a copy to you at the same time it goes to the Commission. That's my recollection.

CHAIRMAN RYAN: Yes, that makes sense. It's at least concurrent. So if we wanted to offer comment, we could do that as they are considering it.

MR. WHITE: Yes.

CHAIRMAN RYAN: Yes, okay.

MR. WHITE: And I think we can do that.

CHAIRMAN RYAN: That's fine. That works. You know, I just didn't want them to offer you comment and then us, you know, get kind of out of step, because we've been concurrent all along, which has been effective for us and --

MR. WHITE: Yes.

CHAIRMAN RYAN: -- and I think helpful to you as well.

MR. WHITE: Absolutely.

CHAIRMAN RYAN: So that sounds good. I think that's our next step. I don't know that we need to offer you any particular comment on today's presentation in letter form. You're reporting on what's in the record already, so --

MR. WHITE: Yes.

CHAIRMAN RYAN: -- I see our next step, then, is come about February to offer any comment or additional insight on the paper.

MR. WHITE: Sounds good.

MR. LARKINS: Can I ask a process question?

CHAIRMAN RYAN: Please, yes.

MR. LARKINS: Curious -- do you have a formal process for dispositioning these comments that you have received?

MR. WHITE: It is not going to be like we would do in a NEPA-type process. So we do not intend to go through comment by comment and mention how they were dispositioned in that manner. We are going to present in probably an appendix to the Commission

paper a summary of -- kind of as Jim has done here -- some of the major themes, and then how those were addressed in the paper. But we didn't want to commit to a comment-by-comment resolution.

MR. LARKINS: I was just curious, because you're going to prioritize, obviously, and then how you were going to do that.

CHAIRMAN RYAN: John, to that end, one of the things that I hope is useful to you, particularly on some of these points that you've mentioned -- and, Jim, you've summarized on compacts and other issues -- we have tried to very faithfully and accurately portray the history of all of this from a factual standpoint without opinion in this NUREG document.

So as that hits the street, hopefully that will serve as a source to you as you write your Commission paper. And in some of the areas where there have been comment, there is kind of the factual history laid out there as well that you could also integrate into your review of comment. And I'd offer that to you.

MR. WHITE: Yes.

CHAIRMAN RYAN: And, again, I appreciate the review that -- Jim Kennedy and others have helped that become a better paper. So, with that, Jim? Oh,

I'm sorry. Mike?

MR. LEE: Oh, I'm fine.

CHAIRMAN RYAN: All right. Jim?

MEMBER CLARKE: Okay. Thanks, Jim. One of the -- we had a -- let me back up. In November, we had a working group meeting on decommissioning lessons learned. And just to comment, one of the things that came out of that, we were talking about cost earlier, is that the experience to date is showing that transportation is a whopping component of waste disposal -- total waste disposal costs and decommissioning. I just thought that's a piece that, you know, fits into here as well.

MR. SHAFFNER: Yes, it does. And I think I alluded to the fact that some people did raise -- you know, in a little different context than what you are right now, but certainly raised that concern.

MEMBER CLARKE: The other thing, in your listing of what doesn't work or needs improvement, complex mixed waste, right below that is interagency communication. I suspect they might be related, but I just -- I don't want to distract us too much, but could you give me a -- or give us just a brief summary of where that -- where mixed waste is right now. I understand there are certain RCRA sites, permitted

sites, that will take it. Is that correct?

MR. SHAFFNER: My understanding is on a case-by-case basis that's true. But I think the -- of course, EPA was in the process of, you know, starting a rulemaking a few years ago that would I guess more -- you know, codify that process. Right now, you know, we -- you know, the path forward seems to be on a case-by-case basis through --

MEMBER CLARKE: We had a presentation on that. It was well over two years ago, I think. I just -- on advanced noticed of proposed rulemaking.

MR. SHAFFNER: Right. And, of course, they -- my understanding is they got derailed because of the Yucca Mountain standard.

MEMBER CLARKE: So it's case by case.

MR. SHAFFNER: For right now, yes.

MEMBER CLARKE: Okay. Thank you.

CHAIRMAN RYAN: Ruth?

MEMBER WEINER: Just to pick up on Jim's comment on transportation, we tend -- it is a very high cost, and from my perspective we tend to overpackage low-level waste for transportation. And one of the problems there is there has been virtually no testing of low-level waste packaging. All our testing is focused on Type B casks, high-level waste

packaging. I'd just leave that with you as -- as a thought.

CHAIRMAN RYAN: I've got to jump in, Ruth. There is a lot of low-level waste package testing. There's a branch technical position on wasteform and waste packaging, including four basic criteria for B waste packages, and perhaps --

MEMBER WEINER: I said B waste.

CHAIRMAN RYAN: -- by degradation -- well, B and C and A as well. Some A waste goes into HICS as well. So it's -- that's a little bit of a sweeping statement. I think there is a lot also in terms of transport units. There's an awful lot of low-level waste that goes in Type B casks, and Type A casks, which also come with a pedigree, including a certificate of compliance from the NRC.

MEMBER WEINER: Yes. Yes, I recognize that they all are certificated. This is -- I think this makes the point that I think we need to look at the extent to which we are excessively packaging low-level waste for transportation, and to the extent to which it -- we could reduce the cost of low-level waste transportation by looking -- taking another look at packaging.

CHAIRMAN RYAN: Well, and again, I'd have

to say most A waste, most not -- I guess by volume probably most, but most A waste comes in 55-gallon drums and B-25 boxes.

MEMBER WEINER: Yes. But that --

CHAIRMAN RYAN: By either flatbeds or regular vans. So I would -- before we make a recommendation to staff, I would say we need to really be clear about the profile of what waste and what volumes and what number of trucks go by different routes and modes.

For example, most of the material, I'm going to guess on a volume basis, it goes to the Energy Solutions site in Clive, Utah, goes on railcars.

MR. SHAFFNER: Right.

MEMBER WEINER: Yes, it goes to --

CHAIRMAN RYAN: Standard rail cars.

MEMBER WEINER: Yes. The Energy Solutions site goes by rail. An awful lot that goes to the Hanford site goes by truck. It's -- you know, it just strikes me that the cost of transportation is very high.

MR. SHAFFNER: The cost -- I think a lot of it is a function of the distance that the material has to move.

MEMBER WEINER: Well, yes. It is the distance, and, of course, the distance to any one of these western sites is enormous.

Moving to another topic, when we had the work -- the working group session, we heard from the gentleman from Harvard that the cost of B and C disposal and the lack of B and C disposal facilities was a problem for medical uses. And I hear you say that the utilities say it's no problem. Where is NRC in this?

MR. SHAFFNER: Well, I don't -- I think we certainly can see the viewpoint of both -- you know, the utilities certainly have the kind of infrastructure and training and capability to -- you know, to manage this material. And we are in the process now of, as part of our nascent effort to revamp our storage guidance, to get out and, you know, find out specifically what some of the materials -- what kind of -- what kind of challenges some of the materials are -- materials users are being faced with with respect to storing this material.

MEMBER WEINER: And what -- was the lack of B and C disposal for medical uses, was that addressed in any of the comments?

MR. SHAFFNER: Yes.

MEMBER WEINER: Okay.

MR. SHAFFNER: Yes.

MEMBER WEINER: That's good to know. It didn't show -- didn't rise to the level of your presentation. Did anybody -- was anything said in the comments that might lead to elimination of the greater than Class C category? Did anybody address that?

MR. SHAFFNER: Not specifically. I think there was some elusion to availing ourselves of the greater flexibility in the regulations that might allow some material that would be considered, from a classification standpoint, greater than Class C to allow it to be disposed of as, you know, traditional low-level waste. But nobody offered a magic bullet for making greater than Class C go away.

MEMBER WEINER: Yes, that was something that occurred to me. Other than the use of 61.58 as a --

MR. SHAFFNER: Well, and then the other direction, the kind of observation that, you know, basically it should go to Yucca Mountain and, therefore, be disposed of as high-level waste. But I'm not sure that --

MEMBER WEINER: That sort of doesn't make

it go away either.

MR. SHAFFNER: Yes.

CHAIRMAN RYAN: Jim? I think there is an answer to your question, Ruth. You did mention that an Academy report mentioned license conditions and guidance and other forms of dealing with these questions, and I can tell you from first-hand experience there are an awful lot of license conditions that address the areas of medical as kind of an ill-defined category, but, nonetheless, one that people throw around.

Sealed sources that are high in concentration but low in activity -- you mentioned that phrase yourself. And I think a lot of the concern is that while it's Class C by concentration, well, that doesn't mean it's high risk. And I think a lot of the smaller quantity sources that happen to be high in concentration have been handled for disposal at different -- at many licensed disposal facilities by specific license condition for specific sources or categories of sources --

MR. SHAFFNER: Right.

CHAIRMAN RYAN: -- or quantities of sources. And that's a fairly straightforward way to -- that it has been routinely handled, frankly, for

decades, as you well know.

MR. SHAFFNER: Yes. Yes.

MEMBER WEINER: Could you expand a little bit on the no competition in high cost? Do you mean no competition for disposal sites? I'm not sure what you mean by "competition."

MR. SHAFFNER: I think the -- I'm obviously paraphrasing it and speaking for a couple of different commenters here. But I believe it was just the whole idea that the free market system doesn't really apply to low-level waste disposal in this country, in that folks are somewhat constrained.

And I'm -- I have to say that I'm not sure I completely agree with the comment as it was made, because I think there's other factors involved. But, again, I'm just reflecting the comment at this point. But I believe it was the idea that the -- that the lack of a free market system, you know, to -- and there's a number of aspects of that.

It's not just the -- you know, the compact system that inhibits that, but also the fact that the kinds of volumes that are out there now are not really driving people to -- you know, to want to invest in the development of a low-level waste disposal facility.

Now, there have been those who have offered the opinion that perhaps that situation will change as decommissioning occurs, and there are tremendously high volumes of waste that may represent a fairly lucrative economic opportunity for an entrepreneur down the road.

MEMBER WEINER: That's an interesting comment. Finally, having looked at this for more than two decades, did you get any sense from the public interest group comments, any sense of the rationale behind the NIMBY reactions to siting a low-level waste facility?

And I ask this question because having -- if I go back to 1980, recognizing that I'm pretty old anyway, in 1980, this was something of a surprise, even to those of us in the -- active in environmental organizations, that all of a sudden there seemed to be this NIMBY reaction. And I just wondered if there were any insights in the comments that could explain this.

MR. SHAFFNER: Quite frankly, I did not see any. I pretty much saw the same type of reaction that I'm accustomed to have seen in the last couple of decades on this subject. I really didn't see any additional insight as to why the -- other than

references to things -- I think I alluded in my comments, the concern for the -- you know, the fact that we have not properly accounted for the synergistic impacts of, you know, all types of hazards, and that sort of thing. But, you know, I can't make a whole lot out of that.

MEMBER WEINER: Thanks.

CHAIRMAN RYAN: Allen?

VICE CHAIRMAN CROFF: In standing back from your presentation, I was I guess a little bit surprised that there wasn't more I'm going to call it overt mention by commenters of waste classification, or, you know, changing waste classification, fixing the system. You know, you had, you know, a couple of bullets on it there that somebody sent in, but --

MR. SHAFFNER: Do you mean --

VICE CHAIRMAN CROFF: -- not --

MR. SHAFFNER: Go ahead. Keep asking your question. I'm going to go back to my base document and see whether I just didn't -- whether I just didn't over --

VICE CHAIRMAN CROFF: I see a fair amount of sort of, you know, indirect reference to it. When you start talking about 61.58 and this kind of thing, and aligning risk with, you know, disposal, that sort

of gets to it. But I guess the real question is: is my takeaway message, or my observation, correct, I mean, that people just don't seem to be interested in directly confronting that issue?

MR. SHAFFNER: Well, I may have underrepresented the concern, because I do have 11 specific comments here that are related to -- that I binned as, you know, waste classification issues. So I think that for folks who, you know, have to deal with radioactive material, I think, you know, it is something that they're concerned with, as opposed to folks who are generally opposed to dealing with radioactive material.

VICE CHAIRMAN CROFF: I'll infer from your comment that most of those 11 favored trying to change something as opposed to the maintain status quo?

MR. SHAFFNER: They were certainly looking to tweak -- I think the one I mentioned was adopt the NCRP classification system, recognition that there are inherently safe quantities of radioactive material, there need to be tiered standards for a range of material.

Reclassification should be based on the hazard life, on the negative side, or on the -- I shouldn't say -- on the opposite side of the issue,

opposition to any kind of a reclassification of what would be perceived as high-level waste to low-level waste. Looking at the need to update the concentration averaging BTP.

CHAIRMAN RYAN: Allen, there's a couple of examples outside of this sealed source business that, you know, a Trojan reactor vessel is one where there was a risk-informed consideration of how to classify it, steam generators, which we heard just a comment about yesterday, and also have been addressed in terms of how they grout the tubes in place inside the foot and a half thick vessel, and, you know, make it a strong, tight container, and all of that.

So there has been a range of examples, I think, where people have done that. So that's not specific to what's the forward-looking view, but there is a pretty robust body of evidence where that sort of thinking has been applied on a case-by-case basis.

VICE CHAIRMAN CROFF: I understand. I just wanted to see --

MR. SHAFFNER: And I'd remind you that it didn't come out in these comments, or were not the subject of today's discussion, but I believe, you know, South Carolina has used some, you know -- in certain cases has, you know, availed themselves of the

flexibility in 61.58 in order to allow the disposal of, you know, some material in one well that otherwise wouldn't have been disposed of.

VICE CHAIRMAN CROFF: Okay. Thanks.

CHAIRMAN RYAN: Thank you. Bill?

MEMBER HINZE: Jim, as you have studied these comments, have you sensed that low-level waste problems jeopardize the safety of the people of this nation?

MR. SHAFFNER: I think there is a -- I think that might be going a little far, but I certainly think that there have -- that there were things that were raised that would suggest that in specific circumstances that may be the case.

A particular example that comes to mind is in the case of the U.S. military where they have a situation where they have lots and lots of little bits and pieces of radioactive material that they may be forced to store at various and sundry venues. And there's a concern certainly about, you know, worker safety and that sort of thing.

There is a general concern, particularly with regard to sealed sources, that this is material that is particularly troublesome from the standpoint of a -- you know, a radiological dispersal device.

And, you know, that didn't come through overtly in the comments, but certainly it was sort of a -- you know, sort of a subtext.

MEMBER HINZE: Well, one of the things you mentioned here in the concerns is that some licensees are not -- may not be equipped to store.

MR. SHAFFNER: Right.

MEMBER HINZE: That has been a concern of mine for some time as -- being in university and other institute research labs, to make certain that these indeed do have a proper facility for storing. Do you have any further comments on that from the comments you have received?

MR. SHAFFNER: I'm trying to decouple my experience working with our internal task force on control of radiation sources, where clearly there is a decided opinion on that, and what I actually received from -- you know, from these comments. And I would have to say that while, you know, certainly such a concern has been broached in other venues, I'm not sure it was a specific theme of these comments.

I mean, the idea that in research facilities that you have juxtaposed some disused sealed sources, sometimes in devices, sometimes not, that people just don't have the capability of getting

rid of, coupled with the influx of lots and lots of folks who may or may not be the right folks to be, you know, around such material, has been a concern that, you know, has been expressed in other -- you know, other activities, not necessarily in these comments.

MEMBER HINZE: And another one of those areas that has popped up is the one that was brought up by Jim Clarke, and that is mixed waste. Jim talked about the interagency communication problems. Did you get a sense of -- in any detail of where the problems -- where the public sees or the agencies, etcetera, perceive problems with mixed waste? Where are the problems with mixed waste today? Is it this problem of a case-by-case -- getting some qualification on a case-by-case basis? Is this overly bureaucratic; difficult?

MR. SHAFFNER: I think that was the overarching concern, the fact that in a lot of cases you're dealing with material that, you know, the hazard, you know, may be overwhelmingly in one direction or the other, and, therefore, it would seem intuitive that the path forward ought to be, you know, in a particular direction.

And, of course, EPA was, you know -- you know, in the process of correcting that situation

somewhat with their conditional exemption rule that would allow the material to go to low-level waste sites, which one of the concerns that was expressed is the uneven implementation of that regulation by different states. And, of course, the effort that is -- has been, you know, not terminated but certainly postponed, you know, to allow waste to go in the other direction.

But I think the perception was, here you have material for which the hazards are easily recognizable. There would seem to be a -- you know, a pragmatic path forward for the material, and yet because of some of the hurdles -- I mean, some of the conflicting authorities, you know, it's somewhat more difficult than that.

MEMBER HINZE: It's a bureaucratic problem. I'll finish up with a question about volume. You had some comments about volumes, and volume of low-level waste seems to have reached some kind of an asymptote. Is that based upon the cost of putting the low-level waste in a repository? Or is that -- have we reached a level of volume which is predicated by how much we could decrease the volume?

MR. SHAFFNER: Well, I think it's somewhat of a combination. I mean, the fact is that, you know,

the folks that deal with this stuff have been on the case for a long time, and coming up with different types of technologies that allow for volume reduction and also processes that they are pretty well familiar with.

So I guess it seems as though that we have achieved some sort of a steady-state condition for the time being, which is a combination of both, you know, practices, you know, that allow less production of waste and also, you know, ways of processing it that will -- it's perceived that it will maintain, you know, a steadiness for a while, until, you know, we get into decommissioning mode, and all of a sudden, you know, we have another whole category of waste that comes into play.

MEMBER HINZE: Thank you very much.

CHAIRMAN RYAN: Thank you. Bill, that's a great question. I think I recall, too, from a couple of briefings we've had, or it may have even been with some of the workshops, that the Corps of Engineers has the fuse wrap sites, and they're sort of hitting a plateau, and maybe even a downward trend in their volumes.

