UNITED STATES

NUCLEAR WASTE TECHNICAL REVIEW BOARD

TRANSCRIPT

FALL 2014 BOARD MEETING

Wednesday

October 29, 2014

Augusta Marriott Hotel
Estes Hall Ballroom
2 Tenth Street
Augusta, Georgia

NWTRB BOARD MEMBERS PRESENT

Rodney C. Ewing, Ph.D., Chairman, NWTRB
Jean Bahr, Ph.D.
Susan Brantley, Ph.D.
Gerald S. Frankel, Ph.D.
Efi Foufoula-Georgiou, Ph.D.
Paul J. Turinsky, Ph.D.
Mary Lou Zoback, Ph.D.

NWTRB EXECUTIVE STAFF

Nigel Mote, Executive Director
Karyn D. Severson, Director, External Affairs
Debra L. Dickson, Director of Administration
Linda Coultry, Program Management Analyst

NWTRB SENIOR PROFESSIONAL STAFF

Gene W. Rowe
Bret W. Leslie
Roberto T. Pabalan
Daniel S. Metlay
Daniel G. Ogg

I N D E X

PAGE NO.

I N D E X
(Continued)

INDEX
(Continued)

PROCEEDINGS

8:00 a.m.

EWING: So you're very responsive, actually. I didn't expect everyone to take their seat so quickly, so thank you.

Good morning, and welcome to the Fall Meeting of the Nuclear Waste Technical Review Board. I'm Rod Ewing, the Chairman of the Board, and it's the Board's pleasure to be in Augusta.

Let me start by telling you a little bit about the Board and why we are holding our meeting here. The Board is an independent federal agency in the Executive. We are not part of the Department of Energy, the Nuclear Regulatory Commission, or any other federal agency. The Board was created in the 1987 amendments to the Nuclear Waste Policy Act to perform an ongoing and independent evaluation of the technical and scientific validity of DOE activities related to implementing the Nuclear Waste Policy Act. Those activities include the transportation, packaging, storage and disposal of spent nuclear fuel and high-level radioactive waste.

The eleven Board members are appointed by the President from a list provided by the National Academy of Sciences. At the entrance there should be a one-page handout at the document table that summarizes the Board's mission, and on the back of that is a list of the Board members including photos, their affiliations, and a brief mention of their expertise. Please collect one of these pages, and feel free to approach and discuss issues with individual Board members during the break and at the end of today's meeting.

Today, due to a confluence of different reasons, we're missing four of our Board members. These include Professor Sue Clark, from Washington State; Professor Linda Nozick, from Cornell; Professor Lee Peddicord, from Texas A&M; and Professor Steve Becker, from University of Virginia. I'm sorry for the loss of these four colleagues for today's meeting, but I assure you that the panel members that remain have plenty of questions to pose to the speakers, and we look forward to the presentations.

Let me say a few words about today's meeting. As you are aware, the Savannah River Site is an important part of the DOE's nationwide effort to manage spent fuel and high-level radioactive waste from past DOE research and defense programs. Today we'll hear presentations on DOE activities at the Savannah River Site related to the packaging, storage and transportation of DOE spent fuel and high-level waste. The focus of the Board's review of these activities is how they might affect the ultimate disposal of the DOE-owned waste. The Board has discussed similar issues at meetings held at the Hanford site and at Idaho National Laboratory. We are also preparing a Board report on DOE-owned spent fuel.

So the information from this meeting will provide us with the information we need to finalize that report.

Some of the issues we discuss today may also apply to the management of commercially-generated spent fuel. And given that DOE is responsible for the disposal of both defense and commercial spent nuclear fuel, the integration of these efforts is important.

I should mention at this point that the Board's charge does not include other issues in which you may have a keen interest. For example, our review of DOE activities does not include the disposition of surplus plutonium, it does not include the construction of the MOX facility, or the management and disposal of low-level radioactive or transuranic waste.

I should also mention this has already been an excellent visit. Yesterday, most of the Board members and the staff visited some of the facilities at the Savannah River Site, and I want to thank everyone on site who made the arrangement and led the trip for us. We had a lot of questions, and there were a lot of answers and good discussions. So thank you very much.

So now let me briefly describe today's agenda. The first presentation this morning will be made by Jay Rhoderick, who is the Associate Deputy Assistant Secretary for Tank Waste and Nuclear Material Management in DOE's

Office of Environmental Management. Jay will describe the activities underway at DOE-EM relevant to the management of DOE spent fuel and high-level waste. Following Jay's presentation, Maxcine Maxted of the DOE Savannah River Operations Office and David Rose of the Savannah River National Laboratory will describe spent fuel receipt and storage at L-Basin. Maxcine and David will also discuss corrosion mechanisms and corrosion control in the L-Basin and the Aging Management Program at the L-Basin.

After a short break, Allen Gunter of the DOE Savannah River Operations Office will discuss fuel processing at the H-Canyon facility and other upcoming missions there. The H-Canyon is a unique facility in the DOE complex, and serves an important role in processing nuclear materials on their way to final stabilization and disposal.

Next, Maxcine Maxted will return to discuss options for the management of spent fuel in the future. And then, finally, we have set aside 25 minutes after her presentation for our first public comment session of the day, which will be then followed by a break for lunch.

After lunch we'll hear from Jonathan Bricker, who works for DOE's liquid waste contractor, Savannah River Remediation. We'll hear about the stabilization of high-level waste into a glass. Jonathan will discuss the operating history and planned improvements for the vitrification process at the Defense Waste Processing Facility.

Then, Peter Hill, also of Savannah River Remediation, and David Peeler of the Savannah River National Laboratory will describe efforts to prepare to receive a new waste stream from the Salt Waste Processing Facility and to integrate that facility with the Defense Waste Processing Facility.

We'll have another short break before Dan Iverson of Savannah River Remediation gives us a presentation on the lessons learned at the Defense Waste Processing Facility. And Vijay Jain, also of Savannah River Remediation, and Sharron Marra of the Savannah River National Laboratory will make a presentation on the integration activities to facilitate the transfer of lessons learned from the Savannah River Site to the contractors at the Hanford Site as DOE designs and builds a vitrification plant at Hanford.

Finally, Jean Ridley of the DOE Savannah River Operations Office and Brenda Green of Savannah River Remediation will make the last presentations of the day on the storage of vitrified high-level waste and the options being considered for a new storage facility for the high-level waste canisters.

The second public comment session will follow her presentation.

I want to emphasize that the Board is very interested in the comments from the informed public. And as mentioned and as I've already described, we have two sessions for public comment today, one just before lunch, one at the end of the day. If you want to take advantage of this opportunity, please sign up on the list to make your comments so we can be sure to schedule everyone. If you have a question you want posed but you don't want to make a public comment, there are cards available at the table. You can write your question down and give it to a staff member, and we'll see that the question is posed. And, finally, written remarks and other materials can be submitted, and they will become part of the record; and I'd simply remind everyone that we maintain a transcript of everything that's said and that transcript, including the public comments, is published on our website.

After the formal meeting today, we'll stay on for an hour or so just outside the Estes Hall Ballroom; there will be a poster session. This is a very good opportunity for members of the public and the scientists and engineers working on the Savannah River Site and for Board members to meet one another and discuss the issue that we've raised today. So we hope you'll take advantage of that opportunity.

Just a word about how we conduct our meetings. During the meeting you'll see that Board members freely express their personal views and opinions. We encourage this, but we want you to know that the comments of individual Board members are not the position of the Board rather the positions of the Board are in our reports and letters to DOE, and these are all available at our website.

As many of you will know, after every meeting the Board prepares a letter to the Department of Energy, generally to the appropriate DOE Assistant Secretary, giving our impressions, comments, and recommendations that come out of this meeting, and that'll be posted on the website.

So thank you for listening to all of these comments.

Please mute your cell phones.

When you make comments--and this is an instruction to everyone including Board members and staff, please identify yourself so it will be part of the transcript.

And somehow, in following the written instructions, I failed to mention that the Board staff are at the table against the wall. Board staff are the full-time employees who are doing the hard labor of pulling these meetings together as well as the information for our reports. Please feel free to engage them, raise issues, and have discussions with them.

So with that I'll turn the podium over to Jay Rhoderick, who will start the meeting.

RHODERICK: Welcome to Savannah River, and I hope you enjoyed your tour yesterday. I think it's always impressive to be down at Savannah River with the progress that we are making in both the spent nuclear fuel and tank waste.

So this morning I just wanted to go over a couple top level complex-wide issues that we have as far as setting up our Corporate Boards on spent nuclear fuel and tank waste as well as go through some of the top level accomplishments that we have both in our Spent Nuclear Fuel Program and Tank Waste Program here at Savannah River. The spent nuclear fuel mission here at Savannah River for Environmental Management is to receive the spent nuclear fuel from the Domestic Research Reactor Program as well as the Foreign Research Reactor Program. We work very closely with the NNSA on the Foreign Research Reactor Program as that's part of the GTRI Program. They set the priorities as far as where the fuel will come from; once it's received, EM has the responsibility for the storage and disposition of that material. For that storage of spent nuclear fuel, the L-Basin area that you toured yesterday is where we store all of the fuel to keep it pending disposition, eventual disposition.

Some of our top level accomplishments in '14, we continued the receipt of the Research Reactor spent nuclear fuel. We continued to prepare for the receipt of the

Canadian target residues and spent nuclear fuel. That's one of our major projects that will happen in 2015 and 2016. We expect the first receipt of the Canadian material sometime in the spring. We have also been working very hard over the last year-and-a-half with the German government, and we signed a Statement of Intent April 1st on the possibility of receipt and disposition of some German pebble bed reactor fuel. We currently have an EA being prepared to examine the receipt of that material and expect some decision either next year or the year after. We also completed the dissolution of the sodium research reactor experiment fuel, and we began processing aluminum-clad spent nuclear fuel this month.

Some of the challenges that we have in the Spent Nuclear Fuel Program, and this is actually--the first one is a challenge that we have across the board in our entire program, is the deteriorating infrastructure that we have and the fiscal challenges associated with our budget profile. Currently we're looking at flat-line budgets that do not include escalation, so basically we lose about $100 million a year in buying power. So we're looking right now at priorities, where those priorities are, and one of the overarching issues that we have is we're dealing with an infrastructure that was built in the '40s and '50s. Maintaining that has been a challenge here at Savannah River. We probably have a backlog of about a billion dollars' worth of infrastructure. I want to emphasize this doesn't include maintenance that is safety related. Our safety significant maintenance that's required under our safety basis is always done, but the overarching--being out at the site you see it's basically a city and a lot of roads, lot of electrical grid, a lot of maintainability that's needed. So infrastructure is one of the major issues that we have that could in the future affect our ability to operate and keep our metrics.

Another one is the integration with the liquid waste system as Salt Waste Processing Facility comes on line in the next couple of years. We are carefully monitoring, and there's integration between the Spent Nuclear Fuel Program as they ramp up H-Canyon to look at the impacts of tank farm operability in maintaining the tank farm as they process more material. At the same time H-Canyon has the possibility of sending more material over to the tank farm to manage, so the integration between those two programs is really crucial.

And, also, the uncertainty regarding long-term storage and disposition options. That's an obvious one to the Board.

We just recently set up a Spent Nuclear Fuel Corporate Board; we have drafted a charter. This really grew out of interactions that we were having with the Office of Science over their HFIR fuel as well as interactions with NE over the fuel at Idaho. So the decision was made we needed to establish a DOE-wide board. The Board will be co-chaired by EM and NE, Nuclear Energy. We have participation from the Office of Science, Naval Reactors, and NNSA. Every site that has spent nuclear fuel is also going to be represented at the Board. Our first meeting--we've had several conference calls. Our first meeting is going to be in November at Idaho Falls; it's actually going to be scheduled in tandem with a Tank Waste Corporate Board.

We have been in the process of identifying the issues that we want to address in that first Board meeting. We have collectively decided that we need to look at the management of the Spent Fuel Program as a "one DOE" that we look at the interactions of the different offices, but look at what is best for the Department overall. And we want to establish working relationships with the other boards, such as the Tank Waste Corporate Board, and that's one of the reasons why we have co-located the first meeting of the Spent Nuclear Fuel Board with the next Tank Waste Corporate Board.

Some of the goals we hope to accomplish out of the establishment of the Board is development of some strategic plans and policy development that overarch all of our spent nuclear fuel throughout the complex. We also want to look at what could be cost-effective options that the Department has not looking within the programs, but looking overall for DOE when you look at the management of spent fuel.

You heard some discussion yesterday about the Idaho swap. That's one of the items that we think is very important when you start looking at management at both Idaho and Savannah River, so we want to look at some of those issues. We want to make sure that we're being consistent across the DOE complex as far as our management of our spent nuclear fuel, and we want to make sure that we have that information exchange that is readily available between our sites and our programs.

Some of the objectives that we hope to establish in our first meeting is develop some complex-wide policies on storage, retrieval, packaging, transportation, technology development, processing and/or disposal and disposal options. So one of the first things we'll be doing in that first meeting is prioritizing which of these areas do we believe we need to go after first. We also want to integrate and leverage spent nuclear fuel management and disposition activities across the DOE complex, and we want to work to develop what would be waste acceptance criteria for a future repository albeit the license repository or, as you're aware of the comingling report, possibly a defense repository. We will also continue to support the non-proliferation goals. Most of those are done here at Savannah River, but we do utilize Idaho as well, so we want to make sure that we have good communication between both NNSA and Idaho and Savannah River.

We will also interface with other boards such as the National TRU Waste Board, the Tank Corporate Board, and then other departmental entities as necessary. And one of the other keys is to make sure that we're maintaining the overall DOE database for our spent nuclear fuel across programs in an acceptable manner.

With that I'll go over to our other program, the Tank Waste Program, and there's been a lot of accomplishments in this program. The mission of the program is to manage the 37 million gallons of radioactive waste that we have and stabilize it for disposition. We also will be emptying and cleaning 51 tanks. We've had six closed so far, and we continue to operate a tank waste system. We emphasize "system," because there's many, many parts to the overall system in order to safely store and disposition the waste. ARP/MCU, I believe you saw yesterday, is basically our bench-scale facility for salt waste that we actually continue to operate, and has been highly successful for us in processing salt. DWPF you also saw. That's our workhorse for vitrification, and our Saltstone Production Facility where our low activity waste ends up. And we're actually in the throes of building our sixth unit for saltstone disposition.

I'm not going to go through this in detail because you have several presentations later in the day that will basically go through this, but this is the overall system. We use this in a lot of presentations to show the inter-linkages between the facilities, because when you talk about funding a facility, you're talking about funding a process and an integrated system. And so you can't look at each individual of how much money am I putting at DWPF; you have to look at how the facilities interact and look at the overall funding of the system in order to accomplish work.

Some of our top level Tank Waste accomplishments this year: We produced 126 canisters of vitrified high-level waste. We continue to operate ARP/MCU and disposition 530,000 gallons. We actually believe ARP/MCU can get up well into several million gallons, and that's one of the things that we're looking at as Salt Waste starts to come on line. We continued the closure activities for Tanks 12 and 16. Those are two important tanks, because they're part of our compliance milestones. And we continued construction and actually accelerated construction of SDU 6, and we completed the infrastructure upgrades and modifications necessary for Salt Waste to tie into the tank waste system.

Some of the overall challenges that we have in the Tank Waste Program, number one is the commissioning of the Salt Waste Processing Facility. It will be a major facility that we'll be bringing on line. And the Department--in the last two nuclear facilities that we brought on line, DUF6 and IWTU, IWTU is still not up and running. It's been a challenge to get through the commissioning and actual operations, so that's something that we're very concerned about. We believe the construction will complete probably either on schedule or ahead of schedule, and commissioning of the facility will be the major challenge that we have left to bring it on line.

We also have our tank farm looking at making sure that we have sufficient feed once we start up the facility. Salt Waste will have the capability of being up in the 7 to possibly even 12 million gallon range given a new generation solvent that has proven very effective in ARP/MCU, so we want to make sure that within the tank farm we are positioning ourselves to be able to provide enough feed. Of course, there will be a ramp-up period. In the first couple of years we're probably looking three to five million range, but that's crucial that once we get Salt Waste up and running, we want to be able to feed it up to its operating capability.

If you've read the papers, we continue to have negotiations with the state of South Carolina on our compliance agreements. As I said, we have closed six tanks to date. We have two that are at risk. We believe one will probably bring in on schedule, but we're currently starting negotiations with the State on those compliance dates. And also in the Tank Waste Program as in the Spent Fuel Program, the uncertainty regarding the long-term storage: How long are we storing, when is the ultimate disposition going to happen, continues to be an issue for the Program.

We already have a standing Tank Waste Corporate Board, and that has been running very successfully for over a year. Our contractors have done a very good job in integrating. We actually have some individuals from our contractor here at Savannah River that have gone to our Hanford site and have brought their expertise of an operating system here, and they are assisting as we start to bring up the Hanford low-activity system to process waste out at Hanford. So this Board has been very successful in collaboration on initiatives as well as information exchange and as well as identifying and prioritizing technology development needs within the Tank Waste complex.

Some of the things that the Board focuses on, again, is the same as the Spent Nuclear Fuel one: Strategic planning, technology development, technology insertion points, tank closure plans, technical reviews and support. The Board serves as a liaison with the Office of Science, the Environmental Protection Agency, and the Nuclear Regulatory Commission on Tank Waste activities. We have a lot of interactions with NRC on our Tank Waste Program, so that's a very important key area that we have. It also emphasizes approaches on the preparation of performance assessments, technical issue reviews, and working with other offices for the final disposition of the treated high-level waste.

So in summary, we endorse the key principles of the BRC's recommendations back in January 2013. Some of the areas that are needed for implementation: The pilot-scale interim storage facility in 2021, the consolidated interim storage facility in 2025, and the geologic repository by 2048. EM is poised to support those goals overall.

We will continue to have our aluminum-clad fuel processed; that is our current campaign that will be continuing. We also will continue to manage our spent nuclear fuel looking at the overall condition of the fuel, managing it safely, complying with our site-specific agreements that we have on the management, our tank waste and spent nuclear fuel as well as continue and look at new technologies to enhance the management of our materials. We understand that we will be most likely in a prolonged storage posture, and so we continue to look at our out-year planning assuming that, but also looking at opportunities as to how we might disposition either our fuel or our high-level waste. Thank you very much.

EWING: Thank you. Our procedure is first we'll take questions from Board members, and then I'll ask for questions from the staff. So from the Board? Questions?

Mary Lou. And identify yourself with--

ZOBACK: Do I turn this on?

EWING: I think they're turning it on back there.

ZOBACK: Okay. Mary Lou Zoback, Board. Thank you. That was a very nice summary. I have a few questions, and these were, in part, part of the questions that were given to you ahead of time. One question is--they're all related to the Corporate Board, I'm sorry, the Spent Fuel Corporate Board.

RHODERICK: Okay.

ZOBACK: Spent fuel's a big issue not just restricted to DOE, but of course there's the commercial spent fuel. And I understand you're trying to manage across the DOE complex, but have you considered having someone from the utilities, maybe not a specific utility, but like someone from EPRI to sit on the Board as well, because we've all got the same problem.

RHODERICK: Yeah. We had a lot of discussions on how broad we should start out. We decided that we probably needed to take a baby step first, because we have some specific internal management of our fuel between programs that we really need to tackle. So we are looking at that, but probably that will be I would say six months to a year away. But we are considering that, but we really felt like internal of the Department there's been a lack of coordination and cooperation, and we really needed to get that underway and we wanted to focus on that.

ZOBACK: That's a good strategy. Another question I have is most corporate boards have some means for public input, and do you anticipate that you will have some mechanism for the public to provide input to your Board?

RHODERICK: We're still working that. I wouldn't say we had consensus, but throughout our programs that they wanted to be open. EM is rather used to that, so that's an issue that we'll have to work. Currently, no, we're not.

ZOBACK: Okay. And then, finally, most corporate boards have some sort of fiscal authority, ability to direct funds. Has the Secretary empowered the Board to do things like that?

RHODERICK: No.

ZOBACK: Okay. Thank you.

EWING: So let me follow up, because I have a few questions on the Board as well. The first is, looking at the Board objectives, from my perspective what's missing is any mention of research, coordinating the research effort. Would that not be an objective for the Corporate Board?

RHODERICK: Yes, and I actually think that's in the charter, I just didn't pull it into this.

EWING: Okay.

RHODERICK: But, yes, that will be one of the things that the Board is looking at.

EWING: And then if the Board is looking at research, how does--you know, that's quite important, because there are a number of common research topics that could be applied from site to site. Would the Board have any ability to direct research funding?

RHODERICK: Very good question. Especially since what will be a multi-program office, we hope at some point that we will have that ability, but that's one of the things that we're going to have to discuss. You know, it gets a lot more complicated when you're dealing with multiple offices within the Department.

EWING: Right.

RHODERICK: And so who would manage that, what office would that appear under, those are issues that we would have to work through. But the idea is that we start getting on the Board what are the common technology needs across the programs and then look at what is the opportunity to get those funded and what's the best vehicle. Currently the Board doesn't have that authority.

EWING: Okay. Thank you. And then, finally, why use the phrase "Corporate Board" for this organization? Corporate Board for me conjures up something very different than what you've described, so what's the reasoning behind that phrase?

RHODERICK: The idea was for the Department, and specifically EM has used this in our other boards. It's to look at--rather than having individual sites worry about their individual issues, we're looking at more of a corporate level across the program. I think that's why the word was chosen is to give the sense that you're not looking at specific sites, you're looking at an overall management and programmatic needs of a program.

EWING: Because usually a corporate board has, very importantly, the responsibility for the organization, it's success or failure, and then also the ability to direct funding to fulfill that responsibility.

RHODERICK: Yeah. And the key will be funding. The boards that we had in the past, we actually had not a spent nuclear fuel, but a tank waste one established back in the 2000s, and they did have budget authority. And that's one thing that we would like to have, especially for these two boards. We would like to have that kind of authority, but we currently aren't empowered that way.

EWING: All right. Thank you. Jean?

BAHR: Jean Bahr, from the Board. I think it's great that you're moving in the direction of an integrated view across the complex of these issues. I'm a little worried though that it's still a bit compartmentalized, because you have a tank waste board, you have a spent fuel board. Some of the tank waste--some of the spent fuel eventually becomes tank waste and high-level waste, and I think there's also a component of high-level waste that doesn't fall into the tank waste, and so is that an orphan waste in this kind of integrated approach? And how do you deal with when something transitions from being spent fuel to being something else?

RHODERICK: And that's one of the reasons why we're having the first meeting of the Spent Fuel Board jointly with the Tank Waste, because we want to identify those interfaces that need to be worked and make sure that they're assigned to be worked. Because there is a lot--as you said, there is a lot of interdependencies and interrelationships between the two.

BAHR: And isn't there not also some high-level waste that doesn't fall into the tank waste or tank waste product category?

RHODERICK: Actually, the term "tank waste" is almost opposite of that. It encompasses all the high-level waste, but we have some material that is currently in tanks that does not really fall into the high-level waste category. When you look at its pedigree, it's actually transuranic. So the tank waste is responsible for all the high-level waste. The reason we use the term "tank waste" is that it encompasses more than just the high-level waste.

BAHR: Okay. Thanks for that clarification.

EWING: Paul.

TURINSKY: Yeah. Paul Turinsky of the Board. One more question on the Board. Who formally established the Board? Because that many times influences the power of a group. Was this set up by the Secretary of Energy, or at what level was it formally established?

RHODERICK: It was set up by the assistant secretary level.

TURINSKY: So that means?

RHODERICK: Office of Nuclear Energy--

TURINSKY: Multiple assistant secretaries.

RHODERICK: Right.

TURINSKY: Okay. And on a different topic, yesterday--and we heard from you also limitations of funding and basically causes disruptions in flows where there's capacity at the site that isn't actually being used because of limitations of funding. Where does that originate? At what level? Is that a DOE decision, an OMB, a Congress?

RHODERICK: I would say all of the above. Just within the Environmental Management Program balancing the priorities, especially when you have scope that's added that doesn't come with dollars, Paducah being the latest example of that, it strains our ability to accomplish what we had planned out. So you have to go back and relook at priorities, relook at compliance agreements. So probably one of the issues, if you want to talk about OMB--that's why I say it's multiple levels--in the last several years when we've gotten our budgets, been without escalation. So you look at that, you're losing buying power each year. So I would say it's a combination of things. There's pressure on the overall defense account as far as a cap; we're in with the Department of Defense. So priorities can get established at different levels, so it's a matter of managing that. So it's a combination of all three.

TURINSKY: Okay.

EWING: Rod Ewing, Board. I just want to follow up on the budget question. In the budget are there any contingency funds? And what I'm thinking about is, as an example, with the recovery of the WIPP site, the cost estimate is something like $500 million. So will that come out of the other site's budgets, or is there, you know, an increased appropriation considered? How does the Department deal with unanticipated events?

RHODERICK: In the WIPP perspective I'm not exactly sure I can talk too publicly about that--

EWING: All right.

RHODERICK: --because that's part of the 15 and 16 formulation. But there are several ways of approaching it. In a situation like WIPP you have the opportunity to go back in an anomaly--this is what it's called, a "budget anomaly"--to Congress and ask for additional dollars. The Secretary has the opportunity to move money from program to program, so that's another option. And in some cases, we have to take it out of specific programs, and programs within EM are impacted.

EWING: All right. Thank you. Other question? Jerry?

FRANKEL: Jerry Frankel, Board. I want to add my thanks for your very nice presentation.

RHODERICK: Thank you.

FRANKEL: Twice during the presentation you commented on the challenges of the uncertainties related to long-term storage and disposition, and then you touched on it again in the end. I just wonder if you could be a little more specific about the ways that those uncertainties are affecting what you're doing and then, you know, how are you addressing those challenges? How are you planning for this uncertain future?

RHODERICK: Well, I'll use a case here at Savannah River. We have our fuel currently in wet storage. When you look over the long term, if we're not able to disposition the aluminum-clad fuel either through H-Canyon or getting it off the site, we're going to have to be looking at it at some kind of dry storage. So in the out-year planning, you see a very expensive facility identified by Savannah River. Hopefully that's only a contingency. We're certainly hoping we don't have to build that, that we can satisfy that need in some other method. Either we have a repository available or that we continue to process the aluminum-clad through H-Canyon.

FRANKEL: Do you have an estimate of how long the wet storage facility will be functioning?

RHODERICK: Yes. Maxcine has that.

MAXTED: Over 50 years.

RHODERICK: 50 years.

MAXTED: Additional 50 years. You'll get more detail on that in Dave Rose's presentation.

SPEAKER: Please speak into the mic.

EWING: Yes.

MAXTED: We have a study that was done by our lab that shows the facility will last an additional 50 years, and you're going to get more detail on that in Dave Rose's presentation.

FRANKEL: Okay. Thank you.

EWING: Thank you. Other questions from the Board? Okay, staff? Dan?

OGG: Yes. My name is Dan Ogg, with the Board staff. I've got a question back on the corporate boards, both of them really. In the previous iteration of the Tank Waste Corporate Board from roughly 2008 to 2012, they established a publicly available website and posted meeting agendas and meetings minutes, those kind of things. Do you expect the same type of publicly available information for the Spent Fuel Corporate Board and the new Tank Waste Corporate Board?

RHODERICK: Currently, no, I don't.

EWING: Other questions? Staff?

LESLIE: Bret Leslie, Board staff. I'll follow up on Jean's question. Not all high-level waste is in a tank. They have the calcine waste, so that would be an example where, you know, even if you have two corporate boards you're not necessarily dealing with a full portfolio. So how do you bring that into--

RHODERICK: The calcine material falls under the Tank Waste Board.

EWING: Other questions from staff? Board? Yes, Mary Lou.

ZOBACK: Mary Lou Zoback, Board. This is just a follow-up on the public input. You know, when I think of corporate boards and when I feel frustrated with corporate boards, I know as a shareholder I have some ability at least to make a presentation, make my perspective known. The Board doesn't have to listen to it. But I somehow feel you might be setting yourself up for some disappointment, because we, the taxpayers, are your shareholders, and we should have a way to provide input to the Board, so just a thought.

RHODERICK: Appreciate it.

EWING: Jerry?

FRANKEL: Jerry Frankel, Board. Just to jump on the bandwagon here, are the Board members known? Is there any place where the public can find out who the Board members are?

RHODERICK: Yes. There's a charter that we will be putting up on our--that will be publicly available. Once it's finalized, it will have all the members of the Board listed on there.

FRANKEL: Okay. And then who determines the Board members?

RHODERICK: They've been selected by the individual programs to represent their program. So in the case of the Office of Science it's actually Johnny Moore, who's the ORNL manager. He was chosen because he has a responsibility for the HFIR facility and the HFIR fuel, which is the biggest contributor that we have from the Office of Science.

FRANKEL: Will you be a Board member, member of this corporate board?

RHODERICK: No.

FRANKEL: Thank you.

EWING: Other questions? Board? Or the staff? Right. Thank you very much. That's a very useful presentation.

So we'll move on now to Maxcine Maxted, and she'll be discussing the L-Basin.

MAXTED: Take a little break? Excuse me, please. So

I'm going to give you--

EWING: Could you put the microphone a little closer?

MAXTED: Is that better?

EWING: Much better. Thank you.

MAXTED: Okay. Sorry. I'm going to give you an update on our program of spent fuel. I am the Spent Fuel Program Manager for the Department of Energy at the Savannah River Site. And an overview for--oh, I've got to figure out this first. Okay.

Overview for any of the Board members that weren't able to make the tour, L-Basin is where we store our spent nuclear fuel. L-Area was one of the five reactors that we had on site. All the reactors had a basin, so the L-Area Basin was decided it would be the recipient of all of the fuel that we were going to receive, so it was expanded to allow additional racks. We didn't actually expand the basin size, we expanded the racks. This is a rack. We have a 4 x 10, or we have a 3 x 10 system as you can see here. Each little space holds a bundle, and that's how we do our performance measures is by bundles. Each bundle can hold up to--typically it's a four--material test reactor fuel assemblies they're about 3 to 4 feet long, so these racks in the L-bundles are about 12 feet long. The basin is about 3.4 million gallons of water. We're very proud of our water because we keep it extremely clean in order to prevent corrosion, so that's one of the things we do to maintain the integrity of the fuel. Our pool depth range is from 17 feet to 50 feet. Thirty feet is about our working level, so not all of the basin is able to store fuel. We have to make sure we have enough water above, and it's only for radiation protection for our workers.

Most of the fuel we get is already cooled. It comes to us dry from the reactors, and then we put it back in wet. It's not vacuum dried, it's just dried, but it's cool enough so that we can handle it under water and safely with our workers.

Let's see, what else. We have one transfer bay, and we are learning that that is going to be our little workhorse and also our stopping point, because we can only do one entry and one exit at a time. And with starting shipments to H-Canyon and then increased FRR--Foreign Research Reactor--fuels in the future, it's going to be very highly booked to use that facility. Oops, what did I do? Thank you.

Just to give you an idea of our water quality, we have a sand filter, we have the ionizers. We do not have forced cooling so we are not like Fukushima, because our fuel is not as hot, so we don't have to cool the fuel; it's already at a cool enough level. But we do maintain pH, we maintain conductivity, we do periodic samplings--and Dave

Rose will go into more detail on all of this information.

We have approximately 18,000 assemblies. Those are put in those L-bundles that we talked about. Most of our fuel is aluminum based, I would say over 90 percent. We do have some fuel that is stainless and zirc. That is a fuel that we cannot process in H-Canyon at this time, so it is something that we have to look for other options for. We have HEU and LEU, highly enriched uranium and low enriched uranium. It's about a 75 to 25 split. That number changes depending on the fuel that comes in, so that's an average amount. And we have every shape and size of fuel that you can imagine. We're not like a commercial reactor where they have a standard fuel coming in and out. We've got every cat and dog out there, but we safely secure it in water in a reinforced concrete facility, and I think the walls are from two-and-a-half to seven feet thick.

And we have a continuous surveillance program that Dave Rose is going to go into more. We had a study done when we--we thought the basin was going to be empty in 2019. When we saw that was not going to be the case, we had the lab do a study to show how long can this concrete facility last. So they did that study; they came up with you need to continue certain things you're already doing, but we would like to know some more things that we'd made assumptions on. So we developed an augmented monitoring condition assessment program, and Dave will go into the details of that.

And just for the pictures, this is one of the L-bundles being lowered into the rack, and that's a picture of the actual L-Basin.

