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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)

178th MEETING

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WEDNESDAY,

APRIL 11, 2007

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The meeting was convened in Room T-2B3 of Two White Flint North, 11545 Rockville Pike, Rockville, Maryland, at 9:00 a.m., Dr. Michael T. Ryan, Chairman, presiding.

MEMBERS PRESENT:

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

NRC STAFF PRESENT:

BILL von TILL

MIKE FLIEGEL

KEITH McCONNELL

DEREK WIDMAYER

ANTONIO DIAS

ROBERT MECK

JOHN FLACK

ALSO PRESENT:

KATHRYN SNEAD (via telephone)

RAM BHAT (via telephone)

CARL GOGOLAK (via telephone)

JOSEPH COOK

DAN FEEHAN

(via telephone)

CHRIS KUNITZ

1

A G E N D A

P R O C E E D I N G S

(9:02:02 a.m.)

VICE CHAIRMAN CROFF: If we could come to order, please. This is the second day of the 178th Meeting of the Advisory Committee on Nuclear Waste. During today's meeting, the committee will consider the following, the Path Forward On An In-situ leach rule making, a Summary of Meetings with EPA and NMA, a briefing on the MARSAME manual, the Scope and Methodology of the Government Accountability Office Ongoing Review of the Global Nuclear Energy Partnership, Discussion of Draft ACNW Letter Reports.

The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Latif Hamdan is the Designated Federal Official for today's session. We have received no written comments or requests for time to make oral statements from members of the public regarding today's sessions. Should anyone wish to address the committee, please make your wishes known to one of the committee staff. It is requested that speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard. It is also requested that if you have cell phone, or pagers, kindly turn them off, or place

on mute.

Thank you. Chairman Ryan will be joining us shortly. He's otherwise occupied, so we're going to proceed. We have the first session on In-situ Leach Rulemaking. Dr. Weiner is the cognizant member. Take it away, Ruth.

MEMBER WEINER: Thank you. And this morning we have Bill von Till and Mike Fliegel from the Staff, and Keith McConnell, who is with us, all of them experts in this area, so we're looking forward to what you have to say. And this is, I understand, background information for the proposed technical support for the proposed rule making. Have I got that right? So without further ado, Bill, I believe you're the first speaker.

MR. von TILL: Thank you, Ruth. Good morning. My name is Bill von Till. Again, I'm the Branch Chief for the Uranium Recovery Licensing Branch. I'm also a hydrologist, and I'm well versed in this subject matter.

We're here today to give the committee a status of the ISL rule making effort. Sitting next to me here is Dr. Myron Fliegel, the Project Manager for the technical part of this effort. Also in the room is Keith McConnell, the Deputy Director for

Decommissioning and Uranium Relicensing, and Kevin Bouchet, who is the Branch Chief on the rule making side of this effort. The Project Manager, Kevin is back there. Thanks, Kevin.

MEMBER WEINER: Kevin, why don't you come up and sit with the rest of the staff?

MR. von TILL: Kevin just started with this group not too long ago. The Project Manager on the rule making side of this effort is Gary Comfort, who's on travel this week and couldn't join us today.

This is a very dynamic time in the Uranium recovery arena. The price of Uranium continues to climb, and is nearing $100 a pound, due to the worldwide demand for nuclear fuel. We've been contacted by nine companies who are planning to submit 12 new applications for new Uranium mills over the next few years, aged in-situ leach facilities, and for conventional facilities. That number is very fluid, and may decrease or increase over time.

It's fair to say that the method of choice at this point forward is in-situ leach mining and milling, where the milling and mining occur all in one shot, so most of the applications, and most of the worldwide production of Uranium mining and milling is in-situ leach at this point. Some formations are not

amenable to in-situ leaching, and they still use conventional mining and milling. The NRC only regulates the milling part of conventional aspect. The mines for conventional, the NRC does not regulate.

The Commission has directed the staff to draft a rule on the groundwater protection aspects of this unique approach to Uranium mining and milling, and we look forward to working with the committee on this effort. With that, I'll turn it over to Mike Fliegel, who will present the briefing this morning.

MR. FLIEGEL: Yes. I'm Mike Fliegel. I'm Senior Project Manager. I work for Bill. If we can have the next slide.

The purpose of our briefing is to provide a basis for the rule making, provide some background and history to the ACNW, background and history that led to the rule making effort, and we'll discuss some recent events, and next steps, including interactions with ACNW.

Atomic Energy Section 84, and that was added to the Atomic Energy Act by the Uranium Mill Tailings Radiation Control Act, UMTRCA, of 1978, and that requires that NRC ensure that 11e.(2) byproduct material is managed in such a manner that it conforms with standards promulgated by EPA. And 11e.(2)

byproduct material, to refresh people's memory, basically tailings and waste from the processing of any, or for its Uranium or Thorium content, source material content.

The standards that EPA was required to write in conformance with UMTRCA appear in 40 CFR 192. The NRC regulations that conform to the EPA's regulations appear in 10 CFR Part 40 Appendix A. And both sets of regulations focus on conventional mills, because at the time that the regulations were written, most Uranium milling was done in a conventional mill. ISLs were new, they were experimental, and we really didn't –- there just weren't enough. We were concerned with conventional mills.

As a result, now that we have primarily ISLs, we regulate ground water protection at ISLs primarily through license conditions. We have guidance that appears in NUREG-1569. We had initiated a rule making covering all of Uranium recovery in 1999, the so-called Part 41, and that was discontinued in 2001 due to the cost to the industry. At the time, the price of Uranium was very low, and a few industry participants, licensees who would have to pay –- we would have to adjust their annual fees to pay for that. And, instead, we updated the guidance and

updated 1569.

In addition to getting a license from NRC, an ISL operator has to get a permit from EPA, or an EPA authorized state, and that's a permit under the Underground Injection Control program that appears in EPA's standards, and that comes out of the Safe Drinking Water Act.

I apologize for this slide, but there's a lot of information. The industry has complained about the dual regulation for a number of years, the fact that they have to get an NRC license, and also have to get a permit from state, or from EPA under the Underground Injection Control program, and the Commission has directed the Staff to try and find a way to eliminate some of that dual regulation by deferring regulation of groundwater at ISLs to EPA, or the EPA authorized state.

The Staff tried to develop MOUs with both Wyoming and Nebraska, the two states that we have active ISLs at to defer regulation to those states, and the Staff met with the regulatory staff in both of those states. The staff found, however, that there was major difference between the way NRC is regulating groundwater protection, and the way the states were doing it.

NRC has, as a primary standard for restoration of the groundwater in the mining zone after the mining has been completed. Our standard is restoration of that mining zone to background. By "background", we mean what it is was before mining commenced. If that's unachievable, we have a secondary standard that looks to the state's class of use standard.

Both of those states have regulations that define various classes of use, and what standards for constituents in those classes of use would be. The states, however, both Nebraska and Wyoming go initially to restoration to class of use.

The NRC - our methodology is in NUREG-1569. And, actually, when we first initiated this effort, Wyoming was regulating groundwater protection in its state essentially the same way that NRC was, but they have been challenged by the industry, and their controlling legislation pointed to class of use, it didn't point to restoration to background, so Wyoming had to change its regulations. And so, we determined that when we went out and met with them, and that's when we came to the conclusion that we weren't compatible, that we could not defer to a state that didn't have the same primary standard.