Decommissioning volumes, of course, didn't get realized, so that is going down. And even the

pressure of price on low-level waste disposal has really created the volume reduction industry. So it's -- I would say it's -- and correct me if you don't agree, Jim, but my view is it's declining some at the moment in terms of volume.

Now, interestingly enough, in terms of disposed radioactive material, it's flat, because the curies are basically all in Class C hardware from powerplants, and that's a fairly steady volume -- steady quantity of radioactive material disposed, so --

MR. SHAFFNER: Yes. And one thing I might also point out in that aspect is, of course, some people are deciding to store waste a business. You know, they're not disposing of it on a voluntary basis, because of cost of disposal.

CHAIRMAN RYAN: Just one last point on the economics. I think it's important to realize that this is a commercial business, and the barrier to entry is a tremendous investment up front. I mean, people talk about, and have talked about in the past, hundreds of millions of dollars to license a site. And it is exactly that. I mean, it's probably north of $200-, $250 million.

MR. SHAFFNER: I think that would be a

very, very conservative estimate.

CHAIRMAN RYAN: North of. I didn't say how far north.

MR. SHAFFNER: Yes.

CHAIRMAN RYAN: But it's a big number, and I think in terms of barriers to competition it's that investment that people just -- it's very hard at 20 or 30,000 cubic feet -- you need to do the math -- what you charge per cubic foot to recover your cost. It's a big number.

MR. SHAFFNER: One of the big factors in that cost -- and I'm sure you know this, Dr. Ryan -- is the time value of money. You know, because of the fact that there tends to be -- and they are not necessarily regulatory-driven, but driven by the process, the fact that there is tremendous delays, you know, in the licensing process, you know, through the hearings, through intervention, through -- you know, through that sort of thing, so that money that you spend in year one, you know, doesn't, you know, get -- you know, its worth doesn't get realized until year whenever.

CHAIRMAN RYAN: And that -- to me, that's an interesting aspect of why new sites aren't here, and, you know, this whole B/C thing, and access to

capacity or access to capacity at a reasonable price, and all those kinds of things get battered around a lot. But I'm sure the staff has, you know, good knowledge of all of those variables.

Mike, one last question before we break.

MR. LEE: Sure. GAO is doing a study right now of best practices. Your Commission paper is going to come out in February. What's the timetable for the GAO study? Are you aware of that, and do you think it might have an impact on what you might want to say in terms of looking forward?

MR. WHITE: We actually had a call with GAO last week on their statement of facts. They didn't provide the findings of their report yet, but they did provide the statement of facts that will be the basis for those findings. I believe their target is for their report to come out in January. Is that right, Jim?

What they told us on that call, though, it probably -- you know, I don't want to commit them to this, but it's probably going to be really centered around a survey that they did of about 18 foreign countries on their low-level waste disposal practices. And they're primarily just going to present the results of that survey without tagging specific

agencies with recommendations that, you know, NRC should do this, DOE should do that.

So I would say it wouldn't have a substantial impact on the findings of our paper, which are really oriented toward what specific activities should the NRC staff work on over the next few years to ensure a healthy regulatory framework.

CHAIRMAN RYAN: That's interesting. Most of the countries they surveyed have a much different waste regulatory structure than the U.S., so that makes it apples and oranges to me.

MR. LEE: Turning to that paper, it seems some of the things that have been talked about today and at previous meetings kind of lay out a program for the Committee -- I mean, for the staff right now. You already kind of have an agenda.

Is it fair to say that your paper that you're working on is also going to be kind of a vision statement of, here are things that we could do, and defer to the Commission on deciding whether or not the Commission wants the staff to engage in these types of activities?

MR. WHITE: It's probably not going to go quite that far. As I said, it's not going to be a notation vote paper. It's not going to be a

revisitation of the '96 strategic assessment where there really were about six programmatic options for low-level waste, all the way from give the program away to EPA to really become a proactive leader in pushing a national strategy for low-level waste disposal.

And the Commission chose a maintenance mode, and so we're really going to propose living within the resources and the scope that the Commission gave us at that time. Having said that, you know, of the things that are out there on our plate, things like guidance for 20.2002, DU, etcetera, you know, what do we view as the high priority, medium, and low priority? And what do we think we can accomplish with the resources we're given?

That's why I said, you know, the passback is a big factor into that as well.

MR. LEE: Where I'm leading to with -- maybe the Committee may want to take up at a future debate, a vision statement on low-level waste nationally.

CHAIRMAN RYAN: Boy, that would be, as they said in Lonesome Dove, a heck of a vision.

(Laughter.)

With that, I think we'll close for our

break time, and we'll reconvene at, let's say, 10 minutes of 11:00, give that 15-minute break. At 10:50, we'll reconvene.

Thank you very much.

(Whereupon, the proceedings in the foregoing matter went off the record at 10:33 a.m. and went back on the record at 10:50 a.m.)

CHAIRMAN RYAN: Can everybody move to their seats, please? We'll come to order. The next item on our schedule is an update on the conceptual licensing process for Global Nuclear Energy Partnership, GNEP facilities. And I'll turn the meeting to our cognizant Member, Allen Croff.

Allen?

VICE CHAIRMAN CROFF: Thank you, Dr. Ryan. Just a couple of words about what got us here. In an SRM early last year, the Commissioners directed the Committee, I'll call it "Get Smart on Fuel Cycle Issues", in particular, the advanced fuel cycle issues that are represented by acronyms like AFCI and GNEP and good things like that And we've been going through a campaign of getting educated, first on general background and then we've commissioned a white paper to summarize that background and move forward

into describing what DOE might do and bring it down to issues for the NRC, including licensing issues.

And the team, a couple members on the team developing the white paper here today, Ray Wymer and Howard Larson sitting there in the back, and John Flack is part of the team also. He's on the ACNW staff.

With that, coincidentally, the NMSS staff has been working on a Commission paper of their own trying to work through issues on how they think such facilities might be regulated and with that, I've driven just about beyond up to my knowledge base. We have three people from FCSS that are going to talk us through this. First, Joe Giitter sitting back here and Stew McGruder and Amy Snyder up in front. And I guess Joe, are you going to say a couple of things to start with?

MR. GIITTER: Yes.

VICE CHAIRMAN CROFF: Take it away.

MR. GIITTER: This doesn't want to sit up here. There we go. First, I wanted to tell you that we appreciate the opportunity to discuss our thinking in terms of developing a conceptual regulatory process for GNEP. This started, officially anyway, back in February of last when DOE announced, actually the

Administration announced the concept of GNEP and what the goals were.

The big picture, the goals are essentially you would have a series of fuel cycle countries and you would have countries that are nonfuel cycle countries. Fuel cycle countries would include the United States, Great Britain, France, Russia, Japan and they would be in a position to supply or lease the fuel to developing countries or to countries that don't have fuel cycle capability and then take the fuel back as spent back and recycle it.

And the broader goals of GNEP are nonproliferation. I'm not going to go into a lot of detail on that, but what that boils down to for the United States is as you will hear developing three facilities as initial facilities. One is a recycling or reprocessing facility. Another is an advanced burner reactor that would burn the transuranic actinides and there would have to be many of them ultimately and then the third is an advanced fuel cycle facility.

So this was announced back in February and originally DOE was looking at more of a developmental program or an R&D-type program and based on that understanding we developed a Commission paper in the

spring and sent it up to the Commission, with some options for how we would, what our role would be and the staff requirements memorandum that we received back from the Commission told us to go ahead and develop a conceptual licensing framework with the understanding that these facilities would eventually be licensed by the NRC. And they'll work closely with DOE as they move forward with this GNEP program.

Then in August DOE shifted gears to a more industry-focused approach and as a result of that we've had to rethink about what -- rethink what our involvement would be in the GNEP program. And the Commission paper that we're developing right discusses the potential regulatory approaches under this accelerated schedule and that's what you're going to hear today. That's what Stew and Amy are going to talk about primarily.

So we do welcome the opportunity to get feedback from the Committee. Our current plan is to get this Commission paper up to the Commission in early January.

So with that, I'll turn the presentation over to Amy and Stew.

MS. SNYDER: Good morning, everyone. Good morning, Chairman and ACNW Members. Thank you for the

opportunity for this presentation.

We'd like to talk to you today about our potential regulatory framework options and some key issues. As Joe just said, we were directed by the Commission in May to develop a conceptual framework, but since then as Joe explained, things have changed.

So DOE has changed their focus and they have activities planned in '07 and '08 that may significantly impact the pace of the regulatory development for NRC.

I'm going to go over today some general things about GNEP and then talk about the regulatory options, present and future, and the time line for NRC review and some key policy and technical issues.

DOE shifted their focus in August and this represents their new approach. What they're intending to do is have an industry-focused approach and there's three facilities, the Consolidated Fuel Treatment Center. I don't have a pointer. It's a CFTC. And the ABR, Advanced Burner Reactor. They hope that they can partner with industry so they'll be industry-focused commercialized. Before August, they wanted -- their thoughts were that they wanted to do an engineering design testing, engineering small-scale testing, so now they're considering large-scale

testing.

And the third facility is the advanced fuel cycle facility which is their R&D facility that they hope to build and meet their R&D needs for the next 50 years. They want to focus on research for the R&D facility for the non-mature technologies. And build the ABR and CFTC in parallel. And once of their goals is also to co-locate the CFTC and ABR, if possible.

And from what we understand DOE believes that the most mature technologies for the ABR is the sodium-cooled fast reactor. And for the CFTC the UREX+1a, but they have not selected a technology yet.

(Pause.)

As I said, DOE intends to work with industry on both the CFTC and ABR and the proposed time in August they set out an expression of -- request for expression of interest for both facilities. And in that, they were saying that they were hoping to have the CFTC operational by 2018 and the ABR by 2020. Now what we're hearing is, the time frame is between 2020 and 2025.

So DOE intends to build the CFTC and ABR in parallel and in June, one real hard date is June 2008, which the DOE Secretary will make a decision on

the scope of GNEP, the scope as far as is it going to be R&D focused? Are they ready to go commercial or not.

So June 2008 is not that far away and NRC could receive an application as early as 2009, 2010 time frame.

MR. McGRUDER: We also point out that the 2008 date is also the date that they would like to issue their final environmental impact statement for the whole GNEP process of doing a generic or programmatic EIS.

MS. SNYDER: That's important because what they hope to have is the conceptual design, the EIS and the location of where they would build these facilities by June of 2008.

Yes, it is. Talking about timing, one of the things that could happen is DOE may decide that, you know, they might think that they could do this work in phases. We've got spent nuclear fuel storage. They'll be storage capacity at these facilities. And Part 72 applies reprocessed uranium storage. Part 70 would apply and so forth.

But what we are very much aware of is that if these facilities are going to be co-located, or even if they're not, we need to be mindful that

there's -- we need to be mindful about the NEPA boundary so we avoid improper NEPA segmentation. So it's quite possible to do things in phases, but there may be some complications.

So what are our regulatory options today if we got an application in? Well, for spent fuel reprocessing and fuel fabrication, we could use the existing regulations. For example, 10 CFR Part 50 specifically talks about production facilities and the reprocessing facility would fall into that. The advanced burner reactor is a utilization facility, so Part 50 would apply.

But the regulation Part 50 and the guidance is focused on light water reactors. And it has been applied before its doable, it's been done for three proposed fast reactors: French River Breeder Reactor, SAFR and PRISM, and then West Valley Processing Facility. But the regulations would need to be reviewed by section by section or case by case. And we think that there would be a lot of perhaps a lot of hard decisions would have to be made and exemptions would come up. And so therefore it may not be the most efficient and effective approach.

Part 70 licensing is designed for one step, but allows two step by ceasing process and it

applies to plutonium, uranium 233 enriched uranium. And other materials that NRC determines to be specially nuclear material. Subpart H was just updated recently. It's risk-informed regulation, performance based. It requires an integrated safety analysis and a PRA is optional. It bins hazards and likelihoods of those hazards. And it has been applied to enrichment facilities like LES, USEC, and other facilities like General Electric is coming in with their SILEX application.

Six fuel cycle fabrication facility in MOX uses Part 70.

MR. McGRUDER: Let me chime in on this too. Obviously, you can go back, Amy, to the previous slide. The special nuclear material determination right now is obviously it's just materials listed there. But obviously we're introducing a lot of different isotopes, a lot of different elements that, you know, we would have be responsible for and the implications of the Commission, and I think we've talked about this before. The implications of the Commission deciding other material, especially nuclear material, has ramifications around the world. There would be a lot of debate, I'm sure, about how to treat this material and I think like I've said we've

mentioned it before, but that's just one of the many issues that we'll be talking with you a lot about, I'm sure.

MS. SNYDER: And then we understand that Part 53 is being considered. The Commission is considering a new part 53 to regulate reactors to be a performance, a risk-informed performance based regulation. It may be technology specific or it might be non-technology specific that's yet to be decided and it's to integrate safety, security, and emergency procedures. The RES staff, research staff, has conducted public meetings and there's a comment period that ends December of this year. And I believe in May there will be a Commission paper on options for what is appropriate, what the staff thinks is appropriate for 53 development.

So our potential regulatory options in our paper, alternatively, the staff could pursue efficient rulemakings, and I want to bring your attention to the fact that this SECY is an intermediate product. We're looking at the regulations Part 70, 50, 52, 53. And there are other parts of the regulation that are going to be affected. And we know we need to incorporate those, but we want a strategy from the Commission on the framework.

So therefore, there are other parts like physical security, MC&A, waste, that need to be addressed but we intend to address with the Agency and outside agencies after we get direction from the Commission.

So we could pursue efficient rulemaking. The first option would be revised Part 70 for reprocessing facilities and remove the reprocessing references in Part 50. This would include the spent fuel handling, separations, vitrification and fabrication. We could also look at crafting, the revising Part 70 to allow for the concept of combined license, the COL design certs.

We can consider, and we also want to consider whether for these facilities, for the CFTC, we would need to have additional quantification of the ISA. We also could use Part 53, technology specific, if it is decided that it's going to be technology specific for liquid metal reactor framework for the ABR. Or we could create a new part when we call that 5X. That would have to be a decision that the Commission makes and it's really tied to the Part 53. We would want to use what we could from Part 53 if they decide that a part 5X is appropriate.

Another option would be develop a new GNEP

regulation, specific to technology. We would address both the reprocessing facility and the ABR as an integral unit. And we would also craft the process to allow for the COL and the design certifications. In this option we would pull in all of the other regulations and put it into a contained one, self-contained regulation to address waste management, security and so forth.

And then the last option that we are proposing is to develop a licensing basis document specifically for these facilities, consider public comment. And then have the Commission decide if they want to issue an order or pursue rulemaking.

So the time line for the review, if we use existing regulations, we could start upon when the application is submitted. To pursue efficient rulemaking or develop a new GNEP rulemaking, we think we probably can get that accomplished within two to five years, providing funding is authorized.

And if an order is chosen by the Commission, then the staff would write a technical requirements document or technical basis document, hopefully before the license can then -- or after a license application.

License application reviews have typically

taken 6 to 12 months. Before an application comes in there's two licensing meetings. There's the pre-submittal activities are about one to two years before an application comes in and historically the process has taken about two to three years for fuel cycle facilities and two to three years for reactors. But that can be longer if there's hearings and contentions and longer if there's design changes and program changes.

MR. McGRUDER: In the paper that we gave you a draft of, you notice we have pros and cons for all of the regulatory options. We try to get into a little bit more details about why one option might be better than the other option and I think a lot of it comes down to kind of regulatory stability for the applicant, knowing upfront what would be required. There are advantages to that, depending on what schedule DOE wants to pursue for various other external reasons, obviously. But the issue of trying to use existing regulations and getting through the licensing process and then opening up contentions in hearings about why existing regulation isn't applicable to different designs is a real issue we think. So that would, I think, you know, impact the schedule for licensing these facilities.

So I think bottom line, you put the time in up front to develop the regulations with input from industry and the public or you can put the time in afterwards to explain to everybody why what you did was acceptable and as I said, there are a lot of reasons and you might want to choose different options, but we just want to kind of point out that there are tradeoffs in the process.

MS. SNYDER: So as Stew said, what you will see in the SECY paper as the options, but then in an attachment we have pros and cons for each of those options.

What the staff believes is that we need an integrated solution for the Agency to ensure that the regulatory infrastructure for reprocessing facility is compatible with the ABR. So we will avoid orphan technology. We think that there's going to be a lot of fuel and material-driven issues that are going to impact reactor performance and operations and that's -- integration is very important.

MR. McGRUDER: We want to also, I think Dr. Ryan has mentioned several times, we want to try to take a holistic view of the process and try to optimize the entire process, rather than optimizing any one piece and to the detriment of the other

pieces.

CHAIRMAN RYAN: I'm glad you mentioned that. I think there's a couple of regulations that were missing from your list, 61 and 63.

MS. SNYDER: Those are on my last slide.

CHAIRMAN RYAN: Okay, all right, great. I'll wait, thanks.

MR. McGRUDER: We definitely have not forgotten about them.

MS. SNYDER: So some of the key technical issues that staff has to consider is the technology differences. PUREX is a process that has significant international commercial experience. It separates out pure plutonium and that would mean more physical protection and safeguard concerns. But it's incompatible with DOE's nonproliferation goal for GNEP. So that's not a negotiable item for DOE as we understand it. It needs to -- PUREX would not work for GNEP.

Also, the COEX process is another process and it keeps plutonium mixed with uranium. It separates out the transuranics, but it might be more advantageous because of the physics of the core and manufacturing of the fuel which is a process similar to MOX, what we're reviewing now.