Okay. So we are approximately 90 percent full. We have 3045 bundles. That's changing now on almost a daily basis for us, which is new for us, and we do have permission under the amended Record of Decision to process up to 1,000 bundles of the material test reactor fuel and up to 200 HFIR cores. Now, our HFIR cores are stored differently than our normal fuel, because it's a circular form. That's the picture here in the middle. As you can see, it's an inner and outer, and we actually have to store them separately, so they are stored in different size racks. They're more square type racks with carriers that allow us to put the circular over so it can't move. We have 120 spaces for HFIR cores, and we are full. And we have been full since 2012, so Office of Science is very--working with us to start that processing of HFIR fuel so that they can then release some of the basin that they have at Oak Ridge to allow them to continue processing.

We do have some fuel of interest to us and the Defense Board; it's in isolation cans. This is mostly our stainless and zirc. It's very old fuel; it was repackaged in the late '80s timeframe from our receiving basin for offsite fuel. It was a much smaller basin in H-Area, and so we couldn't maintain that basin and L-Area. They knew they were going to need more space, so we moved over to L-Area. When they did that, they repackaged some of the fuel that was pitted or showed corrosion or had damage to its cladding, so those were put into isolation cans. By "isolation" we mean it's not in association with the water of the rest of the basin. So it's in its own little can, and then that can is in another can that's in contact with the basin water.

Okay. So here's our capacity chart. I know it's a little confusing, so we'll walk through it. The first line here, that's our actual capacity space in terms of L-bundles. So you see it's 3,650 and we're at 3,045, so we're very close. This is our anticipated: Bundles in is red; bundles out is green, and this line shows our anticipated inventory. Now, this is all draft. We do not have contracts with all of our foreign countries that are associated with this fuel that we've assumed.

This is all done on a forecast that we work with NNSA to get so it's really draft information, but that's our best projection at this time. So hopefully if all goes well with the Canyon processing, we'll never reach our capacity limit, and that was one of the major decisions for the amended Record of Decision to allow us to process. If we had not processed, we would have exceeded that and had to put in more rack space, which would mean a lot of movements in L-Basin and a lot more money.

Excuse me. All right, what did I do?

MAXTED: Okay. The next one, this shows our HFIR cores. Because it's a different rack, we just keep a different chart on it as well. And you can see the red line is our capacity of 120 cores. Here's our anticipated inventory, and this shows the in and the out. So we can't actually receive any HFIR cores until we send some to the Canyon, so we'll actually be shipping out before we receive back from Oak Ridge. And I think we're planning on 2016 to start that.

You had asked about modifications that we need to make for some of the fuels. Our biggest modification we're taking on right now is the fuel from Canada. It's the NRU/NRX fuel, a National Research Universal and National Research Experimental fuel. It is longer; it's about 10 feet long, and it's also heavier than any other fuel we deal with. It comes in the legal weight truck cask from NAC. Our facility is set up to take the LWT, but it was not set up to handle the heavier weight or the longer length, so we are going through modifications of our Shielded Transfer System, which allows the LWT to be emptied to allow us to handle this longer and heavier weight. The Canadians actually prepaid part of their fuel fees so that we could do those modifications. They're underway. We hope to have the fabricated equipment in and at least installed by the end of this calendar year. So, as Jay said earlier, we expect those receipts to start in the spring of next year; we're hoping for March. It's a multi-year shipping campaign. And right now no other modifications to the STS are expected, and if we had another fuel come up like the Canadian fuel, we'd have to handle that on a case-by-case basis. With that any questions?

EWING: All right. Thank you very much. Questions from the Board? I'll start with one.

So, looking at your graph showing what's coming in, what's going out, if H-Canyon shut down, then the fuel would be stranded in L-Basin.

MAXTED: Yes, sir.

EWING: And I'm not proposing that it shut down, I'm just thinking about the worst-case scenario. So the fuel would be stranded there. And one can imagine it eventually going to dry storage and then finally to a geologic repository. How well documented is the fuel that you have in terms of the information required for, say, receipt at a geologic repository? Is this very well documented, or is it--

MAXTED: It depends on the fuel. We do have what we call "Appendix A's," and those are filled out by the research reactor facility, and it requires isotopic burnup, origin of life, where the materials came from. So it's very detailed in the information. Some of the fuel is so old, they didn't have that type of information, so they've had to go back and try to build that documentation. But I think what we have in the Appendix A is as detailed--and meets what was envisioned for at least Yucca Mountain.

EWING: Okay. Thank you. And a smaller question, so HFIR is going strong now, but does it have any expected lifetime? Is there a time when finally its generation of fuel would not be impacting it?

MAXTED: The date that we're using for HFIR in our lifecycle baseline is a 2035 date, and that's just based on a National Environmental Policy Acts document that was used in one of those analyses, so that's the date we use in our long-term planning.

EWING: All right. Thank you. Other questions from the Board? Sue?

BRANTLEY: Sue Brantley, Board. Thanks for the presentation. I'm curious if you'd talk a little bit about the cobwebs, the bacteria that were found in your basin. And I'm interested in it from two points of view. First of all, you know, what was the final decision of what was there, or what do people think were there, what do the scientists think were there? But then also, can you talk also about the process? Because that was something that happened you didn't expect, and so the procedure that you went through in terms of understanding it is interesting to me too.

MAXTED: Yes, ma'am. In 2012 I believe, or maybe fall of 2011, our operators have to do what we call daily rounds, and they go through and they have to do inspections of water levels, fuels, just anything. Our operators found what looked like to them a spider web on top of the fuel. Let's see if I can find a picture to give a better--so basically they were doing their rounds and over the fuel they found what looked like a spider web, so they called it cobwebs. So that got documented on their rounds.

Our engineering folks went in, took a look at it. It was down under the water. It wasn't on the water top; it was down on top of the fuel. So they developed a way to try to sample the material. So basically they were going to--and I don't have a better description, but it's like a duster. They tried to take a duster to go in and swirl it to pull up a sample of the material. When they did that, the material broke into millions of little pieces. So they realized that it wasn't just one string, it was multiple things. So then they had to figure out how would they pull a sample to find out what this is. So they came up with a vacuuming technique, and they were able to go in with a small vacuuming tube and suction up, kind of like a pull--filter tube--suction up that material to filter it out, and then they were able to collect a sample, send that to the lab.

Now, we sent it both to our lab onsite and to offsite labs to do an analysis of what it was. When the analysis came back, it's 3000 different, diverse bacterial colonies. There were many different--many that they would have expected based on seeing similar type materials at TMI and in France and Canada. They've seen these type of growths I would call them. So then they went into an analysis of what--is it doing any damage to our fuel, and what is its food source? So they did sampling and they did an analysis to figure out what that was. We could not find any indication that they liked heat, they liked a certain fuel, they liked a certain lightness; there was no correlation of where these things grew or why.

So then it was a matter of what do we do with them. We know they're not hurting the fuel, but it's really not good for our operators, because you couldn't read--each bundle that's--on top of the bundle there's actually an ID number and that's how we determine what bundle goes to the Canyon, so it was blocking their ability to read the numbers. So they decided that if they used a bigger vacuum system, because where they had vacuumed for the sampling it did not grow back, so we thought, Let's try vacuuming out the material and see if it comes back. So this year they were able to go in, they developed a vacuum system, they were able to vacuum the tops of the cobwebs of the fuel racks, and they removed all of the cobwebs, and we have not seen any come back. Now, they'll be on a routine basis to go in and check for them, if they return, and that's all proceduralized for them in their normal rounds.

BRANTLEY: So a couple of follow-ups. And of course they can be there even though you can't see them, right?

MAXTED: Right.

BRANTLEY: There's plenty of bacteria in water that we simply don't see. So--

MAXTED: We have--I'm sorry. Go ahead and finish. I'm sorry.

BRANTLEY: I'm just curious. I mean, just because you don't see them there, you know, there might be still a bacteria growing.

MAXTED: We do have water sampling that we do and they do check for bacteria on a periodic basis in the water sampling, but these had not shown up in that water sampling before. So--

BRANTLEY: But were you sampling for bacteria before you saw the cobwebs?

MAXTED: I believe so, yes.

BRANTLEY: And you didn't see bacteria in you--

MAXTED: We did not see a rise, but when you're talking about 3.4 million gallons--and I think we only had cobwebs in about seven percent of the fuel racks, so it was a small amount considering the vast amount of water.

BRANTLEY: So from that I would infer that they're probably still there, you just can't see them and you're not analyzing them. I mean--but they must have been there before you saw them as cobwebs, but you weren't getting them in your analyses, right?

MAXTED: That's probably correct, yes, ma'am.

BRANTLEY: So it sounds like the way you looked at this was, you know, is it harming the fuel, which is important. What about the other piece of it, which is how can they be growing there? I mean, if--you know, where is the organic matter that they're growing off of or, you know, it could be some other compound that they're oxidizing or reducing. I mean, was that not of concern? Is there no research into that at all?

MAXTED: We did go through and evaluate, and we could find no source of food that they were using, because that was one of the things we did before the vacuuming. We thought if we could kill the food source then they would be eliminated, but we could not find a food source for them.

BRANTLEY: And then, just finally, you mentioned a number of other places around the world where people have seen this.

MAXTED: Similar.

BRANTLEY: Similar. Were your bacteria the same as their bacteria? And, you know, how much interest in research into this is there?

MAXTED: They were not exactly the same. We actually had some bacteria that had not been identified before in the 3000 colonies that were found, so they weren't exactly similar. Some of the pieces were similar. The bacterial colonies were similar, but they weren't exactly the same.

BRANTLEY: And then this is just my own opinion, but it seems what remains here is to figure out why they're there. Not so much that they're deteriorating your fuel necessarily, but how they can grow there. I mean, that's got a be a solvable problem to figure out what they're growing off of, that sort of thing, which may give you some clues about components in the water that are getting there that you didn't know about.

MAXTED: I understand. And I hate to use the budget, but we are under limited funding so we have to put the money towards what we think is the most important at the time, and, unfortunately, that fell below our funding level line.

EWING: Jerry?

FRANKEL: Jerry Frankel, Board. Just to follow on, how do you know that they're not affecting the fuel?

MAXTED: They were able to go in and sample--we have coupons in the fuel as well, but they were able to go in and, based on the bacteria that they had, see that they weren't causing any pitting or any kind of corrosive activity; they weren't trying to eat the fuel. We actually did samples inside of each of the fuel bundles--see if I can show you. On top of the fuel bundles, there's little tiny holes that let the water of the basin through. They were able to sample inside those holes to see if the cobwebs had actually gotten into the fuel bundles, and they had not.

FRANKEL: Well it gets back to your ability to sample.

MAXTED: Yes.

FRANKEL: All right, so, you know, are there colonies that are places that you're not sampling? So is there any work being done to check and see if these types of microbes can attack metals through microbially assisted corrosion or other processes?

MAXTED: There's no other work being done. We have vacuumed the cobwebs, and they're going to do the inspections on--we just don't have the funding availability to do that work.

FRANKEL: Okay. I have another question. It's sort of related. You said that there are coupons--you have coupons to monitor corrosivity; is that what--can you expound on that a little bit?

MAXTED: Yes, sir. Actually, Dave Rose is going to go into that and he has slides and things to show you that whole--

FRANKEL: That's fine.

MAXTED: --coupon sampling.

FRANKEL: That's fine. Thank you.

EWING: Efi?

FOUFOULA: Efi Foufoula, Board. Just a follow-up question. Did you say seven percent of the fluid was, you know, material that microbial activity was found? Seven percent?

MAXTED: Only seven, yes, ma'am.

FOUFOULA: Seven. Was this continuous or in spots, and--

MAXTED: It was actually in spots, and there was no consistency of where the cobwebs showed up. We thought maybe it was associated with a fuel, we thought it might be associated with a certain HEU level, certain irradiation level; we could find no correlations.

FOUFOULA: Yeah. I understand the budget constraints, but I would say that someone should look at that closer, because it's hard to believe that there are no external exploratory boreholes that would make the 7 percent more likely than the other 93 percent for the microbial growth. So it's low-hanging fruit probably to say what causes it by analysis of the 7 percent.

MAXTED: They went through--and there's a report on what they did to try and figure out what kind of correlations were with the cobwebs versus the fuel, the heat, and we could find no correlations.

EWING: Okay. Other questions from the Board? Paul?

TURINSKY: Paul Turinsky of the Board. You mentioned that a study had been done indicating that the lifetime of this facility could be 50 years. Could you tell us more or less of what the factors were that they looked at and what is the limiting factor?

MAXTED: Dave Rose is going to do that in his piece. We thought we would split that up just to make it--

TURINSKY: Okay. Fine.

MAXTED: Sorry.

EWING: Okay. Other questions from the Board? Staff? One last question from my side, Rod Ewing, Board. So if you wanted to look at the state of the fuel, say, to see if it's corroding, and do you have the capability at Savannah River to pull a fuel element, open it up, take a sample of the actual fuel and characterize it on site?

MAXTED: We have limited capability. We have the ability to remove a fuel bundle, we can put it into our 8-ton cask and send it to our laboratory up in the Savannah River National Lab. They can do some testing, but it is limited what they can do.

EWING: And what type of testing? Would this be using visual inspections, let's say microscopic inspections, or would it also include atomic scale inspections where you look?

MAXTED: I think they have the ability to cut pieces of the fuel and then do analysis on those actual pieces, but it's limited in the size and the irradiation level that they can take of those pieces.

EWING: Okay. And is that done with any regularity, or this would be an exceptional activity?

MAXTED: It would be an exceptional activity.

EWING: Okay.

MAXTED: It's not done on a routine basis.

EWING: All right. Last questions from the Board? Okay. Thank you very much.

MAXTED: Thank you.

EWING: So we're a little bit ahead of schedule. We're supposed to have a break, right?

ROSE: Whatever you want to do.

SPEAKER: No, Mr. Chairman, we don't have a break.

EWING: No break? Keep going?

ROSE: Dave Rose, but fortunately you gave part of my presentation for me, so I'll skip that part.

I am Dave Rose with Savannah River Nuclear Solutions. Let's see if I can figure out how to make--what's the right button to push here. Ah, okay. Good.

I'll be talking about our ongoing programs for extended storage, safe storage for the fuel in L-Basin. Do a little bit of background, and then we'll focus first on the fuel, the racks, the corrosion related to those fixtures and materials, and then wrap up with a look at the basin itself.

As has been mentioned, about five years or so ago we were looking at completing all fuel receipts in L-Basin and being out of business by around 2019 or 2020, and all our surveillance for the fuel, the fuel racks, the basin and all were going with an assumption that we were looking at a lifetime of around 2020 to be out of the basin. And we had established programs for water chemistry, water control being the primary one; and the corrosion program, the coupons that had been mentioned--I'll come back to that--and the structure were all looking at, you know, let's get us to 2020 and make sure that we're safe to that period or beyond that.

However, by about 2010, it became apparent that we were going to be extending the use of the basin much longer than that as you saw in Maxcine's slides now showing out into the 2030s timeframe. And, with that, it caused us to reconsider our planning basis. 2019 is no longer the planning basis; 2035, 2040 is more the planning basis, so we went back and reevaluated the programs that we were using for corrosion monitoring, structural integrity programs and such. And that was the birth of this program that we call Augmented

Monitoring and Condition Assessment Program that we shortened to the acronym (AMCAP). And it had within it--well, the predecessor, in any event, was the study that said we believe, based on all the accumulated information from the existing programs, that we can continue to safe store with this fuel meeting safe storage requirements for 50 years or more provided that we maintain the programs we were doing and then did do some augmented surveillance and some evaluations to make sure that our planning assumptions were correct, our models were accurate, for doing our future projections, and that was the real birth of the AMCAP.

As was mentioned in--can I draw your attention back to the slide of Maxcine's where she had the pictorial of the basin process there? She mentioned it's the single most important factor in maintaining the long-term safe storage of the fuel and protecting the basins, the water quality. And so our focus is heavily on that with the sand filter systems, remove the particulates at the resin columns; deionizing system to take out cesium and any other of the soluble ions. Keeping the ion concentration as low as you possibly can is the key to protecting the cladding on the fuel. And so in terms of the parameters shown in the chart at the bottom, the very first one there, the conductivity, is really the most important one. Keep the conductivity, keep the ions low, and you see we run in the range of less than one-and-a-half microsiemens per centimeter on a typical basis.

We do watch for metals that can cause some attack to aluminum, and those are very real low quantities there. There's no real mechanisms for introducing those materials into the basin. The mercury and the copper, we make sure we don't receive materials that have that in it. And, of course, we're monitoring the activity, cesium-137 being the best indicator of the performance of the ion removal systems. And temperature, mentioned we don't have any active cooling for the basin; it varies seasonally from about 18 to 26 degrees as the South Carolina climate rises and falls in the seasons.

Questions about the monitoring; we have several different types of coupons. I'll go over those here with you. We have the stringer-like coupon columns that are made up of aluminums that are commonly used in the cladding of the fuel, the 1100, the 6160, 6063 types of aluminum. And we've had those in the basin going back to around 1995, and we pull those out periodically, take them up to the Savannah River National Laboratory, and they dismantle them and do very detailed evaluations of the corrosion, the pitting, the weight loss, weight gain, fermoxides, those different types of evaluations that they do.

And the last ones that we have results on were the ones pulled in May 2014. We just pulled another stringer last week that will be going up for the next evaluation. But you can see there, based on the analysis of the 2010 samples that had been in the basin 11 years, you see a general corrosion rate of about .03 mils, thousandths of an inch, per year. One of the more--other interesting observations, the last one listed there is where there's opportunities for particulates and sediments to collect. These are hung in the other direction from what's shown on the slide. The top surfaces can collect some dust particles that the corrosion rates are a little higher on the upper side than on the lower sides.

And so, you know, taking some lessons from that and looking now at much longer period of storage, what are some of the near-term things we're doing based on the corrosion evaluation of the fuel? Couple of things: Galvanic interactions where you have dissimilar metals--in our case, mostly aluminum and stainless steel--can promote the development of corrosion. We eliminated most of those many years ago, and we don't create new ones when we're bringing new fuels in. But we do still have remaining some small amount of cases where the fuel itself wasn't compatible with the normal storage racks where you put the aluminum fuel in aluminum bundles and aluminum racks and don't have those kinds of galvanic couples. We do have some that didn't fit that type of storage system, and there are a few examples still in the basin where we have some aluminum-clad fuels that are in contact with stainless steel buckets. There's a picture in the bottom right that shows one of those examples. And we're in the process, now that we're going to be storing these perhaps longer than we planned, of going in and putting basically a plastic insulator between the fuel and the stainless steel so that you don't have that direct contact of the aluminum with the stainless steel and try to minimize the galvanic corrosion.

And, also, back to the particulates on top, most of our fuels you saw were fuel assemblies in bundles. The bundles have caps; they don't really have any horizontal surfaces to collect particulates on and aren't exposed to those because of the coverage over them. But we do have a few examples, and this one on the right is an example of that as well of some fuel from the Tower Shield Reactor from up at Oak Ridge where there's large pieces that have surfaces that can be subject to sediment on the top, and we're working to design and put covers--clean and then put covers over these so that we minimize the promotion of any corrosion that might come about from the contact with particulates and sediments on the top of the fuel.

It's important to protect the racks as well. The racks are made out of aluminum, subject to the same general types of corrosion as the fuel itself. Similar to the fuel, we have coupons. In this case, the coupons are made out of the material that was actually used to make the racks. When we get racks, we get samples made up to put in the basin. And those, again, are pulled every few years, taken to the laboratory, and taken up and analyzed. Some of those--the July 2011 we pulled some that had been in the basin 16 years. No surprises there: Small pits up to 1 to 2 mils deep in the base metal, a little bit more in the heat-affected region around these. We did have people put welds on these. The welds are a slightly different alloy than the base material itself, so you have this opportunity to have a little bit of galvanic promotion there as well. So we can, you know, really get a good forecast for what might be the worst things that might be happening with our racks.

In 2009 we got a very unique opportunity. We had some racks that we no longer needed in the basin so we removed those, and in the process cut a section out. There was a place where we had some cross-members that were welded together. We cut that section out so we would capture welds, we would capture crevices, and what would be probably the worst--or most likely environment where you might see corrosion, and took those up to the lab and analyzed those. And the results of that were very consistent with what we were getting from the coupons themselves. So, again, we have--with a good water chemistry, we're seeing very low corrosion rates.

Let's see. To the microbes. Appreciate you asking the questions and giving me all the cobweb questions before I got up here.

BRANTLEY: Sorry about that.

ROSE: Appreciate that. We do have these specimens that we put in the basin to--and pull out to examine for biofilms and pitting. Take those out about annually, and we see very low accumulation of film, biofilm, on those pins, and over the years have seen no discernable trends. There's scatter in the data, and if you're having a vivid imagination, you might be able to imagine some increase or decrease depending on which way your tendencies run, but there's really no trending going on in the microbes. Of course, the microbes are there; microbes are everywhere.

Our water sampling that we do, we do look at microbes and microbe count, viable and non-viable. We look at the inorganic and organic carbons looking to see, you know, is there an increase or decrease in the food source that microbes might feed upon in the basin. And, again, very low numbers and no discernible trend, so it came as quite a surprise when in October of 2011 we went into the basin and found these string-like webs that had appeared somewhat quickly and caused quite a concern.

And as we started monitoring it, we noticed they weren't really growing very fast after that, so it really did confuse us. We didn't pick them up on the samples. They weren't attaching themselves to those coupons or, if they were, they weren't--because of their fragility--weren't coming off whenever we--coming out with the samples when we pulled them. The water sampling is, of course, grab samples out of the basin itself, and those weren't picking up on any signs to show that this was about to happen. And even after it had happened, it didn't show any increase. And we did do a lot of sampling. Our basin chemistry process with the sand filters, there's an opportunity in the sand filter and the settler tank to be exposed to the atmosphere, to be exposed to other sources of carbon, and so we did a lot of sampling of the return lines, of the water coming back from those systems thinking we may find the source, because we were looking for ways to maybe kill it. You know, if we could kill it at its source, a lot easier than trying to kill something in 3.4 million gallons of water, and could not find any increase in the microbes in those return lines coming back from our water handling systems. We sampled a lot of different points all around the basin. As Maxcine was saying, we looked for old fuel, new fuel, hot fuel, cold fuel, light, dark, water flow, temperature, any kinds of the-- kind of the parameters. We know from experience that ambient lighting can promote algae growth and those kind of things, and so we don't usually have a lot of lighting on in the basin to minimize that.

And we just flat couldn't find anything. We also don't understand why they formed strings. Bacteria don't--microbes don't form strings, and so that remains a mystery as well as to why did these make these apparent strings that had no real structural strength to them. You disturb the water and they would go into a cloud. It surprised us when we first went after them.

The next slide you asked a little bit about it. And after we considered the different options for killing them, about the only biocide that we thought we could comfortably use and not create damage to the fuel would be hydrogen peroxide, and you'd need a huge amount of that to be effective in 3.4 million gallons of water. After we had watched these for a while and saw they weren't proliferating with the speed at which they had appeared, made the decision to remove them and watch. We did it as Maxcine described, vacuumed them up. And there's a picture there of the same fuel bundles on the left as the ones with the cobwebs; it's a little hard to see, but cobwebs on them. And on the right, after we'd done the cleaning, and as Maxcine mentioned, you can read the bundle identifications easily on the ones on the right. It's a little harder on the ones on the left.

And so now that we know this happens, we're always watching for them. And then we have a formal program to go back and do a full mapping again on annual bases, and we'll have to respond to that when and if we see it.

To the AMCAP program--this ties back into some of the questions you were asking Maxcine. Under the program of AMCAP, dealing with the aluminum-based fuels, we determined that we'd like to get back to doing some very detailed visual examinations of the fuels. We can do some of that in L-Basin, and on the right is a picture of a brand new examination inspection table that we've built. We've selected some fuels out of our inventory that were known to have defects when they came to us: Holes, pits, scratches, through-cladding penetrations that would be the places that might be of most interest looking for accelerated or more increased corrosion, and have built this inspection table where it can take the bundle, take the lid off, remove the assemblies from the bundle, put the assemblies on this inspection table with a very controlled geometry of camera and lighting.

We did some of this a number of years ago and weren't seeing results that were useful, partly because the results weren't reproducible from one year to the next, and so now we've come up with a much more controlled system to do that. And we're just at the point now of being able to move from the procedure of writing equipment development into the actual inspections of some assemblies. So we picked a sampling that covers different burnups, but all the fuels that had known defects. Plus, we picked one extra one from one of the areas that had the highest density of cobwebs to help respond to the question of, you know, how do we know that the cobwebs aren't causing a problem? Pull one that had a lot of cobwebs on it and let's look inside and look at the fuel and see if it looks any different because of the cobwebs.

Also in prep for this we did pull samples from inside each of these bundles and because of the concern of is their chemistry inside the bundle a little different from what it might be out in the bulk part of the basin. And we found in terms of conductivity and those key parameters, almost no difference inside and outside the bundles. Microbes, for example, were lower in the inside of the bundles than they were out in the basin water in general. So, we did gather that information before we disturbed those bundles for inspection.

Probably the more difficult materials, those that are in those isolation cans that cut sectioned pieces, many of these--most of these were canned in the 1960s from very early reactor experiments, many different types of fuel materials, of plutoniums and thoriums and uraniums and oxides and different types of cladding: Zircaloy, hastelloy, stainless steel. They're in these cans, and the concern there is you can't monitor those as well. The water in the cans is isolated from the water in the basin and what might be going on. In those cases where we'd taken and placed a lot of cans inside a larger can, some eight-inch diameter oversized cans, that became our new barrier. It was protecting our basin against what might be going on with these sectioned and cut pieces of fuel.

And so in 2012 we did ultrasonic and visual inspection of those cans to make sure that their integrity was still good. We didn't see any thinning of the can wall. It's a Schedule 80 aluminum pipe, 8-inch diameter with welded ends, J-tube vent for any gas generation to vent out. The height of the cans within the large cans was at the elevation we expected, so we're not--don't have indications that it's crumbling and all descending to the bottom. From a criticality analysis, we've done the--looked to see if there's no issue from criticality if it were to all be in the bottom of the oversized can.

So we went after those because that was an area that had a lot of the inventory in a few places. But because we have so many different kinds and we needed to understand the chemistry of what's going on better, we have a continuing, ongoing program. We built up our history, looked at what we knew, pulled it all together in a more useful fashion, and have gone through and done a risk ranking of all the different combinations of fuels and cans and where there's galvanic couples and where there's highly-enriched material, what's the material at risk, and created a ranking for the next phase of the program. We can't go do detailed analysis for 400 different types of configurations. We picked about a dozen to do further characterization, look at what products might be forming in those cans, and would that lead to deterioration. And do we need to go and construct some means to do more invasive types of inspection or--or indirect if we can do something else in terms of ultrasonics or something to assure ourselves that there's not something detrimental occurring in there that places the fuel, places the basin in danger, and we would deploy those if we find a need to do something.

Not really part of AMCAP but important, one of the fuels that this process also identified as being one of the most risky was that SRE, the sodium reactor experiment fuel, but we can strike that one off our list now because it's all been dissolved in H-Canyon.

Moving on to the basin, you've heard steel reinforced, no liner, 3.4 million gallons. There was a question in the earlier notes--I don't know if it was in the final agenda--about the SRNL report of 2008 that looked at and reached the conclusion that the basin is expected to maintain its structural stability for at least another additional 50 years. That was based on a number of factors listed here. The not having a harsh environment is one of the key ones. It's not subject to acid rain and other things that you see in concrete that's exposed to outdoors. So the good chemistry was a key part of that.

The structural analysis maturity in L-Area is not as mature as what it is for K and some other facilities, but by analogy they were all built at the same time, the same specifications, and have been analyzed for the structure itself and looked at that. The condition surveys looking at the concrete, no extensive cracking, degradation, no spalling of the concrete in the basin above or below the water, a lot of looking at the research that others had done. And out in the literature, the general consensus out there was that the best thing you could do is maintain your material properties and keep watching was the recommended types of surveillances to do on concrete structures and, of course, maintaining our current inspection program, the structural integrity program. Those were the primary pieces of that study, and if we need to come back and visit that with you all later, we can go back over that in more detail.

That leads me to what is our program. We have a structural integrity program for the facility that the basin part of this go in and do visuals, very detailed visuals of the available surfaces all inside the basin looking for cracking, spalling, those types of signs that there might be some degradation occurring on the basin itself: The ceilings, the walkways, the piers, the whole--everything that's there. And those of you who were at the basin yesterday saw that the basin is mostly underground so most of the walls are backed by dirt, but there are a few walls that are available to look at the outside of the wall where they're exposed inside the reactor building itself, so we pay close attention to those. The frequency of the inspections varies based on the results, and I'll come back to that just a little bit on the next slide. We do video recording, photographs, there's audio, even descriptions on the videotapes of what the team observes on each inspection so that if you come back a few years later it may not be the same people you want to see, you know, how did it look then, we have those archive records that we can go back to and use for comparisons. Is it better or is it the same? Is it worse? And there are times when it's better.

It is an inter-disciplinary team including the experts from the laboratory, and they issue, in addition to the individual inspections reports, some reports to management, senior management periodically on what they're observing. And there was that question that appeared in there about deferrals due to funding. This program, Structural Integrity Program, Corrosion Control Program, the Basin Monitoring, Basin Chemistry Programs are all part of our safety basis. They're all part of the minimum safe activities for the facility, so they're not subject to--they're not discretionary is the way to say that. And we had to pay close attention to that during the period of the furloughs and make sure that that was--we maintained staffing and skills to be able to keep these programs going in spite of having to defer other activities due to the furloughs. It's not an option to choose to not do the structural integrity program.

So some of the results: We have not seen any evidence of deterioration that would compromise the structure, no vulnerabilities identified. There's an Amercoat 33 coating that was applied to the basin on the inside originally, a paint. It was repainted during an L-Reactor restart in the mid-80s. That coating has, for the most part, deteriorated. It's cracked, it's slipped off, it doesn't serve any function, and there's no plans to replace it, because in fact at times it might actually have an ability to hide what you want to look at. That's one of the observations there.

I mentioned we had some parts of the building where you can see the outside of the basin walls. There are some spots with some efflorescence. That's kind of like stalactites where there's water that weeps through the wall itself, leaves deposits on the wall, and those are the ones we've given the highest priority to, keep a watch on those. And they come and go. They'll be dry on one quarterly inspection; the next may be moist on the next one. There's one or two that at times will have enough that you can stand there long enough and count a drip, and we stand there and count the drip rate and then come back next quarter and count the drip rate again to see is it going up or down. So that's why it gets the most of our attention. We are very sensitive to looking to see is there any staining that might be evidence of oxidation of the rebar so the reinforcing rods within the concrete might be seeing some deterioration. We don't see any of the telltale rust-type markings; it's all very white. But that's what we look for.

And we look for opportunities. We mentioned earlier we're doing some modifications for receipt of the NRU/NRX fuel. In the middle of that project we're taking out some equipment, we're going to put some more equipment back in. In doing that, it opened up one little corner of the basin that we previously didn't have access to get to visually, so we jumped on that opportunity, went in, did the video and inspections, visual inspections of it, to make sure that we didn't have something unusual going on in that little corner of the basin that we had not previously been able to get access to. And all we found there was the vinyl coating was degraded. At first we panicked because it looked like cracks, but then as soon as we touched it with a tool, the paint flaked off and revealed essentially a pristine wall. So we went through a moment of anxiety, and then it was relieved when we saw it was just that Amercoat falling off.

Under the AMCAP what we wanted to do is validate some of the inputs and assumptions that go into the structural analyses. The structure itself, the design, strength of the concrete--is it 2500 psi concrete? It's now 60 years old. We had an opportunity in C-Basin, which was built at the same time, same construction standards, same--you know, along with the rest of the site--same kind of service history. Periods of reactor operation and the chemistry controls that we had when the reactor was operating; it had periods of non-operation like L-Reactor had. And so we this opportunity to go pull some core samples out. We drilled in and we captured these samples, took them to the laboratory for analysis. The compressive tests on them came back with an average of 4148 psi. We had set 3500 as our goal. That's the 2500 design plus 1000 factor for small sample size, essentially, to get us a confidence factor there. So that came back very good. Did a lot of looking visually, chemically, by taking slices off the basin water side of the core samples to look at are you having leaching of materials out of the concrete that might be deteriorated, are you having ingress of materials into the concrete that might weaken its strength? And basically didn't find anything of any significance there to cause us to want to go back and change any of the inputs or assumptions that go into our structural analysis by analogy, of course, from using the C experience to compare to L-Area.

There was a question in the agenda about have our programs been updated for the newest seismic information. The short answer is there hasn't been any updating. Our subject matter experts are evaluating that input. They are doing some additional looking at the ground motion models and all, and we're waiting for their results. What's expected is that there will be very, very little effect. We'll have to wait and see what comes out of that, but it's a work in progress in the structural analysis by SMEs, or the subject matter experts for the site.