When this occurred, we wrote to the Commission, and SECY 05-0123, and we discussed the problems that we had, the fact that our regulations, or our requirements, because they weren't in our regulations, were more stringent than Wyoming and Nebraska's, and we proposed preparing essentially an Options Paper for the Commission.

The Commission, instead, went to OGC and basically asked OGC to look in more detail about the basis for Staff in its guidance, essentially looking to restoring to background as the primary standard. OGC traced that through UMTRCA and EPA's 40 CFR 192. OGC also concluded that there may be a basis to look to the underground injection control standards, because in the preamble to EPA's standards in 40 CFR 192, they pointed to the UIC standards in the discussion on ISLs. And those standards are less restrictive.

Now the EPA standards, themselves, for the underground injection control program appear in 40 CFR 144 and 146, 145 has to do with their dealing with states on these standards. And, basically, what it does is it exempts the actual mining zone. The basic standard is protection of groundwater outside the mining zone, and that is protecting the capability of

the water outside the mining zone to provide drinking water. And there's really no requirement for restoration inside the mining zone, other than that water outside the mining zone has to be protected.

As an aside, both Wyoming and Nebraska are EPA authorized states, and their regulations are more restrictive in terms of the Underground Injection Control program than EPA's, in that they require some restoration in the mining zone, and that restoration is class of use.

With that, and with the advice of OGC that the Underground Injection Control program standards may be the standards that we could use for groundwater protection, the Commission directed the Staff to proceed with the rule making. And it was to focus on the elimination of groundwater protection at –- the elimination of dual regulation of groundwater protection at ISLs, and to do that by deferring regulation to EPA or the states through their Underground Injection Control programs, to actively engage the stakeholders, and to have the proposed rule to the Commission by January of 2007. And the rule was specifically limited to groundwater protection at ISLs. The staff had inquired about expanding the rule making, and the Commission was clear that it was just

groundwater protection at ISLs.

With that, the Staff proceeded to work on an expedited schedule to prepare the rule making. We had a public meeting in Denver last June, and we worked on the rule, and we actually - we looked at various strategies, and we concluded that what we would do is we would create a new criterion in Appendix A that addressed groundwater protection at ISLs.

We have considered adding it to Criterion 5, which talks about groundwater protection in the context of conventional mills, but felt that that would just add too much to that criterion, and be too confusing, so our strategy was to create a new criterion in Appendix A. For lack of anything else, we were calling it Criterion 14, but we may actually fit it in someplace else. And the criterion will address all aspects of groundwater protection. And we had actually laid out what we were going to look at, and we've got a list in this slide of the various aspects that we were going to put in the actual rule. And we actually drafted rule language, and that was - the first draft was completed last September. It was not made public, though, due to an issue raised by EPA, which I'll get to in the next slide.

Now in basing the rule on EPA's underground injection control permit standards, one of the things we realized was we had to get EPA on board relatively quickly, because if you recall, one of the requirements in the Atomic Energy Act, Section 84, was that our regulations must comport with EPA's standards, and we have to be sure that EPA agrees, because there is language in there that essentially says that EPA has to agree that we've done it properly. So we wrote to EPA last June, basically requesting a confirmation that the UIC regulations are the appropriate standards to conform our regulations to.

Well, in August, EPA wrote back to us, and basically said that they were concerned with our proposal, and they suggested that we hold discussions with EPA before proceeding with the rule making effort. Because of the tight schedule, we continued and actually prepared a first draft in September, but we met with EPA. We met with EPA twice last August, and out of those meetings, two major concerns emerged. One was that EPA considered that the UIC standards for groundwater protection at ISLs are in addition to the groundwater standards published in 40 CFR 192 that also apply to groundwater protection at ISLs. So that

was a disconnect from the direction we were going.

And just to refresh people's memory, the standards in 40 CFR 192 for groundwater clean-up, and they're written primarily in the context of cleaning up groundwater in a conventional mill site where you have leakage from a disposal cell, but they look to background, to drinking water standards, and to alternate concentration limits.

The other EPA concern was that in those states where they were primary; that is, where there was not an EPA authorized state implementing the Underground Injection Control program, and we don't have any ISLs at such states now. There was a potential for one in South Dakota, which is not an EPA authorized state, but in those states, EPA expressed concern about their ability to do a detailed review for an Underground Injection Control permit request, and they had said when they had thought about it, they thought that they were going to look to NRC's review, and use that to help them, because they were limited in their staff resources, so they weren't looking to have NRC defer its regulation to them. It's just a resource problem.

With that, there were further meetings and discussions between NRC and EPA in late 2006, and

those meetings were primarily attorneys, because it really was a –- the basic issue, what's the appropriate EPA regulations and standards to use in our rule making? That's primarily a legal issue, and out of that came –- it was clear that EPA was firm in their conclusion that you can't –- we can't just use the UIC standards, it's UIC plus UMTRCA. But EPA expressed willingness and desire, actually, to work closely with NRC in the rule making process, and they've been very helpful.

We had a Commission Technical Assistance Briefing at the end of last November, where we discussed the situation. And, basically, we were in a position where we were supposed to have a proposed rule to the Commission in January, and here we were, and we couldn't do what the Commission told us to do, because EPA said they essentially would challenge it. And at that meeting, the technical assistance suggested that we prepare a Commission memorandum basically describing what had happened, and proposing options. And we were in the process of preparing that when –- and these things, they were informal discussions up and down the line, and the Commission decided that rather than wait to get a paper with options, and then vote on it, and send us an SRM, we

were directed in January basically to do what would have been the preferred option in the Commission memorandum; that is, to work with EPA and NMA, and try and come up with a way to move forward. And that was what the direction was, to meet with EPA and NMA, National Mining Association, which is the industry representative, and to report back to the Commission on the path forward by April 30th.

Now the Staff met with EPA, and we had four meetings in February and March. February 21st we went down to EPA, and we had four EPA offices involved, and a lot of staff, we had several of their attorneys, and a couple of our attorneys involved. We had later meetings that were more focused on technical issues, on February 26th and March 12th, and we had a more recent meeting, March 28th, after we met with NMA. And we discussed both the flexibility that EPA thought there may be in the standards in 40 CFR 192, and that was trying to satisfy both the EPA conclusion that we had to use as the underlying standard for restoration, the 40 CFR 192 standard as background drinking water standards and ACLs, and the industry needs. So we were looking if there was some flexibility in how that would be applied, and looking for –- and we discussed EPA's collaboration in the

rule making effort.

On March 15th, we met with the National Mining Association, and that meeting was a public meeting, and EPA participated. We asked EPA to participate, and EPA showed up in force. NMA expressed its basic concerns, and the basic desire was the right to use an alternate concentration limit at ACLs. And there was some discussion back and forth because we had thought that we –- that was part of our guidance, so we told them well, we thought you had that already, and their concern was that it's not really codified, it's not really in the regulations. It is in Criterion 5, but Criterion 5 is written in the context of conventional mills, so what they really would like is to have the use of alternate concentration limits codified in a rule that applies to groundwater protection at ISLs.