And if that process were used, it might buy time until we get a better understanding of neutronic behavior and mechanics for the transuranic fuel.

MR. McGRUDER: We mention this because it's been discussed by companies that are working with DOE as an option, but implicit in this is that this would be used in light water reactors now. It manufactures MOX fuel essentially for burning and existing reactors and the transuranics would be separated and stored and then they could be used later on. But this is not part of DOE's plans right now. They're not opposed to it, but it's not part of what they're proposing right now.

MS. SNYDER: And then the UREX+1a, as I said earlier, DOE feels that this is the most mature technology and this keeps the plutonium mixed with the transuranics. Mechanical steps are involved in which the transuranic fuel fabrication are not well understood. The things that we need to consider are the neutron enrichment, the high gamma and the high radiation fuel. We think that significant work is needed to understand the source term, long term degradation of fuel.

Another process that I don't have on the

slide is PYRO processing. That's a dry process, but to our understanding it's only been tested at the lab scale and demonstrated for the process chemistry, but additional work is needed to be done for that and another issue is the viability, is it viable for commercial industry at a commercial scale.

MR. McGRUDER: I think as we mentioned before the UREX technology is what DOE is proposing to recycle the fuel from commercial reactors for the kind of a first recycle and PYRO processing is what they're proposing to recycle the fuel from the advanced burner reactor. And there are advantages and disadvantages of both processes which Dr. Wymer has explained obviously many times and I'm sure he'll talk about it in your white paper. But I just wanted to mention, those are the technologies under consideration and they're quite different from what we reviewed so far.

MS. SNYDER: The other thing that staff is realizing is that there's some key differences in the materials that we would expect for such a facility for a fuel reprocessing facility. There's going to be irradiated materials that are going to be very radioactive, self-heating and many isotopes. And it's going to be different from what we're used to dealing with. Thee's going to be large source terms; more

actinides. We're thinking that we're going to have to focus on -- pay attention to confinement and HVAC controls. There's also the chemical processes that are going to -- we're going to have to consider and energy for dispersion.

And there will be waste forms. High-level waste requires certification. So there's probably going to be a vitrification process.

MR. McGRUDER: DOE has emphasized many times that there will not be any liquid wastes stored at these facilities. That's their goal anyway.

MS. SNYDER: There are some key health and safety concerns with plutonium and transuranic isotopes, the effects and magnitudes of hazards, radiation, the alpha effects on material, gas generation, contamination and movement, activation of materials and the chemical toxic nature of the process.

And then criticality is also going to come into the picture that we're going to have to evaluate from a safety standpoint.

MR. McGRUDER: This is one of the, I guess, most important things that we were hoping to get feedback from the Committee on is whether we've captured all of the differences and all of the things

that we should be concerned about. We want to make sure we're not missing anything important. So we'd really like feedback on this slide.

MS. SNYDER: For the advanced burner reactor, we also think that there's going to be some key differences. The system is going to call for fast neutrons and there's going to be some other things that we're going to need to consider and Joe Giitter is going to discuss that.

MR. GIITTER: I just want to give you a little bit of feedback. We met with DOE yesterday and they brought in -- this is on the ABR and they brought in some people from Argonne National Lab and some other national labs who really spent their career working on sodium cooled fast reactors. It was a very interesting meeting and I worked at one point in my career on Clinch River, so it brought back a lot of old memories, but issues like thermal striping and things I hadn't thought about for some 20 years.

It's a situation where I think for us to review and NRC to review an application for a liquid metal reactor or sodium cooled reactor, I think would present a number of challenges. And I think some of the challenges are knowledge management area. We had very few people left in the NRC who have any

experience in doing the licensing review of a sodium cooled fast reactor or for that matter even understand the technology very well. And in fat, we really haven't licensed a reactor in the NRC for a number of years. So that in and of itself is going to be a challenge, but when you add in some of the differences, the fundamental differences in technology between light water reactors and sodium cooled fast reactors, I think it presents some additional challenges.

Just as an example, a lot of people who are familiar with sodium cooled fast reactors are concerned with the positive sodium void coefficient and what that means for certain transients. But if you look at it holistically, there's also some advantages of sodium cooled fast reactors from a safety perspective. For example, you don't need an emergency core cooling system and standby readiness. The system can operate at atmospheric pressure and you have a set cooling margin of something like 600 plus degrees Fahrenheit which is a substantial subcooling margin.

And there's some other aspects of the design that are more forgiving and they've made some changes in the design. One of the things that we saw

yesterday was for the traditional beyond design basis accidents like the unprotected loss of flow and unprotected transuranic power accident. In the past, those accidents would be very severe. And in fact, for the unprotected loss of flow accident, you'd actually have formation of a fuel vapor bubble that would drive a sodium slug up to the reactor vessel head and you were worried about the integrity of the reactor vessel head. That was one of the big issues. It was called hypothetical core disruptive accidents. With the changes in the design, you know, they've incorporated radial and actual expansion of the core and design your reactor so you never have boiling, you never get to the boiling point so you eliminate those types of transients. There's still the kind of transients that I'm talking about would involve a complete loss of flow with a failure to scram which is a pretty severe transient. But the consequences of those types of transients are much less.

But you know, our entire infrastructure for reviewing reactors under Part 50 is based on light water reactors. The Standard Review Plan is written for light water reactors. The point is there would be a challenge and I think for that reason what the staff

believes anyway is that looking at a more performance-based risk-informed type rule that probably incorporates some of the deterministic general design criteria requirements as applicable, might be the right way to go.

MS. SNYDER: The other thing that we are aware of is that there are a lot of unresolved issues on the NRC sponsored review for the Clinch River Breeder Reactor and PRISM that need to be addressed, if this goes forward. And as Joe said, many of the light water reactor requirements would not apply. And there's inherent reactivity feedback differences that need to be looked at.

And then, of course, with both of these facilities, the scale up factor have not been demonstrated at a commercial scale, so the concern is how are they going to take a leap from laboratory to a larger scale.

MR. McGRUDER: That leads perfectly into this.

MS. SNYDER: So other key technical issues for GNEP are the accuracy of codes, modeling and validation. There's going to be a need for high computing -- it's going to play an integral role in GNEP. Model validation is going to be important for

NRC. It's going to provide the reason for us to believe in these codes. It's going to reduce uncertainty and design margins and costs. But there's also going to have to, we're going to have to look at how they're analyzing data. What we believe is needed is advancing the cross section data, not only for -- to get better data for principal radionuclides, but also for some of the exotic ones.

There was some discussion about safeguards. There's going to have to be development of in-line instrumentation. As I said earlier, understanding of scale-up factors and for industry, the cost is it going to be economical?

Waste forms is an important issue. There will be perhaps new waste forms developed. Process losses, transuranic fuel performance is really going to be key for the -- to the process as far as how many times something could be recycled. Is the high burnup going to be sufficient and what that means economically.

Also DOE is talking about modularity for the ABR, so there's going to some issues about heat transfer, heat capacity.

Again, as we earlier said, we really think that we're going to have to have an integrated systems

analysis approach because of the possibility that these facilities are going to be co-located.

MR. McGRUDER: Even if they're not co-located, I think it makes sense to take an integrated approach.

MR. GIITTER: Just to add to that, from a risk perspective it makes sense to look at the integral risk of the facility and not look at it piecemeal.

MR. McGRUDER: And once again, I'll put in a pitch that these key technical issues, we'd really like your feedback on whether we've captured the right ones and whether we've missed anything in particular.

MS. SNYDER: Other potential issues, we've grouped those in programmatic which we're going to have to deal with now during the conceptual framework development. In the future, there's going to be specific issues. For example, a programmatic, as I talked about there's different technologies and as Joe discussed, we're going to have to think of how to evaluate these systems. There may be different safety approaches that we're going to have to look at, for example, yesterday, we had a discussion with DOE and they understand that they think that industry is going to be using PRA, and PRA analyses for design, as well

as for safety, so to use PRA analysis for design and to try to make that work for safety is going to be a policy issue I think. We're going to have to address that.

Also the GNEP approach and regulation, as I mentioned earlier, depending on the progress, DOE's progress, they might choose to phase their work and that could add some additional policy issues.

Infrastructure needs, how are we going to support the mission? Are we going to have the staff and be able to do the work that we need to do with competing priorities that are out there right now in this time. So one of the programmatic issues is what is the order, what's the priorities? What's the priorities for GNEP with respect to other things that are going on right now. And then the competition for staff. And knowledge management.

Specifically in the future, the Agency is going to have to look at things like financial qualification, D&D funding and D&D requirements, how does Price-Anderson fit in. The facility staffing for these type facilities where is the staffing going to come from and the expertise? Looking at how annual feels factor in if these facilities go commercial. And the advanced fuel cycle facilities is an R&D

facility, but from what we understand DOE says that they want to -- once they have developed a technology or a process, they want to incorporate it into the existing facility. So that's going to mean that given that we're going to have to look at ways of how are we understanding the technology, but how are we still keeping an arm's length distance in being a regulator and keeping that independence.

Specifically for the commercial, for the consolidated fuel treatment center, that's the fuel separation and fuel fabrication center, CFTC, the issue of PRA versus ISA, you're going to have to address that, as I mentioned earlier. We don't have enough information on these facilities, but we feel we need to evaluate it because, as I mentioned earlier, we do think we know a few things about what to expect and how these facilities are going to be different than what facilities that we've licensed.

So we need more specific information so that we can make that determination.

The advanced burner reactor is going to be a non-light water reactor. So we've already discussed that. And we don't know at this point in time how many reactors or how many facilities are going to be built so the issue of standardization will probably

come up once with you and all that. And then funding for the work that we're doing.

MR. McGRUDER: This slide, we've kind of talked about each of these issues already, but we are just going to kind of summarize it. These are the challenges that we think we're facing now.

MS. SNYDER: What we need to do is understand the technology. We need to have the ability to independently assess from a safety standpoint. We need to get our hands on the confirmatory data at the appropriate time and analyses and models and codes to make sure we understand those. And we understand that there's a lot that still needs to be developed so development research is going to take time and it's going to need resources.

What we've been doing over the past six months is we've been working with having technical exchanges with DOE. In October of this year, we went out to Idaho, staff went out to Idaho and we had a technical exchange on the research and development facility. Yesterday, we went to Germantown and talked about the ABRs as Joe mentioned. And then the Consolidated Fuel Treatment Center, the design team is meeting this week in Idaho, but we're not attending that meeting due to funding, so a to be determined

date, we want to have a technical interchange with that team.

MR. McGRUDER: John Flack and Larry Tavlarides were able to go out with us to Idaho and we hope that the Committee can attend these future meetings, if possible.

MS. SNYDER: So we're developing the conceptual framework and in January, we hope to that Commission paper to the Commission. But as I said earlier, it's an intermediate product. What we hope to by the end of Fiscal Year 08 is finalize the conceptual framework, work with NRC organizations and also work with external agencies to address the factors of like MC&A, safeguards, waste minimization and management, environmental impact, fuel integrity and performance, fuel qualification issues and source term. So that's where the Part 61 and 63 come in to see how -- for the waste management and minimalization see how that -- how our regulations relate to what we're going to need for GNEP facilities.

CHAIRMAN RYAN: Thank you very much. Very interesting. I think we'll move right into questions. Bill?

MEMBER HINZE: There are many objectives to GNEP and certainly one of them for the DOE is to

reduce the body of the waste. I guess my questions are what does all this have to do with -- what's the impact of all of this upon the type of waste that might be brought to Yucca Mountain and if that becomes the repository and if that is the case, will it call for the NRC to have another licensing and if so, will that be effected under 63?

MS. SNYDER: The licensing of another facility, is that what you mean?

MEMBER HINZE: No, at Yucca Mountain. Would you have to relicense Yucca Mountain to take into account the new waste? Would you have to consider the new preclosure facilities as well as the repository configuration, tunnelling, etcetera?

What kinds of wastes -- how will this waste differ in terms of its impact upon the repository itself? How will this differ from the waste that we're now planning to put into the repository? There are a whole series of derivative questions --

MR. McGRUDER: Oh yes.

MEMBER HINZE: -- that come from this and we're the waste committee, so please, I don't think you really attacked at all the critical questions that would reside in the mind of someone that's looking at

this from a waste aspect.

MR. GIITTER: I think I can address your question and it's a very good question and I'll start off by saying we've been asking DOE the same question. But the overview, in a nutshell, if you assume that 20 percent of the electricity in the United States is generated by nuclear power for the rest of the century, you would need multiple high level waste repositories. The numbers, seven, eight, nine. And that's assuming you have the 70,000 metric ton capacity of Yucca Mountain. Others, a lot of discussion of what the real capacity of Yucca Mountain is and it's probably not 70,000. It's probably a lot more than that, but we don't know.

As far as whether DOE is redesigning Yucca Mountain for the GNEP concept, the answer is no. They GNEP people have been talking to the people at DOE responsible for Yucca Mountain, but then they are aware of the work that's going on with GNEP and they are talking to each other, but at this point to our knowledge and to my knowledge anyway, there is not an effort on-going to redesign Yucca Mountain for the GNEP concept at this point, although, as I understand it, they're looking at that.

MEMBER HINZE: What are the implications

in terms of regulatory framework that would be developed by the NRC? Would you -- if there is a -- if this waste does go into the proposed repository, would you -- are you thinking about changing 63 or will we have a new 63?

MR. GIITTER: I think you'd have to have a new Part 63 to address that. There's no question about that.

MR. McGRUDER: We haven't gotten that far though.

MR. GIITTER: But we have asked that question to DOE and the answer they gave us, the very short answer was right now they're not actively redesigning Yucca Mountain for GNEP. Now if GNEP proceeds as planned, I would assume they're ultimately going to be doing that, but right now their concern is being able to submit a license application for the NRC, June 30th of 2008 and that's their focus.

MS. SNYDER: And so that issue is going to probably come up in the future and we're going to have to address that. I think there may be a policy issue specifically for if the waste cap is lifted and a couple of weeks ago DOE gave a presentation at the National Academies of Science and Edward Strote said that if the cap is lifted, he would hope that NRC

could determine what the limit would be. And then the question, I think comes up is well, if GNEP is moving forward, is it something that NRC is going to be asking or is it -- it's probably going to be a policy issue.

MR. McGRUDER: This is a goal of GNEP is to have essentially only fission products go into the repository.

MS. SNYDER: The other issue related to waste is what happens if they don't build these facilities in parallel and they just do one. What are they going to do with the interim waste? Put it to the side and then once they get up to speed with transportation then you know deal with that. So those are questions that we've asked DOE and they have not been able to answer our questions yet.

MEMBER HINZE: I'll take just one more moment. One of your slides here, Slide 18, shows waste forms as one of the key technical issues. How are you bearing in on this? How are you boring in on this? How are you trying to get at this problem?

MR. McGRUDER: I think the point, what we can do so far is kind of remind DOE to consider waste forms.

MEMBER HINZE: This is just a place

holder?

MR. McGRUDER: Yes.

MS. SNYDER: Yes.

MR. McGRUDER: In Idaho, we talked about the waste form and we actually had a really good discussion about possibly changing the regulations to be more risk-informed and to consider the actual form of the waste rather than the originating or the origin of the waste and DOE is very receptive to that.

MEMBER HINZE: Thank you.

CHAIRMAN RYAN: I'm going to pull a little sharper edge on some of the questions that Bill asked.

I don't understand why we're not really integrating 61 and 63 in a real serious way. We've seen charts that show uranium is a high-level waste, uranium oxide, which it's not, unless there's something else in it. And when I asked the question what's in it, they said TRU. How much? We don't know. So it could be all the way up to high-level waste or Class A waste based on how much.

So my point is the devil is in the details with regard to partitioning, fractionation, whatever you want to call it throughout these processes and I think experience should teach us and maybe I'm wrong, but my own view is that the experience tells us that

the waste issues drive the bus. What goes out the end of the pipe has a lot of influence on how the process is designed and operated.

To that end and again I may be off-base here, but most countries that deal with reprocessing have an intermediate level waste category. So there is no -- there's something in between 61 and 63 that everybody else figured out they needed and I think you've alluded to a couple of the points that there are radionuclides that are longer lived than what we have now in the current profile, but are mobile and problematic from a performance assessment standpoint typically.

So that's -- do we need a new category of waste management regulation? I don't know.

Now in part, I would think my head tells me a lot of it can be handled between 61, particularly if you look at 61.58, the principal criteria are met; 61.58 looks at alternate classifications. So there is a basis there. And one that we actually recommended for other issues in low-level waste. So it's not a locked door. 63 certainly could be addressed in terms of what really is the high level part, so the answer to my own question in my own question in my own mind is I don't know yet, but I think that's one that needs

to be on the table to get studied and the Commission needs to give direction on how they want to evaluate it, I think.

Leaving that, I would -- I guess I'll never know the answer, but it would be interesting to know if the plutonium inventories from reprocessed fuels is being successfully used in MOX fuel. But my question is is the plutonium inventory that's not being used growing or are we -- you know, or is MOX fuel being used or are we just building a plutonium inventory that's not going to be effectively used in a new generation of reactors?

MR. McGRUDER: You're talking about if GNEP moves forward, how --

CHAIRMAN RYAN: No, I'm talking about the French have been making MOX fuel for a long time. Did they have a big inventory that can't get used or are they selling all of it?

MR. McGRUDER: That's a good question.

CHAIRMAN RYAN: Because that's a fundamental question, I think, of how -- where all that goes. So I'm just trying to understand the drivers of a reprocessing facility, an advanced burner reactor, and a next generation of light water reactor or other kinds of reactors that use the fuel

materials. I'm not done yet. I'm just asking one more question, and then you can have at it.