So our mission is now 2030 and beyond. We believe, based on the past experiences, the models that we have, the evidence that we're collecting to substantiate the models, that it can continue to perform through that time period and beyond provided we continue to be vigilant and maintain the chemistry, continue to do the inspections and respond to anything that we might find in those inspections.

And that's the end of my presentation, so questions?

EWING: All right. Thank you. Board? Paul?

TURINSKY: Paul Turinsky of the Board. I assume you have piping going to your water processing facilities. How do you inspect that piping, and particularly if it's underground piping?

ROSE: Well, the piping comes--we suck the water out and pump it to the facility, so there's no penetrations in the walls of the basin for a pipe break to result in a release. In the old reactor design there were, as part of a very archaic last-ditch cooling system some pipes that did penetrate the wall at a lower elevation. There was a Weir Box there. To protect that, we filled that Weir Box with grout. It's grouted up so that in a seismic event if those pipes were to break or something, there's no potential for the leakage out that way.

For the pumping system--you know, you have a system that's drawing water out of the basin. We have an air break that's there that's connected to that pipe at minus 33 inches from the floor level, so if you were to get a break outside the building where you're pumping water out but it's not returning at the same rate, that's the maximum lowering you could get before it would start to lose the suction on your pump and start sucking air. So there's a passive air break that's built into the system to keep from being able to pump drain your basin to the outside to the sand filters and the filtration facility. Does that answer you?

TURINSKY: Yeah. What about leakage, just long-term leakage?

ROSE: Long-term leakage, yeah, we--there are wells that are placed fairly close proximity to the outside walls of the basin. The dirt side was covered with a bituminous sealant on the concrete before it was backfilled with the soil. And, of course, it's heavy South Carolina/Georgia clay that's backfilled there. But there's wells placed on each side of the basin. Those are sampled semi-annually now I think, and we don't see any indications to show any leakage. Tritium--the water has some residual tritium in it from the old reactor operations. That would be the first sign we'd see, because it would propagate with the water. Cesium would tend to get held up in the soil, but the--we're looking for tritium primarily, and we're not seeing any signs of leakage from the basins on the outside from those wells.

EWING: Other questions? Jerry?

FRANKEL: Jerry Frankel, Board. I'd like to congratulate you on--seems to be a thorough and well thought out monitoring plan, but I do have some questions about it. There really are a lot of metals that are in contact with this water, right, so it's not stainless steel and aluminum. The piping is steel? What's the piping made from? Pumps--is there non-stainless steels and copper or any--

ROSE: Yeah, I can't give you a full inventory, but right. Yeah, within the pumps and--

FRANKEL: You certainly have this huge structure of reinforcing bars that are surrounding it, very protected by the concrete, but is there any monitoring for iron?

ROSE: Yes. Yes. I didn't list that one, but that's one of the--there's a long list of ones that we monitor for: Iron, aluminum, copper, but there's a longer list of the metals and ions and all that are monitored.

FRANKEL: Do you adjust the pH?

ROSE: We do not. We do not adjust the pH. Adjusting the pH would involve the introduction of some type of ion, and what we do is keep the ions out.

FRANKEL: Yeah. Great. I understand the concern about galvanic corrosion, but the mitigation with some insulation also leads to possibly a crevice corrosion. So is that being considered in the assessment here so the plastic insulators causing a crevice--

ROSE: Yeah. It's a polycarbonate that we've--we'll, yeah, we'll place it on a polycarbonate. The goal is to improve. You know, it's sitting on stainless steel today. We put the polycarbonate insulator between the aluminum and the stainless to eliminate that galvanic corrosion. I guess I don't understand the--

FRANKEL: The monitoring coupons, do you have crevice monitoring coupons?

ROSE: Yeah. In that picture of the stringer of the coupons, there are several different types along that string. There's some that are just metal, there's some that have aluminum and a stainless washer basically up against it to create the galvanic couple, and there's some places where we have them together and I think there's--Bob, are there grooves in that?

SINDELAR: The grooves are in the--

SPEAKER: Go to the microphone, please.

ROSE: Sorry. This is Bob Sindelar. He's my--

SINDELAR: Yeah, I'm Bob Sindelar, from the Materials Organization Laboratory, and we are the organization that conducts the corrosion surveillance program for engineering, spent fuel engineering. We, of course, support spent fuel operations. And in our corrosion surveillance program, which, yes, Jerry, I applaud Dave for doing a great job for describing the results that has been going on since the mid-90s. The configuration includes creviced specimens, and indeed crevice--the specimen configuration we did view increased corrosion attacks. So the short answer is even with our good water quality, we want to avoid crevices. That is true. We plan to put the polycarbonate insulations to avoid galvanic. That fixes it--even more--I'll use the words severe condition configuration when you have stainless steel and aluminum, you will get attack. And so this is a mitigating thing and it's a better step, but--we won't go without--so we do have information on what is the extent of crevice. Yeah, we can give a projection of what that causes, and it's reduced from the galvanic.

FRANKEL: Yeah.

ROSE: Thank you, Bob.

FRANKEL: Thank you. Also, one of the concerns about these localized forms of attack would be initiation sites for cracking. Do you have a stress analysis to see if there's any high stress points that might be, you know--

ROSE: I'm not aware--is that a yes or a no?

SINDELAR: No.

ROSE: No. Okay.

SINDELAR: Stress corrosion cracking.

ROSE: Stress corrosion cracking aluminum, short answer. Higher alloyed aluminums are subject to it, but these 6000 series, even 5000 series for fuel claddings are not subject to it. None of our structural materials are subject to it nor have we ever seen stress corrosion cracking of the aluminum.

FRANKEL: Stop here for now. Thanks.

EWING: All right. Other question? Jean?

BAHR: Jean Bahr, from the Board. I'm wondering if the vinyl coating could be a source of organic carbon for your microbial mats, microbial webs.

ROSE: Possibly; maybe; I don't know. One of the things we have seen is that--you know, I said microbes are everywhere, and also you get algaes that form in the basin water that you have to prevent. There are some places where the vinyl coating has separated, and when you disturb that, you find behind it a place that--a pocket where algae in particular can--it likes to collect. So certainly that's a--we've sort of reached the end of what we thought we could do, and so if someone has some good ideas, we're open to good ideas on the microbes because at this point--of course, the microbes are--as I say, they're present everywhere. And many of the species that we saw on the DNA analysis are commonly occurring microbes that we live in daily and so they weren't surprising, but the diversity, the 3000 different species was quite a surprise. So there's a lot of mystery still that surrounds the microbes.

BRANTLEY: Sue Brantley, Board. I would think after all the work you've done, and I did appreciate your talk, that you'd have a theory or a couple theories like--what do you think is happening with the microbe?

ROSE: You know, there's no proof, okay, so what I'm going to tell you is absolutely just a Dave Rose theory, and that's that we brought it in on something. You know, the casks, a cask that came in might have had some contaminant in it, on it that brought it in, because it appeared so quickly without any other process change going on at the facility. The facility's been operating all these years and this hasn't happened, so you start looking at what have you done that might have changed this. But I say there's no proof. You know, just trying to back up a timeline and say, What has happened in the facility in the previous year that--it's still a mystery.

BRANTLEY: So that would be some organic matter came in on some new bundle that was put into the tank that allowed the bacteria to grow. That's that theory; correct?

ROSE: That would be--yeah.

BRANTLEY: And so you tested that? You looked back in the last year to see what came in and to see if there's any differences about it?

ROSE: Right. Right. And there was no correlation. You know, the most recently received fuel, that was the first place we went and looked, you know, and it was no worse or no better than other places. So, you know, that kind of shoots that theory down. Yeah, every theory we came up with we disproved.

BRANTLEY: So another part of this is--the growth was heterogeneous. You only saw it in certain places. And with such a big tank, I would think the chemistry around the tank would probably--could have microenvironments that are different or it could have eddies that maybe aren't getting flushed out. Can you talk about that? Like, how do you know you're flushing it all out? How do you know the bottom of the tank is not--

ROSE: We did--we intentionally went and pulled a lot of samples when we found this from various parts of the basin, ones that were close to where the pump suction is, ones that are close to the return, ones that are in corners where there might be, as you say, still parts. No correlation. The water chemistry within the statistical uncertainty was no different in the calm corners of the pool compared to the more active parts where there's more flow. So we looked at that and didn't see anything.

BRANTLEY: What's the residence time of the water in the tank?

ROSE: I think Maxcine had that on her slide. I'll have to--

BRANTLEY: Oh. Sorry.

ROSE: I'm sorry. I'll have to look at it. Yeah, all the water passes the sand filters about every 32 hours, and the iron column is about 13 days. It's about 2000 gallons a minute through the sand filter, about 200 gallons a minute through the iron columns. So all of it goes--you know, basically all through the sand filters in 32 hours.

BRANTLEY: And you're pretty--I mean, is there--presumably there's a short-circuit path through and that you could have some water that's just staying in there for long periods of time--longer periods of time.

ROSE: Right. Right. You know, it's not 100 percent going to go every 32 hours. Right.

BRANTLEY: And is there a testing at the bottom of the tank versus the top of the tank, that sort of thing?

ROSE: We looked at elevations, we looked at--

EWING: So let me intervene to keep us on schedule. We're just getting to the break time, but encourage everyone to continue the discussion of the origin of the microbe.

ROSE: I'll be here all day.

EWING: Yeah. Because we have only a 15-minute break, so I want to be sure to break in time. And I want to thank both speakers, Maxcine and David, for being so patient and answering all of our questions.

So we'll reconvene at 9:55, so--

SPEAKER: 10:15.

EWING: I'm sorry, 10:10. Thank you.

(Whereupon, a break was taken.)

The next speaker will be Allen Gunter, and he'll be discussing processing at the H-Canyon.

GUNTER: My name is Allen Gunter. I'm the senior technical adviser to the assistant manager for nuclear materials stabilization. I'll be giving you a discussion on where we are on the processing of spent fuel and kind of looking at the road map, what we call the road map which is kind of the integrated processing schedule for the canyon over the next probably eight to ten years. And then also discussion of some of the challenges that we have --

Quickly, as most of you were out there yesterday, I'll give you a little bit on the canyon. It's about a thousand feet long, about 120 feet wide, and about 75 feet tall. Some of the critical parts of it--that didn't work.

Some of the critical parts of this one that we really maintain, of course you got the structural which is the concrete. It's between 4 to 6 feet thick. There is a new addition that sits on top HB-Line. It's basically a plutonium processing facility. It's a glove box versus a remote operated.

Another critical aspect is also these areas right here which are our sand filter. We do not use HEPA's in our facility. We use large sand filters. There's an old and a new one about the size of a football field each that has varying particle size; from rocks it eventually gets to beach-type sand. It works like a HEPA filter. The nice part there is there is no fire issue with that. So in the event of a fire, you do not get any bypass through the facility.

There's our ventilation system. There is a tunnel that goes between the facility and the sand filter. We recently did an inspection. We actually send a robot crawler into that tunnel to look and to see if we'd seen significant degradation that would challenge that. We have seen some. Of course, you've got a nitric acid environment flowing through there. We have seen some degradation, but it's not significant enough to affect the safety of that facility. And then you've got other--we do have a waste header that goes from our facility down to the Liquid Waste System.

Most of you saw this yesterday, but I'll kind of quickly go through it. As you can see, H-Canyon/HB-Line kind of sit in the center of the materials processing and disposition. You've got L-Basin that Maxcine and Dave Rose just talked about as far as the receipt and storage of the spent fuel. You also have K-Area that does store our excess non-pit plutonium that we've consolidated over the years from various DOE facilities.

Kind of the color key, blue is uranium, red is spent fuel--oh, excuse me--red is plutonium. And you can see H-Canyon kind of serves both. It does both missions at the same time. But we are processing aluminum-clad fuel. We also do some enriched uranium from other sites. We process it. You end up downblending that to specification of 4.95 percent enrichment. That is then the sent for fuel fabrication that will be used in commercial reactors.

We currently have a contract with TVA. We have already sent over 300 tons of low-enriched uranium to the Tennessee Valley Authority to fuel their reactors. We currently have a contract for the material we're planning to process of 40 metric tons.

From that facility you also end up with high-level waste that we send to the tank farm or directly to the sludge batch tanks that feed the Defense Waste Processing Facility. It depends on the material. Then you've got defense waste processing. Then it goes to the glass waste storage, and eventually, hopefully, to a repository. And again, the red is more on the plutonium side where you've got the mixed oxide fuel fabrication facility that would then go to commercial. And then you've also got to where we are sending plutonium to WIPP.

One of the things that we to want point out on here is except for the MOX facility, all of these facilities exist and are operating. So from a risk standpoint or a technology standpoint, it's a very high level of confidence that we can process this material.

I'll give you a cross-section of the canyon just for those that weren't here--or weren't on the tour yesterday. The canyon is divided into basically three sections, a hot canyon, warm canyon, and then the center section where the personnel are. Hot and warm refer to radioactivity. In the hot canyon you basically have dissolution. You have the separation of the fission products from the uranium and then high-activity waste system. Hot refers again to radioactivity. No one has been in that facility since it started up in the 50s.

You've got the warm canyon that basically does the purification of the uranium or purification of the plutonium or neptunium. People have been in this facility since start up. Both of these are serviced by an overhead bridge crane that can change out any of our vessels, change out our process piping. And we've done that over the years.

Then you've got the center section. First level is your electrical, second is your cold-feed piping, third is your cold-feed tanks that feed that system, and then fourth level is the control rooms. And again, grade level sits somewhere right about here which would be right on the second level.

This is a picture that was taken of the facility prior to start up in the 50's. It's of the warm canyon. You can see there is intricacy of pipes. Again, the ability--we have what we call Hanford connectors which are on the end of each one of our jumpers that are able to be serviced by the overhead bridge crane. So the crane operator can come in and take all of that piping off of that thing, replace that tank with a new one, replace the piping, verify leakage, and then go back and do the processing. We've done that over the years for the last 50 years.

The other thing is the flexibility this offers. Normally, if you went from this tank to this tank through the piping system, that would be normal. However, if we decide to change our process, and you wanted to go from this tank down to here, you'd just set up the piping group to go that route. So the flexibility of H-Canyon is very, very large from a processing standpoint.

To give you a quick process, you know, what our process is, bring in the fuel. You saw a charging of that yesterday in the videos at the crane maintenance. But we dissolve in nitric acid. You place the fuel into the dissolver. It's about a third of the way up in the acid. As it dissolves, gravity feeds it into the system so that you can control the hydrogen generation, control the criticality and the process.

We then go through what we call head end which is basically a clarification step. That's a gelatin strike. You add gelatin. You run it through a centrifuge. You collect any solids, and the waste coming off the centrifuge, the liquid coming through is a very clear liquid that doesn't have it. Then go through the solvent extraction step. This is very similar to the Purex process, but the modification is that coming off of the first cycle, we do not separate plutonium from fission products which is big from a proliferation standpoint.

We come off of this with our fission products. Our plutonium goes to the waste. Uranium comes through. It is purified in the second uranium cycle. You get your product. We come down. We downblend it with natural uranium that's provided by the vendor. It's right now of Canadian origin. We downblend it again from a varying enrichment. We come into a 4.95 percent. We load that in containers as a liquid. We ship the liquid from here. Right now it is going to Hanford--or Richland, Washington, to the AREVA plant who fabricates fuel for the Tennessee Valley Authority.

Again, just a quick schematic, kind of the heart of the canyon, it's a solvent extraction process. Again, what you're doing, this is very similar to an oil and water mixture. You mix the two. You allow it to settle. You add chemical adjustments to force the uranium or your fission products into your aqueous organic to get a separation. And you do this in multiple stages, and you come out with a very pure solution.

Again, just typical, looking at what a crane operator would be looking at in the facility and the ability to change out.

Again, we do everything with the overhead bridge crane. We have replaced these. We used to have basically old, steel mill cranes that were built in the 50s. Operators rode behind shielded walls or on the gondolas depending on which canyon. We've now replaced these with stainless steel bridge cranes that were installed in the mid- to late-80s. They have remote control, closed-circuit television which removes our operators out of this environment.

We also have an area that we call the crane maintenance where we can actually pull the crane in. We have a big shielding door. We can go and do any maintenance on the crane to ensure that it stays operational because that is one of the hearts of the facilities. If that crane does not operate, then the facility is not operating.

Where are we on the NEPA? Some of the key decisions, in '96 you had the Foreign Research Reactor EIS and the ROD issued that allowed to us begin receipts of foreign fuel from U.S. origin. In 2000 the Savannah River Site Spent Nuclear Fuel EIS and ROD was issued. And at that point the record of decision said that we would do melt and dilute on aluminum-clad fuel. You know, your aluminum, you crop it, melt with depleted uranium to form a low-enriched metal, cast in a disk, and then you dispose of it. We never really--we did some demonstrations, but this never was fully proofed out.

Then in 2006 we did the Uranium Disposition Program, and there the unirradiated uranium, highly enriched uranium, from the spent fuel at Savannah River, we recovered it, downblended it. This was from our own fuel that was left over from kind of the Cold War. Shipped that to TVA; that was part of the 300 metric tons.

Then in 2013, we signed a supplemental analysis, an amended ROD which we're utilizing now and you've heard Maxcine talk about earlier. We're processing a thousand bundles of material test reactor fuel, up to 200 cores of high-flux test reactor cores. And then that material is recovered, downblended, and again, shipped to TVA. And that's what we're on that program right now.

Where we actually--you've just completed and Dave Rose mentioned it, we did identify one fuel that we considered vulnerable, and it was more vulnerable to long-term wet storage than it was to immediate failure. So there was no immediate safety issue. But we did identify the sodium reactor experiment fuel. It was a metallic thorium fuel, and therefore, if you got a cladding breach and the water got exposed to a metallic fuel, then you get a reaction which we felt was unacceptable from a long-term storage.

So we processed the SRE with other high-aluminum/low-uranium content. When you process SRE, which is a thorium, and then you put it into a caustic solution to send it to our waste system, it becomes very thixotropic, almost like peanut butter. So what we did is we processed high-aluminum fuel with very little uranium to basically dilute it to make sure that the thorium material did not plug up any of our pipes.

We then transferred that--we are transferring that directly to the sludge batch tanks. We are not going into the standard what we call "Tank 39" into the waste tank system. We have in the past sent thorium there, but high-level waste really doesn't want us to add any additional thorium. That causes them problems with the sludge. So we're transferring directly to the sludge batch.

We have initiated those transfers. We're working with the high-level waste program to determine how much because there's several things that weigh into that; one is the fissile loading of the glass. We are still under a requirement to stay under 897 grams per cubic meter of fissile. So we have to work with that because that material does have Uranium-233 from a fissile content.

We also have the ability to transfer on everything, so we are working with the high-level waste on how much we can send to each one of the sludge batches. What we don't get in this one that's upcoming which they call Sludge Batch 9, we will hold in H-Canyon and then utilize the next sludge batch that comes up, Sludge Batch 10 to transfer.

As far as the ROD that was issued in March of 2013 which was the high-enriched uranium, aluminum-clad fuel. We have begun that dissolution and are working on that now. We began it in September of '14. We processed some. We then down on a steam outage, and we're coming back up off that outage now.

When we talk about waste generation, of course, waste generation is very--we are very codependent upon the high-level waste system. We work with them on how much waste they can receive from us. And we generate somewhere between 150 and 200,000-gallons of liquid waste that we send to the high-level waste. We work very hard now on how to reduce the amount of waste that we generate. One of the things to give you an idea that we're looking at that's a potential is where we're processing plutonium through the ion exchange columns, it's what we call the raffinate coming off. It has a very high concentration of acid. We're now looking at that as being our make-up solution and our dissolvers for spent fuel versus bringing in fresh acid. So it's things of this nature that we're looking at as to how to reduce our generation.

Based on the projected budgets, about probably six months to a year ago we were looking at restricting how much processing we could do based on the high-level waste projected budgets. Those now, as far as from our perspective, look much better. These are now the amount of waste that Liquid Waste System says that they can accept from us. 150,000 is adequate for FY15 because again, like we talked about yesterday, we're just coming back up into the processing. We're in a lot of start-up mode from the cycles, so we won't be running that part in FY15.

FY16, we're still ramping up. We're at about 200,000 gallons a year. And then in '18 through '25, we're up around 300,000 gallons which clearly does not limit what the canyon can process with the waste volumes.

But again, it is an integrated system that we work very closely with. My contact is Jean Ridley who will be talking to you later. But we talk on a periodic basis to ensure that our plans match up with theirs.

Road map, and I know this is busy, so I'm not going to go through all this because I can--I've told people I can talk for ten minutes or I can talk all day on this roadmap, so I will not do that.

Again, you've got--the spent fuel is in green, plutonium is in the blue. It's kind of a little different. We have two dissolvers; one of them is dedicated to spent fuel, one is dedicated to plutonium. Again, you can see we completed experimental fuel. We're processing the spent fuel that's under the ROD. Right now we're planning the estimate is we'll get through in FY22.

The dashed lines means there's opportunities if the Department so chooses to go further with the processing, so that's why we have that out here. We will be through with the plutonium, so at that point we could concentrate both of our dissolvers on spent fuel. We have looked at and if you look in the budgets there have been discussions about us installing a third dissolver in H-Canyon to support these programs. Right now we are evaluating whether that is really beneficial to us, but we have a position that where an old dissolver was, that we could put that in.

Again, you got the waste management activities-- one of the things we are doing, just to let everyone know, we're doing a lot with the International Safeguards group. We're a test bed since we're one of the few facilities operating with spent fuel and things of this nature. As Pacific Northwest Laboratory, Los Alamos, Livermore, Argonne come up with new safeguards to detect maybe diversion of material from other countries that are processing or anything else, they're using H-Canyon as a test bed. So since we're one of the only facilities, you know, we're working there.

One of the thing that has was mentioned, Jay Rhoderick mentioned, was a Canadian HEU returns that are coming in from Canada. These are returns of HEU that were used in production of moly 99. We are doing the preparations. We are having to do some modifications because those are coming to us as liquid directly to the canyon, so we're having to do some modifications to be able to unload those canisters because there's four in a cask. And then we would receive it. It would then be blended with the enriched uranium, this processing directly from our own spent fuel, and then be downblended and shipped out. And then down here, of course, you heard them talking about L-Area and the receipt of the reactor.

One of the things we're also is we are working on the HFIR processing. Again, like Maxcine said, we've got every cat and dog, so before we process we have to make sure that the National Laboratory has done a flow sheet analysis for us. So from that perspective, each fuel type is a little bit different, so we have to go validate it for our National Laboratory and tweak our system. HFIR, that's one of the things they're doing now because we're--got to look at how much hydrogen is generated during the dissolution of the aluminum, so we're working that right now. And we are planning to begin dissolving HFIR fuel in FY16.

One of the questions is what do you have to do to keep operational? And like Jay Rhoderick indicated, maintaining our infrastructure is a challenge based on the budgets. We are maintaining all of our safety systems like Jay said. We are not relaxing off of that. We do maintain our safety systems. But we do have some infrastructure upgrades. Some of the examples are some of our substations, transformers, roofs especially. We have one exhaust fan. We've replaced three out of four exhaust fans. We have one that was left. We have not replaced it.

These are examples of the things that we look at in the processing. Again, these are more process-related versus safety-related. We have a--the site has a consolidated, integrated priority list that we look at the whole site as far as what's what, as far as needing the infrastructure support for the system, so we're on that list and are working that.

And then one of the questions that come up that says if we did not do the Idaho swap and we were left with the stainless-zirconium-clad fuel, what would we do? Of course, it was mentioned potentially constructing dry storage capability to dry the fuel and just store it and eventually disposition. Another option is to actually figure out a way to process it. And one of the ways is you shear it, and you leach the fuel out of the cladding, and then you disposition the cladding. Those do not exist in H-Canyon, so you would have to install that capability.

There are other chemistries that are being evaluated right now for other processes that may be suitable that would allow you to process this material maybe without installing a shear. But today the shear is the way we would go.

Now are there any questions?

EWING: Okay. Thank you very much. Questions from the

Board?

Yes, Paul.

TURINSKY: Paul Turinsky, Board. Could you say a little bit more about what you're looking at to reduce the volumes of liquid waste and what the time scales are?

GUNTER: You mean as far as reductions?

TURINSKY: Yeah. Yeah.

GUNTER: We have a--our plan was at one point to give you an idea, we were only looking at being able to have 100,000 gallons or 110,000 gallons a year versus a 200 to 300 based on Liquid Waste's ability to receive. So we had some very big initiatives we are still looking at those. Hopefully, in the late '15/'16 time frame is when you'll see a lot of those, either acid strikes on the system or acid--or the raffinate, utilizing the raffinate material. So most of that is probably in the late '15/'16 time period, and we're hoping, again, to keep our waste down.

We would love to--if we can live with 100,000 to 150,000 gallons because we know every gallon less that we send to Liquid Waste the better off they are as far as having handle it because, again, we neutralize our acids. So when we neutralize we, of course, introduce salts into the system which then have to be dealt with, so it's just a vicious cycle.

So we are--from our perspective in the nuclear materials side, from a taxpayer's standpoint, we think it is prudent that we figure out how to minimize our waste, whether we actually need that volume reduction because of what Liquid Waste can receive or not is just a--it makes sense that you don't generate it if you don't need it.

EWING: Other questions? I have one, Rod Ewing from the Board.

So in the discussions from yesterday and today, it's very clear that H-Canyon sets critically in the middle of all of these activities. And some--one can speculate on what would happen if it closed. You know, where would that leave the system and the site?

The other way to speculate is to imagine that it's very necessary and central to DOE mission nationwide, and that one would replace it with a new facility. And I realize this is dreaming. But my question is if you built a new H-Canyon today, how different would it be from what you have? Would it be smaller? Would it be more efficient? Could it play a larger role in DOE activities? And you're allowed to speculate.

GUNTER: Okay.

EWING: You're not held to the answer you give.

GUNTER: There was an initiative probably about five years ago called the Global--yeah, called GNEP.

EWING: Nuclear GNEP.

GUNTER: Global Nuclear Energy Partnership if I'm not mistaken. That program looked at a quote, "new canyon" or a new processing facility. One of the things is back in--still, I guess, is get away from the Purex process. They like the UREX process, UREX 4. They were looking at taking out all of the different actinides.

You would--it would be a smaller footprint because you would probably use centrifugal contactor versus mixer-settlers which are--you know, you can do a much smaller scale, so you get a smaller footprint. I know GNEP, when they were looking at it, they were up over $200 billion for their--

EWING: Sorry. Billion?

GUNTER: Billion.

EWING: Okay.

GUNTER: At one point. Now, again, that's when they were looking at--

EWING: And that's the lowest.

GUNTER: Well, they were looking at separating the americium away from the cesium. And the cesium and the plutonium--I mean, you're talking about breaking it down into the individual components. Well, every time you do that, your storage requirements grow. So it wasn't just the processing facility. It was all the support facilities.

If you look at DWPF that was built in the late

'80s, it looks like as far as a facility a lot like H-Canyon as far as jumpers and a flexibility in how it was constructed. I know the process is totally different, but from a facility standpoint, I don't think you would get away too much from the design of H-Canyon, again, due to the flexibility.

I know some of the facilities the Department is currently building have what they call black cells which are intended never to go into. My personal opinion, that's great, philosophically; but eventually, things break, and you have to go in. H-Canyon does offer that flexibility because, again, we've replaced almost--I won't say every tank, but every style tank. We've pulled new pipes as far as linings on the piping from--through the walls of the canyon because we had leaks. We put new floors in where the acid attacked the concrete, so we put stainless steel floors in.

We basically could rebuild H-Canyon--you know, we have rebuilt parts of H-Canyon as we've been operating. So from that perspective, if you're looking for a long-term mission, and I'm looking there at spent fuel--commercial spent fuel, not just what DOE has, then you would want a facility that has a long life. And to me you would build something that I would do--line it with stainless versus just having exposed concrete. Those are design details, but I think it would look a lot like H-Canyon. It would probably be more efficient, both from energy and efficiency, and you would probably be in a smaller footprint.

EWING: Okay. Thank you.

Other questions from the Board?

Dan.

OGG: Yes. Dan Ogg with the Board staff. We heard earlier from Dave Rose about the damaged or unclad fuel that's in some of the isolation cans and oversized cans and an effort to do some risk-ranking on those fuels. Does your current amended record of decision give you any leeway or allow you to process any additional fuel of those types that might be identified as vulnerable fuels?

GUNTER: Okay. First of all, most of that fuel is stainless and zirc. That's what Dave mentioned when he put it--you know, when he was talking about the material in the isolation cans. So processing that fuel would be difficult. You could potentially--I think Maxcine mentioned the lab has very limited capability, maybe you could take, if it's only a onesy-twosy, take material there and figure out how to declad and expose material, then we could dissolve it in the canyon.

As far as the latitude to handle I'll say problem fuel, we actually have two EIS's. One is the EIS that we had that we just amended. The other is an interim material--interim nuclear materials--IMNM--and I can't think of all the--interim materials management EIS, in there it does identify the problem fuel or like the vulnerable fuel that we just got through processing. That was actually processed under the IMNM EIS. Because it does give you the authority that in the--you know, when you identify a safety concern or a vulnerability to long-term storage or whatever, you do have the authority to go in and process that under that EIS.

So I think, yes, we do have the authority, the leeway. The current ROD that we're processing, I'll call it intact fuel doesn't really give us that leeway. But again, we have the other EIS that does identify that if we got into an issue where we had a vulnerability, we could deal with it.

OGG: Okay. And I have another question. Unfortunately, going back to the microbes. We also heard from Maxcine Maxted and Dave Rose that although they're beginning to look at some fuel inspection programs, really today very little of the fuel is removed from the bundle, the cans, and inspected at the L-Basin. So my question is kind of two. Part one is do you have a opportunity to inspect the fuel when it gets over to H-Canyon, and if not--if, hypothetically, one of those cans showed up over at H-Canyon with 100 pounds of microbes inside one of those cans, would that cause a problem in the dissolver or downstream in H-Canyon?

GUNTER: All right. Let me take them one at the time.

As far as inspecting the fuel, we look when we're--you know, you saw the video yesterday. So when we're picking up the fuel, yes, we're looking at the fuel because the cameras are zoomed in trying to locate the veil on the top of the thing.

Do we do a full-scale inspection from top to bottom? No. That really, to be honest, L-Area has a better chance of inspecting the fuel when they're putting the fuel into the cask car than we do in H-Canyon. So I would say if there's going to be any inspections, it would probably be done more over in L-Area when they're loading the cask car.

As far as if I had a hundred pounds of microbes, I guess my answer is I don't know, Dan. You know, we've got the chemistry set up for the aluminum and the uranium and that type of thing. Would the microbes affect that chemistry if we found that were our case? Then we definitely would get SRNL involved immediately to determine.

First of all, we'd probably--if you'd already charged it to the dissolver, we'd already be seeing either solids or something in the system which at that point we would actually stop processing and go try to figure it out. But if you didn't know it and they suddenly showed up, would it affect? I guess it would depend on the microbes and their resistance to nitric acid dissolution. If they dissolve in nitric, then the answer will be no. But if they're resistant, if they're some kind of super microbes that resist nitric acid or something--

OGG: Well, I think--

GUNTER: --or could perform some kind of conglomeration or something, then it could, potentially. But then again, you may take it out in the gelatin strike because if it's a solid-type stuff, material, then it would come out in our gelatin strike.

OGG: I guess my point is that is quantity of organic material, and I don't believe the canyon process is set up to--for taking organic material.

GUNTER: We don't like organics in--we do not like organics in the chemical separation facility. We try to avoid plastics; we try to avoid that. But again, it kind of would depend, yeah, and one of the things that organics usually do is they form a solid, kind of a--I'll call it a gunk in this process. If it formed early and it could be taken out in the head end, it probably wouldn't affect. If it forms inside the mixer-settlers, then yeah, we're going to have some issues we have to deal with.

EWING: Okay. Other questions? Staff? Board?

All right. Thank you very much. We'll move on, or back to Maxcine who will discuss spent fuel management alternatives.

MAXTED: Hello. Sorry you get me twice today. I'm going to talk about our management approach for spent nuclear fuel at Savannah River which also is directed from headquarters. So we follow the direction that we get from headquarters, so--and what alternatives are out there.

Right now, as you know, we are currently storing wet. We're safely storing the fuel wet. We have been doing that for many years, and we believe that it's safe to continue. We do have approval to process a thousand bundles. We're very excited about that as you can tell. You've seen it in all the presentations. And we also have evaluated that the basin's life could continue an additional 50 years if not more. So that's our current approach.

And then as for the isolation cans, Dave talked about them in his presentation, we really are just safely storing that until another option becomes available.