They also discussed the Class of Use standard that the states were using, and they said they'd like to be able to have that considered in an ACL review. I guess a little background, when looking at an alternate concentration limit and a proposal, there are basically two aspects that the staff has to consider, that the licensee has to address, and that is a protective aspect; that is, you have to show that

if you have the proposed standard that you'll still be protecting public health, safety, and the environment, and you also have to show that it's as low as reasonably achievable, which is different. If you propose a drinking water standard, you don't have to show that –- I can get it lower than the standard. You only have to show that I meet the drinking water standard. But if you propose an alternate concentration limit, you have to show that reasonable measures can't reduce that limit. And, basically, what industry would like is that the states' Class of Use standard for a particular constituent and class of use of that mining zone be used in the protective argument, that one of their arguments in terms of protection is that look, the state says this is what the class of use is, and this is what the standard is. And we're proposing something lower than that, that's protective. And we said yes, we would accept that. That's certainly an argument, and our guidance will probably discuss how that would be used, so that's a reasonable request on their part.

Now in terms of deferral to states, dual regulation, we discussed that. NMA understood that we couldn't write an MOU with a state to defer regulation if the state's standards were not as stringent as

our's. However, NMA proposed the situation that could work; and that is, if a licensee in getting a permit from a state had in its state permit the more stringent requirements that our regulations after they're codified would require, then they asked could we consider writing an MOU with the state for that particular facility, and we said yes, we could look to writing an MOU if the permit actually identifies the more stringent standards that we would codify. So that was the outcome of the meeting with NMA.

So with that, we're now writing back to the Commission with a path forward, and we really can't discuss of what we're writing to the Commission in the public forum. And the Commission, presumably, will then, based on that memorandum, give direction to the Staff in the Staff Requirements Memorandum.

Interactions with ACNW - well, we're certainly, once we're back into the actual rule making and writing rule language, we will share the proposed rule with ACNW for review, and look for ACNW comments, and a letter from ACNW on the proposed rule. And we will also –- we are prepared to hold briefings with ACNW on the technical basis, as needed. Are there any questions?

MEMBER WEINER: Dr. Hinze.

MEMBER HINZE: Well, if I understand correctly, you cannot discuss the technical basis for your decisions until you have proposed a rule for review. Is that right? What is the technical basis? The last point here, briefings on technical basis, as needed. Now that will occur when?

MR. FLIEGEL: Well, once we're into the process, once we have the Staff Requirements Memorandum, and it becomes public how we're going about the rule making, if there's a need for –- it's basically just telling ACNW if there is a need to have a briefing, we're certainly receptive to briefing ACNW.

MEMBER HINZE: And that will cover the topics that we see on the slide where you have the new criterion we'll address from site characterization to corrective actions?

MR. FLIEGEL: That, or anything else you'd like to hear about the rule.

MEMBER HINZE: Well, I guess we'd like to hear that, or at least see it, and then be prepared to discuss it. I don't know what further that I need to ask at this time. I, for one, having gone over this material, and out to one of the sites, all of these segments of the criteria are very important, and will

need to have a strong technical basis. And I'm sure you will have that, but that's something that we would like to look at.

MR. von TILL: One thing to add, excuse me. If you look at that slide, the criteria - look at one in particular, and that is the post-operational groundwater quality monitoring. This is an issue that EPA, in particular, is very concerned with. As we get down to close to license termination at one of these facilities, keep in mind that these in-situ leach facilities, when the license is terminated, they're opened up for unrestricted release. It's not like a regular conventional facility where the Department of Energy or the state takes it for long-term care in perpetuity. So the EPA is concerned that once we terminate a license, they're not going to be left with a problem of groundwater contamination migrating into the United States drinking water area, and that adequate monitoring and modeling, perhaps, is implemented in that aspect.

This particular subject matter is something where the Committee may have an interest in also helping us to explore ways to handle this. I should add that once the Commission hands down the schedule for rule making, we may not have a whole lot

of time, depending on the schedule, but this particular issue, the EPA –- we work with four different offices from EPA, Office of General Counsel, Office of Water, Office of Radiation and Air, and Office of Solid Waste. And the Office of Solid Waste and Water, in particular, are concerned with this issue of when we terminate the license, we're sure that we're not going to be left with a legacy site where the United States government will have to come in and make it a superfund site, or something like that, to clean up contamination that may not have been addressed during the licensing process. And so, the amount of monitoring necessary for that post-restoration, any types of modeling also necessary in our review of alternate concentration limits, and the post-restoration monitoring may be of interest to the Committee, as well, the technical aspects of this.

MEMBER HINZE: Bill, your comment on the monitoring with time, I don't know how far we should get into the technical basis of this, but one of the concerns that I raised I think in a meeting that a few of us had with you, is the temporal variation in these mining zones. I mean, one of the characteristics of these roll front deposits is the fact that they tend to change with time. And I'm just wondering, if one

has another deposit up gradient that may not be ore grade, well, what if that moves down into the site of the previous mining and alters the contamination of that site? There are a number of variables in here that I think you're going to really have to wrestle with.

There's the other question that Mike mentioned, the background. I don't know whether this is background to the aquifer surrounding the area, or whether this is in the mining zone itself, because in the mining zone itself, the quality of the water there may have been very poor to begin with, before the mining took place. And it may have been different from the surrounding aquifer. Which is it, is it the background on the margins, or is it the background in the mining zone itself?

MR. von TILL: Yes, I can address that. That's the background in the mining areas, itself. A typical aquifer with these roll front deposits is more of a squiggly line situation where some of the areas have high concentrations of Uranium naturally from the ore body. That's why they're there to mine, but other areas around it may be pristine drinking water quality, so we have guidance in our NUREG-1569 on collecting background groundwater quality information.

And it's really a combination of some of the higher concentrations in the ore zone, and some of the ones outside, and then they average it, so it is in the ore zone.

The one figure to turn your attention to is this one in blue here, where it kind of shows the mining area in the lighter blue, and the boundary there is where you get into USDWs, the United States Drinking Water area, protected under the Safe Drinking Water Act, so for background, we're talking about in the mining area. And that'll be, you'll have some concentrations, you know, two parts per million Uranium, other concentrations .02 milligrams per liter, so it really varies.

MEMBER HINZE: Do you have any difference in that aspect with the EPA, or with the states? Really, you're not talking about the background as being the adjacent aquifer, but you're really talking about the mining zone? Are we all on the same page?

MR. von TILL: We're all on the same page. The EPA and the states all require sampling, post-operational sampling to determine what the groundwater quality was prior to mining. And that's in the –- now, the EPA's main concern, though, is the protection of the USDW, the drinking water area in the

darker blue.

MEMBER HINZE: Yes. And that may change with time, too. There may be migration.

MR. von TILL: Yes.

MEMBER HINZE: And so the –- how do you handle that? How is it handled now?

MR. von TILL: Well, we don't have really any examples where we have terminated a license from the NRC standpoint of one of these facilities yet, but we have approved a number of restoration in well fields. Now you were talking before about the natural ore bodies and the potential for migration of contamination from those natural ore bodies. A licensee is only required to take care of their own problem, and not what nature –-

MEMBER HINZE: But it may migrate into their problem.

MR. von TILL: It might. And the key thing, though, the way these situations are right now, they're kind of an equilibrium where you have some higher concentrations around the ore body, and lower concentrations outside the ore body. But when you inject oxidant chemicals to loosen up, it changes the whole dynamics of geochemistry. We're looking at a number of applications of using mod flow, MT3D, FREAK-

C, different modeling packages to analyze the geochemical nature of the situation so that we can assure that in the future the drinking water aquifers are protected.