The last one is how many fast reactors that use sodium are working in the world today? That's an easy one. It's zero. Right?

MR. McGRUDER: No, that's not right.

CHAIRMAN RYAN: Power production?

MR. GIITTER: Not for power production. This is off the top of my head, but the Russians operate the BN600, which is a really fairly large fast reactor. The Japanese operate JOYO, which is more of a prototype. And the French operate Phoenix, which is a prototype. In fact, DOE has just -- the NRC has approved the export of lead test assemblies --

CHAIRMAN RYAN: That's good.

MR. GIITTER: To Phoenix for some of its early transmutation.

CHAIRMAN RYAN: In Phoenix doing some power in test reactor also?

MR. GIITTER: I believe it produces powers. Not a lot. It's a small reactor.

CHAIRMAN RYAN: A small reactor. That's another aspect, I guess, of my own mind. How do we get to the scale of a bunch of burner reactors or many, and these are very practical kinds of questions,

but they sort of drift back to what's the regulatory structure to handle all the practical questions.

MR. GIITTER: As far as the question about the plutonium inventory, the advanced burner reactor, of course, is designed to burn plutonium. So the conversion ratio is less than one. It's not, you know, back in the 1970s where the Clinch River breeder reactor, the idea is to produce more plutonium than, you know, more fuel than you consume. So the idea here is actually to reduce the inventory of plutonium.

CHAIRMAN RYAN: The idea. But I really wonder about it in practice, because the French have been at this for awhile and I just wonder what the experience is.

MR. GIITTER: Well, I think part of the problem is the amount of reactors that utilize MOX fuel.

CHAIRMAN RYAN: My point.

MR. GIITTER: Yes.

CHAIRMAN RYAN: So the inventory is building up at the moment? I'm guessing -- I really

MR. McGRUDER: I think to be fair, we have to get back with you on that. I want to make we have the right answer.

CHAIRMAN RYAN: Again, my whole series of

questions are designed to really sort of explore in a real vigorous way some of the bases where bringing it back home, if you will, the NRC is going to ultimately have to have a regulatory framework to address all of these issues, particularly the waste part, and 61, 63 and whatever is in between for an intermediate category and a disposal, or disposition scheme, for something that might look a lot different than anything we regulate today. Thanks.

MR. GILLESPIE: Mike? Just Just for your information. Actually, Catagua and McGuire have mixed oxide --

CHAIRMAN RYAN: I know there's been a few test elements that have come into the U.S. But I'm looking at the steady state issue way down the line.

MR. MURRAY: Can I please comment on that if I could please? My name is Alex Murray. Just to let you know, the French experience is they have approximately 30 reactors where they are recycling MOX 2, or plutonium and MOX 2 as one third course. If you look at it on a large scale, again, we don't have the specific values -- are they getting a net increase in inventory right now or not? But on a large scale implementation of MOX, there would be a net consumption of plutonium.

CHAIRMAN RYAN: Well, that's a theoretical point and not an actual data point. So I appreciate the fact. That's the idea. But I wonder, just wonder amongst us all here, in practice will not be achieved.

MR. MURRAY: Again, we have to look at the actual numbers. The French plutonium, separated plutonium inventory is relatively small.

MEMBER WEINER: To what extent are you using the experience, or is DOE using the experience of the FFTF of Hanford and EBR 1 and 2. And I might point out, the FFTF wasn't operating of sodium cooled reactor that was only not used for power production because the utility chose not to use it for power production. It could perfectly well have been used.

MR. GIITTER: That was talked about quite a bit yesterday. There's a lot of good experience with FFTF. It operated for over 10 years and there's been lots of insights gained on materials, issues, issues related to reactivity, core design. It had many similarities to the Clinch River design. In fact, we found out that the vessel for FFTF was identical in design to the vessel for Clinch River.

MEMBER WEINER: Why did they shut it down? Did you ask?

MR. GIITTER: That was a policy decision

by DOE. And I think the official answer is that it served its purpose. A lot of the work for FFTF, it was designed to be kind of a prototype for Clinch River. And when Clinch River never got built, a lot of the reason for operating FFTF went away. They did do some very interesting testing and analysis with FFTF and they described that in yesterday's meeting.

MEMBER WEINER: Well, I would hope that NRC could make use of some of that experience and not get trapped into the fact that these people worked for the Department of Energy.

MR. GIITTER: An important point that the DOE made, and I think this was extremely fascinating. Back in the early 1970s when DOE had an R&D program on sodium and cold fast reactors, their annual budget was on the order of $600 million a year. And in today's dollars, that would be probably well over a billion dollars.

There is a lot of very valuable R&D and research that has been done for FFTF, EBR 1. In fact, we were out at the site of EBR 1 and they're currently in the process of reprocessing the EBR -- I'm sorry --

MR. McGRUDER: EBR 2.

MR. GIITTER: EBR 2. So there was a lot of valuable experience there. And one of the things

we talked to DOE about was knowledge transfer and knowledge management. When, you know, to use an analogy that I mentioned before, back in the 1980s when DOE developed the GSEP program, there was obviously a lot of people who were familiar with advanced centrifuge technology.

And, you know, throughout the years that knowledge dissipated. USEC was fortunate when they went to start up the centrifuge program again to hire some of those people that had originally worked on the GSEP program and then the advanced centrifuge program, who some of them were retired. Some of them were working at Oak Ridge National Lab in a completely different area in the aerospace area because of the applicability of high speed rotating machinery. And they were able to get those people and use those people to really build on what they were able to accomplish before.

A very similar situation we see here with DOE and the people at Argonne National Lab and other labs who have experience with sodium cooled fast reactors. So DOE has agreed to work with the NRC on a knowledge management effort to try to get, to glean some of that knowledge and build it into the NRC knowledge base.

MEMBER WEINER: GROIS think that's very valuable. To move to another -- question.

MR. LARKINS: May I follow up on that question?

MEMBER WEINER: Can I ask one more? It will be quick. If you could go back to slide 16. You said "Key ES&H concerns", I don't want to minimize the chemical concerns. It's not so much chemical toxicity as it is the fact that with nitrates, you're working with potentially explosive compounds and you have the possibility of very rapid exothermic reaction. And the canyon processes were built to accommodate that. My concern is NRC does not normally regulate chemical hazards of this magnitude and type. Are you considering any interagency cooperative, any cooperation? For example, OSHA which does have this kind of experience, any MOUs, that sort. I'm concerned that the possibility of violent chemical reaction may not be considered seriously enough. These are not fun processes.

MR. McGRUDER: No, we understand them. And actually we are addressing just those issues in the MOX review, where you have the same chemicals. Or essentially, the same mechanicals. And we did have an MOU with OSHA, and we've been sharing a lot of

information and that's a very valid concern which hopefully I'll talk about.

CHAIRMAN RYAN: Jim?

MEMBER CLARKE: I know we're almost out of time, so let me just share an observation. I think Dr. Hinze started a line of questioning and a line of thought that's critical here. All of this it seems to me to just beg for integration. You're going to get an application for GNEP. You're going to get applications for 30 commercial reactors or so, and Yucca Mountain has been promised for June of 2008. And somehow I don't know if the DOE is integrating this or not, but I would suggest that the NRC would want to look at that.

And just a final observation, the concept of a TAD has always struck me as at odds with the concept of GNEP. And there are things, there may be other things that really need to be looked at. Thank you.

MS. SNYDER: Thank you.

VICE CHAIRMAN CROFF: Thanks, Jim. I think I'll take a turn here. I've got a couple things. First, is it settled that the CTFC will be NRC licensed?

MR. McGRUDER: If it's a commercial

facility, it will be licensed by the NRC. Yes.

MS. SNYDER: The DOE will make a decision in June of 2008 on the scope of GNEP.

VICE CHAIRMAN CROFF: And that decision is to whether it's a DOE facility or commercial will be made at that?

MS. SNYDER: Maybe before that, but the scope with respect to do they need to do more are more research and development. Are they ready to take that leap to partner with industry?

MR. McGRUDER: Their expression of interest request right now, that they published this summer, specifically said that they wanted venders to understand that this facility would be licensable by the NRC. And if it's a commercial facility, it's clear under the Atomic Energy Act that we would have to regulate it.

VICE CHAIRMAN CROFF: Second, I guess an observation stemming from your question, is anything left out of a couple of lists like this and the one preceding it. And sort of looking across the presentation, my observation is that it sort of to me reflects a little bit of reactor think. And what I mean is there's a lot of emphasis on accidents. Now a reprocessing plant doesn't have the driving force

that a reactor does, the thermal energy. But also and to my mind more importantly it's by definition it will release or can release a number of radionuclides that get a lot of people's attention real quick.

I'd like to reinforce what Mike said about it raising a whole range of waste classification and waste form issues, where there's a lot of TBDs. It can be a complicating factor.

I would like to focus on the off gases. The krypton, carbon 14, tritium, and iodine-129, that are all volatilized and at least some have EPA regulation now. Others are promised to be regulated, but it didn't seem to make any sense nobody was going to build a reprocessing plant in the 1970s. And I think that deserves some early and serious attention, because deciding how much of those things can go up the stack was a very contentious exercise at the time.

That observation, having been made, what is the path for? In other words, how is that decision going to be made whether it's 99 percent or 90 or three nines, or whatever its, where does the NRC fit into this? Where does the EPA fit into this or anybody else?

MR. McGRUDER: Your concern was I thought represented very well by Dr. Tavlarides when we met

with DOE in Idaho, and we had a lot of good discussion about that. I think that there's a lot of flexibility on that right now. I think DOE realizes that they need to work with us and the EPA to come up with a proposal. I think they're going to do just that. Once they know more about the design, they will propose some thresholds and you know we'll kind of work it out together. But the idea is to talk about it early and make sure that everybody is on the same page about that.

VICE CHAIRMAN CROFF: Does that mean that the existing limits for what is it iodine and krypton, I guess, are subject to change?

MR. McGRUDER: They're certainly open for discussion, yes.

VICE CHAIRMAN CROFF: Okay. All right. With that, Ray, do you have any questions?

DR. WYMER: I have one. I have one observation.

VICE CHAIRMAN CROFF: Get closer to the mic.

DR. WYMER: Fred Wymer, incidently, for the recorder over there. You're really talking about in a sense four reprocessing plants and not one. You have four distinctly separate processes going on

inside this plant which really complicates the operations, which require a lot of attention I think from the NRC and safe operations. And you're talking about at least four different types of recycle from the different kinds of solvents. It gets to Ruth's point about toxic reagents. And it's a much more complicated plant than a PIREX plant ever was. So I think you need to keep in mind that you're dealing, in a sense as I say, with four different reprocessing plants and multiple new kinds of waste streams.

CHAIRMAN RYAN: Thank you. John.

MR. LARKINS: Just real quick. We talked about knowledge management. I was going to mention that you're probably well aware that there was a whole group back in the 1970s that developed a lot of information on phenomena associated with Clinch River and were working on that intimately, and code development and all of that stuff should be captured. There's a few folks still around who have some good working knowledge of that.

The other thing, I was noticing on page four of vu-graph four, it says DOE intends to build CFTC and ABR and start as soon as it can after June 2008. Is that correct? To build?

MR. McGRUDER: I guess your question is

whether DOE would build it or someone else would build it?

MR. LARKINS: No, the bullet above that could receive an application 2009-2010. It's almost like that --

MR. McGRUDER: There would have to be a licensing process.

MS. SNYDER: Yes, as soon as it could after June 2008. So in other words, they want to get the technology commercialized as soon as possible and that June 2008 is a important milestone for DOE.

MR. McGRUDER: Yes, it's a good point. They're not considering bypassing the licensing process.

MR. LARKINS: It seems like putting the cart before the horse. The other observation, you've been talking about the difference between the ISA and a PRA seems like you could use either, whether you're looking both at having a reprocessing facility and a reactor co-located on the site that the PRA could be done for both facilities, and use one as initiator for the others as part of your analysis. So I don't see how why it precludes one or the other.

VICE CHAIRMAN CROFF: I think at this point, unfortunately, we're out of time and then some

and we have to reconvene promptly at one. So I'm going to terminate the question and answer. Thank you very much for an interesting presentation. We look forward to seeing the SECY in January.

MR. McGRUDER: Thank you very much for your help.

CHAIRMAN RYAN: I think in the interest of not trying to squeeze everybody because the cafeteria is a busy place, we will drift past one and reconvene at 1:10.

(Whereupon, at 12:07 p.m., the meeting was recessed, to reconvene at 1:10 p.m.)

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

1:08 P.M.

CHAIRMAN RYAN: All right, our other members are arriving so I'll make the introductions. We're here this afternoon to hear about Boral and dry cask storage systems. Our first presenter will be Chris Brown, Senior Staff Engineer from the ACNW. Mr. Brown, welcome.

MR. BROWN: Thank you. Good afternoon. What I would like to do this afternoon is to give you an overview of the issue, talk a little bit about what Boral is and some background on blistering, how blistering actually occurs. My presentation will be followed by the Office of Research in the order of Patrick Baranowsky, Deputy Director, Raji Tripathi, Senior Staff Engineer, and -- I'm sorry, reactor engineer. And also Dr. Hopper from Oak Ridge National Laboratory will talk about his technical analysis.

CHAIRMAN RYAN: Thank you all for being with us today. We appreciate it.

MR. BROWN: Basically, this will be the order of my presentation, and without any further ado I'm just going to go right on into the presentation. What is the issue? Well, before I talk about the issue I'd just like to mention that neutron absorbers,

as most of us know, are used for criticality control and dry cask storage systems. B10 is generally the principal absorber species. There are other neutron absorbers that are available other than Boral. I'd just like for you to note that.

However, we're going to focus this afternoon just on the Boral material. And there appears to be some notion that the experience that occurred in Spain would actually occur in dry cask storage systems in the U.S. And once you get a blister, blistering could affect the neutron efficacy of the material. And so that's going to be the whole focus here and that was also the nature of the GSI.

I thought it would be very good to present at least some regulatory background. I'll let you read the one for 10 CFR Part 72. That's in dry cask storage system. If you want to look at 10 CFR Part 71, there's a similar regulation for transportation of spent fuel packages. But the staff had interpreted these regulations to mean that the materials should be durable and effective. What we mean by durability and actually for the newer materials that we have approved, we submit them through qualification tests, which are just one time tests to ensure durability in which they're subject to radiation tests, water

immersion, and also temperature tests.

And of course after which you want to check the neutron efficacy of the material and also look at the optical properties of it, SEM, TEM, etcetera. But the bottom line is you want the material to be able to perform for the license period. Also for license renewal, you want it to also be able to perform.

This is just some general information about Boral. Some have asked me about the density of the Boral, what the dimensions of the plates that are used inside of the canisters. And actually it ranges. But I would like for you to focus on the next to the last bullet, porosity in the core region. As we will learn today, Boral is a very porous material and it's subject to ingress of water when we go through the short-term loading operations.

But Boral has been used for other three decades. It's been a work horse for quite a long time. We have a lot of experience about the material, as I also mentioned, but there are other neutron absorbers that are available for use.

Basically, this is what the Boral looks like and I also have a sample of the Boral that I like to pass around to the Committee Members. This sample

has been subject to very extreme steam blistering, very, very extreme. But I only submit that to you just so you can get an idea to see what the texture inside the core is like. But basically the material is fabricated using B((40sub)C, boron carbide, and aluminum powders. They're blended. The blending of the powders are then placed into an aluminum box. The box is sealed, and I'm giving you very rudimentary, fast fabrication of this material. The lid is then sealed. It's annealed and it's passed through rollers and flattened.

Now the ends are cut off because that's actually done to achieve the final dimensions for the canisters. So you have these edges that are subject to the ingress of water. Also, some believe that the needs are also cut off to facilitate those regions that are pretty low in B(10)sub. So as you can see from this picture, you would do that to some void spaces inside the core material.

Boral blistering, some have said that there are two types of blisters that occur in Boral -- hydrogen blisters, which generally are associated with the pooled storage. But also you have steam blisters, and that's sort of the subject, the main subject about our concern today are the steam blisters.

I'll talk a little bit about the hydrogen blister. Basically, the reaction is that when the -- and we've known for years, it's very rudimentary that aluminum will generate hydrogen, small amounts of hydrogen when exposed to water. The reaction that you have is aluminum plus water yielding aluminum oxide plus hydrogen. Now there's a little bit more to that chemical equation, but that's just basically the bottom line.

And when the canister -- actually, I haven't gotten to the canister yet. This is actually the hydrogen blister. But basically when you're coupons are in the pool, because some utilities have coupons are in the pool that they sample periodically to test for the attenuation, water can actually be absorbed into the pores. You have hydrogen cases released. If the hydrogen generates a sufficient pressure, because you have aluminum oxide -- is present, you can actually get a blister on the cladding. And it can occur from long term storage in water, and it can also occur from repeated wetting cycles. You have some tests that we've looked at in which Boral has blistered due to repeated wetting cycles.

The steam blister. Basically, one of my

colleagues to describe the steam blister as almost like a tea kettle on a stove. Basically, what you have is water ingress when the canister is inside the -- being loaded, water will get inside of the Boral panels. You have a pressurization occurring because one of the steps during the short term loading operations is that you have to perform a hydrostatic pressure test of the lid. And that can force water inside of the -- more water inside of the actual Boral core. You have a vacuum drying, and most of the tests that have been done they've used heaters to simulate the vacuum drying.

And basically, if you have a high heat uprate and a higher hydrostatic pressure, you can also generate what's called a steam blister. We've known about this for about eight years. This phenomenon has occurred in Spain. The Spanish did test on a canister. The U.S. also did a test, actually the sister vender of this cast that was used in Spain, did some evaluations of their material. They found their material not to blister. They found some to blister. Their notion is that if the B((4)sub)C content is very high in the material, water will easily get out. That means that you won't have enough time for the steam to occur. But if you have a low B((4)sub)C content,

which was in Spain, the type of material that was used in Spain, the Boral will be subject to blistering.