We successfully completed the SRE campaign. That was 147 bundle, 36 of which were the SRE fuel, but the remainder were high-aluminum fuels. And we had to send the high-aluminum fuel because the thorium from the SRE fuel would form a thixotropic, peanut butter consistency when we send it to our tank farms. And our tank farms do not like that, so we had to add the aluminum fuel in as well. So that's why it's 147 bundles. And we did not recover any of that uranium because of the contamination with U-232 and U-233. It's too high of a dose for any of the fuel facilities, so we just did not recover any uranium.

The amended ROD would allow us to process up to 200 HFIR cores which right now we have 120 stored, so we're at full capacity. I believe Office of Science, they have a limited ability to store at their facility. They're reaching their capacity. I think they have a year or two left of their capacity, so we needed to be able to find a way to support them in that mission. So processing the HFIR cores will allow us to do that.

Also by processing the thousand bundles, it allows us not to have to install additional racks in L-Area which is extremely expensive.

The position of whether H-Canyon could continue to process beyond the thousand bundles that we have approval for, that is definitely a possibility, but there's been no programmatic decision on that at this point.

And then, as Allen just said, we can't--H-Canyon cannot process the zirc and stainless steel fuel without additional capabilities in H-Canyon or additional science that we find a different flow sheet that we can use for that fuel. But none of that's been done at this point. And that is less than 10 percent of the L-Area inventory.

And you had asked questions in your agenda about the Idaho and the SRS exchange. We call it the Idaho swap. Idaho calls it the Savannah River swap. So right now it's currently suspended.

There was a plan in place where Idaho would originally ship to us, and then we would ship to them. And was it agreed to that they would start first because of some of the political issues in their state. They would get our nonaluminum, so they would get the problem children of the zirc and the stainless that H-Canyon can't handle. We would get their aluminum, and we'd be able to process that. And then you'd get an ultimate disposition path because it would then be turned into high-level waste at the end.

We would have to repackage those fuels so that they would be transportation ready. So that would require us to have some type of isolation system where we would open up these containers and then repackage them. So analyses were done, a report was put together on what we call the L-Area Basin Isolation System, LABIS for short.

It was in 2010 or even further back, it was, like, $40 million which we can't afford in our budget right now. So it's one of the reasons that the whole swap was suspended. Nobody had the money from either side to do the swap. So everybody is just safely storing that material at this time.

And then we'd also have to identify a transportation package, which they are out there, but one that would meet both our needs and also Idaho's needs. So that would have to be done as well. And it is one of the topics for the upcoming Spent Nuclear Fuel Corporate Board.

Another option that we've talked about today is dry storage. Our life cycle baseline right now assumes dry storage because we don't have approval to process. And when we change our baseline from processing all of the aluminum-clad fuel to go into a dry storage, we increased our life-cycle baseline by a billion dollars. It's expensive.

And there's also some issues because we're not like commercial fuel. The aluminum clad has an ability. That aluminum hides water. So it's not just go get a commercial entity to come in and have them dry the fuel. We had to do research on how fast do we dry it, how long do we dry it, because if we dry it too fast, we'll generate hydrides which would corrode the fuel. And you can also generate hydrogen with the hidden water, so you could actually have a container that becomes pressurized. So part of our dry storage study that we looked at was to do that additional research to identify what would be needed and how you would properly and safely dry the fuel.

We did include in that study information from Hanford and Idaho. Idaho has dried aluminum fuel. They're a little bit different because they're not a closed cycle. Their pads are actually open to atmosphere, so it's not a closed system. But we were trying to use all the information that those two facilities had come up with in terms of packaging and containers that they would use.

Also, the report was directed to be road-ready. And what we meant by this is we understand they're going to be in a concrete cask, but the canisters inside that cask needed to be able to just be pulled out, put into the transportation package, and sent without any reopening, reevaluation. We wanted it to be a simple in-and-out type of activity. So that's what the report looked at.

We talked about the--did I miss anything? Oh, and we were also told in the report, we wanted to be as much commercially available as possible. We didn't want to reinvent the wheel. So they tried to blend what we had from Hanford and Idaho with what's commercially available and what was the difference with our fuel.

Part of the problem with our fuel is we have every shape and size under the sun. So it wasn't one-size-fits-all, but they were directed to go find few-sizes-fit-all, and so that's what they come up with. We actually had two different sized concrete casks that they would be put into because of the tall fuel we're going to be receiving from Canada. And then all of the other fuel including the HFIR was put into a smaller, lower level, lower height cask, concrete cask for storage. So whenever you design that facility, you had to be able to handle all of those differences, and that causes a lot of the cost increase.

And the storage pad for these in the original dry storage study that was done, the pad was located in L-Area. Now, there has been some work on is there a way to do a multiuse pad for both high-level waste glass canisters and the spent fuel that's dried. There's a preliminary report; this is just a quick look that they've spent maybe a month's time on to look at, so it's very preliminary. They were looking at a central location to see if there were any cost savings or benefits because if you had it all in one location, maybe you could reduce security costs. You could reduce transportation costs because you could have one location; you could load all the trucks and move from there.

So that study has just been done. I don't think it's been approved yet, so we haven't put a whole lot of stock into the report because it hasn't been approved. But it also identified that if you did that, you may have to move your drying location for L-Area, so that would be an additional cost as well. So it's not clear from the initial look, the preliminary results, that a multipad use would be any benefit in costs.

So in summary, our fuel is safely stored wet in L-Basin. We have some fuel that's going to be processed in the H-Canyon and then moved on down through the system to become a glass form. We have evaluated alternatives to wet storage. They are expensive. They're not easy to implement.

And we--the Department decision on future process hasn't been made at this point.

EWING: Okay. Thank you.

Questions? Board? I'll start, Rod Ewing, Board.

So the last point, the need for departmental decision, so in your thinking, would this question be one posed to the corporate board?

MAXTED: Yes, sir. I believe it will be.

EWING: And then the process would be, presumably, the corporate board would make a recommendation to the secretary.

MAXTED: Or through the assistant secretaries, yes.

EWING: All right. Other questions from the Board?

Jean?

BAHR: Jean Bahr, Board. So the dry storage would be very expensive. We also heard that the available storage facilities for the glass logs are almost full. How does the cost of a new vitrified storage building compare to the cost for the dry storage?

MAXTED: I don't know the exact costs. I know that the high-level waste, and Jean's going to get to that or one of her folks later in the presentations, they're looking at not going to the traditional glass waste storage buildings but going to a concrete cask storage, similar to dry cask storage. So that's where you would not have the additional cost of the glass waste storage building, you'd just have the pad cost. I do not know the cost of a glass waste storage building to compare it to the life-cycle costs of dry storage though. I don't know those costs.

EWING: Sue.

BRANTLEY: Sue Brantley, Board. So as I understand it, the canisters that are isolated in L-Basin are often or always the stainless steel, zircaloy-clad bundles.

MAXTED: The majority of them, yes, ma'am.

BRANTLEY: And the reason they're isolated as I understand it is to keep the water inside that large canister not circulating with the other outside.

MAXTED: Yes, ma'am.

BRANTLEY: And the reason you do that is because those bundles are degrading or corroding or breaking apart or something.

MAXTED: We have--we suspect because we--when they repackaged those into the isolation cans back in the '90s, late '90s.

Was it '94, Dave?

ROSE: Yeah. A large part of that--this is Dave Rose again.

EWING: Identify yourself, please.

ROSE: Yeah. Dave Rose, SRNS.

The large parts of that were test pieces from the '60s and were experiments. So they were cut and sectioned.

So they were intentionally corrupted, cut, severed at the time that they were tested. So that's why they were placed initially in these cans is because they were--you know, they had been--these were the remnants of disassembling and running tests on pieces. So that was the origin of the vast majority of these, were tests from the early '60s. So they were put in those cans at that time because of the--they didn't have intact cladding.

And then because those cans are very old, we placed them in the higher-level cans, and there was--because they were showing corrosion on the outside. What our chemistry in the '60s was not what it is today in our basin today. So that's why we've overpacked them because both the material itself was originally corrupted, and the containers were showing some signs of degradation from not being managed to the kinds of criteria we would manage them today.

MAXTED: So the way to stop that corrosion getting into the water and potentially affecting the other fuel that was not showing corrosion.

BRANTLEY: So I was just going to ask, can you comment on what problems are going to ensue if they just sit there for longer and longer?

MAXTED: If we were to do nothing, eventually the fuel is going to degrade. And I think we've seen in the Department some evidence of what degraded fuel does. You get basically a sludge formed. And by putting them in the isolation cans, we felt that was an extra barrier of it getting out into the water if it did become that sludge. But once it becomes a sludge similar to the K-Basin in Hanford, I mean, that sludge at the bottom is basically corroded fuel that they had to deal with. So our plan was to put it in an extra can.

We're checking the integrity of those cans, and as long as they're not showing any signs of degradation, then we've got it controlled into a smaller section than 3.4 million gallons.

BRANTLEY: But is it safe to conclude that the longer you wait, the harder it would be to transport somewhere else?

MAXTED: I think that's probably a safe position, yes.

EWING: All right. Mary Lou.

ZOBACK: Yeah. Just--Mary Lou Zoback, Board. Just a point of clarification. We visited the--you took us on the tour--the glass--the underground vaults for the glass logs. It was a pretty simple building. It had just ventilation to get rid of the truck exhaust; when it was backed up, there are the big mover exhausts.

The second building as I understand was nearly identical to the first. So you have the blueprints. You've been through the approval process. Is it really that expensive to build a third building? It a would seem to me of all the options--

MAXTED: I'm going to let Jean Ridley answer that.

RIDLEY: Hi, I'm Jean Ridley, DOE.

A third building we estimate about 130 million. If we go to the dry storage concept, we have a range probably of 40 to 65 million for the initial start-up cost of that. Long term, the life cycle costs of both are similar. The benefits with the cask storage though is you build what you need. A third building would not house the amount of canisters we're projecting, so we would have to build an additional storage.

MAXTED: Okay. Thank you.

EWING: Thank you. Other questions from the Board? Staff?

Nigel?

MOTE: Nigel Mote, Board Staff. When you were talking about the dry storage study in 2012 you said that it included information from Hanford in Idaho. And the instruction was to include as much--about commercially available options if possible. What you didn't say but maybe implied was whether this was coordinated with the design of the storage facilities at Hanford in Idaho.

In Idaho there was a development of the DOE standard canister, and that's not yet implemented, but there's still the concept of having a standardized system. Is the storage that you were looking at going to be integrated so that transportation would be the same? Storage locations on different sites could be integrated the same way. Is it an integrated plan, or is this another separate storage system?

MAXTED: We tried to integrate it. We looked at the canisters. I think it was the MCO's that they're using at Idaho and Hanford or one of them uses the MCOs. So we were trying to use the MCO container design so that when we put ours into a canister, it would be that same-sized dimension if not necessarily--we wanted it to be exactly the same to make it easier. I think some of our fuel required some differences in maybe lifting or thickness of the containers. So we did look at that. And we did use the MCO as our guideline for developing the canisters that the fuel would go into to be dried. But some of those are going to be longer just because that some of the fuel is longer. So I think that's where we had a little bit of a difference in actual design staying exactly the same.

EWING: Thank you. Other questions?

Dan.

OGG: Yes. Dan Ogg with the Board Staff. Maxcine, will you or someone else from Savannah River Site office be a member of the Spent Fuel Corporate Board?

MAXTED: Right now I am the one that's going to be on the corporate board, but that's ultimately Pat McGuire, our assistant manager's decision, but at this point I'm going to be attending for Savannah River Site.

LESLIE: Brett Leslie, Board Staff, you talked about the length of the Canadian fuel. Do you know whether that Canadian fuel fits within the envelope of the DOE standard canister specs?

MAXTED: I believe it's longer. That's why we had to change it. But we tried to keep all of the tops and the handling the same because the Canadian fuel is 10-feet tall. I think the MCOs at the most were 12 or--I haven't looked at the report in a long time, but there's a limit on the height. And you had to have so much of a spacer inside as well. So I think it was a--we had to go taller.

EWING: Other questions from the staff?

Brett.

LESLIE: Brett Leslie, Board Staff again. So I can see how you can get the aluminum fuel out. How do you disposition the overpacked cans out of the basin to whatever disposition path they are? This would be the latest or the isolation cell. Can you talk a little bit more about that?

MAXTED: I can. Back in 2010 I believe is when they did the LABIS study for the isolation system, and it was basically taking--you didn't get to see, but there's a dry cave. And it's not dry; it just has a dry area above it where you can pull fuel up. There was a concept of trying to isolate that piece of the basin so it had its own deionizer, its own water quality. That was very expensive.

There have been ideas of trying to use some kind of tank system within the basin to open up that fuel. These are all just preliminary thoughts and brainstorming that's been going on. We haven't had funding to fully support our dry storage. We've had to--it's fallen below the line in the past couple of years, so we haven't been able to do the research on the drying nor on how we would actually address those isolation cans.

EWING: Okay. Questions from the Board? Additional questions? Staff? All right.

Maxcine, thank you very much for both presentations today.

So we're a little ahead of schedule, but we'll continue the next item or the public comments. And actually I need to get the list of people who will--so we'll wait just a moment for that.

So for this morning's public comment session, we have five who have indicated they want to say something. So I'd ask each of you to take five, no more than ten minutes to make your comments. And I think we'll be fine, on time then.

So the first is Suzanne Rhodes. And, please, identify yourself and affiliation.

RHODES: I am Suzanne Rhodes. I'm with the League of

Women Voters of South Carolina. We've been watching Savannah River Site about 40 years, kind of off and on, but our long-term concern has been those darn tanks.

And a few years ago we got particularly focused when the Savannah River Site supporters, multiple community folks interested in jobs--am I loud enough? Okay--proposed commercial spent fuel to be brought here which we thought was incredibly short-sighted. And so we developed one report. We did another. And as we were watching, we were mostly filing reports, the Governor's Nuclear Advisory Council, and also the SRS Citizens Advisory Board. And two big issues with them, the CAB kept asking about the international fuel shipments which we'd heard about many different ways. And the Governor's Advisory Council was asked by one of the senators on that council about what had happened to international fuel that had been brought to SRS, and basically the answer was nothing. Any plans? Nothing.

So we keep hearing rumors about international shipments to SRS. This is all in light of our concern about the tanks which are always back and forth used, messed with, and they're leaking, some of them.

So we finally asked, this calendar year, for a programmatic environmental impact statement on the international shipments. Asked three times. Our answers are, well, what we were hoping for was that SRS has long term been planned for international shipment of U.S. origin of a research fuel. That's what we thought, but we're not getting that at all. We haven't really had an answer.

But at any rate, in the meantime, of course, the wastes are building up. And what we really almost have become is a world-wide welcoming center I'm afraid. The current proposal to bring in the German wastes looks to us--and this is Tom Clements--who, you know, heard from before if you haven't already--did an exhaustive analysis of the legal implications on bringing in international spent fuel.

And the part that I think might concern the League the most was it seems to undercut EURATOM and other international attempts as we're stumbling along also to take care of their own spent fuel. We're talking Russia, we're talking Japan, we're talking Belgium and Canada all perfectly capable folks in contributing to some sort of a regional whatever plan they come up with.

So anyway, I want to thank you so much for asking all the right questions. I have a great respect for Savannah River staff. I think they're good, really good, as you've seen, but they're always distracted by these stupid budget decisions. I think it's been nearly ten years since they had a budget that they could count on. It's always--anyway, you know how it is.

So I think that as a result of your questions, I'm hoping, that the local eager beavers that want to bring commercial fuel here will kind of understand that it's a little simpler than--they're convinced that our job is in reprocessing of that fuel. And I don't know what the implications of reprocessing high burn-up spent fuel are, but it's got to be nasty. And anyway, I'm hoping we have a--you all have a sobering influence on our community.

And by the way, DOE is easy to criticize, and I've done my share of it. But the real culprit is Congress. They started diverting the nuclear waste fund almost--I think it was two or three years after it was formed. They--if you were paying attention, you really had to be a little nutty, but if you were looking at appropriations for the Yucca Mountain Project, they were always slow. They're always skimpy. It resulted in impossible contract management. It resulted in huge staff turnover because who wants to work around that.

And then after all that, as if DOE hadn't had enough on their hands, Congress and the industry accused DOE of bad management at Yucca Mountain which, I mean, they made plenty of mistakes, but it's a shared responsibility.

I was very encouraged with the Blue Ribbon Commission which has gone nowhere. I don't know what it's going to take to develop a long-range plan. I'm sure you've got a couple in mind. But it seems to me that for at least 100 years, anything that comes to Savannah River Site will stay there. If it's international, who's to say something's going to happen to it besides storage. If it's reprocessing, nobody is talking about new tanks.

Anyway, I really like your question very much and appreciate the work you've done. Thank you very much.

EWING: All right. Thank you very much.

Next is--sorry--Charles Munns.

MUNNS: Good morning. I'm Charles Munns, a resident of Aiken. And Mr. Chairman and Board and staff, we sure appreciate you coming and visiting what it is like in the field.

By the way of background, I was in the U.S. Navy for 34 years, left as a vice admiral, ran all of our 70 U.S. nuclear submarines. I then came here and was CEO of the management and ops contractors out at the site. Retired four years ago. I'm now chairman of the Citizens for Nuclear Technology Awareness, a 501(c)(3) nonprofit whose role is to educate the public on the nuclear industries.

So I'll take just two or three minutes today, not longer. But as you evaluate the technical and scientific validity of the activities here, I'm suggesting you keep in mind the ecosystem under which we operate in the area. And so I would like to make just five points about that ecosystem. And I think it's unique to one that you would find anywhere else. Those points are geography, geology, community, government relations, and safety.

Geography, we're located in the Southeast, a permanent--I mean, a great place to do this work, and where much of the nuclear industry is.

Geology, we're probably the best understood 300 square miles of land that there is through our 60 years of monitoring it and watching what goes on, and it's quite a stable area.

Government relations, we have a good relation with regulators, both at state and EPA. A tough relationship with them, but it's one where things--people can talk and things can get done for the right purpose.

Community, we're very supportive in the main. We have here retirees from the site. We have almost 10,000 employees that work at the site. We have that workforce. We have a culture of safety I'll get to in a moment; educational facilities, a technical school and a four-year college, and now the support of those activities; and of course the Savannah River National Laboratory which is crucial to what you're studying here today.

And then let me end with safety. This site and the culture it has developed with those retirees and those employees is on the average ten times better than its peer in the nuclear industry and is almost always the first or second in the entire DOE complex.

So that ecosystem, geography, geology, community relations, the workforce, and safety ought to be part of your understanding as you look at the technical and safety aspects of the sight. Thank you very much.

EWING: Thank you.

The next is Tom Clements.

CLEMENTS: Thank you. I am Tom Clements, the director of Savannah River Site Watch, a small, public interest organization that oversees a lot of the activities at the site. And I'd like to thank you for this first meeting of the Board coming to South Carolina. As you can see, there's a lot of high-level waste issues that are of great concern at the site and of public concern.

On a lighter note to start off, I want to underscore a little bit of a side show that's playing out, and you probably have noticed it related to terminology and definitions. The Department of Energy switched over to using the term "used nuclear fuel" a few years ago that was not legally defined. It appears they might be switching back now to the legally defined term "spent nuclear fuel." I appreciate you using the term. The EPA uses the term. The NRC uses the term. DOE had muddied the waters with this other nondefined terminology. So I hope you stick to the legally defined term on spent nuclear fuel. And I think they were doing it to imply that the material could be reprocessed, commercial as well the material here.

The greatest concern in my opinion, the public around Savannah River Site and the state of South Carolina across the river in Georgia is, of course, management of the high-level waste and making sure that it continues at pace. We are all hearing about the great budget pressures on this side, and it looks like the high-level waste management program is at some threat from a funding level.

And, of course, other programs within DOE such as the mixed oxide fuel program are putting great strains on the entire Department of Energy budget. I know this is not really your necessary area of concern, the budget, but it is of people around here as you're hearing.

The South Carolina Department of Health and Environmental Control--I don't know if there's a representative here--is holding DOE to the agreement, to the Federal Facility Agreement on tank closure. There's a schedule for tank closure, and starting, I believe, as early as next year into 2016, Department of Energy could fall behind the commitments in that Federal Facility Agreement. And so far, DHEC, all the way to the top of the Department of Health and Environmental Control, they're holding DOE's feet to the fire on the tank closure schedule. And I think you should be very attentive to that.

As you're hearing, there's a lot of interest in keeping the reprocessing H-Canyon going at the Savannah River Site. And it appears to me that that, besides clean up of other materials, has become one of the highest priorities of the site. And I feel there's some problems with that.

You briefly heard with no explanation that melt and dilute had been the record--the preferred option in a record of decision on taking the fuel assemblies, melting them, and blending them with depleted uranium. That was about 15 years ago when the decision was made. It has been put to the side. I think you should ask more questions about that and ask for documentation why melt and dilute wasn't deployed. I guess it would have been about 14 years ago.

Also the issue of dry storage of spent fuel in my opinion, there's not been enough public information. It seems like the cost of this continues to grow as we hear more about it. So I would request to the Board that you ask for this dry storage assessment that was done in 2012 to be put into the record for this meeting because I would like to see their analysis on why dry storage hasn't been more vigorously pursued. And part of the reason, H-Canyon is a money maker for the site and they want to keep it going.

Now, related to keeping H-Canyon operating, as we heard, there's some exotic materials that are looked at to be brought to the site in addition to the possibility of commercial spent fuel coming here for interim storage. And the Savannah River Site Citizens Advisory Board actually reaffirmed a position back about two months ago for not bringing commercial spent fuel to the site for so-called interim storage by 16 to 0 vote. I don't think the community is in the mood for bringing more high-level waste in here unless it's absolutely necessary. And commercial spent nuclear fuel would open a whole new ball game. And I still think that the long-term plan is to eventually reprocess that material, but that is certainly not on the agenda.

But talking about exotic fuels coming into H-Canyon, we've heard mention of this Canadian liquid high-level waste. A supplement analysis was prepared on that, and there was no public input into that document. As far as my talking with physicists, that material could be denatured in Canada. It's a liquid material in a tank.

But Department of Energy, Savannah River Site stands to make I think it's reported $60 million to bring this liquid waste here. And I'm baffled from a nuclear nonproliferation perspective why the option of downblending that liquid in the tank and solidifying it in Canada as has been done with the same material for the last ten years, why that's not an option. We get back to wanting to keep H-Canyon operating.

The other issue of concern that was mentioned is bringing in German graphite spent fuel. It's balls that were used in two graphite gas-cooled reactors. I was just at one of the facilities where 300,000 balls of this graphite fuel were stored. DOE has claimed that there's 900-kilograms of highly enriched uranium in the fuel from the two reactors. This is a figure from over 30 years ago.

There's an analysis that there's no HEU remaining in a portion of the fuel, the first fuel that will be considered to be brought here from the ADR reactor. A lot of the fuel never, ever had any HEU. It was LEU fuel. So DOE wants to reprocess material, but as far as I can determine, there's been no nuclear proliferation impact assessment prepared on this. And I can't imagine that they're going to push forward with developing a new reprocessing technique by Savannah River National Lab without doing assessment on the proliferation risk of this new reprocessing technology.

And I think it falls within your purview to ask more questions about that. To me that's the biggest proliferation risk involved with the German material. Until about 2011, it was always planned to be disposed of in Germany. There was no proliferation concerns raised. It was a hard-to-manage fuel, hard to remove the uranium. But all of a sudden in 2011, there was a move to get the fuel here.

One of the local members of the Citizens for

Nuclear Technology, when this was reported that it's a billion dollar deal, people in Germany, even in the government and at the site were wondering where that figure--at site where the fuel was stored, wondering where that figure had come from. With a billion dollars the Germans could go a long ways towards disposing of that material in their country. And it's illegal to export commercial spent fuel. So they tried to redefine the reactor, only in the last two years, not 25 years ago when it was operating as a research reactor.

Anyway, this is a controversial issue, and you may hear more about it. But just to conclude, I want to thank you for raising some questions about the Spent Nuclear Fuel Corporate Board and pushing to make sure that it operates in daylight, that the public has a role, that all the documents are made public, that the minutes are made public, that there be some kind of mechanism for the public to formally participate in the meetings. And I haven't heard anything about that at all, so your support on that front is very much appreciated. Thank you very much.

EWING: Okay. Thank you.

Next is Karen Patterson.

PATTERSON: Thanks. I'm Karen Patterson. I am chair of the South Carolina Governor's Nuclear Advisory Council. So as you probably know--louder?

EWING: Get up close.

PATTERSON: Can I, like, get in closer?

EWING: Yeah.

PATTERSON: Okay. I'll start over.

I'm Karen Patterson. I'm chairman of the South Carolina Governor's Nuclear Advisory Council. As you probably know, there's a lot of nuclear facilities in South Carolina besides the SRS. Our role is to provide the--primarily the Governor, but the government advice and recommendations on the nuclear issues that we're facing in this state.

Now, the advantage of being a member of the public and being able to make public comments is I don't necessarily have to stick to comments that are relevant to the board I'm speaking to. So my comments are mostly addressed to DOE. But not directly addressed to your charter, but I believe you would have--the technical review boards would have an important role in the things I'm going to talk about. So what I really want to talk about is what we fund, we being the taxpayers, the citizen of the United States.

Dr. Turinsky asked Mr. Rhoderick how you address limitations to funding. And Mr. Rhoderick replied, "We relook at authorities and compliance agreements." He didn't say we relook at technical programs, but I'm sure in a more elaborate answer, he would have included that.

What I'm not aware of DOE doing is looking closely at the costs of some of these programs. From here on out I think we'd all agree that the funding is going to be difficult. We're not going to get the funding--nobody is going to get the funding that they would hope. I think all of us, the public, the regulators, DOE, the contractors all need to stop hoping that we're going to drive an Acura and face the fact that we're going to be driving Hondas. So I would appreciate DOE taking an organized look at the technical programs, what is really necessary to do it safely and officially versus what they would like--the bells and the whistles that would be nice, but they don't necessarily have to have.

And I think if they do that, back to y'all's role, this is where technical boards like you could help. So as you probably know, the DOE published their commingling report last week, and there was a suggestion that they look at boreholes. But a relook at--if you've been around as long as I have, they would be relooking at borehole disposal. Should we spend precious dollars looking at a borehole demonstration program? Is that worth the money it would cost given our limited funding?

And again, with apologies to Mr. Rhoderick, I don't know if he's still here, but when being a cynic or having grown cynical over the years, when I heard him talk about that Corporate Spent Fuel Review Board, all I could think was this was another study which means another way to delay decisions and delay actually processing what we need to get processed.

So we split the atom in the late 1930's, and seven years later we dropped the bomb, two bombs. We need that kind of urgency in this country to get rid of the wastes that were generated in the Cold War. So as a member of the public, I'd like to see DOE focus their limited funds in processing and on those remaining studies that we need to execute the plans that are already in place. And I'd like DOE to ask for independent, outside, technical input to those decisions.

So thank y'all very much for the work you do. Thank you for coming. I hope you've enjoyed the Savannah River Site. It's really a very interesting place. Thank you.

EWING: All right. Thank you very much.

Next speaker is Rick McLeod.

MCLEOD: I'm Rick McLeod. I'm with the SRS Community Reuse Organization. And I will not--like as Karen, I'm not going to overstep my bounds on y'all's charter since you cannot talk about budgets and you cannot talk about regulatory issues. But hopefully, you do realize that the two do connect, and what we get done on a technical basis depends on those two.

So what I do want to refer you back to is Maxcine's chart. And even my Clemson engineering degree on mass balances in and outs, I kind of did a quick analysis on that, and it appears after the campaign of the thousand bundles, we're still going to be 90 percent full in L-Basin.

So my recommendation to the Board is can you not ask the site several questions, one being what is the technical basis? Can we process--how much fuel can be processed through L-Basin in the current configuration if, hypothetically, money and the RODs for getting it done were complete?

And then another question as you saw at the site when you toured it, the connectability between the different processes, if you were to process all the fuel in L-Basin over some period of time, what impact does that have on the tank farms? What impact does that have on DWPF and the canister production?

So my recommendation to the Board is to ask DOE is what is a deinventory plan for L-Basin? Like me, it's not getting any younger, and I can't do some things I used to do. And I'm sure H-Canyon may be moving in that role as we grow older and older. We have a 50-year horizon on the L-Basin. So again, why aren't we utilizing that facility to the maximum capability that it is?

So my recommendation to the Board is why aren't we asking for deinventory plan? What would it take? It would involve dollars, but it would also involve EIS's to remove the additional bundles that are in L-Basin. Thank you.

EWING: Okay. Thank you.

Any additional comments from the public?

LAWLESS: I thought I had signed up.

EWING: Okay. I don't have you. But please.

LAWLESS: Sure.

EWING: And identify yourself.

LAWLESS: My name is Bill Lawless. I'm a citizen of Augusta. I teach at Paine College. A little bit about my history, I blew the whistle on the Department of Energy 31 years ago for mismanagement of nuclear waste throughout the Department of Energy complex, primarily at the Savannah River Site.

After I got my Ph.D. in 1992, the Department of Energy invited me to join the Citizens Advisory Board. And we had great success. I'd like to contradict the first speaker from the League of Women Voters, I don't recall her name. She says nothing ever leaves the Savannah River Site. Actually, we've had great success in removing almost all of the legacy transuranics to the WIPP facility in New Mexico. And I understand that the last residual amounts are packed and ready to go pending funding.

I was also the technical adviser on the Savannah River Site Citizens Advisory Board twice. I noticed about three years ago, after I followed Tom Clements in his talk, Tom Clements at that time was vociferously opposed to the closing of Tanks 18 and 19. Now today I see that he's joined the bandwagon and wants to close all of the tanks as expeditiously as possible under the regulatory guidelines.

Of course, closing the tanks once they're cleaned is not important. It would be nice to close the tanks were the money there, but once the tank's cleaned, all of the risk is gone, virtually all of the risk. So I think that that has to be balanced against the budgetary funds that--the monies that are available.

I'm sorry I missed your presentations this morning. I was having dental work, and I'm sorry I can't stay this afternoon. I have to fly to Washington, D.C. to give a presentation. Here are my comments for today.

We saw the Savannah River--I can't remember, SRR, Savannah River Remediation or something like that. I was hired in 2009 expressly to speed up the production of high-level waste, vitrified high-level waste cans. They had projected 300 initially cans and then 400 cans, and now they're down to 100 cans. And I hope they don't go any lower. I'm really concerned about the production of vitrified high-level waste cans. You should be too, and all citizens should be.

As I said, most of the legacy transuranic waste has left the Savannah River Site. Our Citizens Advisory Board at the time, being a leader in pushing the acceleration of the waste cleanup at the Savannah River Site, did everything it could to see that WIPP was open. And I even testified to open up WIPP. I'd like to see WIPP reopened as soon as possible, and I'd like to see the vitrified high-level waste stored at the Savannah River Site be sent to WIPP. I know that's under consideration.

As I understand it, from a technical standpoint, radiation levels aside, that the transuranics in the vitrified high-level waste cans are no more out of the line of criteria than the existing transuranic waste we've already sent to WIPP. So it makes sense from a technical perspective.

If you start sending vitrified high-level waste cans to New Mexico, you will not need to build as large of a glass waste storage building number 3 here at the Savannah River Site. They're already talking about just building a pad. I would hope that we could even get rid of some of those notions if we just start sending the vitrified high-level waste away as soon as possible.

I understand from news accounts that if the Republicans take over from the Democrats in the Senate that there will be an attempt to reopen Yucca Mountain. I think that's laudable. I certainly support it. I'm not sure that it will be as timely as opening up WIPP. I think WIPP is a better option.

In my opinion, the Savannah River Site Citizens Advisory Board has become dysfunctional. You heard Tom saying how much support there is, 16-0 is the number I think that he gave. The Savannah River Site Citizens Advisory Board seems to be to be more interested in transmutation than anything else.

I recommend that we take the German fuel, the spent nuclear fuel and any other spent nuclear fuel that we can bring here to the Savannah River Site. We have the tools. We have the technology. We have the equipment. We have the people to do the job, and we can do it safely.

I do not blame the Savannah River Site's CAB for becoming dysfunctional nor its leadership; I blame the Department of Energy. I don't know if you can help here, but the Department of Energy has seen fit to make sure that there is very little technical expertise in the citizens that are on the board. And they're off after six years just about the time that they've got enough know-how about the materials that are going on. And by the time they understand what happening, they're gone. So I think that something could be done there.

I'm open to any questions. There being--

EWING: We don't--

LAWLESS: All right. Thank you.

EWING: --ask questions, but we appreciate your comments.

LAWLESS: Sure.

EWING: So thanks.

Any other comments from the public? Okay.

SPINELLI: My name is Nina Spinelli, and I'm a member of the Citizens Advisory Board, but I'm speaking today just as a member of the public. I do want to thank DOE for all the work they put into the presentations that they give us, both at our local committee meetings and the full board meetings.