MEMBER WEINER: Allen.

VICE CHAIRMAN CROFF: First, thanks for the presentation. It was very helpful in putting, I guess, the rule making and the legalities in perspective.

I guess I have a fairly fundamental question, and that is, what are the hazards we're trying to protect people from in these in-situ leach sites? I'm assuming it's mostly chemicals?

MR. von TILL: Yes, it's –- the groundwater aspects. We're trying to protect them from chemicals, like Uranium, Arsenic, Molybdenum, Selenium, and all the metals that are freed up in the process. The main ones we're typically looking at are Uranium, Radium, things like that, but in the UMTRCA space, this is one of the only programs in NRC where we're tasked to not only look at the radiological hazards, but also the non-radiological hazards presented in this milling, and for the most part, from a groundwater contamination perspective, the driving factor is metal toxicity. The Uranium, for example,

it's renal toxicity, and that's why EPA came up with their new MCO .03 milligrams per liter, so that the risks really are for groundwater ingestion, and even livestock-type risks from the contaminants that get in groundwater, for just the groundwater part. Now the surface facility, there's other risks, as well, but we're just talking about groundwater.

VICE CHAIRMAN CROFF: So the injected chemicals aren't really an issue here. It's what's freed up by the –-

MR. von TILL: It's what's freed out, yes.

VICE CHAIRMAN CROFF: Okay. Second, in talking to this, you mentioned a number of standards, I mean, drinking water. There were some others, and then alternative concentration limits. To what extent are the existing standards risk-based or risk-informed?

MR. von TILL: UMTRCA is a regulation that's very flexible, and I believe it has a lot of risk-informed and risk-based aspects to it. In the groundwater arena, you've had your primary standards being background or MCLs, whichever is higher, in the case we were talking about earlier. Background is higher than MCLs, then it would be background. If MCLs are higher, it's MCLs. Then we have the concept

of alternate concentration limits. Alternate concentration limits, by its own nature, is really a risk-based, and risk-informed standard where you use Fate and Transport modeling, and performance of corrective action to come up with a more risk-based standard. We've approved a number of ACL applications on the conventional side for a lot of our mills, Western Nuclear, Ute Medico, Real Algrem, and Brogia Lake, Lisbon; whereas, a licensee has to demonstrate that they tried to pump and treat as much as they could. They couldn't get it down any further, and through the use of Fate and Transport modeling and monitoring, they demonstrated that this was safe enough in an ACL-type situation. So we think that ACLs is a risk-based and risk-informed standard within the regulations under UMTRCA.

VICE CHAIRMAN CROFF: What kind of risks are typically posed by these sites after you finish cleaning them up, and this kind of thing. Does anybody ever calculate that?

MR. von TILL: Not from a, I guess, a quantitative standpoint, but moving from a conventional facility to an ISL facility, ISLs, you don't have the mining, you don't have the exposure to Radon in the mines. A lot of the risks that you have

at a conventional mining and milling are not there with an in-situ leach facility. However, the biggest potential environmental impact and risk from an ISL facility is groundwater, because everything happens in the groundwater. And most of our facilities, all of our facilities are out west where groundwater is gold out there. And so the community is very sensitive to groundwater contamination, and so that's the biggest risk, is degradation of the resource for drinking water, inhalation, I mean, ingestion of groundwater from wells around the area. From the groundwater aspect, that's the biggest risk. From the surface facility, we still do have risk from the Yellow Cake Dryer and the processing itself.

VICE CHAIRMAN CROFF: Okay. You mentioned early in the presentation that the focus of this whole thing was on groundwater protection. Are there other technical issues associated with in-situ leach mining, other than the groundwater protection?

MR. von TILL: There's a number of aspects that could be improved upon even from the surface facility, but the Commission is very clear that they just wanted us to narrowly look at the groundwater aspects. But yes, there are other aspects that we could improve upon. And even with the conventional

facilities, as Mike mentioned earlier, at one point, the Staff wanted to do a Part 41, which was a large rule making effort, to get UMTRCA up with the modern times, and then the industry didn't support that with the low price of Uranium. Now our effort is just the narrow aspect of groundwater protection at this facility; but yes, there are other aspects.

VICE CHAIRMAN CROFF: But no current plans to include that in the rule making scope.

MR. von TILL: No. We were getting ready to send a paper up, and the Commission sent a clear message to us that they wanted us to just, at this point in time, to focus on the groundwater aspects at ISLs.

VICE CHAIRMAN CROFF: Okay. Thanks.

MEMBER WEINER: Mike.

CHAIRMAN RYAN: Thanks. I apologize being late. I've been getting a little help in my vocal chords here. And, again, I have read all the material, so I'm sorry I missed the opening part of your briefing. It seems to me that you guys have a good handle on what the dance card has to be to get it done, and the trick is really how do you integrate MCLs, ACLs, issues of ALARA, and issues of when monitoring and modeling are done. Are those the four

big questions that you're trying to integrate between EPA and NRC guidance?

MR. von TILL: Yes, the main ones, and what the restoration standards will be was one of the big ones. I think we have a consensus on the path forward on that, and now it's a matter of coming up with a rule and revising the guidance that we have on the issues you just spoke about.

CHAIRMAN RYAN: I mean, it sounded like the Mining Association comment was that they'd really like that to be explicit, rather than not?

MR. von TILL: Yes, they want ACLs to be codified so that --

CHAIRMAN RYAN: Tell us what you want.

MR. von TILL: One of the things that Mike didn't mention is, they want consistency and predictability as we move forward with this resurgence in the market. They want know where they are, what are the standards, what do we have to look at?

CHAIRMAN RYAN: Sure.

MR. von TILL: We don't want a change in field all the time, and that's a big thing we hear from our licensees, we want some consistency.

CHAIRMAN RYAN: Sure. I think just clarity of exactly what's required is good. That's

great. All that being said, as we all move forward here, where do you think the ACNW can best give you additional insights and review?

MR. von TILL: I think several ways. As we move –- if the Commission approves going forward with the rule, during the rule making process itself, we want to work with the committee and listen to the committee's comments on the technical basis parts of the rule. In addition, what I mentioned earlier, this issue of post-restoration monitoring, in particular, is an interest that we have that is a very technical nature that the committee could help the Staff with. And whatever else the committee is interested in in this aspect.

CHAIRMAN RYAN: I thought that was kind of, maybe even the toughest one of them all, because that questions tends to vary quite a bit based on where you are.

MR. von TILL: It is a tough question.

CHAIRMAN RYAN: So it could be real simple, if you have a simple groundwater system, and the monitoring is very predictive of what you'd expect, or if it's layered and fractured, and whatever all else Professor Hinze can tell us about the geology and so forth, that it would be tough to do. So that's

the kind of thinking, where you've got to offer guidance, but it's across such a broad range, some thought needs to go into that.

MR. von TILL: I should also mention, on a separate note, we're going to be looking at a number of Reg Guides that we have, and revising those Reg Guides. And the ACNW would also be able to comment and help us with that, too.

CHAIRMAN RYAN: Great.

MR. von TILL: I just wanted to mention that.

MR. FLIEGEL: Yes. In terms of the ACNW's guidance, I think it's going to be more on the regulatory guides, because the standards, the regulations itself doesn't –- isn't really going to get into the details. For example, if there's a regulation that looks towards ensuring that in the long-term, the USDWs are not impacted, the regulation may not say very much more than that. It's the guidance that's going to explain well, what kind of monitoring needs to be done, and how, and what's sufficient.