Just some general information about the hydrogen blisters. This is just a range, because a lot of the information was proprietary. So this is basically guessed information on hydrogen blister dimensions and also steam blister dimensions. The Agency has done some studies. EPRI has done some studies. They produced blisters. The bottom line of those studies is basically that the material does remain effective as a neutron absorber. In other words, the B(10)sub is still there and it's doing its job. And basically, that's all I wanted to do is give a brief introduction of this. And now I'm going to pass this onto Patrick who will talk about the GSI process.

CHAIRMAN RYAN: Patrick, I'm going to guess it will be better to take -- best if you probably go up there, because I think you're going to be running your own slides.

MR. BARANOWSKY: That's what I was trying to find out.

CHAIRMAN RYAN: There we go.

MR. BARANOWSKY: Good afternoon. This is the first time I've been in front of the ACNW in my

more than 30 years at the Nuclear Regulatory Commission, so I'm glad to say I've added that to my experiences while working here. Chris did a really nice job of describing the Boral operating experience, and really appreciate that. Today I have, as Chris mentioned, Raji Tripathi, who is the cognizant staffer for taking in this issue through the generic issue resolution process. And Calvin Hopper from Oak Ridge National Laboratory who performed the technical assessment to help us to come to the conclusions that we're going to discuss at this meeting.

I'm sure you're probably familiar with the generic issue program, but it's described in management directive 6.4. We followed that directive in both process and technical matters associated with getting to this point in the process. I would like to point out that our focus has been primarily on the criticality implications of long-term storage of spent fuel using Boral to maintain sub-criticality, and that there are other issues associated with storage of Boral that might raise some questions about technological issues that could come up during its storage that are not part of this generic issue.

But at the same time, we've made a few observations and we have some comments on that too.

But it's not really what we're asking this Committee to review. After we took a look at this ourselves internally we decided that we needed some help from a consultant to look at it a little bit more closely, and that's when we went to Oak Ridge National Laboratory.

And so the purpose of this meeting is to present the findings that were made after going through how we got there. And as part of the Management Directive 6.4 process, we'll be asking this Committee to endorse our conclusions about bringing this issue to a closure before we send the matter to the EDO with our final recommendation.

So the rest of the presentation will be Raji Tripathi who will talk about how we followed the generic issue process and what we did in looking at this issue. And then the specifics on the technical assessment will be provided following that by Calvin Hopper. And with that, I'll turn it over to Raji unless there are any questions from my direction. Okay.

MS. TRIPATHI: Good afternoon. As a Senior Nuclear Engineer with the Office of Nuclear Regulatory Research, and since July 2005 I have served as a project manager for this generic safety issue.

What I would like to do is just briefly walk you through the process that we have gone through in addressing various aspects of this management directive and what our focus has been. By long-term we simply mean the cask life, the license life of the cask, which is 20 to 30 years. When it comes to the chemical disposal off waste we have not touched that at all.

So by long term we do mean a certain limited time, 20 to 30 years.

Our approach has been to look at the operation experience, critical calculations. Perhaps some dissertations and see if we can find any basis that will show that in spite of the strength, that Boral as it's used in the dry cask storage will remain neutron absorption characteristics so that there are no criticality implications at least not in the time frame that we are talking about.

As Pat mentioned, the reason we are here is the process that we have followed and the activities that we briefly described that we have concluded that criticality is not a concern over these 20 to 30 year period and we'd like to close this issue and Management Directive 6.4 requires us to have the endorsement from the Advisory Committee and hence we

are here.

As part of the direct issue resolution process, once an issue is identified, we go through a screening process, looking at some of the operational events in the available data and see whether or not the issue has merit. And if it does, documentation is prepared and there is a panel convened of in-house experts chaired by an ANCS manager.

The panel independently reviews the staff screening analysis and comes to a conclusion, final recommendation whether to proceed formally as a generic safety issue or to drop it, is given to the Director of Research who can accept the final recommendation or if does not accept has to have some justification.

In this case, we went through that process. The issue floated because there was some qualitative risk issues that there was sufficient merit for this issue to be examined.

Past the screening process, next step will be of technical assessment. This is where we develop the basis that now that we know it's an issue, what the possible fixes there would be in part of the assessment we have to develop the technical basis as to what the possible regulatory solutions of the fixes

might be.

The first formal step was to see what is available in the literature, something, either we can dismiss this issue -- I should back up a little. Technical assessment doesn't go on that we just go on and find a solution and develop a tech basis. It doesn't help to go on for 2, to 5 or 10 years or longer. The whole idea is that each step we take we develop an action plan and each time we take a step back and see, does the issue still have merit? Shall we still proceed with the part that we are in?

The first step is always to look at what's available in the literature and shall we at least develop the preliminary basis for the issue.

We identified a number of literature, some key documents, some of which are from colleagues in our field who have been deeply involved in looking at some of the available literature -- I'm on Slide 6, gosh, I just forgot to move on to the next slide.

CHAIRMAN RYAN: That's okay.

(Laugher.)

You're following your presentation well, so we'll follow along. But that helps the audience.

MS. TRIPATHI: I apologize.

CHAIRMAN RYAN: Don't worry.

MS. TRIPATHI: And I have used the word "pristine Boral" in some other literature, the package that we submitted to the Committee also and by that we simply meant that anything that's unused, never been exposed before never been applied in the commercial use and so on. Because many times when the dissertations that we have looked at or some of the lab data, they have never used any aged Boral, never simulated all the relevant operating conditions.

So this always occurs. The degree and the variation of the sizes of the blisters varies and I think Chris made that point.

What our concern here was when we did the screening analysis, that if you found that Boral comes down like a powder and then drops down, but significantly you can reduce the neutron absorption capacity and it will be an issue.

If you can show that that does not happen, then we will consider this issue as defined in the scope of the safety issue 196 and will consider that as closed.

Most of the data that I have looked at was generated in the lab and they always used the small coupon, small specimens.

So this is when we get some expert advice,

people who are criticality experts who know something about neutronics, know something about material degradation who can look at our assessment independently and help us either support the conclusion that we have come to or say no, this doesn't really happen and we need to look at it in greater depth and we go to the next step in our Pegasus assessment.

So with this, I would like to turn it over to Calvin Hopper.

MR. HOPPER: Good afternoon.

CHAIRMAN RYAN: Good afternoon.

MR. HOPPER: ORNL was engaged to participate in the overview of this perceived problem and as part of that we were provided in excess of about 65 documents dated from about 1949, the origination of production of Boral when it was developed, and it turned out it was developed at ORNL and then transmitted to and then was transitioned over into industry, but these documents ranged -- it says 1949 to 2003, but the last action, the last EPRI report that was reviewed was a 2004 document and it was the one that was most relevant to today's issue.

We assessed these tests in the literature from a 2-0 degradation and resulting potential for

impact on criticality safety, primarily how can it erode? What happens to the plates and so forth.

And the documents having specific test analysis relevant to this GSI provided a bases for our determination of ORNL.

These documented tests, Boral coupons under long and short-term demonstrate some material degradation. Blistering deformation are due to what Chris spoke about earlier, steam generation and the chemical reaction shown there.

The results of these tests and I'll show you in a moment, are inconsequential reduction in criticality safety for minimal loss of neutron absorber B(4)C within the aluminum metal matrix as it was demonstrated in these experiments in the literature.

Potential operational safety concerns may exist from the swelling of these plates, these blisters. Those blisters can get upwards of an eighth of an inch thickness. And so if you have tight tolerance in spaces in your cask or in your storage, then there's that potential for dragging and removal or insertion of fuel

We are talking dry cask storage though. We're not talking about long-term pool storage. I

want to show that in contrast, I wanted to show you a contrast in material degradation relative to this PG&E and Humbolt power plant, installation of Boral, where there were some Boral cans placed around the fuel elements, so you can see around in the pool for 18 years, the degradation of that Boral, and the blistering of that particular Boral -- I am unable to show you some of the pictures from the EPRI report, but they do demonstrate that report does demonstrate progressive blistering with each cycle. And the tests ran for like five cycles of pressurized wetting and drying and heating under vacuum. And indeed, if you continue to do this, cycle this material and you pump the water in and create steam repeatedly, you get blistering. You will get blistering with Boral if you work at it long enough.

CHAIRMAN RYAN: Just to clarify, Calvin, if I may, would it be fair for me to say that sounds like from what you all have said so far, that that's a fairly extreme test. Is that realistic in terms of

MR. HOPPER: What I wanted to do is to -- thank you for your question. Because those tests were designed allegedly to mimic the cask handling and loading. And in turns out that when you put the cask

down in the pool, you're going to have it down there 30 more feet. So you're talking about 16 PSI water. The test, there were three phases of the test. One was pressurization with fresh water or borated water. And because fresh water is more corrosive, that's the one I happened to look at it. It was the most denigrated. Okay, and then you close the thing out and you pull it out and you pressurize it again to force the water out. And that pressure is always upwards. And then you do a hydrostatic test upwards of about 21, 22 psi. And then through the heating process, and their tests took it though a heating process where they took -- the water pressurization is a 16 psi for 96 hours. So it pretends that it is underwater for an extended period. And then there's this 17 hour ramp to 200 degrees Fahrenheit, where you pressurize it to 16 to 21, 22 psi. Maximum 21.5 for about 10 minutes.

Then you have a 14 hour drying, vacuum drying period, where you pump it down until about 3.5 inches of water vacuum. And the temperature in these tests, temperature range between 250 and 550 degrees with the temperature increase gradient of less than 7 degrees Fahrenheit for a minute. So there's an attempt to try to mimic the experience that you might

find in loading and drying the cask. We are talking about dry cask storage.

Granted, each time you just go through that cycle from the test demonstrated, the blistering increases.

MR. BROWN: If I may just add to that that MNSS had an opportunity to address a letter back to the Spanish about three years ago in which they questioned the particular cask design used in the U.S. And your response was back to the Spanish that the cask did not see these high heat-up rates or high hydrostatic pressures that are used.

MR. HOPPER: We also need to remember that after this drying process, it's covered with helium gas. So it is inert atmosphere. The analysis examined neutron absorption effectiveness in degraded Boral, and we picked what we considered conservative assumptions where we took on realistically degraded Boral. Arbitrarily initially picked ten times the corrosion rate, edge corrosion rate in fresh water. The edge corrosion rate is like .0009 inches per year in fresh water. But that's what generated galvanic reaction.

So after 20 years exposure at an increased corrosion rate, we're talking about a half inch edge

to edge lost in Boral between plates. If you have plates in a cruciform, then as it erodes its about a half inch. We modeled this in two ways. One way was as a 7 and half inch wide Boral plates, and the two ways were -- we modeled those as Region 2 cool racks with Westinghouse 17 by 17 fresh fuel elements, PWRs, on a 8.9 inch pitch.

Of course, those would normally be in borated water, but in this case we modeled this in fresh water so the reactivity was higher as a result of that. The second model we chose was a HOLTECH Multi-purpose Case 24 filled with 4.2 weight percent 235 percent enriched uranium, Westinghouse fuel elements. And these were on a 10.91 inch pitch. This was just a problematic model that we figured would be the worst, the highest reactivity to see the maximum impact on.

Those are what the models look like. You can see that the initial reactivity of the Region 2 pool that we modeled has a K effect of about .982. And you all are familiar with neutron multiplication? Okay. And in the model MPC 4, you can see that this is initial reactivity in this particular model with fresh water was about .95.

These are the computation results. They

eroded all edges of the Boral plate, assuming that the blisters did not open, which they typically do not until you've blistered it four or five, six times. And you'd get cracking of the cladding in the tests we've observed. You can notice that at the actual 1/64th inch loss in 20 years, you have increase the reactivity of the Region 2 react from about .93 to about .932. It's rather minor in this particular instance.

If you extend that out to 10 times that, up to about half an inch, you'll notice that the reactivity increased again a couple of percent in total over that period.

MEMBER WEINER: Excuse me?

MR. HOPPER: Yes?

MEMBER WEINER: Those are model results?

MR. HOPPER: Those are the calculational results of the models.

MEMBER WEINER: Thank you.

MR. HOPPER: You're welcome. Yes, we did this at various degradation edge separation, edge degradation. So out there, you notice there's a 3.25. There's also a 3.5 we don't see. That's essentially almost a total erosion of the Boral plate. And so where it says a half inch there, because this is edge

degradation that would mean that there was an inch gap. Okay.

So the conclusions we came from looking at that, all the literature and the test results that we found in the EPRI and other open literature, not so open, was it's a laboratory generated small-scale coupon test. We're likely no rigorous damaging than full scale application due to the increased edge exposure, the sheering of the plates which has a tendency to peel the cladding away from the edges to increase edge corrosion, enhance ingress of water, or damage.

The slow B4C aluminum matrix edge corrosion rate in fresh water is really pretty minor. And as you may realize, in an acidic environment for aluminum is less damaging, less corrosive than is the fresh water or caustic environment. Blistering, swelling, the distortion of Boral flatness is not a criticality safety issue so long as you maintain the aerial fitness, aerial density of the Boral neutron absorber. The once blistered Boral, and I'm speaking of once blistered meaning you cycled it once, you cycled it twice. The first cycle for which your blisters appear, which typically is the first cycle, but not necessarily. Blisters on the first cycle, it

may be small, like an eighth of an inch in diameter with almost no raising. You continue to do this cycling and the blister can get large, at two inches, three inches.

Once blistered, the Boral will remain an effective neutron absorber in a dry cask storage in spent fuel, providing the Boral is not repeatedly cycled through more than two cycles of water pressurization and vacuum drying and heating.

We went into that simply because once or twice blistered, to assure ourselves that we're not prepared to step into the other world of continued abuse with pressurization vacuum heating. So with that, do you have any questions?

CHAIRMAN RYAN: Let's go ahead and start. Bill Hinze.

MEMBER HINZE: A couple of questions if I might. How did you validate your modeling?

MR. HOPPER: Those models were taken from plant design -- are you speaking of the criticality models?

MEMBER HINZE: Yes.

MR. HOPPER: Those were taken from designs from Region 2 and the HOLTEC was a conjectured model but using the Westinghouse 17 by 17 fuel.

CHAIRMAN RYAN: And those have presumably been verified, those models have been validated?

MR. HOPPER: Yes. Yes. If you mean in the sense that they were verified to be properly --

CHAIRMAN RYAN: Against empirical data, yes.

MR. HOPPER: They have been.

CHAIRMAN RYAN: They have been. That's great. Thank you.

On page 6, a question here, the last bullet under findings, the applicability of small scale date to real life situation needed further examination. Can someone expand upon that a bit and how this study has solved that problem?

MR. HOPPER: The small samples I was trying to allude to earlier are -- they will abuse far more than a large panel.

MEMBER HINZE: These are the tests then that --

MR. HOPPER: They were done on small scale, yes.

MEMBER HINZE: And what difference could we expect as a result of this scale? Why were you concerned about this?

MR. HOPPER: The concern is the realism of the tasks? Are they really real and for what applications are. And there was an attempt, as I mentioned earlier --

MEMBER HINZE: Are there any aspects of the physical process that you would expect to find a difference as a result of this scale?

MR. HOPPER: Differences in the sense that you may have weldments on the boiler unit like tig welds or spot welds. There are differences in that the site would be much larger, so the shoring wouldn't be as much damaging to the small, as they are to the small ones.

And that's about the extent of it.

MEMBER HINZE: Thank you very much.

MR. HOPPER: You're welcome.

CHAIRMAN RYAN: Allen.

VICE CHAIRMAN CROFF: Just one. I hate to back it to the end of the slides and conclusion slide, but that's the last bullet where you talk about one is blistered.

That seems o be kind of a performance criteria of sorts. Has that been translated into operating requirements for the cask in any way or is that -- it seems like it's pretty clear?

MR. BROWN: No.

VICE CHAIRMAN CROFF: Is there any caution or anything like that or is it just well below that radar screen?

MR. BROWN: No, not that I'm aware of.

VICE CHAIRMAN CROFF: Okay.

CHAIRMAN RYAN: Thanks. Ruth?

MEMBER WEINER: Do you tend to get blisters at the edges more or uniformly throughout the coupon?

MR. HOPPER: It is not uniform. It has much to do with the fabrication process as well as the matrix of the aluminum metal and boron carbide and the void fractions. You do get blistering at the edges and the picture I was showing earlier is pretty demonstrative of that, regarding at the edges and I don't have a pointer, but -- is this one?

This is actually the age of the Boral and there's the edge of it right there and you can see how the blisters have clustered around the edge of the Boral and that is primarily due to the hydrogen production from the water being tracked in there. And then when the aluminum oxide gets formed it has a tendency to plug the exit of the gases and you get this blistering.

However, you can get blisters in -- to the far away from the edges as a result of the rolling and damage or tramp oils that may be left on the thing. ADR has improved their production processes to reduce those tramp oils and boron carbide particles.

As you may know, boron carbides are very, very hard. And it would puncture the surface. And this is a relatively thin surface of aluminum with clad on that boral. And so you get minor puncturing and it becomes a source for corrosion and ingressive moisture and so that you can get blisters elsewhere besides the edge.

Yes, ma'am.

MEMBER WEINER: So the corrosion would be the major process by which the boral would eventually degrade?

MR. HOPPER: From the model that I presented to you. We had edge lost. Yes. Where you had the blistering and it can cause distortion of the material.