I'm one of the few members of the board that does not come with a scientific background. I'm a social worker. So I do agree that by the time you do feel like you have a footing, your six years is up pretty quickly. But I do appreciate the input and feedback that DOE gives us.

My comment today, if I can read my own horrible scribble, is as we talked about earlier, in March of 2013 we heard that there are going to be a thousand bundles of spent nuclear fuel. And in the reports that have come out that I've read, there are those four disposition pads: dry storage, wet storage, the alternatives for it. And in all of the reports that I've read, when the alternatives have been discussed is what to do with the bundles.

They all agree that a final repository will need to be in existence by 2048. And so one of the goals in our recommendations from the CAB is to really understand the long-term goal and placement for the bundles and for the fuel at SRS. Thank you.

EWING: All right. Thank you very much.

Any additional public comments? All right. So this marks the end of this morning's session. I want to thank all of the speakers from Savannah River. And also want to thank the members of the public who provided us with their comments.

We'll reconvene after lunch at 1:15. So we're done. Thanks.

(Whereupon, a lunch recess was taken.)

AFTERNOON SESSION

EWING: Please take your seats. We'll start in just a few moments.

(Pause.)

All right, if you could take your seats, I'd like to begin the afternoon session.

And just a gentle reminder from the AV staff. When you are speaking into a microphone, please speak loudly, stand close to the microphone, and also always identify yourself.

We'll open this afternoon's presentations with a presentation from Jonathan Bricker on the vitrification of high-level waste, the Defense Waste Processing Facility operating history and plan.

BRICKER: Thank you, Rod.

As was mentioned, my name is Jonathan Bricker, and I am going to provide operating history, current status, and planned improvements of high-level waste processing at the Defense Waste Processing Facility at Savannah River Site.

The agenda for this afternoon includes an overview of the Defense Waste Processing Facility as well as an update on the current status of operations since the last time we met in April of 2013 in Richland. And then additionally, as reflected on the agenda, the Board had specific questions related to the status of modifications to improve production rates; so I will discuss improvements already implemented in the facility as well as the status of ongoing improvements. Then I'll close and take any questions you have.

So this is a high-level pictorial of the liquid waste system. Currently we have 45 tanks remaining with 37 million gallons of waste left. The sludge component comprises about 8 percent of the volume and about 50 percent of the total curies. That gets sent to DWPF. We also process by-products from the Salt Waste Processing Facility. We currently do this by way of the Actinide Removal Process and the Modular Caustic Side Solvent Extraction Unit, and in the future we'll do this on a scaled-up version of the Salt Waste Processing Facility. And, of course, the output is a durable borosilicate glass waste form.

So this afternoon we'll discuss how the scale-up from ARP/MCU to SWPF impacts DWPF, so I'll cover the processing side. You'll hear from Mr. Hill and Dr. Peeler, who will discuss other aspects of SWPF integration, how it impacts system planning as well as glass formulation, and then Brenda Green will discuss options for canister storage.

The Defense Waste Processing Facility can really be broken down into three main steps; that's batch preparation, melter operations, and canister storage and handling. Prior to receiving sludge from the tank farm, we prepare and qualify the sludge in a dedicated one-million-gallon feed tank. The preparation process includes bulk waste removal as well as sludge washing to remove any of the soluble salts. We then qualify the batch. Part of the qualification process, which is well laid out, is ensuring that the sludge batch is acceptable in terms of our waste acceptance criteria. We go through a frit selection process, we ensure that the glass product is acceptable, and then we also go through our analytical techniques to make sure we can process the sludge.

Once it’s prepared and qualified, it then gets transferred to a dedicated one-million-gallon feed tank before coming to the Defense Waste Processing Facility. The first processing vessel it reaches is the sludge receipt and adjustment tank. As I mentioned earlier, we also receive by-products from Salt Waste Processing, specifically a cesium-rich strip-effluent stream, as well as an actinide-rich solid stream from the actinide removal process.

We chemically adjust the sludge in the SRAT by adding formic acid and nitric acid. We do this for three primary reasons. One is to remove mercury from the process before it makes its way to the melter; also to adjust the reduction oxidation state prior to melter operations; and then lastly to adjust the radiological properties.

We then concentrate the material; it gets transferred over to the slurry mix evaporator. In the slurry mix evaporator it continues to get concentrated, and this is where we add our glass formers by way of frit. We do this through two different methods. One is a direct frit addition; the other is an addition from decon frit water addition. So on the back end of our process we decontaminate our canisters with a dilute mixture of frit and water. That material is recycled back into the process, so we credit that frit.

After concentration we pull a sample in the slurry mix evaporator. That's a very important point in the process. It's a hold point where we make sure the glass is acceptable.

So our strategy at Savannah River Site is to utilize a statistical process control methodology versus a product quality control methodology. And so we actually utilize the elemental compositions and relate it to the glass properties before transferring it on to the next feed tank.

Once we've determined that the glass will be acceptable, we then transfer it to the melter feed tank. This represents a transition in the process from a batch process to a continuous process as the melter feed tank continuously processes the--feeds the melter--sorry.

The melter is a joule-heated melter. It has a set of upper as well as lower electrodes. We did outfit the melter--which I'll talk about in a little bit--with four bubblers to improve convection. And a little bit later on Dan Iverson will give you a little bit more details about the design of the melter and how it differs from the WTP high-level waste and LAW melters.

The portion that I don’t show here that’s equally important is the canister handling and storage. We talked a little bit about that in the morning session. This includes the temporary plug, the leak inspections, the decontamination that I referred to earlier, the permanent plug in the welding, and then the transfer to the Glass Waste Storage Building.

So all of this works together to produce a highly durable borosilicate glass waste form.

So the Defense Waste Processing Facility is the world’s largest operating high-level waste plant. We commenced radioactive operations in 1996. We are currently processing Sludge Batch 8. We have processed about 4 million gallons of high-level waste, which corresponds to 3,800 canisters filled or 15 million pounds of glass, which corresponds to about 55 million curies immobilized. And just to give you an idea as to where this stands in the liquid waste plan and the mission, the original plan is to produce about 8,500 canisters. So we’re about halfway through our mission.

So to make all the glass and to support upcoming demands on the facility, a number of initiatives were kicked off several years ago to increase flexibility in the facility and throughput in the facility to accommodate incoming streams. And these are broken down into short-term improvements that have already been implemented as well as longer-term initiatives that the Board specifically asked about.

So I'd like to go over the short-term improvements that have already been implemented. So the increase in DWPF throughput and flexibility is really required to accommodate salt processing. Recall that, in addition to sludge, the facility processes by-products from salt processing. This presents a number of challenges even today with processing ARP/MCU and further challenges when we process larger-scaled by-products from Salt Waste Processing Facility.

A couple examples of this is the coordination between facilities. Obviously any unplanned downtime in DWPF affects the Salt Waste Processing Facility. We're very sensitive to that, because we are an aging facility. Recycle management is also important to us, as a lot of the streams that come to us as by-products are very dilute streams. They have to be boiled off and managed in the Defense Waste Processing Facility. And, lastly, the impact to glass formulation, which we talked about earlier.

So I'll focus on the operational challenges in this section of the talk. So generically, as I mentioned earlier, the process can be broken down into three major steps: the batch preparation process, the melter, and the canister handling and storage. So prior to 2010 the capability of the facility was around 225 canisters per year. What's not shown here is canister handling and storage, because that was not the bottleneck. So that particular portion of the cycle is able to handle closer to 400 canisters per year.

Around that time frame we implemented melter bubblers, which I'll talk about. That shifted the burden to the batch prep. You're only as fast as your slowest step. So I'll talk about some recent improvements we've made in that area to kind of bridge the gap between batch prep and the DWPF melter. But regardless of the impetus, the goal is to maximize waste throughput to reduce environmental risk.

So the DWPF melters, obviously the goal here is to bubble gas into the bottom of the melt pool. As the bubbles rise and expand through the melt pool, they increase melt pool convection. So, as opposed to just natural convection from thermal gradients, you actually get a forced convection in the melt pool. This increases melt rate.

What's interesting about this is we implemented the design in 2010 and solvent design implemented in 2010. And what we actually did is we retrofitted the existing melter design with the melter bubblers. This required rearrangement of a lot of the top head components to allow the placement of four bubblers into the melt pool, and since then we've seen approximately a 50 percent increase in the melt rate observed.

So, as I mentioned earlier, this actually shifted the rate-limiting step to the DWPF batch prep portion of the process. And although there are longer terms that the Board specifically asked about, I wanted to hit very quickly upon some shorter-term actions that we've already implemented.

So the batch preparation is a little bit more complicated. If you were to break down the pertinent process into discrete steps, you'd find that a significant portion of the process time is dedicated to concentration in each of the vessels shown here in the SRAT and here in the SME. Those are really the goals for the longer-term initiatives that the Board asked about. So in the short term in the 2010 time frame we really concentrated on the analytical portion of the cycle for both the SRAT and the SME.

And the goal, really, here in this case was to increase the production capacity of the facility through innovative yet simple solutions in the batch preparation process. So, really, we're looking at things that are efficient and cost-effective, all of this in parallel with working the longer-term initiatives.

So a couple examples I wanted to share with you, the first of which is additional sludge transfer from the tank farm. And, really, this manifests itself as a maximization of processing volume. So no matter what your cycle time is through the SRAT or the SME, you're trying to maximize the amount of material you process each time you process it through those vessels. And, really, the impetus for this particular change was the addition of the salt waste processing streams, which prompted us to concentrate in the middle of sludge transfers to allow us to take up a third transfer.

The second bullet is a simplified blend strategy. Really, what I mean by this is a sample-and-send-type strategy. And here what we do is we reassess the processing risks and utilize process control versus process validation to ensure that our processing goals are met. And, specifically, we implemented this on the SRAT processing; so in the past we used to pull a sample at the end of SRAT processing, wait on results for that sample, and then transfer once it's been validated to the SME. Now we pull the sample, transfer it to the SME, begin processing in the SME, and then do our batch calculations. That saves quite a bit of savings for very little money.

The last one that I think is worth mentioning is streamlined facility interface. And here it's, again, a simple streamlined approach using existing tools, procedures, as well as newer technology to streamline the process. And this is using--building in that interface between engineering and operations into procedures and web applications.

The one modification that we did make on the batch preparation side, which you guys may be familiar with, is we moved to an ISOLOK® sampler, which is similar to what WTP proposes to use. The old sampler is a Hydragard sampler, so what they would do is, in any given vessel, any different scenario, we'd have to take about 20 to 30 peanut vials worth of sampling material. For each one of those, what they would do is they would use a manipulator to turn a handle, extending a plunger into the stream. That would then divert a portion of the stream through the peanut vial. Any excess as the peanut vial overflowed would be directed back to the recycle stream, very intensive on the manipulators, obviously impactive to the recycle stream.

So what we moved to was an ISOLOK® sampler system. This is a pneumatic system, a piston-driven system, in which you extend a spool piece into the sample stream, it collects a predetermined sample size, pulls it back into the stream, and deposits it into the peanut vial. Here there's a lot of advantages, one of which is the flexibility of the size of the samples, just a simple swap-out of the spool piece.

That's important because the sample size dictates how long some of the analytical techniques take, for example drying time for the samples; it eliminates recycle waste; there is no stream that returns back to the recycle system; it’s commercially available; and obviously the biggest thing for us probably was the impact on reliability. So you reduce equipment wear and fatigue.

So the result of all these short-term improvements is depicted here where we plot the number of discrete canisters poured as a function of the fiscal year. Again, as I mentioned, a lot of these were implemented late in 2010; and you can see the response in production in FY11 and 12 where we saw record production, specifically in FY12, the 275 canisters. So it gives you an idea as to the capability of the current setup.

And then I’d also like to point out, although it’s maybe not important to this discussion, is that we also increased waste loading. So you’re not only producing more canisters, but you’re putting more waste in each can.

We did see a reduction in production in FY13 due to some reliability issues. Once we got past those issues, we actually had a record month in August of 2013 where we produced 40 canisters. So I’ll talk a little bit about that in the next slide. And in FY14 we reduced production to align with system objectives.

So, as I mentioned, in early 2013, late 2012, we ran into some reliability issues in the facility. It is an aging facility. In response to that, we contracted an independent review team to review our practices and provide recommendations. This review team consisted of a representative from SRNL, SRR, URS, Areva, EnergySolutions, as well as individuals from WTP and Sellafield. And, really, their scope included not just engineering, maintenance operations, our daily business, and spanned both DWPF and 512-S, which is our actinide removal process, our filtration process downstream of that.

And, really, they came up with a lot of recommendations related to our maintenance practices, our canyon equipment, our housekeeping. What I list here are mainly some of the technical recommendations that they made. I'll summarize these, really, in three main areas, the first of which is refinement of the flowsheet and gaining a better understanding of the flowsheet so that you can optimize the flowsheet and take advantage of the flowsheet.

The second is improvement to reliability, so the system health is a good example. The process vessel vent cleanup plan is another good example. And then, lastly, reinforcement of some of the longer-term improvements that the Board asked about and we'll talk about in the next few slides. All of these focus areas, as well as all of the secondary areas, are currently being addressed, and an improvement plan has been developed to address them all.

Some of the longer-term improvements, there is obviously a growing need to provide additional flexibility to accommodate variability in the SRR System Plan; and this can be by way of waste feed compositions or input streams, specifically Salt Waste Processing Facility.

So, as you recall, following the short-term improvements to the batch preparation process as well as the melter process, our maximum throughput corresponded to approximately 325 canisters per year. With the bottleneck still in the batch preparation process, the longer-term improvements really address bridging this gap between the batch preparation process and the melter process; and that’s what we’ll talk about in the next few slides.

Probably the most impactive of these improvements is the alternate reductant task. As I mentioned earlier, we chemically adjust the incoming sludge by adding formic and nitric acids. The issue with formic acid is that it decomposes catalytically in the presence of noble metals. That presents a problem with us. It’s something we have to purge for in our vessels.

So, really, the goal for the alternate reductant task is to replace formic acid or reduce formic acid with an alternate reductant to reduce that catalytic hydrogen generation, and I’ll talk about what that buys us here in a minute. And, really, at a higher level it buys us operability and flexibility during the batch preparation process to allow that bridge between the melter process and the batch preparation process.

A couple of the operational benefits of note is it does eliminate a formic acid hazard for us on site and the associated response actions with that hazard. It does allow for the adjustment of rheological properties for potentially higher solids content. We talked about the ability to move as much of the waste as we can during each of the processing in the process vessels. The biggest thing it probably buys us is reduced CPC off gas production. This allows us to reduce the purge, increase the steam rate, and decrease the flammability hazard again in the process vessels.

The alternate reductant task was really broken down early on into three phases. The first phase was the feasibility phase. That phase is complete. During the feasibility phase we identified the alternate reductant. We decided to move to glycolic acid. We looked at a range--SRNL looked at a range of acidic and non-acidic reductants, and we down-selected glycolic acid for a number of reasons, primarily because it achieves all of the same things formic acid does without the catalytic hydrogen generation.

Phase 2 was the targeted testing utilizing a variety of simulants at a variety of different scales. We are currently about 80 percent complete with the initial scope. There are some recommendations that came out of that work that will probably push that work into the next six to nine months, and maybe next summer we'll be done with Phase 2. And then there are a couple of options for moving into Phase 3, which is implementation. We're targeting implementation around the summer of 2016-2017 time frame.

Two others that I'd like to talk about, one of which is the dry frit addition. Currently we--we would like to replace the current slurry-fed transfer design with a dry phase conveying system. So currently we transfer a bulk of our frit in a slurry of about 40 weight percent, so there's a lot of water that needs to be boiled off, and specifically about 2,000 gallons of water for each frit addition that's made. Typically we make two frit additions per SME batch.

This represents about 5 percent of the overall water return to the tank farm, so it's a benefit to the tank farm, the tank farm evaporators, and the overall liquid waste plan. And it also corresponds to a cycle time reduction potentially of about 7 percent, which is a big deal for us. Currently where we're at with that is, the technology has been identified; we have completed the feasibility study; and the conceptual design is complete.

The last one is the cesium-rich stream to the slurry mix evaporator. Currently we only have the capability of adding the strip-effluent stream to the SRAT process.

We’d like to be able to have the opportunity to either add it to the SRAT process or the SME process. And obviously this expands the operational flexibility to allow the disposition of those by-products to either vessel. The benefit is obviously you leverage the reduction in water in the slurry mix evaporator from the dry frit addition task to be able to add more capability there in the slurry mix evaporator. And currently we’re undergoing design and testing of the slurry mix evaporator, the SEP to SME modification.

So, in conclusion, we’ve been working since 2010--really, earlier than that--in identifying improvement to the Defense Waste Processing Facility in anticipation of receiving by-products from Salt Waste Processing Facility. Optimization of the melter feed preparation system was performed through innovative yet simple process alterations. We did see record production in 2011 and 2012 as well as the month of August in 2013. And then we were really reliability and system alignment focused in 2013 and 2014, hence the decrease in canister production. The longer-term projects were aimed at bridging that gap between the melter and the batch preparation portions of our process.

So, with that, I’ll conclude and take any questions you have.

EWING: Okay, thank you very much.

Questions from the Board? Mary Lou.

ZOBACK: Mary Lou Zoback, Board. Right at the end of your talk, particularly the last two long-term improvements you described, Slide--I can't read it--17--both of them seemed to make a lot of sense in terms of increasing the efficiency, but both require new capital equipment; right?

BRICKER: Well, the alternate reductant, they do. The alternate reductant requires very, very little capital equipment. We have--

ZOBACK: Yeah, I'm talking about the other two.

BRICKER: Yes, ma'am, that's correct, specifically the dry frit addition does.

ZOBACK: Okay. So in order to make those two improvements, what's the cost relative to the overall operating cost of this facility? Is it one percent of the cost? Is it 40 percent of the annual operating cost?

BRICKER: I don't have a really good feel as a percentage for the cost for that particular project.

ZOBACK: Do you know what the operating cost is for the facility annual? Anybody?

(Pause.)

RILEY: The annual operating cost for DWPF is about $100 million.

ZOBACK: 100 million. And these two additional pieces of equipment?

BRICKER: I don't know--I don't think--so if we kind of walk through the scope for the dry frit addition, it requires a Butler building, some new pieces of equipment. I can't imagine--you know, we're probably in the one to three percent range to implement.

The other one for the cesium stream to the slurry mix evaporator, you know, we're talking about a jumper or two, so it's very, very low cost.

ZOBACK: A jumper?

BRICKER: Uh-huh.

ZOBACK: I don't know what--

BRICKER: Piping, some piping. It's just re-routing some piping.

ZOBACK: Okay. Okay.

BRICKER: That's correct.

ZOBACK: Okay. So relatively small impact in terms of--

BRICKER: I believe so; that's right.

ZOBACK: Okay, thank you.

EWING: Efi?

FOUFOULA: Efi Foufoula, Board. Along the same lines, you mentioned utilizing process control versus process validation, and this is a very important concept in an engineering modification to improve production. So does this also involve different sensors?

BRICKER: Different sensors?

FOUFOULA: Yeah.

BRICKER: No. In relation to the slurry mix evaporator and how we ensure that we're going to make the glass, is that the question?

FOUFOULA: I mean, it's a different concept to the validation--

BRICKER: Right.

FOUFOULA: --versus control during the process.

BRICKER: Right, right. No, in this case all we're doing is we've developed models which relate the composition of the material in the slurry mix evaporator to the glass properties. And so it's all model-based.

FOUFOULA: Oh, it's all model-based.

BRICKER: That's right.

FOUFOULA: Okay, thank you.

EWING: Rod Ewing, Board. To follow up on that, I understand you use process control for quality assurance, but do you ever take samples of poured--

BRICKER: We do.

EWING: --glass, and how do you take those samples?

BRICKER: We do. In between canisters we collect pour stream samples while we're processing. Those are packages sent up to SRNL for analysis.

EWING: But, of course, one of the properties that's of interest is, say, the degree of crystallinity of the glass, which would be different if you take a small sample of the melt as compared to the larger amount of melt in the canister; right?

BRICKER: Yeah, that's correct.

EWING: So how would you confirm the degree of crystallinity?

BRICKER: I'd have to defer--

PEELER: David Peeler, Savannah River National Lab. Rod, could I ask you to repeat your question? I'm sorry.

EWING: So, you know, just thinking about process control versus product control where you actually take a sample--and I realize it's difficult to take samples as you pour the glass into the canister--but there are properties such as the degree of crystallinity--

PEELER: Correct.

EWING: --which are of interest and, I think, part of the qualification process. So how is that done?

PEELER: One of our--Jonathan described our process control system, which is an integrated set of models, the composition of the melter feed to the glass properties. One of those models is a liquidus temperature, which is related to crystallization. DWPF operates with the strategy with respect to crystallization that we're going to minimize or avoid the crystallization within the melt pool.

So what we do is we set--our liquidus temperature model will actually predict a liquidus temperature value.

The nominal operating temperature of the melter is at 1150. We put a hundred-degree safety factor on that liquidus or that nominal melt pool temperature. So now I'm down to 1050. And our liquidus prediction can't be above 1050 without uncertainties being added. So when we process, we are very confident that we have very little, if any, crystallization within the melt pool. We pull the pour stream samples, we can actually send those for x-ray refraction, and we'll get an amorphous glass with no crystallization.

Did that answer your question?

EWING: That's the answer that I thought I would get, but I would just point out that the amount of crystallinity depends on the thermal history of the sample.

PEELER: Correct.

EWING: Of course, the thermal history of the glass poured into these large canisters is different than a small sample that you take.

PEELER: Yes. So the liquidus model is related to the melter itself.

EWING: Right. Right.

PEELER: One of the crystallizations in the--if we get crystallization in the canister, a spinel formation, there's been historical work that shows that it has no negative impact on durability. One of the crystals that we're concerned about in the canister is nepheline, which is a high-aluminum-high-sodium. And that can actually form on the center line of that canister as it's being cooled slower than the external portions, and that will have a very negative impact on the durability of the product.

And, actually, as part of that process control strategy, we have a nepheline discriminator to keep us out of that compositional space (inaudible) that would form nepheline on a slow-cooled glass.

EWING: Okay, thank you.

Other questions? Jerry.

FRANKEL: Jerry Frankel, Board. I'm sorry that I wasn't able to join the tour yesterday, but I recall from a visit about five years ago that you periodically replace the ceramic spout in the melter. And I'm curious about the reliability of the other system components. So you've been operating this plant for almost 20 years, and you are actually increasing the solids content in some of your process streams. So how is it holding up? Are there erosion problems? Are there corrosion problems? Have you had to replace large parts of it? Are you able in your waste acceptance criteria to control things so that you don't have these problems?

BRICKER: Yeah, I think the programs that we have in place have done a pretty good job over the years. Now, I did mention we did have a reliability team come out and provide us with some recommendations, and we did spend a bulk of this year really looking at asset management and infrastructure upgrades--so pumps. We did not do anything on the melter side. The melter design is designed to last for two years. I think this one has been in place for 11 years. And so it's been very robust. The design has been very robust.

That's not to say we don't have our issues. We do. And we're revamping our system health program to be able to help us through that, and it will become more important as we become integrated with Salt Waste Processing Facility. But for the most part I think the degradation that we've seen is expected, and we are addressing it as it arises.

FRANKEL: So you do replace components, pipes, and vessels? Vessels have been replaced?

BRICKER: We have replaced a SME vessel years ago that wore a hole in it. That was in 2006 time frame-ish, maybe earlier, 2004. But, other than that, no, everything has been minor in terms of having to replace things.

FRANKEL: How do you assess the need? Is there any non-destructive evaluation to know if there are thinning walls or--

BRICKER: Yeah, we do some of that. We have planned outages where we'll take apart equipment and inspect it, and we'll do it in run-in tanks. We do a number of different functional checks on the systems that are in place. We also do that through the system health program that we have in place that allows us to evaluate mean time to failure. So there's a number of different things that are in place to kind of help us identify what needs to be replaced when.

FRANKEL: So you don't see any concerns with operating the plant for another, whatever, 40 years or--

BRICKER: We don't think so. If we continue to take the approach that we have of really paying attention to planned outages and asset preservation, we don't believe so.

FRANKEL: As part of my interest here is the WTP, you know, could you see operating in a black cell environment?

BRICKER: I can't comment on their design. I can tell you that our design is robust, and it's worked for us.

EWING: Very diplomatic. Other questions from the Board? Sue?

BRANTLEY: These are just simple questions to see if I've got it right.

BRICKER: Okay.

BRANTLEY: You talked about some improvements that you could envision or that your team is thinking about for the DWPF, but ultimately you have to slow down right now or going into the near future because you're running out of room for your canisters; is that correct?

BRICKER: There are a number of reasons why we slowed for this year. Currently we don't have an issue with Glass

Waste Storage Building. This year we did not. We are addressing that. Brenda Green will address how we're looking at expanding that capability.

There are a number of things--Pete Hill will also talk about the integration with SWPF, so the more canisters that we produce now, the less canisters we have to accommodate salt, so the number of things that go into the reason why we don't produce canisters at as high a throughput as we used to.

BRANTLEY: But, I mean, ultimately you're running out of space for the product from the DWPF.

BRICKER: That's correct. That's correct.

BRANTLEY: And so what you talked to us about was some ideas for making your process faster, which would be great if you don't run out of room for your canisters.

BRICKER: That's correct. That's correct. They go hand in hand. That's correct.

BRANTLEY: So that was the first thing. The second thing was--and I may have gotten mixed up, but yesterday I thought we were told that you had to have some kind of balance between the salt and the sludge or whatever and that you were running out of sludge also. Did I get that right?

BRICKER: Well, it's kind of going back to my earlier explanation, hence the reason why we--part of the reason why we slowed down 2013 to make sure that we have sludge, because, really, we can now pace salt processing right now.

BRANTLEY: So you are running out of sludge?

HILL: I'll cover that in my presentation.

BRANTLEY: Okay, all right, that's good.

EWING: Other questions from the Board? Staff? Dan?

OGG: Dan Ogg with the Board staff. You talked about a number of potential improvements to address potentially improving throughput or addressing hazards, for example, due to the formic acid. When you consider these improvements, are you looking also at life cycle impacts and, say, the total number of glass canisters produced? Is that a criterion--

BRICKER: Oh, absolutely.

OGG: --that you use to minimize the total number of glass canisters?

BRICKER: Absolutely.

EWING: Other questions from the Board?

ZOBACK: Mary Lou Zoback, Board. Just a follow-up to Sue's question where she was asking about the limiting factor. I thought you said running out of canisters. You're not running out of canisters. You're--

BRICKER: No, storage, storage. I'm sorry.

ZOBACK: Storage. Okay. I wanted to be sure that was what--

BRICKER: Yes, correct. Thank you.

EWING: Any additional questions from staff? Board?

All right, thank you very much.

BRICKER: Thank you.

EWING: We'll move on to a pair of speakers. The subject will be the start-up of the Salt Waste Processing Facility, and the first speaker is Peter Hill.

HILL: Thank you. I am Pete Hill. I'm the manager of system planning for SRR. I'm going to give just a brief talk on where we are with the current state of the liquid waste system, which kind of tees up Dr. Peeler's talk relative to incorporating SWPF into the vitrification process.

Okay, is that good? Good. Okay.

So Dr. Bricker showed you this slide. And when we talk about system planning, what we do is we model all the waste we have today plus projections for future processing at H Canyon, and we then model that waste compared with the throughputs of the operating facilities. And one of the real important factors is the timing of the start-up of the SWPF; and also, really, the driving input for some of the more recent system plans has been the projected funding profile for the liquid waste system.

And where we are now--so the current system plan that we issued in May is Rev 19 of the Liquid Waste System Plan. One of the ultimate driving inputs for development of Rev 19 was projecting potential outcomes given a funding profile that was relatively flat based on FY14 funding. And looking here, this is a table out of Rev 19. The top two lines are just indications of when the waste tanks that don't have full secondary containment--when they would be bulk waste removal complete, that's the top line, and finally closed, line 2032.

The ones that I wanted to call out are this middle section, and it kind of goes back to the question about why aren't we pouring canisters faster. Our projections indicate that the bulk of the sludge in the waste tanks we'll have removed by 2030. And by the bulk of the sludge, that means for those sludge tanks we've removed the sludge down to about five, six inches in the tank; so the tanks are about 40 feet tall, nominally, 85 feet in diameter, and we've removed the sludge down to the bottom six inches. The sludge above that comes out relatively easy with two or three cycles of operating mixing devices and transferring out, and then after that it becomes more intensive with the water additions, pump operation, etc.

And you can see then that the bulk of the sludge is done in 2030, and the bulk of the salt is done in 2033. And by the bulk of the salt, that means that we've added liquid and dissolved the salts that are readily dissolvable, and you're left with a heel of insoluble material. Some of that is sludge; some of it is things that are precipitated out during the dissolution process like aluminum hydroxide. And so then you're left with a small heel in the salt tanks, which also then has to be removed similar to the sludge tanks with large mixing devices; and it takes a while.

So the key thing there then is that three years before we're done processing the bulk of the salt, we've completed processing the bulk of the sludge. Those heels that I've talked about take several more years, so 2039 we've completed getting all of the heel waste out of the tanks.

Some other items of interest, the maximum canister waste loading we assume is 40 weight percent, our nominal max canister productions 276 cans per year. And an important item, I believe, for this Board is that none of the canisters that we've produced have cesium-only waste. While we're removing that heel out of the bottom of the tanks, that contains actinides, strontium, just a broad spectrum of radionuclides. So even though the bulk of the sludge is gone, there still is some sludge in each of the canisters.

And then looking at this, the bars represent the annual salt processing throughput, so you can see here in the current time frame where we're processing with ARP/MCU, you know, that's nominally a million, million and a half gallons of salt processing a year. When SWPF comes online and then reaches full capacity, we're at 9 million gallons per year. So, as Dr. Bricker mentioned in that chemical processing cell, in addition to receiving the sludge and treating that, preparing it to be fed to the melter, we have to incorporate the effluent streams from salt processing, the strip-effluent in the MST solid stream.

So when we get out at full SWPF production, you’ll have about nine times what we have now relative to those inputs. And that, really, then leads into Dr. Peeler’s talk about how do you successfully incorporate those streams into the vitrification process.

And just to aid with that, along the top we’ve laid in when the different sludge batches are being processed, so we’re currently on Sludge Batch 8. And then we have 19 full batches. And then once we get after 2030 we’re processing those heel materials out through 2039.

And so one of the--just kind of a summary of that, and then I’ll open it up for questions, because I’m sure there will be quite a few. Our current projections, based on the funding profile we used for development of Rev 19, was that the bulk of the salt or SWPF will continue processing salt for three years after the bulk of the sludge has been processed.

In order to accommodate the strip-effluent stream from SWPF at the rate of 9 million gallons of salt processing per year, we need to produce about 280 canisters. We’re limited to 15,000 gallons of that strip-effluent per SRAT batch, and that works out to about 280 canisters per year. When we get into the heel removal phase--as I have mentioned, that’s time-consuming, slow--we’re not getting sufficient insoluble material out of those heels to produce canisters at a rate of 280 cans per year.

One of the questions that Dr. Peeler will talk to is simulated sludge. So for our system planning purposes--and we have the product composition models that both Dr. Bricker and Peeler have mentioned, and then we actually take the projected compositions of the sludge batches and the heel batches, and we process that through a couple models called Glassmaker and the PCCS. And in order for us to make those heel batches meet the constraints of the model that exists, we add simulated sludge. That’s done for a couple reasons, not only to meet the glass windows, but we have processing constraints within the tank farm and at DWPF like rheology, some of the higher aluminum materials we have difficulty transferring. So to make our models work, we assume that simulated sludge is added in the tank farm. And that doesn’t necessarily mean it has to be done that way.

New frit formulas, like I said, Dr. Peeler will talk about this. They may reduce or eliminate the need for that simulated sludge, but with the constraint of 15,000 gallons of strip-effluent per SRAT batch, we’re still going to need around 280 canisters per year to accommodate and integrate SWPF into the process.

So that’s all I had to tee up Dr. Peeler’s talk. I’ll open it up to questions.

EWING: All right, let’s move to Dave Peeler’s talk, and then we’ll handle the questions together. We’ll have you sit up front. So thank you very much.

PEELER: Thank you, Mr. Chairman.

As Rod said, my name is David Peeler from Savannah River National Laboratory. I serve as the technical lead on the glass formulation efforts primarily in support of the Defense Waste Processing Facility.

Today, as Pete Hill just mentioned, what I’d like to do is talk about the integration of the SWPF process into the DWPF flowsheet, again, through the eyes that I look through in glass formulation space and what impact it may have or what efforts we need to put in place now to get out in front of the implementation of SWPF so we’re ready for the implementation and the process can be seamlessly transitioned.