CHAIRMAN RYAN: How many, what location, how long, all that stuff.

MR. FLIEGEL: Yes, and so that's probably

--

CHAIRMAN RYAN: No, that's -- I mean, the devil is in the details there.

MR. FLIEGEL: Yes.

CHAIRMAN RYAN: So we appreciate that.

MR. FLIEGEL: Yes.

CHAIRMAN RYAN: Before we go on, let me just thank you guys for involving us very early in your process and having us meet at industry, stakeholder meetings, and other activities with you. Whenever the ACNW can get involved in those earlier stages and learn as you're learning, it really helps us be better prepared and we do a better job, so you've been really proactive in getting us involved in this, and I just want to recognize how important and helpful that is to our activities, as well.

MR. von TILL: We appreciate that, and we appreciate your members attending the National Mining Association meeting, and also going to one of the sites.

CHAIRMAN RYAN: Good. That's all. Thanks.

MEMBER WEINER: Jim.

MEMBER CLARKE: I'm starting to gain an appreciation for the complexity of this, not only the

physical, you've got surface facilities above ground, injection wells, production wells, mining zone, outside mining zone, and then all these different regulatory pieces.

Just out of curiosity, I think my first encounter with an ACL was in a RICRA corrective action. Is the concept of an ACL in the Safe Drinking Water Act regulations, as well? It's really more of a remediation concept.

MR. von TILL: It comes from RICRA. You're exactly right. When the NRC codified its groundwater standards for UMTRCA for Uranium mill sites, they took a lot of the language verbatim from RICRA, so a lot of the groundwater standards and the ACL criteria that we have is almost identical to RICRA. The one key difference is the ALARA part.

MEMBER CLARKE: All right.

MR. von TILL: But other than that, it's pretty much identical.

MEMBER CLARKE: Is ACL referenced in the UMTRCA regulations?

MR. von TILL: It is. It's our Criteria 5.B.6, Appendix A, Part 40.

MEMBER CLARKE: The other question I had is, the committee has also been following closely the

revised guidance for decommissioning complex material sites, and decommissioning under the LTR. And you have a memorandum of understanding with the EPA on that, that was, as I recall triggered by –- well, the dispute between 15 and 25, but also concentrations, in this case, I think radionuclides in soils and groundwater. How does that fit with where you're going with this?

MR. von TILL: That particular MOU is not for Uranium recovery facilities.

MEMBER CLARKE: I understand. There was a reasoning behind that, I guess.

MR. von TILL: I'm not as familiar. I'll have to turn to Keith on that.

MEMBER WEINER: Could you say who you are for the –-

MR. McCONNELL: Keith McConnell, Deputy Director of the Division of Waste Management and Environmental Protection. When the license termination rule was promulgated, it was clearly defined that it would not apply to Uranium recovery facilities. And so, the MOU that we've developed with the Environmental Protection Agency to address those complex material sites where the thresholds would be exceeded, which are, in most cases, the MCLs, really

doesn't apply in this particular instance, and so we don't coordinate with EPA through the MOU on ISLs. I think, Bill, you have separate arrangements with EPA.

MR. von TILL: We do. I should point out that we have two sites in New Mexico, these are conventional sites. The Homestake site, and the UNC Church Rock site in New Mexico, where they are also EPA superfund sites, and we have an MOU with EPA specific to those two sites in which anything that's groundwater-related, we have to consult with EPA. And for both of those sites, for Homestake, which I'll be out at in a couple of weeks, actually, we coordinate with the State of New Mexico, and the EPA Region VI, I believe. On the UNC Church Rock site, we coordinate with the EPA, the state, and the Navajo nation, Navajo EPA, so those two sites we do have EPA MOUs. And from time to time, EPA becomes interested in some aspects of what we do. Sometimes our ACL reviews, EPA will get in there and communicate with us on some concerns they have of a particular site-specific nature, but that's –- we don't have an MOU.

MEMBER CLARKE: I think you just answered my next question. One of the reasons I brought it up is, as I recall, I think Keith confirmed that, the MOU on the material sites has an MCLs, is triggered by

MCLs. ACLs are not part of that Memorandum of Understanding, that you're really working towards ACLS in this case. Is that right, or is that wrong?

MR. von TILL: Well, the standards are background MCLs or ACLs, but we don't have any trigger for Uranium sites like the MOU for decommissioning sites with EPA. But we work with EPA quite a bit, and this --

MEMBER CLARKE: You can have a site-by-site --

MR. von TILL: Site-by-site. And I should just emphasize, this rule making effort is really a collaborative process, too, with EPA. I think we've strengthened our relationship with EPA through all these meetings that you saw, four different offices of EPA.

MEMBER CLARKE: That was a nice presentation. Thank you.

MR. von TILL: Thank you.

MR. WIDMAYER: Hey, Jim, as far as the complex decommissioning MOU, the MCL is the trigger, but then, like they were just talking about, the applicant can move to an alternate concentration limit as far as how they're actually going to clean up the groundwater. But the process in the MOU would be

triggered, because it's --

MEMBER CLARKE: Basic considerations are really consistent. It's just that you're dealing with non-radionuclides on these sites. That's probably more of a problem.

MR. von TILL: I should also mention that the difference, too, between the decommissioning site and the Uranium mill tailing sites, decommissioning, the NRC is mainly looking at dose assessments of radiological risk, hazard from these materials in groundwater; whereas, UMTRCA staff are looking at the radiological and the chemical risks, so there's a little bit of a difference in the programs.

MEMBER CLARKE: I appreciate that. I'm familiar with the issues. Thank you.

MEMBER WEINER: Dr. Ryan has another question before I go.

CHAIRMAN RYAN: Just one follow-up, Bill and Mike. Whenever I hear kind of this complex system of state, federal agencies all getting together, I usually can pick my way through the road map, just because I know it a little bit better. Do you have any plans to think ahead to how you're going to explain all this to the public? This is kind of a complex situation.

And, by the way, I think pretty well done, the way you've explained it, and the way you're heading forward, so at some point, though, there's going to be a lot of moving regulatory parts here, and somebody is going to ask you how do all these pinwheels fit together?

MR. von TILL: You're exactly right. Part of the rule making process, we plan to have a number of workshops, like we had in Denver, perhaps in Albuquerque, get some of the other stakeholders, maybe even in Texas, maybe Denver again, wherever we need to do that, to get the public and the stakeholder industry comments, and try to explain this complicated process. We did that before at Denver, but we had a paradigm shift in our approach. Back then we were assuming that the Underground Injection Control standard was the appropriate standard. We need to get back out there, we need to change the technical basis and get back out there in the public and explain what we're doing.

CHAIRMAN RYAN: This is kind of an off-the-top-of-my-head thought, but I'd be thinking ahead to not only that stakeholder group, but also how you're going to help folks who are in the groundwater protection program in a state or tribal organization

communicate to their constituents. Are you going to have materials that will help them explain all that, and that kind of thing, because it is a very intricate arrangement, one that you looped everything together, at least have plants to loop it together in a successful way, but it's still pretty complicated, so helping everybody communicate that to the residents and constituents would be probably something that's worthy of thought at this earlier stage.

MR. von TILL: Sure. I appreciate that. Thank you.