In the last -- in 2004, the work that EPRI published, they had some very -- some relatively large blisters internal to the plate, evidently as a result of punctures or corrosion towards the center of the plate and when they opened it up they found the

matrix, the aluminum carbide matrix intact and still stiff, somewhat like you saw in that plate. And it had not been removed, did not come out.

So we do not expect that the boron carbide with a matrix to come loose form the plate. Only around the edges.

MEMBER WEINER: Thank you. These are just questions for the -- you know, a mental picture of this process.

But I understand that it doesn't interfere with the neutron absorption.

MR. HOPPER: Yes.

MEMBER WEINER: You get the same as if you had virgin or naked or pure Boral. MR. HOPPER: That's correct. You've got to substantially distort to degrade its geometric position. That's important.

MEMBER WEINER: Thank you.

CHAIRMAN RYAN: Jim?

MEMBER CLARKE: Just one quick one, Mike, if I could? Following up on the questions of Dr. Hinze asked and your responses and he asked you about comparing model predictions to measure data and he also asked you about scales. I was wondering what the correspondence is for the model predictions compared to the coupon data or how did that work?

MR. HOPPER: Presumably we're talking about these models?

MEMBER CLARKE: Yes.

MR. HOPPER: Okay, these models are full scale models. They're large and so the panels -- those are about seven and a half, eight inches broad and about I forget how many feet long.

MEMBER WEINER: Twelve maybe?

MR. HOPPER: Those are likewise panels of about the same dimensions, maybe a little bit smaller. The pitch of those storage -- is that storage? Let's see. Did I say it? Yes, I did. You can see the pitch is somewhat different. And so the coupons, the test coupons in the reports and literature that we've observed were much smaller. They were like two by four inches. And so in the handling and sheering, you have much larger edge to volume surface for damage.

MEMBER CLARKE: Since scale appears to be an issue I thought I would see if that correspondence was, but your model predictions, compared to much larger scale?

MR. HOPPER: The neutron calculations are, yes.

MEMBER CLARKE: Thank you.

MR. HOPPER: You're welcome.

CHAIRMAN RYAN: Thanks Jim. You have to recognize that we deal with models sometimes in the environment where two orders of magnitude is good.

(Laughter.)

Some of the significant digits there is real.

MR. HOPPER: That's right, and really --

CHAIRMAN RYAN: Reality is a whole lot different.

MR. HOPPER: Well, in reality these digits are out here. I presented it just so that you would just -- these numbers in that fashion to understand, but we beat it to death.

CHAIRMAN RYAN: One last question that I have is, I was taken by the fact that you've really tracked since 1949 until now in terms of literature search. Has there ever been a failure of Boral on a cask that's resulted in a criticality accident?

MR. HOPPER: Good Heavens. I would say no, and I pretty well know criticality accidents.

CHAIRMAN RYAN: I think that's a telling summary point to finish up on is that this has been in use in many, many applications from 1949 forward. Probably more recently than earlier perhaps, but it has not failed and resulted in a criticality accident.

That's an important point for us to take away. Yes, ma'am?

MS. TRIPATHI: I would like to make the point because when you open the case, you can see what it looks like inside.

CHAIRMAN RYAN: That's excellent. Thank you.

MS. TRIPATHI: I think it was a study of spent fuel cast has been in Idaho for 15 years and he had been working on it at Argonne National Lab to look at the determinants. We will have to wait and see. Nobody has opened the casks yet.

CHAIRMAN RYAN: If I recall, we've had a briefing as well on a cask that was opened. I think more to inspect the fuel relative to the eventual movement of fuel to any repository. The same kind of thing came out is that it looked, I think the claim was it looked just like it did the day we closed it up. But again, that was not a huge amount of time -- 10, 15 year period. That kind of thing. So I think it's important. Well, folks, thank you very much--

MR. HOPPER: I have to turn it over to Raji.

MR. BARANOWSKY: I think our wrap-up is just really to say that we think for dry cask storage

for the life of the cask, 20 to 30 years, we don't see a criticality problem with the Boral. It doesn't mean people aren't going to look at these things. As you say, when they open them up or they decide to move them in different places and should observations change, then action will be taken as appropriate.

But at this point, we don't see the necessity for doing anything further on this generic issue or coming up with any further requirements other than to close it out for now. We will look for the Committee's endorsement of that position so we can finish up.

CHAIRMAN RYAN: Great, well thank you very much. Chris, did you have any closing comments? Okay, great. Well, thank you all very much. We have traveled a great distance for a briefing. It's been -- just a second. I'm talking. But I appreciate it. It's been a very informative briefing. Thank you very much. Are there any other questions or comments?

MR. INTERRANTE: Hi, I'm Charles Interrante from formerly SFPS, FST now.

CHAIRMAN RYAN: Thank you.

MR. INTERRANTE: From the laboratory test, the thing I would have been looking for in determining whether or not there was an effective, or whether or

not there was any effect on the efficacy as a neutron absorber, I would have been doing metalography. I didn't hear you talk about that at all. But what I would be looking for would be any evidence that the B4C particles had become dislodged in any areas that might have gotten blistered and like that. And you know, that's the place where if there's going to be an effect, you would get some evidence that you might have twice as much in an area instead an even distribution everywhere. And I was wondering if there was any metalographic work that accompanied the studies that you did.

MR. HOPPER: There were attempts --

CHAIRMAN RYAN: Use the microphone, please.

MR. HOPPER: There were attempts at metalographic work, but to prepare a metalographic sample for microscopic exam, it's necessary for you to polish it. It's very difficult and not really possible to polish boron carbide particles within a limited matrix. There was a thought about going to a electron microscope to examine this, but actually in some of the tests where they had removed the blister surface, the cladding -- where they had removed the cladding, you could still see the matrix internal and

it remained in position. I think that was the fourth or fifth blister cycled blistering. That's the limit of it.

MR. INTERRANTE: You were looking for this particle and that sort of thing?

MR. HOPPER: Right, yes.

CHAIRMAN RYAN: Thank you. Any other questions?

MR. DIAS: May I say something?

CHAIRMAN RYAN: Yes, you may.

MR. DIAS: Please correct me if I'm wrong on this, but first of all I think it's important to mention that it so happens that the industry is actually moving away from the use of Boral. As Chris indicated, there are other materials then that have been chosen recently instead of Boral, and it's not because of this degradation issue. It's because of what they used when that happened with the Boral.

Another thing to mention is that they talked about the cycling situation. And I really am not aware of any storage cask that actually gets to be reused. They only do it once, okay? For example, most of the cask is an MPC. MPC is literally a sealed canister that will never be opened again. It's going to be put inside some transportation cask and shipped

to wherever the repository is.

Another thing that I have to say is Boral is actually, even though it's put in during the storage phase of it, it's literally much more possible, okay? But because -- because that's when the criticality is an issue, okay? But again, you all think that the particles will basically be falling and kind of calculations that people do it to support the license application will be in any way affected by this. That's my comment.

CHAIRMAN RYAN: Thank you very much. With that we will close. I think we're scheduled at the moment for a break and that will -- let's see, where are we. We will take a break until let's say 2:30. And we're off the record for the remainder of the day. And with that we will close and we'll reconvene at 2:30.

(Whereupon, at 1:57 p.m., the meeting was concluded.)

CERTIFICATE

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

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Docket Number: n/a

Location: Rockville, MD

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Christina Warner
Official Reporter
Neal R. Gross & Co., Inc.

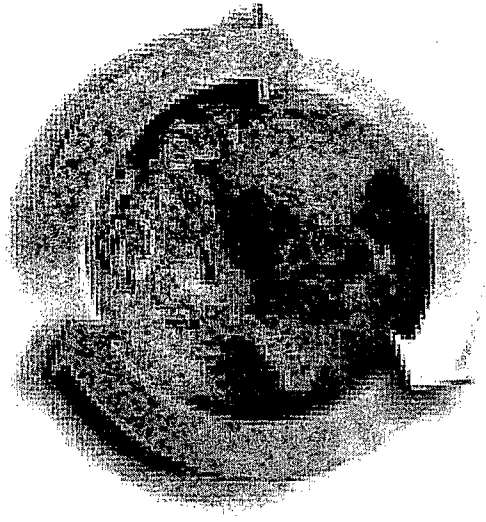
Global Nuclear Energy Partnership: Potential Regulatory Approaches and Key Issues

Presentation to ACNW
December 13, 2006

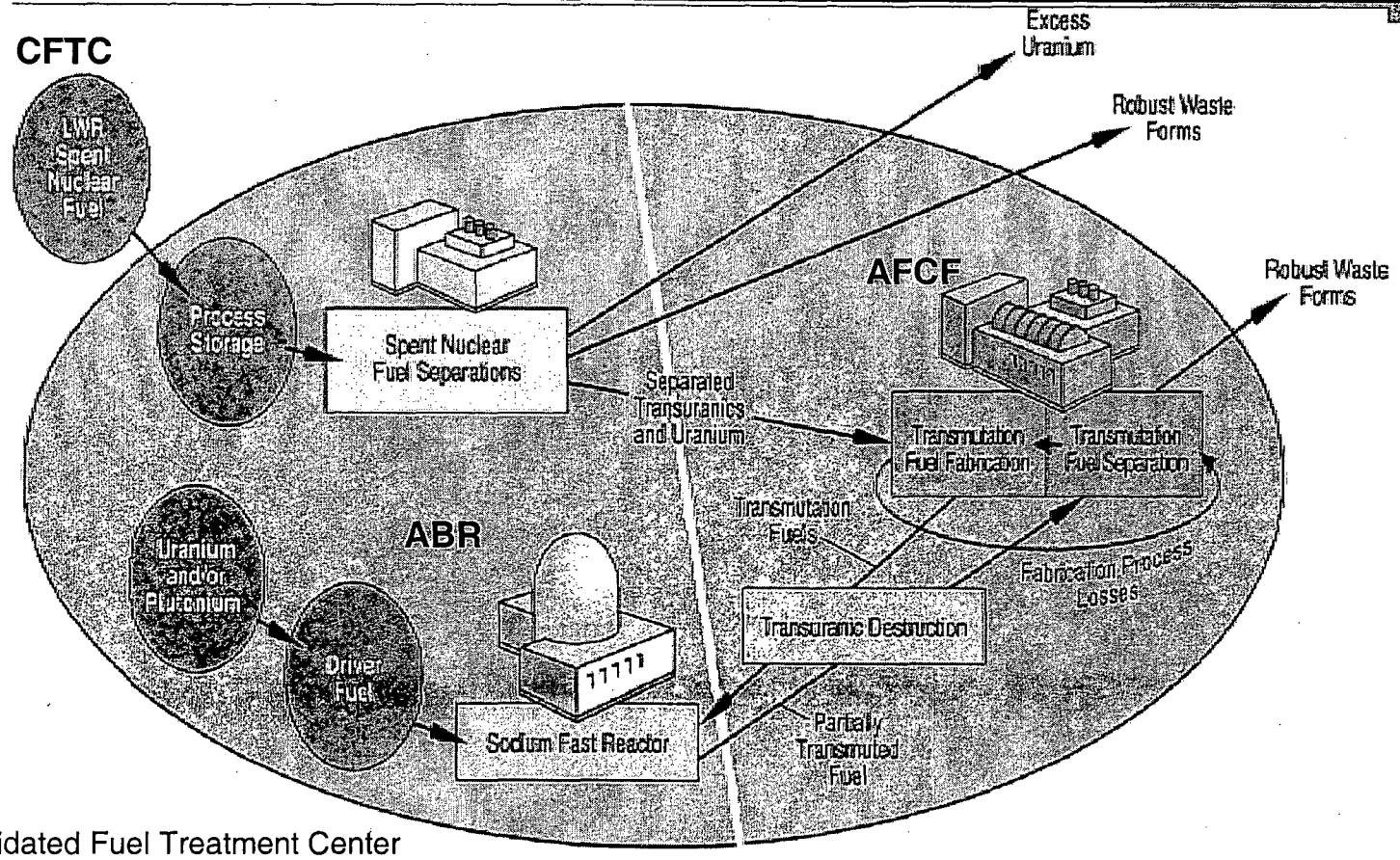
Presented by FCSS

Presentation Overview

- Global Nuclear Energy Partnership (GNEP)
- Regulatory Options: Present and Future
- Timelines for Review
- Key Policy/Technical Issues



GNEP



CFTC: Consolidated Fuel Treatment Center

AFCF: Advanced Fuel Cycle Facility

ABR: Advanced Burner Reactor

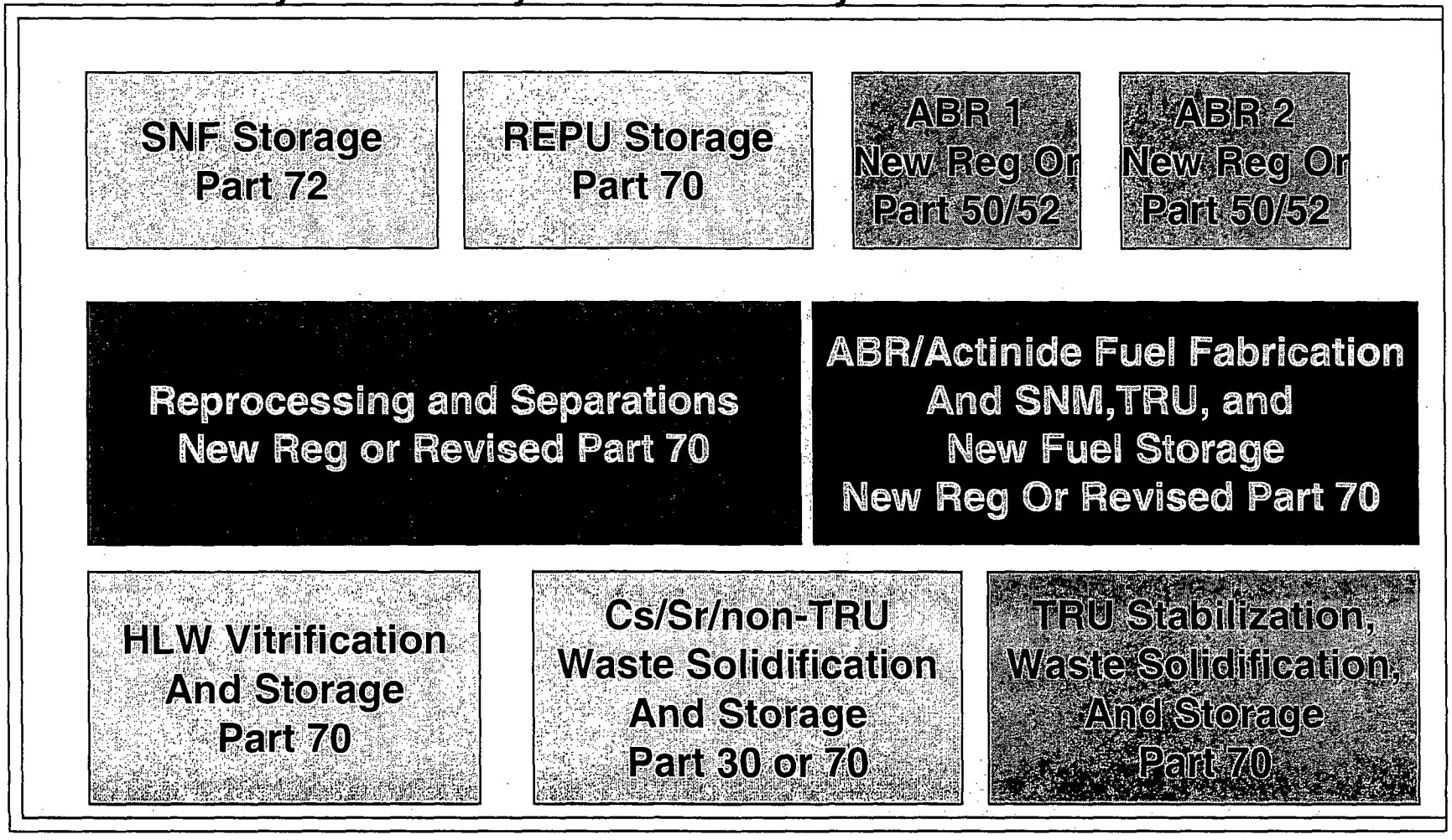
GNEP

- DOE intends to work with industry on CFTC and ABR:
  - Proposed Timelines for Facility Operation:
    - Reprocessing/Fuel Fabrication facility (CFTC): 2018
    - ABR: 2020
    - ~2020-2025
- NRC could receive an application in 2009/2010
- DOE intends to build the CFTC and ABR in parallel and start as soon as it can after June 2008

GNEP Facilities And Regulations

(Facilities in yellow boxes could enter licensing now)

Site Boundary **Likely NEPA Boundary**



What Are The Regulatory Options Today?