You’ve seen this slide a little bit, but this is a little different version to it, again, kind of slanted toward at least my view of it. Jonathan Bricker talked about the feed tank. This would be a sludge batch that’s several feed tanks from the tank farms have been brought into a tank, Tank 40, which is the feed tank to the Defense Waste Processing

Facility, which is basically being outlined here. That feed is then transferred into the SRAT where Jonathan talked about doing some of the chemical processes with formic and nitric acid, again to control redox or steam strip mercury.

If you were to stop there or if I were to stop there and we were to process this sludge over to the SME and to the melter, you will hear me refer to that as a sludge-only process; that is, we're only processing sludge. There is no salt being introduced into the SRAT.

But ultimately we are going to be receiving strip-effluent and MST product from Salt Waste Processing Facility, which will come into the SRAT, and again you will have a certain volume of SWPF product along with sludge coming in. And I'll refer to that as a coupled operations flowsheet, so now we're truly coupled between the tank farms bringing in sludge into the DWPF as well as SWPF bringing strip-effluent and MST into the SRAT.

So from my perspective, my perspective is when we get to the SME, we transition the coupled operations or the sludge in the Salt Waste Processing Facility strip-effluent and MST over to the SME, we add the frit. And your questions that the Board has asked really revolve around can we take or design our frits to accommodate that SWPF product coming in, and can we design the frit such that if the volume of this changes or the volume of SWPF product changes, do we have to make any kind of special adjustments. And that’s what I kind of want to walk you through today and the technical program that we’ve got underway.

So once we’ve added our frit, again, this frit is a tailored frit to match this incoming sludge product as well as the SWPF. We’ve started tailoring the frits because we can fine-tune the frit to take--to lead us to higher waste loadings as well as take advantage of some melt rate that both then contribute to increases in waste throughput for the facility, which ultimately reduce mission life.

Once we’re into the SME, we’ve added our frit. Dr. Bricker talked about pulling the SME samples. This is the integrated set of process control algorithms that we have that predict various glass properties as a function of that composition. So you measure the composition of the SME; you run that composition through the models; it will produce or predict various properties such as viscosity, liquidus temperature, durability; it’ll look at sulfur solubilities and so forth.

And why we want to do that is we want to make sure that the melter feed going into the melter will not only produce or meet our melter constraints such as viscosity or liquidus temperature, but we also make a high-quality product coming out the back end of the facility with respect to product performance in terms of the durability.

So, again, what I would like to do is focus on this portion. Again, this is the compositional knob that I had to adjust to the incoming sludge of the SWPF product in the coupled operations flowsheet to see if we can meet the minimum requirements or the requirements that DWPF is looking to meet such as waste loading.

So some of the key questions from, again, the glass formulation perspective are: What are some of the key changes to some of the key oxide components as we transition from what we're currently processing with ARP/MCU to SWPF, are there significant changes in those oxide concentrations, are there new components coming to us that we haven't accounted for?

Another question is--we've talked a lot about the process control models--are those process control models still going to be applicable or valid in this new compositional space when we bring SWPF online? And we'll talk in a few slides, there's a new glass compositional region that we're going to be dealing with, and we need to fill the gap between what we're currently processing and what we'll be processing with SWPF from an experimental standpoint.

And the last question we'll talk about is: Again, can we design frits--again, tailored frits--to match for each one of those sludge batches that will allow DWPF to hit their operating goals, if you will. Pete Hill talked about the systems plan looking at 40 percent waste loading. When I hear 40 percent waste loading, that really means to me that the frit/sludge combination really has to work between about 36 to 44 percent waste loading to give the facility some operational flexibility, because we don't want to run on the edge, you know, of the waste loading--property failing at the next waste loading point, if you will, so we have to do a lot of remediation.

So we need robustness for that frit to be tolerant to the waste loading intervals as well as all the properties to meet both processing strengths in the melter viscosity, liquidus temperature, several solubility-type issues, as well as the product performance.

The frit also has to be robust in terms of the variation that we see on SRAT-to-SRAT transfer. Even though you have a million-gallon tank that's feeding the facility, you will get some compositional variation as you transfer 11,000 gallons into the SRAT. The variation is very subtle. It's about 7, 7-1/2 percent. So we account for that in terms of our frit development efforts. And we'll talk about that in a second.

As I mentioned, there is a current program, a technical program, underway that's looking at the integration of that SWPF flowsheet into the current operations at the facility. We've done a paper study--and we'll walk through that--that really used Revision 19 of the High-Level Waste Systems Plan that Pete Hill mentioned as the basis for that. In particular, if you look back at his slides, we're looking at Sludge Batches 11 through Sludge Batch 18. Again, that's the sludge processing before the solid or heel removals would be implemented.

We're going to use what we call a paper study assessment. So we have our process control models in place that actually run the facilities. We can use those process control models to our advantage and do paper studies to look into the future basically. We can design frits on paper; we can run our models; we can get compositional projections from the systems planning group; we can marry each sludge batch composition projections with frits, run it through a process control model over a series of waste loadings, and see what these operating windows look like with respect to the ability to target 40 percent waste loading. That was a lot, and we'll go through that in just a second.

One of the things we also again--as I mentioned earlier, we have a--we know that we're going to have a gap, if you will, compositionally from where we're currently processing and where our current models are valid over to where SWPF is going to be processed. And I'll give an example in a minute. One big example is titanium concentration. So we know we're going to have to have an experimental program to fill that compositional gap to make sure that our model can accurately predict in this space; and, if not, we need to revise these models to get in front of that so we can have those new revised models implemented and in place before SWPF comes online.

A couple of assumptions that I need to make sure that I'm pretty clear on is, we are using the current models to kind of predict the future, if you will. I know there's a gap, again, in the titanium concentration; so I'm making the assumption at this point that the models are giving me accurate predictions in the future. That's something that we will come back around and revisit once we go through experimental program, and I'll touch on that a little bit later.

A key assumption to me is this right here; if SWPF will actually meet this WAC limit of 0.7 M sodium, that is total solids. Again, in the next slide or two we'll talk about (inaudible) and the glass formulation space is the sodium management issue. You've got, really, three sources of sodium. You've got sodium coming from the tank farm, how far do you wash or how much washing do you do in the tank farm, which has to do with the water management in the tank farm. You have sodium coming in from SWPF, and then I have the ability to put sodium in the frit to kind of balance that issue out to make sure I meet all the properties in PCCS, the liquidus, viscosity, or durability.

So it really becomes a sodium management issue, and this limit really ties--or limits the amount of sodium SWPF can send, which really makes my job easier in terms of the variation that you may see in sodium concentration if the SWPF volume fluctuates. So, again, we’ll see in a second we ran these simulations, if you will, at 7 million gallons a year, Pete mentioned, up to about 9 million gallons. But the variation in sodium concentration coming from SWPF, if they hit that limit, this total solids limit of .7 M sodium, really, this really minimizes the compositional swings in sodium space between what I’ll call a sludge-only flowsheet with no SWPF coming as well as the 9 million gallons or 7 million gallons of SWPF being processed. And I can dial in the frit to match that to meet the glass properties of interest.

So this is a really busy slide, but this is kind of what we’re looking at.

Let me go to the next slide first. Pete mentioned the sludge batches from the Rev 19 System Plan. This is Sludge Batch 11 through 18, and these are most of the major oxides coming in with Sludge Batch 11. So you can see that there is some compositional variation between sludge batches, one aluminum based--and we can go down--and sodium based.

But just recognize that each sludge batch is different, you know, it's got different iron concentration; it has different aluminum concentrations. But even though those concentrations (inaudible) look at this and say, well, that's not (inaudible). In glass formulation space, it can have a huge impact on the properties of that glass.

With that being said, let's talk about the variation stage of the paper study assessments we're going through to look at again, making sure we can integrate SWPF into the DWPF flowsheet. The sludges I just showed you are basically considered--I look at those as a nominal composition. They're projections. They're to the second decimal. I know that's not the case.

So what we need to do is look at and put some variation around those nominal compositions, and we know that on SRAT-to-SRAT transfers we get about 7-1/2 percent on the majors, about a half a weight percent on the minor compositions. So now we can build this sludge base, if you will, for each sludge batch. We've got this multi-dimensional sludge base, based on adding variations to those nominal projections coming from the Systems Plan.

So we have this hopper here that basically are PCCS predictions. Those are our models that we have that are currently operating the facility. And we can take and use what we call an extreme vertices type of design where we can take the mins and max of all these components and generate 10,000, 15,000, 18,000, 20,000 different combinations of this sludge composition, that nominal sludge, based on those min/max values.

So what I need to do is to make sure that if I pick a frit, that it is robust enough to that compositional variation, any one of those extreme vertices type designs over the waste loading range of interest. And that tells me the operating window of interest; that is, if I have a frit that will tolerate or be PCCS acceptable, that is, it’s acceptable from the property predictions over that waste loading interval, then that waste loading will be 36 to 44, since the nominal was 40 percent waste loading, then that is a candidate frit for that particular system, for that particular sludge batch. Hopefully, you can follow that.

So, again, for each sludge batch, you generate a set of EVs, we generate a frit grid, thousands of different frits, computers are our friend, we run this through the hopper. So if we look at a particular output, we would say for a particular frit or sludge batch over this compositional sludge region--if we look at 25 percent waste loading up to, say, 50 percent of waste loading, the number of EVs that pass that are more acceptable--that is, pass those proper predictions--are shown on the Y axis. So a 25 percent waste loading, that one frit can handle all these EVs over waste loadings at 25. And if you march up, that frit still can handle all that sludge space, if you will, up to 40 percent waste loading. When I go to 41, it will still handle all that; but when I go to 42, some of those outer layer EVs start to fail property predictions.

So in this particular case, since my--in future space where we're looking at SWPF integration and the waste loading needs to be between 36 and 44, that particular frit would not be acceptable, because it does not process up to 44 percent waste loading with all the EVs being acceptable.

Does that kind of--okay, great.

So I'm looking for operating windows between 36 and 44 to be clean for a candidate frit for each one of those sludge batches to be a candidate frit, using our current PCCS predictions.

And I'm going to cut to the chase here, so let's go right here.

These were the sludge batches--again, this really comes--kind of important to me from a glass formulation perspective. I've highlighted four rows, if you will, on oxides. Aluminum oxide--these first four are highlighted because in the PCCS process control strategy we actually have a lower aluminum constraint that has to be in the glass; that is, we have to be at least 3 weight percent aluminum oxide in the glass or it will fail that PCCS constraint.

And if you start doing some math, you can take these nominal aluminum oxides, look at 40, 36 percent waste loadings minus 7-1/2 percent, and we'll actually fill that constraint. So what it does is it forces you to put aluminum in the frit to make up that difference. And we'll talk about that later. But, again, that's the reason these are highlighted. That's the reason that, you know, these, to me, may not look like a big difference to you guys, but it really makes a big difference in glass formulation space.

The cesium really is basically constant across the board, because there is a fixed 7 million gallons of SWPF processing rate being assumed, so there is a fixed cesium concentration, fixed titanium concentration coming in. Sludge-only processing, we're looking at somewhere on the order of maybe half a weight percent titanium. When we go to SWPF, now we're looking at 12 weight percent titanium coming in through the sludge. And when you project that into glass based, you're up around the 5 or 6 weight percent. So that's the gap that I'm talking about where we're currently processing and where we're going to be in the future. And I need to make sure the models are up-to-date.

The other big factor is sodium, and this is, again, just what will be considered the SRAT product. The sodium concentrations are starting to become higher, because we're underwashing sludges in the tank farm. SWPF, we bring sodium in from the Solid Waste Processing Facility, and that limits me on the amount of sodium that I can add to the frit again to meet these--simultaneously meet all these compositional property relationships.

So if you look at Sludge Batch 11 through Sludge Batch 18, you go through this process, the paper study process that we just talked about, we can actually find frits for Sludge Batches 11 through 18 that will yield projected operating windows of at least 36 to 44 percent waste loading while accounting for all the sludge variations.

So that’s using the current models. So, again, the assumption being made is that current models are applicable to the space that we know that we’re getting into is a little bit outside of our model validation ranges. But if we use those models, we can actually find frits that would meet DWPF processing expectations and meet the 40 percent waste loading criteria.

Some of the key challenges that we--challenges may not be the right word, because they’re actually solutions. But the key issues that we came across was low aluminum concentrations, so those first four or five sludge batches that I showed, the 10 or 11 or 12 percent. We’re working with the System Plan on, you know, how much aluminum dissolution was being done, how much--when you bring in the SWPF, you actually dilute the aluminum in the sludge, so there is a dilution factor we have to account for. The first four or five sludge batches that have low aluminum concentration drive you or drive me to add frit or aluminum to the frit to meet that lower aluminum concentration limit in PCCS. So then there's a trade-off here that we're working with the system planning folks.

The sodium concentrations in the SRAT, again, I've talked about that. That basically is, as we bring the SWPF in, three sources of sodium that we're really trying to balance, the sodium coming from the tank farm, the washing strategy or retrieval strategy in the tank farm, the SWPF flows, the volumes that may be changing, and the ability of that frit--because once we design a frit for a sludge batch, it has to be robust enough to handle all of those variables--the washing, the volume changes that we may see--and still meet all those properties.

So let's talk about the glass formulation space and the gaps that we've identified. I don't have it on here, but this now is in glass base. It's not sludge base. This is actually glass base. So we've identified--since we went through the process, reached Sludge Batch 11 through 18, we've identified frits, we have the three things that really identify the glass compositional space for SWPF. We know the sludge, the projections from the sludge. We can add the variations to the sludge that we've seen in the past. We've identified the frit compositions that are candidate frits, and we know the waste loading range over which we want to process. And with those three factors, we can develop this multi-dimensional compositional space in glass base now, because we know that glass base.

And this is the glass base that if you took all those inputs, that when SWPF comes online, we will start to see these kind of compositional trends. I'll point out titanium. We'll be up around 6 weight percent titanium in glass at those maximum volumes. We'll talk about it--well, let's talk about it now.

The primary gap in titanium space is this 2 to 6 weight percent. With MCU/ARP the titanium concentrations only go up around 1 or 1-1/2 percent. So our models--actually, one of our models, the liquidus temperature model, is valid to 2 weight percent titanium. So one of the things we're looking at is, okay, well, if SWPF is going to be processing at 40 percent waste loading and there's this much titanium coming to the glass, is our liquidus temperature model valid in that space?

So what we've done is we've defined the glass composition region for SWPF. We've identified those gaps in compositional space from where we will be processing with SWPF to where we are currently processing or where our models are valid, and now we have an experimental program. We actually designed a test matrix to fill those gaps. Actually, we are currently fabricating those test matrix glasses, and the future activities are to measure those various properties. And then we'll assess those measured properties in this SWPF space against our model predictions. If our models predict accurately, we have no changes that need to be made. If our models are off, we need to refine the models before--and implement those new models into the new PCCS before SWPF comes online.

So, again, it's an experimental program that fills compositional gaps and makes sure that the process control strategies that we have in place are going to be in place before SWPF comes online for Sludge Batch 11. And when we do that, if we have to refine the models and implement--or have to refine the models--that is, the current model predictions are not predicting accurately enough--then what I have recommended to SR is that once we refine those models, go back and do this type of reassessment to make sure that we can still meet these operating windows with our current models.

Kind of switching gears, this is a question about salt-only or salt sludge or heel processing. Right up front, we haven't done an extensive study like we have with SWPF on salt-only or salt-to-heel processing. But, again, from a glass formulation perspective, with the sludge running out or we're processing salt with our heels, some key things that come to my mind are going to be, again, this minimum aluminum content. There's no alumina or very little alumina coming in from SWPF, so we have to have a source of alumina or have to come up with a new process control strategy because, again, we have that minimum aluminum criteria or glass that we're going to have to meet. And I'm not sure that we can add enough aluminum to the frit to get to that form.

What are the impacts on waste loading in terms of the fissile limits or the heat load limits in the cans? We need to take a look at that.

Pete mentioned this--simulated sludge--that they may be adding simulated sludge to go through their system planning for these solid or heel processing sludge batches. One concept that at least I'm considering is, instead of, again, a simulated sludge, why don't you make the frit look like the glass and then just bring it in, because if you target the same end point, it really doesn't matter how you get there. So maybe you can design the frit to make it look more like the end product and just bring the salt coming in with it and still meet all your process control strengths.

Again, we haven't done any kind of formal assessment, but those are some of our thought processes.

Again, we'll have to look at model ranges of applicability. We'll have to look at solubility limits on titanium, sulfur, chlorine/fluorine. And I'm just kind of focused on the glass, but there's a whole other host of issues with respect to chemical processing cell~~?~~, the SRAT, the SME, rheology-wise, settling issues, suspension issues that would have to be looked at in the future for salt/heel processing. I think that was it.

So, in summary, based on our current process control models, again, assuming those give us a valid read or a good read into the future for SWPF, it looks like the DWPF could process the SWPF at the 7 or 9 million gallons processing rate through the facility and with very little impact on the glass, because, again, we're tailoring the frit for each sludge batch to take advantage of what's there or not there in the sludge so we can meet these process control strengths.

So, again, for Sludge Batches 11 through 18, based on what we know today, DWPF would be able to hit the 40 percent waste loading, really 36 to 44 being clean, if you will, with candidate frits that we've identified.

We've talked about this, a uniquely tailored frit. Again, we're assuming the composition models are valid. And, again, if they're not, we're not just going to implement them, but we're going to verify that through a qualification program before those would be implemented.

We do have an experimental program in place to fill those compositional gaps to make sure that we're ready and our facility is ready once SWPF comes online. And, as I mentioned, really, there's not been a lot of detailed assessment on the salt-only or salt heel processes to date, but there are--I can see some key issues coming down the line.

And, with that, I'd be happy to answer any questions.

EWING: Okay, thank you very much. I'd invite you and Peter to sit up front, and then we can address questions to both of you as we move forward. Just take a seat here if you'd like and make yourselves comfortable.

So questions from the Board? Yes, Jean.

BAHR: Jean Bahr from the Board. These questions are just reflecting my ignorance, but what is the reason for the .7 molar sodium limit on the waste acceptance criteria?

PEELER: If someone can speak for SWPF, from my perspective--

EWING: Speak into the microphone, please.

PEELER: From my perspective, it's really to control the sodium concentration to make sure that the frit is robust enough to handle any variation in volume that SWPF may come online to bring down the heel into facility, because if that sodium concentration--if we didn't have the spec on the .7 molar and it was 1-1/2 molar and the swings in sodium concentration from a sludge-only flowsheet or 2 million gallons of SWPF being processed versus 9 million gallons being processed, that sodium swing is so huge--and we actually see that in ARP--that one frit can't handle that whole range of sodium concentration coming in from Salt Waste Processing. So that--

BAHR: So it's the glass integrity, or is there something about this sodium being in the waste that's a problem?

PEELER: Great question. Sodium controls a lot of different glass properties, one critical one being durability. You can get too much sodium in the glass that you can actually make water glass; it will dissolve on a bench top. So we actually have an aluminous sum of alkali constrained in our process control strategies to make sure that we don't get too much sodium or too much alkali in the glass system to basically maintain integrity of the waste form. It also has other properties like liquidus temperature viscosity. It affects those too, so we have to kind of balance all those impacts on glass properties. And some of them move in opposite directions.

BAHR: Okay. And then, just because I don't do these conversions in my head, you have the .7 molar as the--I guess that's the optimal value? Is that what you want, or is that the maximum value? And then you had percentages of sodium oxide, and those were 8 to 18. I'm trying to figure out how those relate to that .7 molar.

PEELER: Well, we're talking about--I'm talking weight percent. Sodium--the 8 weight percent in the glass base that we came up with?

BAHR: Right. So you gave us one criterion that was in molar units and then another that was in weight percent, and I don't know how to do those conversions in my head.

PEELER: I'm not sure I could do that either. But what we did in the glass base is--I think it was 8 to 18, I think it was. That really is not being driven solely by SWPF. That's being driven holistically from the tank washing strategies, SWPF, and what I think we can get to in the glass base, that upper bound of 18 weight percent. I feel a little bit uncomfortable going above that 18 weight percent, primarily for durability.

BAHR: So is that 18 weight percent the same as the .7 molar criteria?

PEELER: No, it's not. That .7 molar is being factored into the 8 to 18 range. Does that make sense?

BAHR: Well, it's probably not worth going through all the details. I'm just confused about what the criteria is and whether it's a maximum or whether it's an optimal value and whether--and how the range that you're projecting fall into that.

PEELER: Well, it’s my understanding the .7 molar total sodium or total solids, if you will, is an upper limit coming into DWPF from SWPF. Now, what that translates into weight percent, I’m not real sure; okay? But what I can tell you is that was accounted for from the perspective of when we projected the 8 to 18 percent sodium space and glass space.

EWING: While we’re in the details of composition, looking at the--Ewing, board--your glass composition, the final results, you don’t have molybdenum in the list. Would that be in the--

PEELER: Is the lithium listed on the one page, Rod, with the boron concentrations going from--

EWING: On this, which I take to be the glass compositions.

PEELER: Yeah, if it’s not there, that is a mistake. You typically range from about 4 to around 8.

EWING: Right. Okay.

PEELER: Yeah, if that’s not listed, lithium concentrations to key oxide--

EWING: --in the frit.

PEELER: --that is a mistake on my part.

EWING: Okay. Other questions from the Board? Sue?

BRANTLEY: So I now know a lot about the sludge problem, so that’s great. When you have your sludge, you know, 11, 12, 13, 14, 15, how do you know those all out into the future? Is that analyses of the tanks or something?

HILL: So as part of the system planning process, we have compositional projections for each of the waste tanks. We then develop, based on the funding profile, a retrieval sequence to get the waste out of the sludge tanks, focusing on the older style tanks that don’t have full secondary containment. And then there are other criteria that we use to identify the sequence at which we retrieve the sludge, and then we calculate how those compositions are blended within the feed tank for DWPF. And we have limitations on the size of the batch, so that’s why it’s not one big batch.

But as part of our modeling of the system from where the waste is today until all the tanks are closed, we develop these batches that have projected compositions based on characterization of the waste that’s in the tank and the relative quantities of the sludge from those different tanks, and we’re able to provide that to Dr. Peeler.

BRANTLEY: Okay. Isn’t it also true that you’d be producing more waste that went into the tank as you go along?

HILL: Could you rephrase the question?

BRANTLEY: Well, maybe I’ve lost track of something, but isn’t there continuous production of waste?

HILL: So in part of the system planning process--

BRANTLEY: That’s included in your calculations?

HILL: We include--for Rev 19 we had continued H Canyon operations through 2025.

BRANTLEY: Okay. So that's part of the calculations.

HILL: That's right. And while we don't know the exact composition of future materials that are going to process, we do have historical records for waste that came from H Canyon, and we use that as representative.

BRANTLEY: Okay. And then this idea of a sludge simulant kind of--I mean, you don't really make a sludge; right? Don't you just try to take what's in the sludge that you need in the glass, and you make up that composition? Isn't that what you're doing? Whatever the different oxides are that you need for your glass that would have come from the sludge, that's what your sludge simulant is.

HILL: That's correct.

BRANTLEY: But it isn't a sludge the way the pictures show us, this horrible, gooey kind of thing.

HILL: Oh, no, no.

PEELER: It's just the oxides that would represent--).

BRANTLEY: Right. It's just a recipe--

HILL: Yes.

BRANTLEY: --that you're using to make up so that your glass is in the compositional range that you want.

HILL: Correct. That is correct.

EWING: Jerry.

FRANKEL: Frankel, Board. So what is the current status of the tank farms? How many retrieved tanks are there, and how many single-shell tanks and double-shell?

HILL: Okay, well, we started with 51 tanks; 24 of those were not full secondary containment. In the 27, they have the full secondary containment to the newer style tanks. Of those tanks, six have been grouted.

FRANKEL: Six of the original single-shell tanks?

HILL: Of the 24, that's correct.

FRANKEL: They've been grouted?

HILL: Have been grouted, 17, 18, 19, 20, 5 and 6. Tanks 12 and 16 have had--we're at the point where the waste has been removed, and Tank 12 we're analyzing the residual samples. Tank 16 we're a little further than that. So they will be closed--I'm trying to think what the date is--in about a year.

As far as sludge goes, we've done the bulk sludge removal out of Tanks 4, 7, 8, 11, and 13. The only older style tank with considerable quantities of sludge is Tank 15, and we're in the process of preparing for the bulk sludge removal on that tank, which should happen in about a year, maybe 18 months. And then beyond that the remaining older style tanks--that's out of Tanks 1 through 24--contain primarily salt cake, and a few of those have liquid supernate.

FRANKEL: You talked about the difficulty of removing the heel. So how successful are you at doing that? You don’t go down to the bare metal, right, so how much radioactivity are you grouting; do you know?

HILL: I don’t have that answer.

FRANKEL: So do you know how much is left at the bottom of the tank?

SPEAKER: Jean, maybe you can--

RILEY: In some of the tanks it ranges from, like, 3 to 5,000 gallons.

HILL: So it’s about an inch.

RILEY: Right.

HILL: Yeah, if it was averaged, an inch.

EWING: Additional questions from the Board? I have one still, you know, stuck on process control; so I just want to be sure. So the composition of the sludge that comes into the system is somehow estimated; it’s not a direct measurement, is that correct, at the stage it leaves the tank?

HILL: Yeah. So at the stage where we are now for Sludge Batches 9 and beyond, they are estimated projections. When we assemble the sludge from the various component tanks, once that is compiled in Tank 51, we then slurry the tank to get a homogeneous representative sample; and then that begins the qualification process for that batch.

EWING: Right. And so you sample and measure the concentration then, but then you add the flow or the stream from the Salt Waste Processing Facility; right? And you mix those, and you take another sample then?

HILL: That happens inside DWPF. That actually happens in the SRAT. So you have Tank 40 feeding the--

EWING: Right.

PEELER: You assemble that, you pour--as Pete just said, you pour your three liter sample that sets off the qualification process, and then your SWPF product is coming into the SRAT. So, again, from my perspective, you have to make sure that the frit can handle--I know the composition here--we're highly confident on the composition coming out of SWPF; and if I know the volumes of those coming in, you can design the frit to handle sludge-only to couple them.

EWING: So the final mixture before it goes into the melter is never directly sampled.

PEELER: Yes, it is. That's in the SME. So we have the SRAT that brings the sludge in and the SWPF product; we add a formic/nitric acid solution--formic acid rheology; we transition that over to the SME where the frit is added; that's stirred; it's sampled.

EWING: And it's sampled.

PEELER: That's sent through composition where it's measured compositionally, and that composition is run through our process control models to make sure that everything is acceptable from a processing standpoint as well as product performance standpoint.

And those models are demonstrated in the qualification process to be applicable to that composition space, because at that point, Rod, we've got our frit specified and our sludge base known.

EWING: Okay, right. Thank you.

BRANTLEY: One question.

EWING: Okay, Sue.

BRANTLEY: So you have to be able to change your frit composition fairly carefully, so how do you do that? Is it just quartz ground up and with different alumina or something?

PEELER: No, we actually just--it's about a--we have an off-site vendor fabricate it. It's designed--

BRANTLEY: Is it--

PEELER: I'm sorry?

BRANTLEY: Is it another glass?

PEELER: Yes, it's basically a glass that's melted. It's ground to a specific--

BRANTLEY: So they're making you a glass composition--

PEELER: --particle size.

BRANTLEY: --and grinding it up for you?

PEELER: Correct. And shipping that over to the facility.

BRANTLEY: So they make a glass for you, and then you take that and make a glass--

PEELER: Yeah, we take that and--it's kind of in contrast to WTP where they're adding glass forming chemicals. We're just basically taking this glass from chemicals, making a prefabricated glass product that's controlled compositionally, and adding that to the SME, because those require some energy—

BAHR: Rod?

EWING: Yes.

BAHR: Jean Bahr from the Board. So if you ran those compositions through your model and it didn't meet your criteria, what would you be able to do to the mixture before it goes into the melter?

PEELER: We have a couple knobs. We could either--we could wash further; we could wash less. I'm assuming that they were not at this stage getting ready to submit. If we can't design a frit for that particular sludge batch, you'd have to lower waste loading. That's the only knob that we have, if you were to lower waste loading, because when DWPF started up in 1996, we had what we called a one-frit solid concept. We had one frit that was going into all the sludge batches, but it was a 25 to 28 percent waste loading. And at that waste loading, you can pick a frit that is compositionally robust enough to handle all the sludge batches.

But as you go up in waste loading, that game changes a little bit, and that's the reason you have to tailor the frit compositions to be able to account for waste loadings and--

BAHR: But I heard you say that after you had mixed the sludge and the salt waste and the frit, then you take a sample of that and you run that through your model. What happens if it doesn't pass at that step?

PEELER: Correct. You can remediate the SME. You can either add more frit to lower waste loadings; you can add more sludge and increase waste loadings. So you can play those--

BAHR: So you've got enough free volume that you can actually--

PEELER: Free--yes, working space.

BAHR: --do those things.

EWING: Okay. From staff, questions? Dan.

OGG: Yes. Dan Ogg with the Board staff. You mentioned that you're working on future glass compositions, and I believe the lab is fabricating new glass samples, and then you're going to measure the properties of the glass.

PEELER: Correct.

OGG: Can you elaborate a little bit more on what some of those measurements are, what properties you're measuring in the glass?

PEELER: Sure. The primary properties are viscosity, how thick or thin the glass is, how thick or thin the glass is. We have a constraint in the facility in terms of the melter constraint of 20 poise to 110 poise at 1150. So the glass has to be at 1150 at that temperature. It has to be between 20 and 110 poise or it's unacceptable. So when we're measuring this glass composition envelope, we'll see if we have compositions that go outside those limits; and if those are outside those limits, that's space that we can't get into.

Another property is liquidus temperature, which is a crystallization kind of measurement where we--again, I think I talked about this earlier--where we measure liquidus temperature of the glass products. We see where crystals actually start to form. We have a constraint in PCCS that says liquidus temperature has to be below this. If those measured properties are--you know, won't let you get into that space, the model will cut you off into that space.

So liquidus temperature, viscosity. Durability on both quench glasses, as you can envision, is the pour stream coming out of the melter. It goes into a two-foot-by-ten-foot-tall canister, stainless steel can. The glass then hits the can; it's cooled pretty rapidly. The glass along that center line or pour line is going to cool slower, so we actually measure durability on both thermal profiles to make sure we balance thermal profiles. And there’s a series of about seven or eight critical properties that we measure.

OGG: And are those properties based originally on the waste acceptance criteria for Yucca Mountain?

PEELER: The only criteria that would be linked to that is the durability, which is an ASTM C 1285 product consistency test. The other properties are ASTM based, but they are really related to the melter, not the final product, if you will.

OGG: And do you know of--are you aware of any potential changes to those criteria? Are you sticking with that criteria based on the Yucca Mountain acceptance criteria?

PEELER: I’d have to refer to the DOE on that.

RIDLEY: Jean Ridley, DOE. The answer is no. We are maintaining the status quo. We have not been given any type of direction to change our formulations. And I’ll talk a little bit about that in my presentation.

EWING: Other questions from staff?

Okay, Sue.

BRANTLEY: Sue Brantley, Board. So this is all a game in compositional space, and so you’ve got models of the input and models and, you know, you’re figuring out how to change your frit. So have you ever thought about what--and I think it’s predicated also on the--the waste stream here is pretty homogeneous compositionally relative to, say, Hanford's waste stream. Have you ever thought about Hanford's waste stream? Would this kind of game work out there as well or--

PEELER: They play the same game, Hanford does. I have a colleague out there we interface a lot with. In fact, I was out there last week working with those guys. You could consider the DWPF processing region compositional space a subset of Hanford's space. They have a much broader composition.

But they have basically the same kind of strategy with respect to developing models to cover this space to make sure that they can meet their property or process controls. There are some different approaches or acceptance criteria that they're using, particularly in the processing arena, that we haven't adopted, but it's basically the same thing. But they are a much broader compositional space than we are, because they ran so many different processes.

EWING: Okay, we've come to the end of this session, so let me thank both speakers.

We'll take a break and reconvene at 3:00, just 15 minutes. Thank you both.

(Whereupon, a break was taken.)

EWING: So let's get started with the remainder of the afternoon session. So the first speaker is Dan Iverson of the Savannah River Remediation, and the title of his presentation is “Lessons Learned DWPF Waste Treatment Plant Melter Design and Influence of Glass Formation.”

IVERSON: Good afternoon. Again, my name is Dan Iverson, representing Savannah River Remediation. I’ve been asked to address two of the Board’s questions, one of which is a comparison between the DWPF melter design and the WTP melter design, and then to address the influence of glass formulation on the melter design.