CHAIRMAN RYAN: Thank you.

MEMBER WEINER: Just to follow-up on that, as I recall, when the public meeting was held in Denver last year, almost no members of the public attended. In fact, you want to comment on that? Do you have any –- that was just my understanding. We didn't stay for the public meeting.

MR. von TILL: At the time, we were also planning on having - back on that paradigm, additional workshops after the meeting. Now this time, and we'll have to get Commission approval, but we would like to have additional workshops in places like Albuquerque, New Mexico, for example, to get the public's feedback.

MEMBER WEINER: Be happy to attend, and I

suggest you have one, if you can, in Gallop. It's a great place to be.

To move to the questions I had, and I want to thank Allen for asking my question about what are you protecting? You talked about class of use, going back to class of use as a standard. Have you thought of what happens when the state changes the class of use to make it more –- to make the standard more restrictive, which is actually what happened in New Mexico. They changed the class of use standard around the proposed ISL site.

MR. von TILL: That's a good point, and EPA has voiced that concern of a change in standard, too. And I should be clear, we're not going to have four standards where we have background, MCLs, ACLS, and class of use. What the industry is interested in now is in looking at an ACL as part of the criteria to look at class of use. We do have one of the 19 criterias in 5.B.6 is to look at the current and future use of groundwater use, so it kind of fits into that, so it wouldn't be really a de facto standard, but only a part of a criteria looked at under a full ACL review.

MEMBER WEINER: I see.

MR. von TILL: And I note your concern

that a class of use designation can change over time. EPA's Office of Water has the same concern.

MEMBER WEINER: Thank you. That's very helpful. What's been the track record in groundwater contamination, or non-contamination? I mean, there are ISL sites that are operating, have been operating in a number of states. Can you give us some idea of what they have met? Have they mostly gone to ACLs? What's been their track record in meeting some criterion that protects health?

MR. von TILL: Sure. And what I'm speaking to is in the United States under the NRC Headquarters purview. Keep in mind that Texas also has a number of ISL operating facilities, and I'm not as aware of those aspects, but in Wyoming and Nebraska, the NRC has approved a number of well-field restorations. And the way we do this is, the licensee will request a restoration approval well field by well field, or mine unit by mine unit, some of these facilities have 18 mine units, and so as they go along, they'll produce out of one mine unit and restore it, and move to the next one. The track record has been pretty good, so far. The ones we've reviewed in Nebraska and Wyoming, the licensees have been able to get a lot of the constituents down to

primary standards. Some of the constituents they have not been able to get down to primary standards, we had to fall back on secondary standards. And the licensee was able to demonstrate that they tried to get down to primary standards, and leaving it in the secondary standard was protective of human health and the environment. Some of the licensees, one of the licensees in Wyoming is using some innovative techniques of kind of bio-remediation-type techniques to try to get groundwater contamination down even lower, so the track record so far in the licenses that we manage at NRC has been pretty good.

MEMBER WEINER: Do you know anything about –- let me ask it a different way. Do you have any cases where the ISL - where the facility was unable to remediate to a satisfactory level?

MR. von TILL: I don't have anything like that, so far. We do have a lot of excursions that may occur from a faulty injection well, that gets into a separate aquifer. We may have excursions where some of the contamination comes out a little too far. They bring it back in. Our experience has been that the licensees have done a good job at correcting any contamination that they had, and we haven't seen situations where contamination has migrated off 20

miles, or anything like that. Worldwide, some of the other countries use Sulfuric Acid, as opposed to Oxygen and Bicarbonate, and that could be a different situation. But in the United States, these licensees have demonstrated a pretty good track record.

MEMBER WEINER: Just out of interest, what fraction of the ISLs add Bicarbonate?

MR. von TILL: Most of the ones we have.

MEMBER WEINER: Most of the ones that you have.

MR. von TILL: Yes.

MEMBER WEINER: In other words, there are relatively few that use just ozonated water.

MR. von TILL: And it might vary, too, based on the different ore bodies they have. What we've seen in our main producing facilities is Bicarbonate and Oxygen. The two main ones we work with right now are the Krogue Unit facility in Nebraska, and the PRI Smith Ranch facility in Wyoming. The PRI Smith Ranch facility, we have a number of amendments, and we try to ramp that production out to different satellite facilities. And the ore bodies may be different 20 miles away at a satellite operation, than close by, but leaching them is Bicarbonate and Oxygen.

MEMBER WEINER: Finally, I notice in your introduction that basically a third of the new applications are for conventional mining facilities. Is addressing the groundwater adequate for - addressing only the groundwater, focusing on groundwater, is that adequate for the conventional facilities? Are you looking at further regulation? I mean, recognizing that those are now regulated under Part 40.

MR. von TILL: There are some lessons learned we're looking at, but for the most part, the criteria that we have in the Criterion 5 of Appendix A, adequately covers things like mining of these tailings impoundments, and detection monitoring, and corrective action for contamination that occurs at these facilities. Some of the things we're looking at, for example, we've seen groundwater contaminate plumes occur from the facilities themselves, the actual mill and the ore pads, and we hope to, for new facilities, we hope to remedy that situation, but we do have an adequate regulatory structure for that. And most of the –- as I said before, some of the formations that have Uranium, especially in New Mexico, and some in Wyoming, are not amenable to in-situ leach mining, and so some conventional facilities

we see as being out there.

We have one facility on standby, the Sweetwater facility in Wyoming. There's a producing facility in Utah, the White Mason mill, and there's a producing facility that's on hold right now in Colorado, the Kotter mill. But we had a lot of interest, in particular, in New Mexico in the grants renewal region of some conventional facilities.

MEMBER WEINER: How are you handling the interaction with the Navajo?

MR. von TILL: With the Navajo nation, we mainly deal with them on the UNC Church Rock site, and our HRI in-site leach facility, which we had a long history of litigation under the ASLD, I think we've really strengthened our communication with the Navajo nation. As you know, the Navajo nation has a ban on Uranium mining and milling. They feel that it poisons the waters, and they don't like the Uranium mining and milling, and so they're pretty much against that. But on the sites that we have, we meet with them often. We meet with them in Gallop, in Window Rock, in Albuquerque, Santa Fe. I've personally dealt with them quite a bit. I gave a presentation a couple of years ago in Flagstaff, Arizona to a number of Hopi and Navajo nation folks on abandoning Uranium mines

and mills, and listened to their concerns.

MEMBER WEINER: I would say that's a very fruitful area for public communication. Thank you. Staff? Latif, I know you have some questions.

MR. DIAS: Could I ask one question, because we're going to have to leave very soon. It's one question.

MEMBER WEINER: Yes.

MR. DIAS: I'm trying to understand, basically. This is Antonio Dias from the ACNW Staff. I'm trying to understand basically the background of this. And on Slide 3 that you described the legislative and regulatory background, there's one bullet that says, "EPA and EPA authorized states regulate groundwater protection at ISLs through the UIC program." That's fine. And then when I go to Slide 6, which are the EPA interactions, and that's based on EPA meetings you had in late 2006, there is one bullet that says, "EPA does not agree to use the UIC standards as basis for ISL groundwater protection."

What exactly is the difference between one and the other? One says that that's how they use it, and the other one says that EPA does not agree to use it.