- For Spent Fuel Reprocessing/Fuel Fabrication:

  Use Existing Regulations – 10 CFR Part 50/Part52

  - Production Facilities:
    - Any reactor designed or primarily used for forming Pu or U^{233}
    - Any facility designed or used for the separation of special nuclear material (SNM) from other substances
    - Any facility designed or used for the processing of irradiated materials containing SNM
- Similarly, for an Advanced Burner Reactor (ABR)
  - Utilization Facilities:
    - Any nuclear reactor other than one primarily designed or used for the formation of Pu or U^{233}

Part 50 Licensing Experience

- Regulation and guidance focused on LWRs
- Has been applied to:
  - 3 proposed fast reactors (an FSER, 2 PSERs) for CRBR, SAFR, PRISM
  - West Valley reprocessing facility
- Regulations would need to be reviewed to determine what sections do/do not apply and additional requirements established for reprocessing facility and/or ABR
  - Many decisions on applicability of Part 50 requirements and alternative design criteria would be subject to hearing
- Although possible....may not be the most efficient and effective approach

Part 70 Licensing Experience

- One or two-step licensing process
- Applies to:
  - Plutonium, U^{233}, Enriched uranium (U^{235} and/or U^{233})
  - Any other material the NRC determines to be SNM per AEA Section 51
- Subpart H
  - Risk informed, performance based
  - Requires Integrated Safety Analysis (ISA) – PRA is optional
  - Bins hazards and likelihoods
- Has been applied to:
  - Enrichment: LES, USEC, others proposed (GE/Silex)
  - Six fuel fabrication facilities and MOX

Part 53 Development

- Commission considering a new Part 53 to regulate reactors
  - Risk-informed and performance based (RIPB)
  - Technology-specific (High-Temperature Gas Reactor [HTGR] and LMR) vs. Non-Technology-Specific
  - Integrates safety, security, and emergency preparedness
- Commission issued an Advanced Notice of Proposed Rulemaking
- RES staff conducted public meetings, public comment period over end of December 2006

Potential Regulatory Options - Future

Alternatively, staff could....

- Pursue Efficient Rulemakings*
  - Revise Part 70 for Reprocessing Facility: Remove reprocessing from Part 50
    - Include spent fuel handling, separations, vitrification, fabrication
    - Craft process to allow for (Combined License) COL, design certifications
    - Consider the need for quantification of ISA for Consolidated Fuel Treatment Center (CFTC)
  - Use Part 53 technology-specific liquid-metal reactor (LMR) framework for ABR and/or create Part 5X
- Develop a New GNEP Regulation Specific to the Technology
  - Address Reprocessing Facility and ABR as an integral unit
  - Craft process to allow for COL, design certifications
- Develop a document of licensing-basis document for the reprocessing facility and/or ABR, consider public comment, then implement through a Commission Order

*Note: other regulations to be modified as needed
(e.g., Part 73 – Physical Protection, Part 74 MC&A)

Timeliness For Review: When Could NRC Start An Application Review?

- Use Existing Regulations
  - Start upon Application submittal
- Pursue Efficient / New GNEP Rulemakings
  - Within ~ 2-5 years, provided funding is authorized
- Order
  - Staff writes technical requirements before/after license application.

License Application Review Timeline

License application review typically involves:

- Pre-licensing meetings (6-12 months before application)
- License application pre-submittal activities:1-2 years
- Licensing process (Historically- to include hearing process)
  - 2-3 years for fuel cycle facilities
  - 2-3 years or more for reactors
  - Longer if multiple hearings and contentions
  - Longer if design/program changes

Key Technical/Policy Issues

- Need an integrated solution for the agency
  - Ensure the regulatory infrastructure for reprocessing facility is compatible with ABR – avoid orphan technology
- Technology Differences:
  - PUREX:
    - Significant international commercial experience
    - Separates out pure Pu so more physical protection and safeguards concerns
    - Incompatible with DOE's non-proliferation goal

Key Technical/Policy Issues

- Technology Differences (cont'd):
  - COEX:
    - Keeps Pu mixed with U, separates TRUs
    - May be more advantageous because physics of core and manufacturing of fuel understood (similar to MOX)
    - Buys time until neutronic behavior and mechanics of TRU fuel is optimized/understood
  - UREX +1a:
    - Keeps Pu mixed with TRUs
    - Mechanical steps involved in TRU fuel fabrication are not well understood
    - Neutron enriched, high gamma, high radiation fuel
    - Significant work needed to understand source term and long-term degradation of fuel

TRUs=transuranic actinides

Key Differences Between Reprocessing And Part 70 Facilities (Potential Safety Issues)

- Irradiated materials
  - Very radioactive
  - Self-heating
  - Many isotopes
- Large source term
- More actinides (> 100x MOX)
  - More confinement/HVAC controls
- Many chemicals
- Energy for dispersion
  - Potential/reactive (solvents and reductants)
  - Actual (thermal/electrical for pyro)
- HLW requires solidification (vitrification)

Key ES&H Concerns With Plutonium And Actinides

- Usually mixtures of Pu/TRU isotopes (which ones and %s)
  - Affects type and magnitude of hazards
- Radiation
  - Primarily alpha, some beta-gamma, and neutron from spent fuel
  - Usually some ingrowth or FP traces
  - Inhalation primary pathway – HVAC/filters important
- Alpha effects
  - Pu/TRU compound lattice damage
  - Gas generation (He and H_2/others with organics)
  - Contamination and movement (e.g., "fleas")
- "Chemically toxic" (complexed/soluble and reactions)
- Thermal – frequently "warm" due to significant watts/kg
- Criticality

Key Differences Between ABR And Part 50/52 Facilities (Potential Safety Issues)

- Liquid metal (Na) coolant
  - Reactive with air, water (produces hydrogen), steam etc. – cover gas needed
  - No/low pressure (T[hot] = 550ºC; BP = 883ºC/1,621ºF)
  - Opaque
  - Solidifies near room temperature (97.12ºC/207.9ºF)
  - Na-24 – 15 hour half life, 5.5 Mev beta
  - Positive void coefficient
- Intermediate heat transfer loop
- Higher enrichment/fissile fuels
- Higher burn-up spent nuclear fuel
- Larger actinide source term

Key Technical Issues for GNEP

- Accurate Codes/Modeling/Validation
- Data analysis
- Advancing Cross-section Data
- Safeguards In-line instrumentation
- Understanding of Scale-up Factors and cost
- Waste forms and cost
- Processes Losses
- TRU Fuel Performance – high burn and economics
- Modularity- scaling with regards to heat transfer and heat capacity
- Integrated Systems Analysis- Integrated Facility

Other Potential Issues

Programmatic - now

- Different technologies
- Different safety approaches
- Risk-Informed, Performance-Based criteria
- GNEP Approach and regulation
- Infrastructure needs
- Competition for staff, Knowledge management, and nuclear industry resources

Specific - future

- Financial Qualification, D&D funding, Price-Anderson
- Facility staffing
- NRC annual fee basis
- Commercial involvement in AFCF?
- CFTC – PRA versus ISA
- ABR – non-LWR
- Standardization
- Funding

Factors Affecting NRC Readiness

- Understanding the technology
  - Likely different from existing plants
  - May affect safety
  - Safety may be accomplished in non-traditional ways
- Ability to independently assess safety
  - Independent confirmatory data and analysis (e.g., models and codes)
  - Development takes time and resources
- Acquiring and maintaining staff skills and availability

NRC GNEP Activities

- NRC-DOE Technical Exchange
  - AFCF- October 24-26, 2006
  - ABR- Dec 12, 2006
  - CFTC- TBD
- NRC-DOE Interagency Agreement
  - Understand Technology
  - Understand DOE Plans
- SECY- Conceptual Framework
  - ~Jan 07 to Commission (intermediate product)
  - ~FY07 – FY08: Final Conceptual Framework
    - Work with other NRC organizations
    - Work with external agencies

Other Technical Areas to Consider

- MC&A
- Safeguards
- Proliferation Resistance and Physical Protection
- Offsite Emergency Response
- Waste Minimization and Management
  - Waste Mass
  - Volume
  - Head Load
  - Radiotoxicity
- Environmental Impact
- Fuel Integrity and Performance
- Source Term

Questions?

Public Comments on NRC 2006 Low-Level Radioactive Waste Strategic Planning Initiative

Presented to the
Advisory Committee on Nuclear Waste

By

James Shaffner, P.E.

Environmental Protection and
Performance Assessment Directorate
U.S. Nuclear Regulatory Commission

December 13, 2006

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1

Primary Sources of SA Input

- **ACNW LLW Workshop May 2006**
- **Responses to FRN July-Sept 2006 (Today's Focus)**
- **ACNW August 16, 2006 Letter Report to Chairman Klein**
- **Independent Position Statements**
  - -HPS
  - -ANS
  - -SECC
  - -Others

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FEDERAL REGISTER NOTICE

- **Vol. 71, N0. 130**
- **July 7, 2006**
- **Request for Comments on NRC's LLW Program**
- **30 Day Comment Period plus 30 Day Extension**

3

Response to FRN

- **46 Sets of Comments**
- Some Representing Numerous Individuals
- Significant Variance in Length and Detail (one sentence to dozens of pages)
- Some Representing Broad Industry Perspective
- Wide Range of Views on Certain Topics

4

Categories of Stakeholders Responding to FRN

- State Agencies
- Radioactive Material Users
- Private Industry
- Government/Military
- Users Advocacy Groups
- Compact Commissions
- Public Interest/Environmental Groups
- Public Policy Groups

5

Staff Compilation/Assessment

- **Summaries Prepared**
  - **- Responses to Specific FRN Questions (17 only)**
  - **- Responses by Individual Respondents (all)**
- **Comments Assessed For**
  - **- Common Themes/Topics**
  - **- Opinions/Concerns**
  - **- Suggestions for Improvement**
- **NAS Hierarchy Applied where Possible**

6

Specific Responses to FRN Questions

- 17 out of 46 respondents
- Primarily Users, Users Groups, Industry Advocates, Regulators, Compacts
- One Environmental Group

7

Key Safety and Cost Drivers, Other Concerns

- Lack of Assured Disposal Capacity
- Lack of Economic Incentives
- No Competition = High Cost
- High Cost = Reduced Use of RAM
- Some Licensees Not Equipped to Store
- Little Opportunity for Citizen Evaluation of Safety and Security

8

Vulnerabilities in Current Regulation of LLW Disposal

- Regulatory Requirements and Systemic Delays
- Transportation Distance and Trans-Compact Shipping
- Lack of Free Market Opportunities to Solve LLW Disposal Dilemma
- General Licenses = Deregulation

9

What's the Future of LLW Disposal

- Near Term - Steady Waste Volume
- Long Term - Significant Increases in LAW, VLLW
- Cost Increases
- More Pessimism than Optimism Regarding Disposal Capacity
- Fed Solution?
- Flexible/Risk Informed Disposal Solutions will Evolve

10

How Might Scenarios Impact Disposal/Storage

- Economic Drivers for Disposal and Centralized Storage the Same
- Lack of Disposal Creates Different Regulatory issues
- Federal Government Intervention Needed re: Broader Spectrum of Waste
- Little Problem w/ B/C Storage

11

What Actions Might Yield Benefits

- Open DOE sites to Commercial Waste
- Align NRC/EPA Regulations
- Graded Regulatory Structure
- Maximize Use of Existing Flexibility
- Switch to Alternative Energy
- Caution: Changes Can Affect On-Going Processes

12

What Specific Actions SHOULD Take Place

- Separate Facility Design/Siting
- Update Storage Guidance, Particularly re: Sealed Sources
- Allow Greater Packaging Credit for SS
- Align Controls on Uranium-Bearing Waste
- Public Education = Improved Acceptance
- Proper Disposal = Enhanced Security

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What Unintended Consequences May Result

- Alternative Disposal Hinders LLW Economics
- Long-Term Storage Issues: Security, Exposure, Contamination, Cost
- Public Resistance to Alternative Disposal
- Disruption of On-Going Compact Activities
- Uneven Adoption of Regulations by States

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What Works/What Doesn't Re: WM

- **Works**
  - Stakeholder Communication
  - Community Goodwill Programs
  - NRC Participation in National Organizations
- **Doesn't Work/Needs Improvement**
  - Complex Mixed Waste Regulations
  - Interagency Communication
  - Knowledge Transfer

15

Improving Federal Coordination

- Integrated Strategies for LAW Regulation
- Foster Multi Agency Cooperation
- Interagency Task Force to ID/Resolve LLW Issues
- Risk Based Standards for Clean-up (D&D)
- ID Confusing Issues with Stakeholders

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Binning By Topic

- All Respondents Included
- Fourteen Broad Topics Identified
- Often Contradictory Opinions
- Opinions/Concerns consistent with Workshop
- Somewhat Broader Representation
- No Real Surprises, But Some Nuances

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FOR EXAMPLE.....

- Risk Informing
  - Revise Part 61 to Incorporate Risk Insights
  - Better Use of Inherent Flexibility
  - Risk Informing = Deregulation
- Clearance
  - Transparent, Harmonized Rule Needed
  - Abandon Clearance Altogether
- GTCC
  - Dispose at Yucca
  - DOE Should get on w/EIS

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Examples (continued)

- B/C Waste
  - Dispose on Federal/Tribal Land
  - Stability Requirements Discourage Licensing
  - Congress Should Ensure Disposal Capacity
  - Lack of B/C Disposal No Emergency
  - DOE Should Dispose of B/C Sealed Sources
- Waste Classification
  - Model after NCRP 2002
  - Don't Reclassify HLW to LLW (e.g. WIR)
- Long-Term LLW Storage
  - No New Guidance Necessary
  - Update Guidance Before Barnwell Closes

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OTHER TOPICS

- Ideas for Federal Solutions
- Increased use of Uranium Mill Tailings Impoundments
- State and Compact Progress
- Economics of Waste Management
- Comments and Concerns about Process
- General Concerns and Opinions

20

A FEW THEMES.....
use with caution

- Need for LAW Path Forward
- Need to Align Regulatory Rigor with Risk
- Treat Similar Risks Similarly
- Cost of Disposal Should Not Drive the Beneficial Use of Radioactive Material
- Look to Federal Government for Solution
- Don't Mess with What's Working

21

WHERE TO NOW

- Useful to Inform Strategic Assessment
- Must Be Mindful of
  - NRC Mission
  - Resource Limitations
  - Commission's 1997 Guidance
- View Volume of Opinion Cautiously

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For Actual Responses

- In ADAMS Internal – Perform Boolean Search— "71FR38675"
- Also Accessible from Web Based ADAMS
- EPAD/LLW Staff has a few Paper Copies
- Staff can provide Accession Numbers for Specific Responses

23

BORAL in Dry Cask Storage Systems

by

Christopher L. Brown
Senior Staff Engineer

December 13, 2006

Overview of Presentation

- What is the "issue?"
- What are the Applicable Regulations?
- What is BORAL?
- What is a Steam Blister and how is it formed?
- What has been observed?

Why is this an Issue

There appears to be the notion that experience with blistering of BORAL in spent fuel pools (and from tests conducted in Spain) suggests the existence of a problem in U.S. cask designs that could reduce the neutron absorption efficacy.

Regulation and Expectations

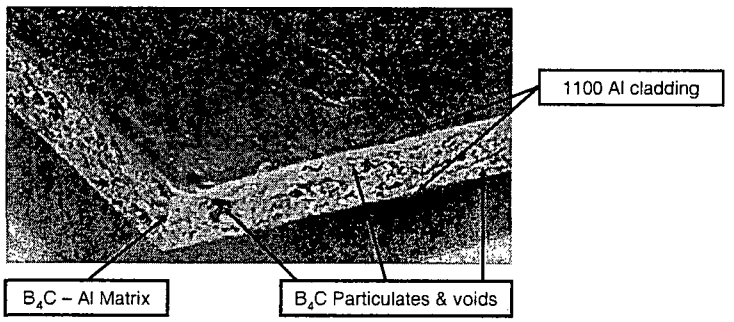
- The materials used for criticality functions shall be adequate for performance of intended functions. [10 CFR 72.124]
- Durable
- Efficacy
- Expected to perform over an extended period

BORAL

- Used for many years for both wet and dry storage of spent nuclear fuel in both domestic and foreign nuclear reactors
- Other materials are in use
- B_4C-Al matrix with Aluminum Cladding hot rolled
- W = 5 to 10 inches, L = up to 12 feet, and t = 0.075 0.270 inches
- Porosity in core region = 1 – 8%
- Approx. density 2.44 g/cc

Observed BORAL product character prior to use

Matrix porosity and edge exposure



Blistering of Boral

- There are two distinct and separable mechanisms that can cause swelling or blistering of Boral as follows:
  - Hydrogen gas generation by the chemical reaction (passivation) of aluminum and water
  - Water trapped internally flashing to steam

Hydrogen Blister

- Hydrogen generation by passivation of aluminum and water. If internal porosity becomes plugged by the hydrated aluminum oxide formed.
  - Water ingress
  - Hydrogen gas is generated internal to the Boral plate can't readily escape
  - Hydrogen generates sufficient internal pressure to cause swelling of the cladding
  - Can occur from long-term water immersion
  - Can occur on the second or third wetting cycle

Steam Blister formation

- Water trapped internally can flash to steam
  - Water ingress
  - Pressurization
  - Vacuum drying and heating
  - Unless the open porosity is large for the steam to escape (about 10% by volume), swelling can occur.
- First observed in Spain
  - A cask vendor performed an evaluation

Blister Dimension from Tests

- Hydrogen blisters are:
  - Circular
  - typically 0.26 to 4 inches in diameter and 1/15 to 1/8 inch high.
- Steam blisters are:
  - Elongated
  - Can be approximately 7 to 8" long and 1.39" high

INDUSTRY and CASK VENDOR'S RESPONSES

- Observations by neutron attenuation testing show that Boral swelling always seems to occur between the core and cladding and does not reduce the neutron absorption property of the Boral panel.

- Coupons with low B_4C/Al ratio (Type used in Spain) exhibited significant swelling
  - » porosity is less than about 8%.

PRESENTATION TO
THE ADVISORY COMMITTEE ON NUCLEAR WASTE

GENERIC SAFETY ISSUE 196
"BORAL DEGRADATION"

Patrick Baranowsky
Deputy Director, OERA/DRASP

Raji Tripathi
Senior Nuclear Engineer
Generic Safety Issue Team
Office of Nuclear Regulatory Research

Calvin M. Hopper
Distinguished Development & Design Engineer
Oak Ridge National Laboratory

December 13, 2006

1

Generic Safety Issue 196 – "Boral Degradation"

OPENING REMARKS:

- Staff followed the program implementation guidance in Management Directive (MD) 6.4 "Generic Issues Program," to address GSI-196, "BORAL Degradation."
- The focus of the staff's effort remained on assessing the long-term criticality implications of blistered BORAL, and not on fuel retrievability aspects, which is a compliance matter.
- After an independent review and assessment by the Oak Ridge National Laboratory, a decision was made to close out GSI-196.
- Purpose of the briefing: ACNW endorsement is required prior to informing the EDO of staff's decision to close out the issue – Handbook 6.4, pg 10.