Again, first I’ll hit some of the similarities of just about every melter design in the waste processing complex has settled on Monofrax K-3 as a glass contact refractory. The majority are joule-heated melters operating at a nominal 1150 degrees C. Most use Inconel 690 electrodes, water cooling of the shell. Many have gravitated to bubbler-driven glass stirring to maintain the desired melt rates. Slurry feeding is the norm and similar borosilicate glasses.

From that point, we move on to the differences. Size, we’ve needed to increase the size of melters to achieve the desired throughputs. Shape has differed specifically with DWPF. An important thing is the design philosophy. And, again, I’ll get into these in detail later. The method of providing auxiliary heat to the melter, in particular the plenum heating; the method of pouring glass from the melter; the method of draining the melter; the layout of electrodes for various reasons; the means of bubbling the melter; the gas used; offgas treatment systems; the method of introducing glass formers, which has already been discussed to a certain extent; and how the glass is disposed of in the canister.

First, a quick diagram of the DWPF melter. It's a cylindrical vessel, very heavy-walled and robust, entirely water-cooled outer shell, with no external provision for a change in size of the melter. And I'll get into that in more detail later. It has four electrodes, two of which you can see here, that are opposed across the melt pool; dome heat in the way of Inconel resistance heaters. This represents two of the four bubblers in the melter, which, as were described before, were retrofitted to the melter. A central feed tube. It's a teapot approach where feed-in produces a cold cap in the melt pool, and basically just a mass balance feed-in equals glass up a riser and poured out. The key thing is that the level difference between the riser and the melt pool is controlled by a pressure differential between this region of the melter and the pouring section and the plenum.

We go on then to the HLW melter design, which is a basically square melter cross-section. It, again, is lined with Monofrax K-3, a glass melt pool of approximately 6 foot square by about 30 inches deep. We get into a primary difference here in the pouring with a riser section that uses an airlift device to bubble glass up out of the melter. The discharge chamber, which is basically gravity flow through a trough. And, again, I’ll get into details there later.

Then, finally, the LAW melter is much larger due to the required throughput that’s required for the LAW waste at Hanford. It’s still approximately 6 foot across by closer to 15 feet long, so much more surface area again so that it has a much higher throughput capacity. It was designed to be bubbled. Each of these represents a bubbler in the melt pool. When it’s in operation, it’s intended to be just a nominally rolling, apparently a boil in the pool, producing forced convection to help transfer heat to the cold cap and melt the feed and stir the glass.

Comparison here, the DWPF is the smaller of the three designs. It’s approximately 2.6 square meters of melt surface area, which was deemed to be adequate during its design phase to give a production rate of around 100kg an hour and meet the requirements of the Defense Waste Processing Facility.

Hanford has a little more waste to deal with; therefore, the HLW melter needed to be a little bit bigger; and they stepped up to about 3-3/4 of a square meter to meet the perceived production rate requirements there.

Then, finally, the LAW melter is 10 square meters, because there is a much greater quantity of waste to be dealt with in the LAW stream compared to the HLW streams at either site.

As I described, the DWPF melter is a cylindrical, heavy-wall vessel with resultant, very complex wedge or curved refractory shapes. The other melters are more based on simple refractory shapes and something more akin to commercial glass melter design.

The biggest thing here is the design philosophy. When the DWPF melter was designed, they wanted to produce the most robust design that they could come up with; and the designers were very familiar with cylindrical processing vessels for chemical processing lined with refractory and had very good luck over the years with a system that locked the refractories into shape in the vessel and didn't allow them to move. So that was the philosophy there. That keeps the refractories in compression, locked within a water-cooled rigid vessel, and by design it had to incorporate compressible materials behind the refractory between there and the cooled shell in order to accommodate thermal expansion of those materials as they heated up.

Opposed to that, the more commercial design is a simple rectangular design that uses jack screws behind the panels on the melter walls to accommodate thermal expansion of the blocks. They require adjustment as the melter heats up to keep from over-stressing the system and yet keep the refractories held together to prevent leakage and problems similar to that. Those designs also include a multiple layer approach that has insulating castable materials backing the primary refractory as opposed to DWPF, which has a very simple expansion layer against the walls.

Okay. Plenum heated melter. The philosophy at DWPF was to provide additional heat in the vapor space of the melter in order to boil off water and add the heat that's required for the slurry-fed system. Those heaters are used during normal operation as opposed to the Hanford designs, which only use resistance heaters in the lid for start-up of the melter to initially get the glass conductive so that joule heating can take over. The philosophy there apparently was that they didn't need the extra heat just to "super-heat" the offgas.

Glass pouring method I already touched on. DWPF is a continuous overflow pouring system where pouring is initiated and terminated by use of a pressure differential between the pouring spout area and the melter plenum, but normal feeding is a simple overflow setup. The WTP uses a batch pouring mode. The melter is fed. When it reaches a certain level with a certain inventory, air lift bubblers are turned on in order to lift glass up a riser section to then gravity flow out of a spout down into the canister.

Glass draining, DWPF design incorporates a bottom drain valve, the intent of which is to be used once during the melter life at the end of its life to drain the residual glass out of the melter. WTP, the approach is to use some other means, potentially an evacuated canister system, to drain the melter at the end of the melter life.

Electrodes. As I mentioned, DWPF has two pairs of opposed large plate electrodes that are used to try to skew the power in the melter from the top to the bottom or vice versa, depending on the demands on the system. The HLW has three electrodes, similar philosophy, but also trying to address concerns about noble metals shorting between two of the electrodes and potentially impeding the melter operation or not allowing power to be pumped in. The LAW is backed more toward the DWPF approach to where it just has the six opposing pair of electrodes, because noble metals are not perceived as an issue in the LAW stream.

The bubblers, DWPF elected to use argon as opposed to air for a number of reasons, one being the redox of the glass, concerns about impacting the redox state of the glass. Another is the fact that we were already using argon as a bubbling medium for our level detection. And there were also questions about the impact of air bubbling on the life, I think, Inconel 690 bubbler tubes and components in the melter. So argon was considered to be a conservative approach to bubbling gas as opposed to air. WTP, both systems do use air.

The offgas treatment system at DWPF is fully redundant. The approach there was that we always wanted to have a method to control cesium volatiles coming from the melter. If something went wrong with the primary offgas system, the back-off offgas system is functional and operating at all times, there is an automatic switchover such that we didn’t have to have concerns about where volatiles from the melt would go.

WTP had a slightly different philosophy. Let me back up. We got the redundant systems, but our system included a film cooler immediately off of the melter, intended to prevent hot, sticky materials coming from the cold cap in the melt pool from sticking to the walls of the offgas system immediately downstream of the melter. We had seen problems with that in pilot scale work. Therefore, it puts a laminar airflow immediately downstream of the melter plenum to keep those materials from touching the wall, as well as cooling them with air and/or steam as necessary to get them below a temperature at which they were believed to adhere. That’s followed by a quencher intended to do a bit of scrubbing, but to take the steam out of the system in order to allow the rest of the system to work on non-condensables and minimize the size of the rest of the system.

We then have a venturi-type atomized scrubber followed by a condenser to get rid of the steam that was introduced in the scrubber, a mist eliminator, finally a heater, HEPA filters, an exhauster where the material is then sent to our sand filter, which filters all of the effluent gas from the facility.

The WTP has a similar approach to DWPF with a film cooler, but then the philosophy changes. Based on early work and work that was done at West Valley, they go to a submerged bed scrubber, a wet electrostatic precipitator, again, a mist eliminator, heater, HEPAs. But then there's another stage where it goes to a caustic scrubber, thermal catalytic oxidizer, which a lot of those tail end parts of the process were intended to satisfy regulatory requirements that were required for the WTP that weren't requirements at DWPF.

Another key difference that's been touched on a bit already here is the fact that DWPF uses a glass frit, which is simply a pre-manufactured glass that's ground to a powder and introduced as a component of the feedstock. There were a number of reasons for that, one being the fact that DWPF felt that we wouldn't have to deal with the uncertainty in measuring out material in batching formulation that may have a dozen components. That increased--if you had to do that, it increased the uncertainty of your batch prep and clamped down on your ability to deal with variation in composition.

We force all of the QA on the frit components up front. It's dealt with as a single raw material. The uncertainty is dealt with by analysis of the frit rather than uncertainty introduced by a number of separate components in batching up front.

Finally, we get to the canister. DWPF design is a two-foot-diameter-by-ten-foot-tall canister with a relatively small opening that was based on the choice of canister welding technique, which was a resistance upset welding. We were current limited in the welder in going much larger than the plug that we have in that canister, so that approach was taken as opposed to the WTP, which followed the scheme that was taken at West Valley where the canister plugs will be welded with a TIG system, which it was felt at the time it wasn't as reliable as the upset welding system, but did allow a much larger opening, because you're not limited on the current based on the electrical path to the plug to be welded.

The HLW, again, I believe, to economize as far as space goes in temporary storage as well as the repository, they went to a 15-foot-tall canister. The LAW, based on the sheer volume that's required, went to a larger diameter canister that didn't have to fit in holes in the repository due to the approach of trench burial concepts at the Hanford Site.

Then the next question that we've had to address here is: How have developments and changes in the DWPF glass formulation influenced the design of the WTP melters? And the answer there is: They really didn’t. Our approach, between glass formulation and melter design, really works in the opposite direction. The glass formulation is governed by our defined performance and processing constraints. We’ve already hit on that to a certain degree. We have defined a range of glass viscosities, for example, that we are comfortable with operating the melter, that minimize the risk of, say, glass leaking out of the melter, that makes for the best processability.

Resistivity is impacted by the formulation, and we have to be careful there, because we’re passing current from a couple pairs of electrodes; and if the resistivity drops too low, we’re current limited, and we can’t put in the required power that we need in the melter.

We have the durability constraint, which is the key thing for the repository. We have the liquidus, which can be a glass quality constraint, but is more a melter processability constraint, because we don’t want to clog up the system with the vitrified materials.

But, in general, it’s those type things that govern what we will accept in our feedstock that defines our requirements as opposed to trying to change the melter to accommodate the waste stream coming in. So we have to impose those constraints. And it’s the same thing at WTP. No matter what, you have to be able to melt it in order to process it. And if your properties aren't such that you can deal with it in the melter and produce the right glass, no matter what you do to change the melter, it doesn't help you.

And if there are any questions, I'll address them.

EWING: We have a bundle of three presentations and then time set aside for questions. But because there are three, I think it would be appropriate, if you have a pressing question, to ask it now.

So any questions from the Board? Yes, Jean.

BAHR: Jean Bahr. Just one clarification on the DWPF melter. It looks like there's a fair amount of volume below the outlet spout, and maybe that's just the diagram that you've drawn. How much--at the end of the--on your diagram that's page 37--yeah, there. So how much glass is left at the end of the pour? Is the vacuum that you pull able to suck it out below that level?

IVERSON: In the normal operation the vacuum only initiates the pour. The intent is--this represents, let's say, an equal pressure between this chamber and that chamber. Therefore, anything poured in overflows and goes out into the canister.

BAHR: So you're drawing that level down at the end of a run; right?

IVERSON: During normal pouring we may have a five-inch water column difference between this area and that area, which represents maybe two inches of glass level difference if we don’t continue to drop that level. We maintain that DP for two reasons. One is so that when it’s time to terminate pour to change canisters, we can do that quickly. You release the DP--with a two-inch delta here, you’re overflowing here, but this level is a little lower. You release that Delta P, and the glass changes its equilibrium height and quickly terminates the pour, because this level then drops two inches below that lip, so we can have a quick change there to terminate pour.

BAHR: Right, but what happens when you get to the last canister of a batch?

IVERSON: Well, the last canister is poured the same way. At the end of the melter life we can then increase the vacuum in this area till we draw the glass down to this point to do the final de-inventory of the melter. At that point we go to the melter drain valve, which is--

BAHR: So you’re running the melter continuously until you change the melter out?

IVERSON: Oh, yeah, the melter--

BAHR: There’s never any downtime for the melter?

IVERSON: That melter has been hot now for 11 years.

BAHR: Okay. And what would happen if for some reason you lost power? I know you have backup generators; but if you lost power for more days than those could run, would you end up with a big slug of glass at the bottom of that?

IVERSON: Potentially. Depending on the failure mode you'd postulate, we could end up with a full melter, full failed melter full of solidified glass. And our facility was designed for that. Our shielding takes care of that. Our failed equipment storage vault where the melter is placed, you know, a spent melter is placed, provides adequate shielding. It was designed for a failed melter full of glass.

Our procedures, though, depending on the mode of failure that you'd speculate, call for us--say a component fails; it doesn't mean immediate death. We then have the ability to draw down as much glass as we can into a normal canister. After that the procedures call for us to heat up this drain valve, raise a plunger into the bottom of the melter, and we have five canisters staged underneath the melter to accept whatever residual is left over.

BAHR: Although I understand that that bottom drain function didn't work as expected--

IVERSON: That's right.

BAHR: --when you changed out the first melter.

IVERSON: That's why I said our procedures call for that. The last time--of course, you know, this is only our second melter. We had tested that drain valve and shown that it worked during our non-radioactive operation. And we believe that that is the reason that it didn't work the first time, because we tested it; and, therefore, rather than having a nice, pristine, clear path here, we had a system that was at least partially coated if not full of glass and solidified. And we believe that when we heated it up at the end of Melter One life and tried to operate it, it heated fine, but the rams and the probes here wouldn't actuate. We believe that testing early on contributed to our inability to drain at that point.

We discussed what might be done to attack that. We elected not to change the design, because it was felt that--the logic was that the testing is what caused our problem.

BAHR: So just one more question to make sure I understand sort of the procedure. So normally you would run this hot until you felt it was time to change out the melter for whatever reason.

IVERSON: Yes.

BAHR: But most of the components of the melter were fine; is there something else in the system that might trigger you to have to shut down the melter prematurely?

IVERSON: Only a--well, I guess as an example, the first melter didn't fail. The first melter was showing signs of age. It had had--one of the dome heater sets had failed. The top heater in the drain valve had failed, because that's operated continuously to keep this from being a cold finger and causing the vitrification at the bottom of the melter.

But we were still making an acceptable production rate even though we had lost some of the power input due to that dome heater and were struggling along. So the decision was made to keep going.

We then had a failure of another vessel in the facility; and considering the melter was eight years old at the time, we had had those two failures, we elected to take a single outage to replace both of these major components in the facility rather than take an outage for the one that had just failed, one of the tanks, and then possibly in a year have to have another outage for a melter that had already gone well past its design life. So we elected at that point to take an out because of other conditions in the facility.

Other than that philosophy, the only thing that we feel would cause us to take the melter out of service is if we had a failure of one of the major components on the melter, something that took it down, the riser heater, for example. We can’t pour glass if we don’t keep it fluid here. Same thing applies in the pour spout area. If we’d have a failure of one of those heaters, then it’s time to say, okay, the melter has failed. But I can’t foresee anything other than what I’ve described triggering shutting down that melter.

BAHR: Okay, thank you.

EWING: Let me suggest that we go on to the next speaker, but you'll be available for questions when we come to the end of this section.

So the next speaker is Vijay Jain of Savannah River Remediation. We'll continue the discussion of the transfer of lessons learned.

JAIN: Good afternoon, members of the Board and the staff. This presentation gives a summary of ongoing integration activities.

So the presentation is divided into two parts. I'm going to talk about one of the programs and the processes that we are discussing with various DOE sites to integrate those lessons learned program, and then Sharon is going to talk about more from the R&D space and the relationship between SRR and WTP and Hanford and all the information exchanges--so the three objectives of the high-level waste integration are to share experiences between facilities, which is more like a lessons learned program; and the second objective is to jointly develop programs, including technology development for waste storage, retrieval, treatment, and closure. And this is more of our current (inaudible) program. We are looking at what technologies other sites have that can be used without investing into the new technologies that are there. And we want to accomplish this through the focused meetings, visits, collaborative execution activities.

So some of the examples of the complex-wide integration are shown here: people, they are the best source of lessons learned. In the morning Jay Rhoderick indicated that many of our senior staff, highly experienced in waste treatment, have been moved to Hanford to physically help the Hanford program from the current mode into eventual operations.

We have Functional Area Coordination Teams across the DOE sites that support information exchange. The Technology Maturation and Management Program we are using, we are sharing information on existing technologies and also looking at jointly developing some new technologies that are useful for us.

System planning, Pete talked about the system planning. We routinely share the information regarding management and the revisions of the system plan with other sites, indicating the complexities of these programs and inventions that are made in these programs.

Risk and opportunity management is another area we routinely talk with the sites about their risk matrices and so on. And I’m going to touch on some of these things in the upcoming slides. We have the programs ongoing on the tank waste tanks, waste retrieval, waste treatment, waste characterization, integrity programs, and performance assessments. On a regular basis we share information with other DOE sites.

So let’s talk about Functional Area Coordination Teams. FACTs are established across the URS contract sites for many functions. Some of the functional areas we have, the teams are ES&H, Quality Assurance, Operations, Maintenance, Engineering, and Contractor Assurance. And we use a network approach utilizing benchmarking, regular conference calls, site assistant teams, visits to help nurture these teams and exchange information.

Exchange and sharing information includes procedures, training packages, lessons learned, technical bases, best practices, and assessments.

So some of the examples that the FACT teams are currently sharing are the shared safety website for exchange of procedures, training packages, lessons learned data. There is a workshop to share the technical bases for Documented Safety Analysis for enhanced efficiency in development and revisions of the DSA.

We established a complex-wide QA Subject Matter Experts and the development of common supplier lists, again to enhance the procurement activities for the critical items.

Technology maturation and management, this is a forward-looking program focused on the current and the future needs. Each site has various levels of technologies that are different levels of maturation (inaudible) their insertion points for their applicability for the sites. For example, Hanford is developing tools for the waste retrieval—- for sensitivity programs to improve the assessment of the tanks, because they're a big site and they look at the tank bottom. And some of these tools might be very useful at the Savannah River Site, so we are jointly working with them. Our subject matter experts are talking to them, determining the path forward for providing them the feedback on the process.

On the other hand, SRR has technology such as rotary microfilters, small column ion exchange, solvent extraction, and the vitrification technology. We, on a routine basis, are working with Hanford to provide implementation of some of these technologies for their application.

We are also working with DOE headquarters on the tank waste R&D plan. All the sites are contributing towards the R&D needs on this plan.

So moving along, the next topic is risk/opportunity and management. In this program we have exchanged risk registers to help identify risks, innovative and successful handling strategies. SRR has provided training on the risk management tools for other DOE sites. We are developing a Risk Management Body of Knowledge. The database is updated every three months with input from Hanford and other DOE sites, and the data is searchable by different ways, if you want to look at it and examine the lessons learned, technical issues, and the risk identification and mitigation for each.

The next one is performance assessment. We had a very successful workshop with Hanford recently. We shared the approach we used in our performance assessment and the lessons learned in preparing and obtaining approval of the PAs. We discussed the strategy for engagement with the Nuclear Regulatory Commission for consultation and monitoring. We discussed the lessons learned in obtaining DOE approval on waste determinations, issuance of closure authorizations, and disposal authorization statements. We are further exploring other avenues for collaboration with them.

So, in summary, we have very successful ongoing integration efforts with the DOE sites, which are resulting in benefits to the Environmental Management Office, as well as all the contractors.

The areas of continuing integration efforts include, very similar to what I talked about, look at the flowsheets; streamline the waste acceptance process from tank farms to the final product; application of the salt/sludge batch preparation experience, especially to the direct feed low activity waste at Hanford. We also looked at the at-tank treatment/conditioning of the waste for WTP, LAW, and HAW melters, vitrification plants and, lastly, waste disposition.

That's all I have. Open for questions.

EWING: All right, thank you. What I'd suggest is we go on to Sharon Marra now to continue, and then we'll have questions for the both of you.

MARRA: Good afternoon. I was told to talk loud, so if I'm talking too loud, please hush me up here.

Thank you for the opportunity to speak to you-all this afternoon. I'm going to kind of continue Vijay's presentation along with some of the ones you have heard earlier this afternoon and try and maybe tie it together. I won't take very long, just a couple minutes.

Let me start out with why SRNL, why the Savannah River National Laboratory. We've been a national laboratory for ten years, but we have been, as an organization, as an entity, part of the Savannah River Site since the beginning. So we have been involved in developing flowsheets and technical solutions and providing technical options since the beginning of the Savannah River Site.

So now that we're a national lab, it just makes sense that it be part of our mission to expand that knowledge base and the lessons learned and the technical solutions across the country and, really, internationally as well. So we've expanded our mission into other areas, but we are still

DOE Environmental Management's national laboratory, so focus on the Hanford and taking what we've learned here as a key mission force. It's a key strategic initiative.

So I'm just going to touch on a couple things that really were covered by Vijay's presentation, but I'll just talk about that a little bit and give you a few relevant examples.

So Pete Hill earlier talked about salt and sludge batch planning, and David Peeler talked about glass formulation and things like that. There's a lot that goes into that. There are assumptions; there are technical bases, there's a whole bunch of work that goes into that. And it's really critical to plan that work ahead of time.

So one of the things that we've worked with at SRR and the contractors and DOE out at the Hanford Site is talking to them about that, how critical it is to plan ahead. DWPF has been running radioactive waste since 1996. When you step back and think about it, that's a long time. The Waste Treatment Plant has not started up yet, so there are numerous opportunities to share what we've all learned here at the Savannah River Site out at the Hanford Site.

Their facility design is not the same. Their melter design is not the same that Dan talked about, but there's a lot of fundamental strategies, lessons learned, that can still be carried to the Hanford Site.

The system batch planning, as I mentioned, we've had a couple workshops with EM-1, the most recent one in January of 2013, almost two years now, where we had several contractor folks from the Hanford Site and DOE visit here with presentations from us at the lab and SRR. And then we heard from them, what are they thinking, what are some suggestions that we can provide. And this was--we've worked with the Hanford Site, as somebody mentioned earlier, for decades; but this was the start of several recent workshops while we were trying to exchange information, lessons learned, identify technical gaps or perhaps additional thought and work needed to be put in place.

And one thing I want to mention, too, is this has opened the door. There have been several folks from the Hanford Site who have visited here, and I'll mention a couple of those. And they haven't been exposed to an operating facility, the tours you-all had yesterday. And that's eye opening when you see what it takes to operate a facility of that scale. And Dan and others talked about some of the challenges with that, but there's also a lot of positives and a lot of lessons learned that can be shared across the complex.

Another area--and I wanted to just touch on this a little bit. There were some questions earlier. The whole waste feed/waste form qualification program and the things that you heard about earlier.

Am I okay? Okay.

There was a program that we developed well before DWPF start-up of how we were going to control the process and put in some acceptable glass products. One of the things that was alluded to but wasn't specifically mentioned is before DWPF introduced the first gallon of radioactive sludge, the facility was operated as if it were radioactive with simulated waste, using the same procedures and the same operators, producing about 70 canisters that were cut up and characterized extensively.

So we understand the temperature profile of the canister; we understand the relationship between the pour stream and the glass canister; so we have a strong technical basis that can serve the facility well as it goes forward.

There was recognition early on that all of the waste wouldn't be the same so that a robust program needed to be put in place that would be able to adapt to those variations over time. And I think, as you heard from the earlier speakers, that's being realized right now, and the facility is being able to handle that.

So this whole area, whether it's feed qualification or waste form qualification or some of the things that we're trying to share with the Hanford Site, things we would do the same and things that we would probably change, they have some additional challenges, some tank farms that are miles and miles apart, which are a little different than here. But the fundamental building a robust program from the beginning that can be used throughout the facility’s operational life we view as critical.

So we have had several discussions and meetings with them, both with the lab, Savannah River National Lab, and with SRR to share those lessons learned and build on what we’ve learned here.

David Peeler talked to you about the glass formulation work that needs doing today for DWPF. We are also teaming with the Pacific Northwest National Laboratory to share some of that information from a glass formulation perspective with the Hanford Site, both on the high-level waste glass and the low-activity waste glass as well.

And I’ll just mention, just last week we had some visitors from the Waste Treatment Plant here that toured the DWPF facility that we are doing some work for in designing and developing some tools and processes for how they can qualify their waste, using small-scale systems and remote-type environments. So just last week we had an example of that where we had folks visiting.

And I’ll just mention, this is a little bit different than the glass waste form world, but at the lab we’re also working and sharing information and our knowledge base with the Hanford Site in different areas, cementitious waste forms as an example, with experience built here from the salt waste processing facility that you probably saw yesterday and the tank closure that was mentioned. Several of our tanks here in this site have been grouted closed.

Looking at mixing, we do not have pulse jet mixers here at the Savannah River Site, but some of the fundamental understanding of how sludges and salt and waste tanks can be mixed, can be applied at the Hanford Site. So that's the piece that we're trying to bring to the table.

Troublesome components, if you will, things like technetium and how it behaves and separation processes and how it might behave in a treatment process are other areas, and also our materials expertise, again working with the facility. We have a very robust structural integrity program here, which has, I think, served the tank farm well as far as controlling the chemistry so that we can maintain the tanks' integrity as long as feasible.

And then let me just close with a couple comments. I mentioned things--some of the technology development work we're doing with the Hanford Site. But we also have several folks actually embedded out there, again, teaming with PNNL and other national laboratories, trying to carry the experience base from here out there. We have a person embedded with the DOE Office of River Protection staff. We are working with the tank farm contractor out there as well as the Waste Treatment Plant with staff out there that can reach back here to our knowledge base in the lab and then obviously teaming with SRR as well to try and bring as much knowledge to the table as possible.

We also have occasionally been asked to lead technical assessment teams, as has SRR. So I think there is definite examples of where we're trying to bring the knowledge base across the country.

And start-up and commissioning, we didn't talk a lot about that, but that was a huge effort here; and many of the speakers you've heard so far today were very engaged in that. And that's one of those things, until you live it, you don't really know what to expect. And I think there's a lot of knowledge base that collectively we can bring based on our experience here.

And that's all I had.

EWING: All right, thank you. So let me invite you to sit at the front.

And, Vijay, could you join? And then if you'll stay by this microphone, I think we're all set for questions.

I'll ask first, questions from the Board?

(Pause.)

So then I'll start and I guess--well, any of you can answer, but maybe it's best directed towards Sharon.

So could you clarify the role or relationships between the Vitreous State Laboratory, the glass work at Hanford, and then the work at Savannah River?

MARRA: Yes. Vitreous State Laboratory is part of this. I didn’t mention them specifically. It wasn’t a slight. I just didn’t mention them specifically.

As part of the team, not only at the Hanford Site, but also here at Savannah River, SRNL is teaming with VSL to support the DWPF facility, so it’s--I mean, David could probably talk more about the details of how the scope and things are divided, but we are teaming with them, using their knowledge base as well.

One of the things that SRNL does not have the capability anymore is large-scale melters. VSL teamed with Energy Solutions has been critical, I believe, in some of the large-scale melter operations and supporting the Waste Treatment Plant.

EWING: Okay, thank you. Vijay?

JAIN: I would just like to add that VSL and Energy Solutions are the provider for the bubblers in our melter. Based upon the WTP experience, we did install the bubblers retrofitted in our melter (inaudible). So (inaudible) part of our R&D space that we do here.

EWING: Okay, thank you.

Additional questions from the Board? Sue?

BRANTLEY: Sue Brantley, the Board. So we just heard three talks, and the first one was--it seemed to me that the melters out there are really different than the melters here, and then the other two talks were how much integration there is. So that seems like a contradiction to me. Why are these melters so different if there's so much integration?

IVERSON: I guess I'll try to hit that. It's been a parallel development effort for many years. DWPF jumped into it from a different perspective, let's say. The original developers of the DWPF melter design were all Dupont process engineers who had the philosophy that everything should be a cylindrical tank and should be very high integrity, and that's the path that this site took. We investigated other designs and pilot work but finally settled in on the most conservative approach that could be taken.

The other sites, you know, Duratek history, West Valley history, they leaned more toward the commercial approach with standard refractory shapes and follow a commercial glass melter type of construction that was based on economics; it was based on personal preference of the designers. I don't know that we can defend a great deal either approach. It was just different philosophies.

But it started so many years ago that the path was already set for Hanford quite a long time ago before DWPF had a whole lot of experience. Hanford did look at--for example, I was on a team years ago where we talked about taking the DWPF design and implementing it for HWVP at the time. There were some problems with that. One was the size of the melter wouldn't make rate. Scaling up the melter had its own difficulties. There were questions about melter life at the time, because DWPF hadn't been in operation that long. But it was investigated. Then Hanford had a change in direction and a change in contractor, and the rectangular melter philosophy became ingrained, and that's the path that they took.

I don't know how to defend or criticize that. It's just the way things evolved.

JAIN: And also I would like to add to the fact that the Hanford melters took a lot of design from the successful operation of the West Valley melter. A lot of engineers who designed the DWPF melter were a part of the West Valley team and moved to the (inaudible) and took many of the features that were part of the successful West Valley campaign.

EWING: Efi.

FOUFOULA: Efi Foufoula, Board. So the integration efforts are to be congratulated and very much missing, but I would like to ask, do you have more specific plans? For example, you say that the integration efforts are resulting in benefits to EM. There is no question about that. But do you have specific targets and demonstration projects in the next, say, three years to more quantitatively show these benefits?

JAIN: If you look at the technologies, Hanford is seriously thinking into a rotary microfiltration system, the small column ion exchange, and maybe the next generation solvent that might be applicable to their direct feed LAW melter system. So, yeah, there might be targets coming up as they explore the existing technologies that can be directly employed that will save a lot of money as well as the time it takes to develop the technology and take it to the TR level of 5 and 6. So there will be a tangible benefit should Hanford decide to adopt some of these technologies that SRR currently has.

And also some of the things that Sharon talked about, they can take a head start from the lessons learned in the planning of the waste qualification process where we have a well-documented process for SRR that can be duplicated with some changes for the Hanford, which will be another tangible benefit that comes in place.

EWING: Ewing, Board. This is a follow-up question. I am also looking at the list of, say, the continuing integration efforts, your Slide 53, and trying to imagine the specific activity that is, in fact, an integration effort. So I'm wondering, the last item you have is waste disposition. So what does that mean in terms of the integration?

JAIN: We're looking into the low-level waste, what are the alternative strategies are there for the final disposition. Currently our waste is all dispositioned at Saltstone, the grout.

EWING: Right.

JAIN: Hanford is exploring--at one time they were looking at low-level glass for their final disposition. Now they're looking into Saltstone, and they're exploring what alternatives they have. So they are in the process of exploring different disposition pathways for their LAW.

EWING: Right, but--

JAIN: So we are providing a significant support to SRNL through their Saltstone program for alternative disposition they're planning to do.

EWING: But at Hanford Saltstone is not in their future. That's not an alternative that they're considering or--

JAIN: I don't know if it's in the alternative, but it's being explored.

IVERSON: Well, it's my understanding that it was on the table out there, but years ago, wasn't it, the Three Party Agreement? They decided that the way to go was vitrification of the LAW.

MARRA: Yeah, certainly vitrification is the baseline for their LAW at the Hanford Site. However, the current facility is not large enough to process all of the existing material, so there are options analyses going on. And I don’t know if anybody else may know more detail there, but we are supporting some of those options analyses.

Certainly, from a laboratory perspective, what we’re trying to do is identify other options that could ultimately be viable, and then ultimately maybe a different decision is made. But it is not the baseline. Glass is the baseline today.

EWING: Right. So the other options might be just examples, so--

MARRA: It could be a cementitious, a low-temperature waste form. It could be a cementitious material. It could be another thermal treatment method. But, you know, there’s performance assessments and other data, you know, key data that would need to be collected for those waste forms.

EWING: Okay, thank you.

Jerry?

FRANKEL: Frankel, Board. So I’ve always found the relationships between DOE and the contractors to be pretty complicated, you know, so you’ve got all these organizations. There’s DOE, there’s Savannah River Remediation, there’s URS, there’s WRPS, there’s CH2M HILL; so all these people somehow are involved with all the operations. Does that affect the exchange of ideas or people? So your predecessor leaves to go to Hanford. Does he have to change companies to do that, you know, and change retirement plans and everything or is there--you know, is there a free exchange of people that really can allow for ideas to flow back and forth?

JAIN: When you make a permanent move, yes, you change employers and your pension plan, yes. But there are a lot of short-term exchanges we do right now, maybe one to two weeks to extend it to three months, where our subject matter experts goes to the site and helps them out with certain specific issues. So those short-term exchanges work very well, because there's only a limited number of subject matter experts. We don't want to lose all of them to one site, and it's much better or fruitful or more beneficial for both sides if you share time between sites and work on specific problems and so on.

FRANKEL: But if there were one organization in charge of spent fuel and the high-level waste, wouldn't that simplify things?

JAIN: Of course.

FRANKEL: Yeah.

EWING: All right. Questions from the staff? Nigel?