MR. FLIEGEL: The –- for an ISL, an ISL must get essentially two licenses. It gets a license from the Nuclear Regulatory Commission or one of our agreement states, it gets a permit from EPA or one of the EPA authorized states under the Underground Injection Control program, so the Slide 3 points to the latter, that a facility must get a permit from EPA under the Underground Injection Control program, which is a safe drinking water requirement. And that's looking to protect the underground sources of drinking water around the mining zone.

The license they get from us is under the Uranium Mill Tailings Radiation Control Act, and that says that –- when that was promulgated, it required EPA to write regulations that would be applicable to Uranium mills, Uranium mill tailings, and controlling 11e(2) byproduct material, and it directed EPA to look to the Solid Waste Disposal Act in writing those regulations. So EPA wrote those regulations, and part of those regulations look to what happens in groundwater, and how do you protect groundwater? And so those standards look to background, drinking water standards, and ACLs.

When we looked at –- but those standards were written in terms of conventional mills, and

groundwater contamination that essentially leaked from impoundments. We've been regulating ISLs and restoration of mine fields, which are typically much deeper than groundwater contamination at a conventional mill. We've been regulating them basically with the same kind of standards, and so when the thought was to try and look at eliminating dual regulation and deferring, one thought was well, EPA already regulates these facilities under the Underground Injection Control program, the Atomic Energy Act says we have to conform our regulations to EPA's regulation. Rather than looking to the groundwater standards in the EPA UMTRCA regulations, can we look to the groundwater standards in the Underground Injection Control program? And that's what we started to do, but EPA said no, for NRC's regulation of ISLs, you still have to look to the UMTRCA standards, even though we, EPA, in addition to that, impose the UIC standards on that.

MR. HAMDAN: Can I help with this?

MR. DIAS: We're going to have to go.

MR. GILLESPIE: No, no, not you guys.

MEMBER WEINER: That's fine. I think Latif was next.

MR. HAMDAN: Antonio, I just want to help

you with this. On the latter slide you mentioned, which is EPA does not agree to use UIC standards, what they are really saying, EPA doesn't agree to use UIC only. They need to use that in addition to the standards. That helps?

MR. DIAS: Okay.

MR. HAMDAN: And, Ruth, just your question the conventional; the Staff, the NRC already has comprehensive standards for conventional mining, so that's not –-

MEMBER WEINER: Yes, that's what –-

MR. HAMDAN: Can I ask a couple of questions?

MEMBER WEINER: Please, it's your turn.

MR. HAMDAN: Yes. Mike, first of all, I want to thank you very much for responding so quickly on short notice to our request for this briefing. We didn't ask you until what, 20 days, and here we are, and I really want to convey to you that we appreciate it very much. Echo what Mike Ryan has said already.

I have two clarifying questions about the scope of the rule making. On this new criterion, Criterion 14, is this going to be an all-inclusive criterion, or are you going to make cross-reference to the other criteria in the –- in other words, when it

comes to one thing, are you going to have section in this Criterion 14 on monitoring, and financial assurety, or are you going to just cross-reference to Criterion 7, 7A, or Criterion 9, and so on and so forth?

MR. FLIEGEL: The simple answer is yes.

(Laughter.)

MR. FLIEGEL: We've got to get into the details, and whether, in some instances, we point to a different part of Appendix A, and in other instances because –- and those details we'll have to work out in actually writing the rule.

MR. HAMDAN: Okay. That's good.

MR. FLIEGEL: I don't know that –- we haven't got that pre-set.

MR. HAMDAN: Very good.

MEMBER WEINER: I would say that when you make the presentation on the technical bases, please expand on what is meant. We are not all as knowledgeable as Latif is.

MR. HAMDAN: Yes. The other clarifying question also is, how about the on-site disposal of effluents, whether it's in evaporation pond, surface facility, or deep injection? Are you going to address that, because clearly, that's groundwater protection,

too.

MR. FLIEGEL: As for deep injection, that a licensee gets a specific permit from EPA.

MR. HAMDAN: Okay.

MR. FLIEGEL: And in the past, I don't think we've ever tried to get that. We're going to look at that now.

MR. HAMDAN: So the rule making will not address either the deep well injection, or effluent disposal on-site? And if not, why not?

MR. FLIEGEL: Effluent - well, the –-

MR. von TILL: Evaporation ponds?

MR. HAMDAN: Yes. Because ultimately, it goes to groundwater.

MR. von TILL: The evaporation ponds is possible. The deep well injections, EPA - we only look at the radiological aspects in the actual building where the deep well injection head is. We don't have any aspect of that. EPA handles that under a separate permit, and that particular deep well injection has no part of really the extraction of Uranium, so we don't have that, but that's a good question.

MR. HAMDAN: Yes. The question there, the reason why I bring, especially the evaporation pond,

as you know, in the conventional mill tailings, there's almost always an evaporation pond on top of th tailings, and that's a source of contamination. And then you may want to make sure you address at least that, if not the deep well injection.

MR. FLIEGEL: One of the things that we're going to have to look at in detail is, obviously, a licensee has to address potential for contaminating groundwater from an evaporation pond. The question is, do the requirements in Criterion 5 already cover it, or do we have to add anything in the rule making? Because the fact that you have an evaporation pond at an ISL, that part may not be any different than an evaporation pond at a conventional mill that's already got –- so we're going to have to look in detail at whether we need to add something to that.

MR. HAMDAN: Yes. My question, not so much that you write something new, that's why I talk about the cross-reference. I think you can cover a lot of ground, you can have a very brief section in the new criterion that makes reference to aspects of groundwater protection that are already in regulation, and you do not need to rewrite them. And this is one example.

MR. FLIEGEL: Yes, and that may be as

simple as in the new criterion having a sentence or two that focused on an ISL, that basically says if you have an evaporation pond, all the requirements in Criterion 5 apply.

MR. HAMDAN: Exactly. Thank you.

CHAIRMAN RYAN: I think that's an example of the road mapping I was talking about, to make it a little bit more transparent. If you can get as many of those done as Latif is suggesting, either in guidance, and that's probably the right place for it, that's going to eliminate a lot of well, how does this fit together for me, or how about this circumstance? That would be a great table, for example, to put together.

MEMBER WEINER: Before I recognize, Derek, who does have a question, there's a comment I wanted to make, that you touched very briefly on it, but there is a huge difference in occupational exposures between conventional mining and ISL. And I don't know where the appropriate place is to put that, but I think it's something that you definitely should pay attention to, particularly in your public information section. And for that matter, in the general environment impact of –- the general surface environmental impact of an ISL is very different, and

much less destructive, than a conventional mine. I just think that's something that people tend to forget.

Derek, you had a question?

MR. WIDMAYER: Yes. Earlier in response to a question by Dr. Croff, you mentioned that there were some aspects of ISL mining that were not being improved in the regulatory framework. And you mentioned that there had been this Part 41 that the Staff had worked on in the past, and it got cancelled. Are you going to address any of those in regulatory guidance, or has your job from the Commission really limited you to just changing the Reg Guides for groundwater protection, or can you address some of those other things?

MR. von TILL: The main effort that the Commission has directed us to do at this point is only the narrow rule making of the groundwater protection aspects at an ISL facility, and the revision of the guidance, the main guidance that we have, which is NUREG-1569, the groundwater aspects of that. We don't have any direction from the Commission to go beyond that at this point.

MR. WIDMAYER: Okay. So none of these other weaknesses, if you will, are going to be

improved at this point.