2

Generic Safety Issue 196 – "Boral Degradation"

PRESENTATION:

- Staff's assessment of Generic Safety Issue-196 "Boral Degradation, Raji Tripathi (RES/DRASP/OERA)
- Independent assessment of the safety/criticality implications of blistered Boral for dry cask storage spent nuclear fuel, Calvin Hopper (ORNL)

3

Generic Safety Issue 196 – "Boral Degradation

GSI-196 OBJECTIVE:

- Ascertain criticality implications for aged and blistered BORAL (or Boral) as a neutron absorber in dry cask storage of spent nuclear fuel (i.e., during licensed life of 20 – 30 years)

APPROACH:

- Examine whether any operational experience, theoretical calculations, experimental data demonstrate that in the long-term application aged and blistered BORAL would continue to remain an effective neutron absorber.

PURPOSE OF THE ACNW BRIEFING

- Management Directive 6.4, "Generic Issues Program," requires an endorsement of the advisory committee(s) prior to issue close-out.

4

Generic Safety Issue 196 – "Boral Degradation

BACKGROUND – GENERIC ISSUE RESOLUTION PROCESS

- After issue identification, the staff completed the following steps in accordance with Management Directive 6.4, "Generic Issues Program":
  - Screening Analysis
  - Review and endorsement by a Panel to address this issue as a GSI
  - Acceptance of the Panel recommendation by Director, RES
  - Development of a Task Action Plan
  - Technical Assessment
- **TASK ACTION PLAN** Consisted of two milestones:

  Task 1: Summarize Existing Information on the Effect of Boral Degradation
  Task 2: Provide Interim and Final Technical evaluations of GSI-196 with recommendations

5

Generic Safety Issue 196 – "Boral Degradation

STAFF'S TECHNICAL ASSESSMENT – Initial review of Boral-related literature

- Findings:
  - "Pristine" Boral* is highly resistant to radiation
  - No data found that were generated using "aged" Boral and integrating all in-service parameters – radiation/high-heat/inert atmosphere
  - No Boral-employing casks ever opened and internals examined
  - Some laboratory-generated data from irradiating small samples of Boral seem relevant
  - Applicability of small-scale data to "real life" situation needed further examination to establish relevance for sustained neutron absorption effectiveness of BORAL
- Recommendation:
  - Multi-disciplinary expertise needed to determine applicability of the laboratory data to "real life"

* New, unused, and unirradiated

6

Generic Safety Issue 196 – "Boral Degradation

- **INDEPENDENT REVIEW AND ASSESSMENT BY THE OAK RIDGE NATIONAL LABORATORY**
  - In Spring 2006, ORNL independently assessed staff's literature review, a report was issued in Summer 2006.
  - ORNL concluded that in the long-term application (20 – 30 years) for dry cask storage of spent nuclear fuel, blistered BORAL presents no criticality concerns.
- **FOLLOW-UP ACTIONS**
  - The staff initiated GSI-196 close-out activities in accordance with MD 6.4.
  - Before closing out GSI-196, the ACNW endorsement requested in accordance with MD 6.4 – Handbook 6.4, pg 10

7

ORNL Review and Assessment

- Reviewed literature provided by NRC
  - More than 65 documents, dating from 1949 to 2003 regarding fabrication, testing and evaluation of BORAL or BORAL-like metallic bonding, were reviewed for relevancy to GSI 196
- Assessed tests in literature for material degradation and resulting potential for impact on criticality safety
  - Documents having specific tests and analyses relevant to GSI 196 provide the bases of the ORNL letter report assessments

Documented test results of BORAL coupons under long- and short-term demonstrate some material degradation

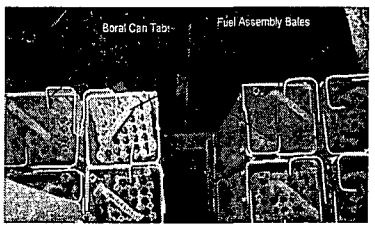
- Blistering and deformation due to
  - Steam generation within the matrix subsequent to water wicking, pressurization and heating
  - Chemical reaction

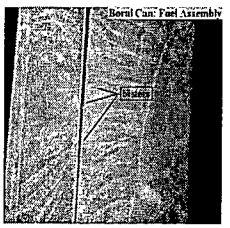
aluminum +	water/steam	→ aluminum oxide +	hydrogen
$2Al_{(s)}$ +	$3H_2O_{(g)}$	→ $Al_2O_{3(s)}$ +	$3H_{2(g)}$.

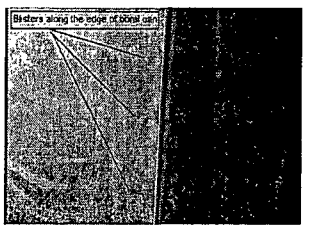
- Results show
  - Inconsequential reduction in criticality safety from minimal loss of neutron absorbing B_4C within aluminum metal matrix
  - Potential operational safety concerns (i.e., fuel handling) where close tolerances may exist (e.g., $^1/_8$" surface-to-surface spacing with BORAL)

The laboratory-generated small-scale coupon tests were more rigorous/damaging than full-scale applications due to increased edge exposure in small coupons

~ 18 yr after 1985 PG&E Humboldt Bay Power Plant installation of BORAL cans (~10" x ~10" square) in the Unit 3 BWR spent fuel pool





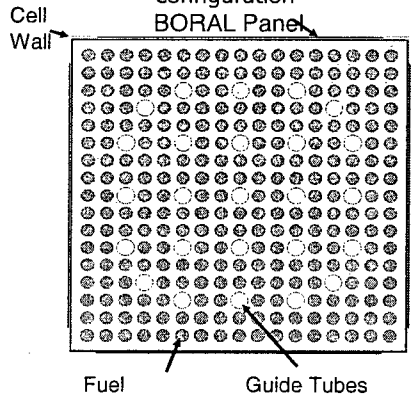


"BORAL™ Behavior Under Simulated Cask Vacuum Drying, Part 2 Test Results," EPRI 1009696, Nov 2004 report demonstrates progressive blister growth (i.e., 1/8" dia. to greater than 2" dia.) with repeated (up to five times) cycling of pressurized wetting and vacuum-heat drying

Analyses examined neutron absorption effectiveness of degraded Boral

- Conservative assumptions applied
  - Unrealistically degraded Boral
    - Arbitrary 10 X 0.0009" corrosion rate per yr resulting in ~$^3/_{16}$" per 20 yr exposure in fresh water with limited galvanic reactions – $^1/_2$" edge-to-edge loss
  - Demineralized water (no boron in water)
- Modeling with 7.5" wide BORAL plates as
  - Region 2 pool racks with Westinghouse 17x17 fresh fuel elements on 8.9" pitch
  - HOLTEC MPC-24 with 4.2 $^w/_o$ ^{235}U enriched Westinghouse 17x17 fresh fuel elements in a 10.91" pitch

Example Region 2 spent fuel pool storage rack infinite-planar configuration



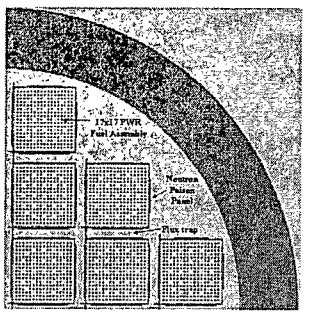
8.9" square pitch minus

7.5" BORAL panel (0.030 g $^{10}B/cm^2$)

= initial 1.4" gap

k_{eff} = 0.92821 ± 0.00042

Model of MPC-24



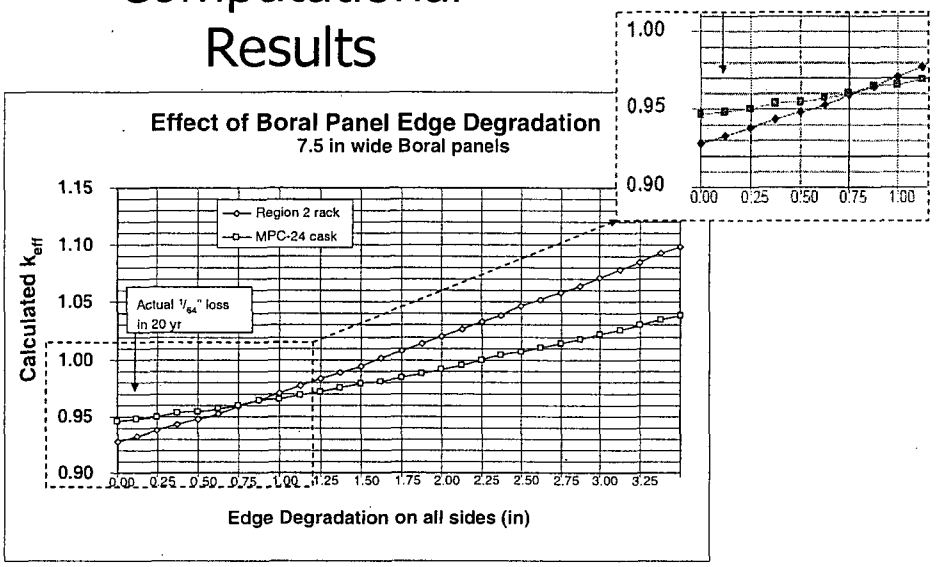
10.9" square pitch minus

7.5" BORAL panel (0.030 g $^{10}B/cm^2$)

= initial 3.4" gap

k_{eff} = 0.94594 ± 0.00074

Computational Results



Conclusions

- The laboratory-generated small-scale coupon tests were more rigorous/damaging than full-scale applications due to increased edge exposure in small coupons
- Slow B_4C-Al matrix edge corrosion rate in fresh water (i.e., 0.0009"/yr surface corrosion rate) results in minor loss of matrix and inconsequential increases in neutron multiplication factor, k_{eff}
- Blistering, swelling, and distortion of BORAL flatness is not a criticality safety issue
- "Once-blistered" BORAL will remain an effective neutron absorber in dry cask storage of spent fuel providing the BORAL is not repeatedly cycled through more than 2 cycles of water pressurization and vacuum drying/heating

Generic Safety Issue 196 – "Boral Degradation"

CLOSING REMARKS

- Blistered BORAL has no critically implications in the context of dry cask storage of spent nuclear fuel during the licensed life (20-30 years) of the cask
- Independent assessment by ORNL supports the staff's decision to close out GSI-196
- After receiving the ACNW endorsement, the staff will inform the EDO of the decision to close out GSI-196

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ACNW Meeting

Revision
of
Standard Review Plan Chapter 11.2
Liquid Waste Management System
(LWMS)

December 13, 2006
Jean-Claude Dehmel
(NRR/NRO)

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Overview of Presentation

- Purpose and scope of SRP Chapter 11.2
- Approach applied in revising SRP Chapter 11.2
- Types and extent of revisions
- Important revisions
- Changes in primary and secondary review responsibilities
- Conclusions

2

Purpose & Scope of SRP Chapter 11.2

- Applicable to the Liquid Waste Management System
- Typical sources of liquid wastes:
  - Equipment drains – high quality, treat, recycle
  - Floor drains – low quality, treat, release, dispose
  - Chemical drains – treat, release, dispose
  - Detergent drains – treat, release, dispose
- Sludge and liquids for solidification dealt in SRP Chapter 11.4 (Solid Waste Management System)
- Operation of LWMS relies on permanently installed subsystems and mobile processing equipment
- Equipment includes components used to process, treat, and store liquid wastes

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Purpose & Scope, cont'd

- Major components include: tanks, pumps, valves, filters, demineralizer beds, chemical neutralization, instrumentation, etc.
- Typical treatment methods used: filtration, reverse osmosis, ion-exchange, charcoal adsorption, etc.
- Selection of treatment method considers endpoint (recycling, release, or disposal) based on NRC, EPA, State, and local regulations
- Design features reflect expected volumes, storage capacities, processing flow rates, etc.
- Instrumentation addresses operation, radiological monitoring, process and effluent control, treatment effectiveness, etc.
- System operation addresses safety, radioactive releases, equipment testing and inspection, maintenance, and calibration

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Purpose & Scope, cont'd

- Radiological characterization identifies average yearly source terms (Ci/yr), and potential effluent concentrations (uCi/ml)
- Characterization considers:
  - Effectiveness of treatment method (filtration, reverse osmosis, ion-exchange, charcoal adsorption, etc.)
  - Physical, chemical, and radiological properties of liquid wastes
  - Treatment system capacities and processing flow rates
  - Treatment system effectiveness (decontamination factors or removal efficiencies)
  - Endpoint (recycling or release) vs regulatory requirements
- Characterization based on BWR/PWR-GALE code, or other methods (e.g., modified ANSI/ANS N18.1-1999 standard)

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Purpose & Scope, cont'd

- Key acceptance criteria cited in SRP Chapter 11.2
  - Part 20, Appendix B, Table 2, effluent concentration limits
  - Part 20.1302, dose limits for the public
  - Part 20.1301(e), doses to the public and 40 CFR Part 190
  - Part 50.34a, design objectives and equipment in controlling releases of radioactivity in effluents
  - Part 50, Appendix A, GDC 60 and 61
  - Part 50, Appendix I, ALARA dose objectives for liquid effluents
  - 10 CFR Part 20.1406, minimization of contamination
  - Parts 52.47 and 52.97, ITAAC as they relate to DCD and COL

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Purpose & Scope, cont'd

- Key regulatory guidance cited in SRP Chapter 11.2
  - RG 1.70 and 1.206, format and content of applications
  - RG 1.112, source term development
  - RG 1.109, 1.110, and 1.113, dose assessment
  - RG 1.143, design guidance
  - RG 1.33, operational QA programs
  - NUREG-0016 and -0017, BWR/PWR GALE Codes
  - NUREG/CR-4013, LADTAP II Code, effluent doses
  - NUREG-1301 (PWR) and -1302 (BWR), and -0133, dealing with SREC (aka RETS), ODCM, REMP, and PCP

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Structure of SRP Chapter 11.2

- Structure of Chapter 11.2, still as:
  - Review responsibilities (primary/secondary)
  - Areas of review
  - Review interface
  - Acceptance criteria
  - Technical rationale
  - Review procedures
  - Evaluation findings
  - Implementation
  - References

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Changes to SRP Chapter 11.2

- Focus on Part 20.1406, minimization of contamination
  - D&D lessons-learned FSME memo (Part 20.1406)
  - Liquid release lessons-learned NRR taskforce (tritium leaks)
  - NUREG/CR-3587, evaluation of D&D techniques
  - NRC bulletins and circulars, as examples of issues:
    - IE Bulletin 80-10, contamination of non-rad systems
    - IE Circular 81-09, effluent rad-monitoring bypass
    - IE Circular 79-21, prevention of unplanned releases
  - Above items are interim guidance, to be supplemented:
    - by rulemaking on revision to Part 20.1406, and
    - Issuance of a supporting new regulatory guide

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Changes to SRP Chapter 11.2, cont'd

- Focus on mobile liquid waste processing equipment
  - Reflects increasing trend in using mobile systems, as rented/leased, contracted, or as outright purchase
  - Definition of mobile system interfaces with permanently installed LWMS
  - Design features to reduce leakage, spills, and unmonitored releases
  - Design features to prevent contamination of non-rad systems
  - System interconnections for multi-unit stations, as applicable
  - Definition of the boundary of the LWMS, from system interface to point of storage, recycling, release, or disposal

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Changes to SRP Chapter 11.2, cont'd

- Supplemental guidance on meeting Part 20.1301(e) and EPA dose standards of 40 CFR Part 190
- Considerations of all potential sources of radioactivity and radiation
  - Potential internal exposures, inhalation and ingestion
  - External radiation exposures, onsite contained sources of radioactivity, and offsite deposited radioactivity
  - Doses due to the entire site, all units, buildings, and facilities
- Dose receptor is a "real member" of the public
- Integration of all exposures and pathways in assessing "total dose"
- Confirmation of compliance demonstrated in ODCM and REMP
- ODCM and REMP are reviewed in SRP Chapter 11.5
- Dose from external radiation is dealt in SRP Chapter 12.3-12.4

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Changes to SRP Chapter 11.2, cont'd

- Miscellaneous changes and updates
  - Clarifications on ITAACs for COL and DCD applications, as they relate to SRP Section 14.3
  - Clarifications on COL action items, and certification requirements and restrictions
  - Update of internal cross-references, within Chapter 11.2 and with SRP Chapters 11.3 to 11.5
  - Update of review interfaces with other SRP chapters
  - Changes in assignment of review responsibilities
  - Addition of citations to Part 20.1406 and Part 52
  - Addition to and update of cited references
  - Editorial updates, as clarifications, corrections, etc.

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Conclusions

- Minor updates and chapter structure remains unchanged
- Update provides more detailed guidance to the staff and applicants on specific topics
- Update includes requirements and interim guidance on Part 20.1406
- Update incorporates information from recent staff studies:
  - ground water contamination lessons-learned taskforce report into the review of new reactors (NRR, ML062650312)
  - D&D lessons-learned report (FSME, ML0619201830)
- Next steps:
  - Address public, staff, and stakeholder comments in early 2007
  - Finalize SRP Chapter 11.2 for March 2007 publication
- Any questions?

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