MOTE: Nigel Mote, staff. One thing, not about the melters, but about the canisters. I wonder if anybody can say why the canisters are different sizes between Hanford and Savannah River Site, which happens to be the same as West

Valley. If this is an integration discussion as part of this session, maybe you can say where that came from, and is too late to change the design at Hanford?

OWEN: John Owen, Savannah River. DWPF was directed years ago to plan on not only rail transport, but truck transport. So that basically limited us to a 10-foot canister and staying within the weight of the legal weight truck. I don't know about West Valley. They may have gotten the same direction. Plus, having to have a drain valve under the melter would have added more height to our big vitrification building. But those were the two main factors.

EWING: Yes, Nigel.

MOTE: Can I ask the other half of the question? Why is the Hanford canister 15 feet long? If the 10-feet-length limit were to allow transportation by road, it sounds like going to 15 feet at Hanford means that you just ruled out the opportunity of transportation by road. Was that intended?

OWEN: I'm going to guess on that one, but I think the answer is, yes, Hanford was the one that did the rail.

MOTE: Okay, thank you.

EWING: Other questions from staff? Bobby?

PABALAN: Roberto Pabalan, Board staff. Just to follow up on Nigel's question about the--

EWING: A little louder, please.

PABALAN: --size of the Hanford glass canister, the

15-foot-tall canister, would that fit into the waste package if it was going to go into Yucca Mountain?

OWEN: Yes, yes. The waste package that was going to go into Yucca Mountain included--

EWING: A little louder, please.

OWEN: It included not only DWPF, but the Hanford 15-foot can.

PABALAN: Okay, thanks.

EWING: Okay, thank you.

Other questions from the staff?

PABALAN: I have another question for Vijay. Vijay listed a number of examples of integration across the DOE complex. Most of the examples appear to be one to two years old examples. My impression is, these integration activities, for one thing, it's not formal; right? There's no formal program for this integration effort.

The second thing is, is it fair to say that there wasn't much integration more than two years ago, and there's been an increase in activity in terms of integration in the past two years?

JAIN: I mean, we did have some integration with the sites before two years back in different forms. But the last two years we have really increased the level of integration between Hanford and us. That's really exponentially increased.

IVERSON: Well, I can address that also. I mean, I have worked on and off with Hanford and West Valley since the late ’70s. We have exchanged people and exchanged information between this site, West Valley, Hanford throughout that time. I mean, it’s come and gone, but it has always been there. There were more formal programs. I remember during our pilot scale work here, our pilot facility, we had a person full-time at Hanford doing liaison work as far back as the late ’70s that I remember.

So it’s been happening. It’s been more formal at some times than others. It’s come and gone as required.

PABALAN: And just one more question for Sharon. For Hanford to use cementitious materials for it’s low-activity waste, would that require legislation to allow them to do that, similar to the NDAA allowing Savannah River Site to grout and use Saltstone?

MARRA: I’m not a hundred percent sure about the legislation part of it. It would certainly require discussions and modifications of their agreements between DOE and the State of Washington. If somebody else knows for sure, please answer. But formal legislation, I’m not sure. I apologize.

EWING: Other questions from the Board?

Maybe this will be the last question. So you’ve described vitrification activities around the DOE complex.

Looking beyond DOE, there are other types of melters and new melting technology. So where in DOE would I go to find the people who are well-informed on, let's say, the cutting edge technologies in melter development?

MARRA: I think the national laboratories--

EWING: Well, but who and where?

MARRA: Savannah River National Laboratory has been very engaged.

EWING: So cold crucible research?

MARRA: For example, with the cold crucible melter, we have worked with EM internationally both with CEA in France. In the past we've had interactions with the Russians, who have used cold crucible technology certainly in the UK, some of their technology. So we are very active in the international glass waste form, if you will.

EWING: Right. So would it be a reasonable expectation that in the U.S. we'll be using some of these technologies at Hanford or other sites?

MARRA: There have been evaluations done on the use of cold crucible melter in the U.S. There have been several reports out there that talk about that. Ultimately it comes down to a decision by the Department whether--it kind of goes back to the earlier question, whether the cost to install a different kind of melter is worth the benefit, so--I mean, I can't speak to whether the Department would make such a decision, but certainly the evaluations have been done that could inform such a decision.

EWING: Okay, thank you.

Any last question?

All right. I'd like to thank all three of the speakers, and we'll move on to the next topic, which is the storage of vitrified high-level waste. And the first speaker is Brenda Green from Savannah River Remediation.

GREEN: Good afternoon. Thank you, Mr. Chairman, the Board, and the staff. And I will be answering three of the four last questions dealing with the canister storage production numbers and also how we plan to do the storage at Savannah River Site, so I will be covering the back end of DWPF essentially.

So what you have on this slide represents the predicted canister production rates. And this is based on System Plan 19, and that is what Pete Hill had discussed earlier how we do our system planning. So this is the current approved system plan. It reflects all the integration between the different parts of the process.

So what you're seeing is, for Fiscal Year 15 we are looking at 156 cans, and we go up to the 276 for Fiscal Year 19 and beyond. We will have reduced rates with the melter outage. Currently the System Plan 19 assumes that would be in Fiscal Year 16. If the melter is not at the stage it needs to be replaced at that point, that date will tend to slide to the right. As far as Fiscal Year 18, which you're seeing there, is a smaller number also due to the integration and outage activities that will be required to actually integrate the SWPF.

Production to date through the end of September Fiscal Year 14, we have produced 3,877 canisters. The anticipated or estimated canister production with System Plan 19 is the 8,582; and currently, therefore, we've produced about 45 percent of the predicted canisters. We do see that our canister production today would exceed our storage requirements in Fiscal Year 19.

So currently we have two glass waste storage buildings. Glass Waste Storage Building 1 is full, and Glass Waste Storage Building 2 we have about 711 spaces left. If we go to what do we do with supplemental canister storage, there were some questions dealing with do you anticipate a third Glass Waste Storage Building. That is not planned at this point. There is a large up-front cost. You can see we're talking about approximately 130 million, and there also would be additional future D&D cost. What we have looked at is a future Glass Waste Storage Project that's being developed, and it will provide multiple features for us. It would transition to above-ground storage containers with supplemental canister storage similar to the SNF storage. We have the loading station; we have storage pads; also storage containers procured as needed to support the canister production; and it would also be able to allow in the future the canister transportation capabilities.

Current status of the Glass Waste Storage Project, that line item has been deferred until Fiscal Year 18. So in the interim we need to have an interim canister storage, and so that interim canister storage I'll discuss in the next couple slides. And our plan is to initiate double stacking within Glass Waste Storage Building 1 that would give us the capability if needed to go from 2,254 canisters to 4,508 canisters, so essentially double the capability in that building itself. It does involve a simple physical modification, which I'll cover also in a little bit more detail the next couple slides. Bottom line, it lets you end up putting where you have one canister, you put two canisters. That's what it does.

Simple concept of the interim canister storage, what we call the double stack, you can see right here, this would end up being that you would have the double stack configuration. And so what does that mean? That means that, again, the simple modifications currently. The single cylinder is set here on a crossbar, and it would have to be removed; therefore, the first canister would sit here on a smaller support plate closer to the floor. The canister support system here would still remain in place. You can see it’s been placed over here. The other change is the size of the shield plug, which sits here in this five-foot concrete space. It’s currently four foot; now it has to be a much shorter shield plug.

So that more or less covers the changes. Again, we just talked about those. You would end up having the first canister almost sitting on the floor; the second canister sits on top of the first canister and would actually extend into the concrete operating floor deck of the Glass Waste Storage Building.

This picture provides a little better perspective, so what you’re seeing here is actually the canister support. These cylinders are where the canister supports that the current single canister sits in is the top of the single canister here. This is the support plate that it actually sits on, so this support plate would actually be removed. That support plate is one-and-a-half-inch-by-three-inch galvanized carbon steel. We also have these tabs. There’s three tabs or three guides in two different locations, and you would have to ensure that those guides stay in place.

Here’s another perspective of what the change looks like. So here again is you have--the plug would be replaced with a smaller plug that’s tapered, you would remove this crossbar, and then you would install a floor plate and end up with a two-stack configuration.

So what does this do for us? What it does do for us is, it allows you now to have storage space for canister production rates in our system plan into Fiscal Year 26. If the decision is made that we would pursue and double stack the entire Glass Waste Storage Building positions, all the positions in that building, you would be covered into Fiscal Year 26.

We have done a technical feasibility summary. Essentially that feasibility summary does confirm that double stacking is feasible. We did evaluate heat transfer to ensure there were no concerns with tripping any of the temperature constraints required. We looked at future wattage of future sludge and glass that would be produced based on the system plan. So, again, there would be no issues with the future canisters that would be produced. We evaluate it from a seismic/structure sampling to make sure we would have no concerns from a seismic performance, from the standpoint of static, or also from the canister integrity with one can sitting on top of the other. We evaluate it from a cutting tool technology, do we have the ability to go into this location 20 foot down and remove that crossbar, and that is not a concern.

We have also done preliminary radiological calculations that looked at, well, what would be the dose rate when you finish if we now had double stacks with the same five-foot concrete floor where there would be shield plugs and found that that would not be an issue. It would remain an underground radioactive material area, which is currently how it's posted today. On your tour you may have walked into the Glass Waste Storage Building. I'm not sure. That posting would not change when we've finished.

We also looked at the calculations that would--we also did radiological calculations to say, oh, how would we implement this? How would you--would you have a concern with people getting dosed as they're actually removing the crossbar? And so we've been able to identify the minimum number of canisters that have to be relocated such that we would stay below 5 rem per hour--excuse me--5 millirem per hour as they're doing the work.

We've also evaluated from the safety basis and fire hazards. There's no real concern. It's just a matter of implementation. For example, if we're doing the cutting, you know, we'd have to ensure things such as combustible controls and egress controls and things of that nature. We know the safety control requirements based on our safety strategy that we've already addressed and issues.

So, in summary, for the canister storage, we have a technical feasibility evaluation that supports that double stacks in Glass Waste Storage Building 1 is feasible. This becomes an interim canister storage to bridge the canister storage gap until we have a glass waste storage project implemented. It does increase our capacity in the Glass Waste Storage Building and doubles the capacity to the 4,508 canisters and additionally provides adequate storage through Fiscal Year 26.

That's all.

EWING: All right, thank you very much.

Let's move on to the next speaker, and then we'll pose questions to the two of you. So the next speaker is Jean Ridley from Savannah River Operations.

RIDLEY: I'm Jean Ridley. As you said, I'm with DOE. I'm the director for the Waste Disposition Program at the Savannah River Site. I'm kind of changing topics from the storage to just talking a little bit about--to answer the Board's question on the integration between headquarters and the sites on the packaging, shipping, and disposal of spent fuel and high-level waste.

Fortunately, it's the end of the day, and I only have one slide.

As far as internally at the site, I communicate regularly with my counterparts that you met earlier, Maxcine and Allen. We do talk about some integration, especially the receipts that we get from the Canyon into the high-level waste system. But we also--as Maxcine talked about in her presentation, we have considered long-term storage, putting the spent fuel and the high-level waste canisters together. We're looking at it; but as you toured the site, we have a distance problem between where the spent fuel is and where the high-level waste is. Not that it can't be overcome, but it's not a real good fit right now. So we are looking long-term how we could possibly package the material together, but right now it's not on the horizon.

So currently we are going to continue to respectively store our material safely in their current configuration. Long-term, as far as the high-level waste canisters, you just heard our storage plans for that. With spent fuel, you heard about their storage plans with the wet storage and maybe in the future dry storage.

We are maintaining our glass requirements according to the protocols and the requirements document that headquarters has given us that was developed by the Office of Civilian Radioactive Waste Management. That's our Waste Acceptance System and Requirements document and the Quality Assurance Requirements and Description document. We are audited every year by headquarters in accordance with that QARD, Q-A-R-D, requirement document. They come down; they look at our processes; they look at our samplings; and they ensure that our documentation is maintained so that eventually, whenever a repository is ready, our material can be accepted.

I put that third bullet there on the NRC Safety Evaluation Report. I know that it just recently came out. It deals with post-closure, so it really doesn't affect how we're producing our glass right now. But I just wanted to note it in case there was a question.

As far as our integration with headquarters, we have--as far as on the high-level waste side and the spent fuel, we do deal with the Office of Waste Disposition in headquarters. They look at the long-term strategy for dispositioning the waste forms. As you know, the BRC, the Blue Ribbon Commission, came out with their strategy document.

As far as Savannah River's concern, we are not integrated into a lot of that discussion at this point, because right now that strategy has been given over to the Nuclear Energy Office, and they are addressing the strategy. But as far as EM is concerned, we are looking at information and possible suggestions to NE on how to dispose of our waste forms. One of them is, they are looking at the decision to commingle the spent fuel and high-level waste with the commercial side. What they're looking at is splitting the defense waste away from that, and there's a little section in the strategy report that talks about maybe the first interim storage materials would be the defense waste. But whether or not that comes to fruition, I don’t know.

The other decision that EM is looking at is the consent-based siting process. Again, NE is leading that, but EM is looking at what that would entail as far as integration with NE.

And just another factor to consider on the integration, NE did sponsor a technical report through Sandia National Lab on permanent geological repository. As far as the Savannah River Site is concerned, what we got out of that was, it doesn’t affect the way that we are producing our glass. Right now we’ve been assured that our waste form, the way we’re developing and producing our glass, will be an acceptable waste form into whichever repository place that’s chosen.

And, with that, that’s all I have for our integration.

EWING: All right, thank you very much. And let me invite you to sit at the table up front. And, Jean, if you want to join us.

So these last presentations are open for discussion. Questions from the Board? Yeah, Jean.

BAHR: Jean Bahr from the Board. So you gave us an estimate of the cost for a new high-level waste building of 130 million. I’m just trying to get a feeling for what are the alternative costs for, first of all, the interim double stacking costs of doing that, because there's, I'm sure, a lot of human power that's going to be involved in moving things and all of that, even if you don't have to build a new building; and then also what would be the cost to build a surface storage outdoor pad and the associated concrete casks or whatever go over the waste. And just ballpark, I mean, I don't need--

GREEN: I'll address the first one. What we've looked at is, the costs would be around 43 million approximately for us to do the double stack in Glass Waste Storage Building 1.

RIDLEY: And for the glass waste storage project concept, it was a range of, like, 40 to 60 million. With that, that only includes the garage, I'll call it, that Brenda talked about, the transfer station, the pad, and two of the casks. Additional casks would be purchased as we produce canisters. And, again, that's between 40 and 60 million.

BAHR: Are there differences in the maintenance requirements in terms of security or anything like that for storing materials outside versus in the ground?

RIDLEY: No. The concrete casks themselves, when we put the canisters in them, the intent is to put a fence around the canisters; but it's more for radiological protection.

BAHR: Thank you.

EWING: Other questions from the Board? Jerry.

FRANKEL: Frankel, Board. So maybe you've thought about it, but if the numbers work out, you could stack one canister right on top of another, and the top one would stick out like two feet. Couldn't you just do that and put a plug right on top, you know, a big shielding concrete plug and then not have to worry about moving things?

RIDLEY: Well, in the first building the shielded canister transporter cannot go over bumps. It has to stay flat, which is why they have to redesign that plug in the first building. There has been talk about whether or not we could do the same concept in the second building. The problem with that is, the second building the floor is only four foot thick; it's not five foot thick.

So if you saw--remember the diagram. The second canister protrudes significantly into the floor, and in the second building, if you do that, you're pretty much at the top level. So could it be redesigned? Yes. But at 43 million to design those plugs versus putting in a whole new floor in the second building--

FRANKEL: The floor couldn't support another foot of concrete? Just put it all the way across; then it's flat again.

RIDLEY: And then you have to engineer each hole in that. So cost, yeah, we would require a cost benefit analysis.

GREEN: Yeah, we would have to go back; and, like, we just completed the feasibility report for Glass Waste Storage Building 1. With that difference in the operating deck height, the four foot versus the five foot, you'd have to step back and look at the same type of information.

RIDLEY: And, second, you've got to remember, when we start producing the higher cesium canisters from Salt Waste Processing, the radiological concern to store those canisters double stacked in the second building may be a question. We think it's okay in the first building, because we're going to mix it with the very, very low activity canisters. But when you get to the second building, you're going to have to use the canisters that are there; and I'm not sure the building can support that. Again, we would have to do a feasibility study to see.

EWING: Other questions? Sue.

BRANTLEY: Sue Brantley, Board. Not knowing very much about this, it doesn't seem very reassuring to me that you designed it to have a four-foot-thick floor, and now all of a sudden you're going to turn around and make it so that there's only a foot between the, you know, air and the top of the canister, so--

RIDLEY: Double stacking was never in the picture up until six months again, a year again. So the vision was never to double stack. So when they built the second building, they were looking for cost savings, and reducing the floor thickness saved a considerable amount of money.

BRANTLEY: Well, I guess I confused you. I mean, you originally designed the first building with a five-foot floor, and then the second building was a four-foot floor. So that tells me that there was some safety reason to do that, because you could have built it right in the beginning with a one-foot floor, which is what you're going to end up with, or two-foot, I don't know, whatever it is, is the double stack.

GREEN: When they built the Glass Waste Storage Building 1, they were looking at the--you know, at that point their best projection on what they would have to design for, both from a cooling standpoint, the temperature controls for the glass itself, and also for the concrete. And it was chosen to go with something that you would have plenty of space between the bottom of the canister and the top of the canister for air flow. And also the thickness of the concrete operating floor deck, the five feet was trying to make sure that when the canisters would be produced that you would have adequate shielding.

We have found that actually it provided more than adequate shielding, because, like I said, currently it is posted as underground radioactive material. It wasn't envisioned that it would be posted that low. What we have found is that the actual characteristics of the glass canisters have been able to--have been less.

John, is there anything you want to add to that?

OWEN: John Owen. We should add that that plug that's shown from the double stack is a steel plug. It's not a concrete plug. So it basically has the equivalent shielding of the original plug that's there. Does that answer your question?

BRANTLEY: Yeah, I think so. So you said that the canisters have less--I think you said that they're less radioactive than originally planned, and then you said that the steel plug actually is just as shielding. So there's actually two--

GREEN: There's actually two.

OWEN: So the building was originally designed for Savannah River plant to be continuing running reactors, continuing making fresh waste, and DWPF catching up and get within 10 or 15 years of the waste generation. So it was going to be much higher activity waste than what we have today.

EWING: Mary Lou.

ZOBACK: Mary Lou Zoback, Board. Jean, a question for you. First of all, I really want to congratulate you and everyone that's made the presentations today. We visited a number of sites, and it was so refreshing to see everyone show the entire system and where they fit in the system and the awareness of the constraints of other parts of the system.

So, as the person in charge of this huge system and recognizing there are real budgetary constraints, I've gotten a little lost in all the acronyms and everything. What's the biggest bottleneck right now, and is it a $130 million fix? Could it be a $40 million fix? You know, there are budgetary realities, but the reality, too, is you guys have a process that's working, that's doing the job it's supposed to do, and I think we feel sort of--I personally feel like you're a model for what the other sites should be doing.

So if we could help with resources--and we can't because they don't listen to us--but what would you want, and what's a realistic--you know, you can't ask for the sky, but how do we help you?

RIDLEY: So there's two parts to the answer. First, our bottleneck is in the amount of salt we have. We have to process the salt in order to make the system work.

ZOBACK: So bottleneck meaning you have too much salt?

RIDLEY: Too much salt and limited capability to process it. As we talked about and Pete talked about, the actinide removal process and modular caustic solvent side extraction--I'll say ARP/MCU--and forgive me for the acronyms; I'll try to spell them out--currently that's limited to about a million gallons per year. We have the capability of ramping that up provided we have sufficient funding to do so.

The other part of the--

ZOBACK: You have the actual capacity on site already.

RIDLEY: Yes.

ZOBACK: You just need more money. And why do you need more money? To run it hotter or faster, whatever? I don't know

RIDLEY: Modifications.

ZOBACK: You'd have to physically modify it. Okay.

RIDLEY: Because you have to prepare the batches. So in order to get the sludge and the salt out of the tank--the tanks were designed to pour things in, not to get things out.

ZOBACK: Right.

RIDLEY: So every time we try to get things out of it, the salt and the sludge, we have to put in infrastructure to do that. So in order to ramp up, we need to be able to accelerate the amount of infrastructure materials that we need.

ZOBACK: So you need more tank removal hardware?

RIDLEY: Pumps and--

ZOBACK: Pumps and such.

RIDLEY: --other things. And if Pete was still here, he can fill you in a little more on the details of that.

But the second part is the Salt Waste Processing

Facility. As we discussed before, it’s planned to run at nine million gallons per year. We, with ARP/MCU, believe we can get up to 4.5; so, you know, that’s still twice the amount. SWPF was supposed to come online back in 2015, and the current baseline now is somewhere between 2018 and 2021. So that’s our bottleneck.

ZOBACK: And can I just probe that a little? That delay in the completion, was that because of funding shortfalls?

RIDLEY: It was a combination of--for SWPF, no, it wasn’t funding-related. It was due to redesign of the facility to increase its seismic capability.

ZOBACK: So that was something imposed on you from the outside?

RIDLEY: Yes.

ZOBACK: Okay.

RIDLEY: And then there were some other issues with tank deliveries that delayed it.

In order for us to increase, again, the ARP/MCU to ramp up as an interim step to help us overcome that bottleneck, we have various scenarios, funding scenarios, that we look at projecting. And right now probably we’re talking in the range of $75 to 100 million a year additional above our current funding level.

ZOBACK: And that 75 to 100 sounds like a lot of money to me, but what’s your overall annual operating budget for the entire--

RIDLEY: For the liquid waste system it's about 500 million.

ZOBACK: Okay. So this--

RIDLEY: It's been as low as 430, and I believe System Plan 19 is based on that 430 level. And, like I said, historically it's around 500 million, but the amount that actually goes to the contractor is about 400.

ZOBACK: Thank you for being very straightforward.

EWING: Staff, questions? Okay, Bret.

LESLIE: Bret Leslie, Board staff. You did a very good job of talking about integration on the site, but kind of something that I didn't hear was the integration into disposal. So, for instance, I thought I heard that, you know, in evaluating the storage of the cask that it would be a storage-only cask rather than potentially storage and transportation, which commercially they do.

So knowing that you need to transport, can you talk a little bit more about why you would just use a storage-only cask?

RIDLEY: Basically, the reason we looked at only a storage was funding. We were looking for the most economical way to continue production at DWPF. And in light of the fact that we weren't going to ship probably anytime soon, that was the decision.

LESLIE: I have another question, and you'll probably answer it, I hope. With the Assessment of Disposal Options for DOE Managed High-Level Radioactive Waste and Spent Nuclear Fuel report that was sent out a couple weeks--or last week--that was really this last week--you know, and the double stacking buys you six more years, basically 2026, again, how is this integrated in terms of getting material out of the State of South Carolina?

RIDLEY: It's strictly for storage. Until we have a repository or an interim site that we can ship to, we are doing the most prudent path that we think so that we can continue to operate and put the liquid waste in a stable form.

LESLIE: Thank you.

EWING: Any other staff questions? Okay, Dan.

OGG: Dan Ogg with the Board staff. Looking longer term at Savannah River Site, do you have in your planning basis a packaging and transportation facility where this material would be loaded for transport off the site?

RIDLEY: We are looking at those options as part of the Glass Waste Storage Project Optimization Study. Those ideas will be part of that study on what we would need to do to the Glass Waste Storage Project to make it usable to load a transportation cask, but it's not part of the actual project at this point.

Now, in the past it was always on the books to have a shipping facility. There was a tentative location identified for it, but in recent years I don’t believe they have continued to carry that potential project because of the delay in the repository.

EWING: Mary Lou.

ZOBACK: Mary Lou Zoback, Board. A bit of a follow-up to Bret’s question. You know, you’ve given us some numbers for the various options. And, for example, with the dry cask storage, you know, I understand you’re doing just what the utilities are doing, put it in the biggest casks you can to buy fewer casks, and it saves money now. But if in the end it means DOE pays more later when potentially these things have to be repackaged, not to mention the risk to workers and things, does that ever factor in when you’re creating budgets and having discussions with DOE, you know, the entire life cycle costs? You know, yeah, we can save money now, but I’m sure I’m expressing your own frustration, but--

RIDLEY: I concur. Pretty much, you know, the optimization study, the garage concept, the transfer station, part of that study will show that, because you put the canisters in the storage casks, you can bring the casks back, and if you add a--I’ll call it a wing--onto the side for a transportation cask, you can just reload it into the transportation cask. That’s kind of the conceptual-type ideas they’re looking at. But, again, it’s so far in the future, unfortunately, we look at short-term budgets, and that’s where we’re at.

EWING: Actually, I’d like to ask a question. It may be the last one, depending on the time.

Is yours a short one, Jerry?

FRANKEL: Well, it just is related. So these--anyway, the high-level waste is already in a protected canister, you know, unlike the fuel, which would need a canister to be put in for dry storage. So wouldn’t it just need like a concrete overpack for radiation protection? It wouldn’t have to be just for the temporary storage. It could be very inexpensive.

RIDLEY: Yes. The Glass Waste Storage Project is just a concrete cask.

FRANKEL: Just the concrete overpack then.

RIDLEY: Right. There is no steel in it except, well, rebar, but it’s just a concrete cask.

FRANKEL: So it’s not for transportation.

RIDLEY: It is not for transportation, no.

FRANKEL: Right, right, right.

EWING: So a question for Jean. You raised or referred to the commingling report that just came out last week, and I referred to it as a demingling report; that is, consideration of separating the DOE-owned high-level waste and spent fuel from the commercial side. And one can imagine many scenarios growing out of the report that came out last week.

But if they were separated, then one would presumably, given budget choices, have to give priority to either the commercial side or the defense side. And thinking about that, does EM have a position or the Savannah River Site on this possibility?

RIDLEY: I am not aware of a position yet on that.

EWING: So in the discussions prior to the most recent DOE report, did they talk to the sites about the impact on--

RIDLEY: Well, I can tell you from Savannah River's perspective, we are pushing for us to be chosen first.

EWING: Right, right. I'm sure everyone who reads that report sees themselves as first in line, but there has to be someone following. So--

RIDLEY: And I would have to defer to someone from headquarters to answer that question.

EWING: Any last questions? Staff? Board members?

All right. I want to thank you both. And I want to thank all of the Savannah River Site personnel who have hosted us, who have spoken to us. I want to say, you know, we have this procedure, giving you questions ahead of time, and what the Board very much appreciates is, you've been very responsive. We can look at the questions; we can listen to your talks; and you've given us the information and more than we had asked for. So thank you very much and extend our thanks to all your colleagues.

So we're to the public comments section, and we have--okay, right, two people, Rick McLeod--yes, Rick, if you'll take five, ten minutes, no more than ten minutes.

McLEOD: We don't get to split the 30 minutes into 15?

EWING: No.

McLEOD: Then we won't do that.

You kind of heard today the different processes. You saw yesterday the different processes. Hopefully you have now realized that they are interrelated and connected. You heard from multiple contractors. Professor Frankel mentioned the different contractors and how they set up and run different parts of the piece of the puzzle. Professor Zoback mentioned the budget, and we know there are limited budgets moving forward. But three years ago H Canyon was on the chopping block, and some folks, I think, on the Board even mentioned what a prime and robust facility and a needed facility within the complex.

So what I'm hoping you-all leave today with is, if we cut H Canyon, it impacts several things, the domino effect. If we cut funding to Savannah River National Lab, you could see that they are integrated through the whole process at the site. I'm not sure some of our DOE headquarters folks even understand how much of connectibility we have down here. I know our congressional staff do not and our congressional delegation.

As you finish your report today or you formulate your recommendations, I hope you at least acknowledge in that and recognize and make folks aware of how connected all of these things. And regardless of whether is under your purview or not, you can at least let them know that the technical relationship between those exists; and if you mess with one thing, it messes up something else over here.

And just to say thank you again for you-all attending and being in the region. I hope you come back when you're not in business and enjoy our southern hospitality.

EWING: All right, thank you very much.

And Tom Clements.

CLEMENTS: Thank you. Again, I am Tom Clements with Savannah River Site Watch, and that's www.srswatch.org if you have interest.

I want to underscore how important it is that you're here, and thank you for coming. There are only a few avenues that the public can get information from the Department of Energy from Savannah River Site, and those are primarily through meetings like this where presentations are basically required to be made.

You've heard about the Savannah River Site Citizens Advisory Board, the Governor's Nuclear Advisory Council, and occasionally the Nuclear Regulatory Commission, which is monitoring the tank waste issue and waste incidental to reprocessing. Those are the main places and your being here that we get information about what’s going on at the site. There is very little voluntarily put out there. You cannot find documents like were presented today on the Savannah River Site website.

So it is very important what you’re doing, and it helps the public understand what’s going on at the site. And I think they should, you know, publicize more the good news of what’s happening. And talking about that, my impression as a member of the public who attends a lot of these things is, there is a lot of good news about the DWPF and filling of the waste canisters. I have long supported emptying the tanks and making sure that DWPF was operating in an ever-improving manner.

So I think it’s quite an unsung record that Savannah River Site has filled over 3,800 canisters here. And thank goodness we’re not Hanford, and there’s a lot of work to be done there, so I hope you can help address those challenges. But I think it’s a very positive thing that the tanks are being emptied and the casks are being filled.

And I have some reservations. One of them is that I am not convinced that the Salt Waste Processing Facility is going to start up in the way that’s being presented, because

I know that it’s had big cost overrun problems. There were problems with the design and delivery of certain tanks. We’ll see. A lot of things obviously depend on that facility operating, but I won’t necessarily believe it until I see it.

We’re hearing about improved cesium stripping out of the waste. It’s a good thing. I think there are some positive signs, but there are some warning signs that remain about salt waste processing.

Related to emptying the tanks, I would flag two things for you to keep in mind. One is that back about ten years ago the Natural Resources Defense Council brought a lawsuit about disposing of high-level waste in all the tanks in a geologic repository. There was a law passed that allowed for the salt waste to be disposed of in the cells here at Savannah River Site, and also that law applies to Idaho. But that lawsuit in many ways, I think, helped slow down the process, which was a good thing in my opinion, because it helped for improved technologies to remove as much waste as possible from the tanks. But I remain concerned that they might get to a certain point and stop improving things.

So I would encourage you to encourage DOE to continue developing processes to remove as much waste as possible from the tanks, because what remains is going to be in tanks forever, a lot of them will be sitting in the ground.

The second thing on the salt waste disposal cells, because of the NRDC lawsuit and by improvement in the technology and the ability to strip out the cesium, there are fewer curies going into salt waste.

So I would encourage you to encourage DOE to continue to improve technologies with the Salt Waste Processing Facility and the ARP/MCU to figure out how to take more of the uranium nuclides out of the salt waste so less material goes into those cells, which is going to stay here forever.

So that's all I really wanted to say about high-level waste. And just one more thing about the demingling report that came out last week. I was a little bit baffled about the timing of it. And one thing that I noticed was not in it, that underground at WIPP before the accident, I'm not quite sure where the test was, but they were either about to start conducting a heater test on a cask of high-level waste type, maybe from Savannah River Site. That wasn't discussed in the report as far as I saw.

So I don't know where that kind of testing is going on; but as far as changes to the Land Withdrawal Act, if WIPP is going to open and be able to receive material, if there's going to have to be expansion of WIPP or a second salt mine, having to look at two geologic disposal sites, I think it kind of could complicate things in a big way.

And I know people are talking about the demingling issue, but I'm not so sure that report really helped the discussion for overall high-level waste disposal.

But thank you again for being here and maybe chat with a few of you after the meeting. Thanks very much.

EWING: Thank you.

Any other public comments?

All right. Then my final thanks to those of you in the audience who have stayed throughout the day, a fair number of you. I invite you to the poster session, which will start at 5:30. I think it must be out in the--just out here. And there may or may not be wine or beer available. There's not?

SPEAKER: There's a bar downstairs.

EWING: There's a bar downstairs. You may have to rely on your own charm to make for interesting conversation, but we really appreciate being here. We enjoyed the southern hospitality. Please come to the poster session. The Board members and staff will be there. Look forward to talking to you.

To the Board, separate announcements. We'll be meeting in Estes B Ballroom tomorrow, and then we'll meet for dinner at 7:15, the Board--this isn't a general invitation-- in the restaurant in the hotel, the Augustino.

So thank you very much, and the meeting is adjourned.

(Whereupon, the meeting was adjourned.)

C E R T I F I C A T E

I certify that the foregoing is a correct transcript of the Nuclear Waste Technical Review Board's Fall Board Meeting held on October 29, 2014, in Augusta, GA, taken from the electronic recording of proceedings in the above-entitled matter.

November 15, 2014 /s/Scott Ford____________________

Federal Reporting Service, Inc.
17454 East Asbury Place
Aurora, Colorado 80013
(303) 751-2777