MR. von TILL: Well, I should say that the Reg Guides, though, separate from NUREG-1569, we had a number of those, anywhere from environmental reports for new applications, to bio-assay issues, that we're looking –- we with the Office of Research right now, towards trying to have an expedited schedule to revise some of those Reg Guides. That's a separate effort from this effort.

MR. WIDMAYER: Okay. Thank you.

MEMBER WEINER: Keith, you had a comment?

MR. McCONNELL: Well, it's just - Bill said, I think, what I was going to say, but just to elaborate a little bit - we're doing this other effort to revise some of the NUREGs in the context of getting prepared for the, what we expect to be a surge of new applications for in-situ leach facilities, so there's really two efforts going on in parallel. There's the rule making effort, but then an effort to be prepared for the new applications.

MEMBER WEINER: Further questions, anyone? Hearing none, I also want to add my thanks to a very excellent presentation, and the fact that you put it together on really short notice. And I just wanted to thank the Staff for all the help that they have been

to the ACNW, and ACNW staff, in keeping us informed with meetings, assisting us when we went to visit the Crow Ute site. This has all really helped us develop a very good background, so thanks again, and I'll turn it back to the Chair.

CHAIRMAN RYAN: Thank you. With that, we're scheduled for a break. We'll take a break now until 10:45. Thank you.

(Whereupon, the proceedings went off the record at 10:25 a.m., and went back on the record at 10:45 a.m.)

CHAIRMAN RYAN: I would like to ask the meeting go come back to order please.

Speaking for this section on the MARSAME Manual -- it’s the Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manul -- is Dr. Robert Meck, Senior Health Physicist in the Health Effects Branch, Division of Fuel Engineering and Radiological Research in the Office of Nuclear Regulatory Research.

Dr. Meck is a cofounder and leader of the inter-agency working group that developed the MARSAME Manual.

There are several individuals on the telephone who are on the working group who were

involved in the development of MARSAME. And I'd like to ask each of you to introduce yourselves now please. Do we have any folks on the bridge line?

MS. SNEAD: This is Kathryn Snead. I'm the EPA point of contact for the MARSAME work group.

MR. BHAT: Good morning. This Ram Bhat speaking from U.S. Task Force. I'm one of the MARSAME Committee members.

DR. GOGOLAK: This is Carl Gogolak. Before I was a member of the MARSSIM, the MARLAP, and the MARSAME work groups.

CHAIRMAN RYAN: Hey Carl, how are you? It's Mike Ryan.

DR. GOGOLAK: Hi, Mike. How are you doing?

CHAIRMAN RYAN: Good.

Anybody else?

(No response.)

CHAIRMAN RYAN: So we have three participants on the bridge line. And if I could ask you folks to put your phones on mute, that will help us. And we can certainly open them back up for comments or questions and discussion.

Without further ado, let me turn the microphone over to Dr. Meck. Welcome.

DR. MECK: Thank you and good morning. I'm Bob Meck and I'm here this morning to give you an overview of the MARSAME Manual, its processes, methods, and status.

The MARSSIM website is full of information, including MARSAME. I invite you to visit it if you haven't already. I think that you would enjoy it.

The MARSSIM and MARSAME have the same author agencies: EPA, NRC, DOE, and DoD. And we've had support services from Cabrera in contracting.

The names of the leads -- if I name someone and you've just come on the line, please say here to indicate that you are on the line after I call your name. Our Chairman is Captain Colleen Petullo. Kathryn Snead is on the line we've heard. Nidal Azzam and Vicki Lloyd, George Powers from the NRC is here in the room, Dr. Alexander Williams is the DOE lead. And from DoD, the lead is Dr. Steve Doremus from the Navy, David Albert from the Army, Dr. Ram Bhat from the Air Force --

MR. BHAT: I'm here.

DR. MECK: Okay, thank you, Ram. Lieutenant Colonel Craig Bias is also from the Air Force and has participated.

In addition, the contractors are Scott Hay, Carl Gogolak, and Nick Berliner.

To give you some -- are there any others on the phone?

(No response.)

DR. MECK: Okay. I would prefer to answer questions at the end of this presentation and it will take about 30 minutes. The level of this presentation assumes some familiarity with MARSSIM AND MARLAP and the statistics of hypothesis testing.

To give you some background, the MARSSIM is concerned with the measurement of radioactivity on lands and structures and came out in 1997. It was followed by MARLAP which is the measurement of radioactivity in the laboratory and laboratory protocols.

MARSSIM has a different scope. It is the measurement of radioactivity associated with materials and equipment. And its need was stimulated by the feedback from the use of MARSSIM and the statistical approaches that were developed in MARLAP.

Overall this suite of documents are aimed at providing technically defensible and efficient measure methods for radioactivity.

The purpose of MARSAME is to provide

technically defensible processes and methods and the strength of MARSAME is that it is multi-agency endorsed. Each of the authoring agencies endorse these methods as technically defensible. It quantifies uncertainties of measurements and serves as a supplement to MARSSIM.

The scope is non-real property. The real is in the sense of real estate here. And the materials and equipment may be with or without radioactivity. Examples of the kinds of materials or equipment that are in the scope of MARSAME are listed on this slide.

MARSSIM has similarities with MARSAME or MARSAME has similarities with MARSSIM in that their flexible approach is a graded approach. The surveys use the data quality objectives process. Classification of the materials or equipment to be measured determines the intensity level of the survey. And after the results are obtained, they are evaluated using the data quality assessment processes. And a separate decision is made for each survey unit.

There are also differences between MARSSIM and MARSAME. Certainly the scope we've talked about. The disposition options include not only release, as MARSSIM includes, but it also includes interdiction.

If, for example, you are not expecting radiation or radioactivity from materials and equipment and you want to detect it, it is the other side of the coin.

And an example of refusal to user accept would be the cobalt-60-contaminated steel that arrived at the gate of Los Alamos National Laboratory some years ago. They refused to accept that because they expected nothing there.

Difficult to measure radioactivity areas are included as are sentinel measurements. Sentinel measurements are most often wipes or smears. And they can indicate the presence of radioactivity but they are not taken to represent the absence of radioactivity. So that is a one-way sentinel measurement.

Scan-only surveys is a method that is applicable for MARSAME but not MARSSIM.

I've prepared a handout taken from the MARSAME document that has the similarities and differences. It is information intense and doesn't present well as a slide. I'll skip over that but we can come back to it in the questions and answers as needed. But the first page is the similarities and then the next two pages are the differences between MARSSIM and MARSAME.

MARSAME processes follow a logic flow that is similar to that of MARSSIM. The chapters are ordered in the order of the logic. And they are listed here as initial assessment and development of the decision rule, how you design the survey, what do you do to implement it, and what are the results.

The case studies are actually examples of how to implement this logic flow. And serve to illustrate the processes.

We will be going into each of these main chapter topics in the rest of this presentation. There is a flow diagram in your packet that describes the MARSAME process. On the left-hand side, you see there are four major processes -- the plan, implement, assess, and decide. And that's very similar to MARSSIM. And so this is the logic flow in a flow diagram format.

Going into this logic flow, the first step which is a different one from MARSSIM, is to categorize the M&E. It is different in terms but we do characterize in MARSSIM in that we make a determination is what to be measured impacted by radioactivity or not.

And if there is no reasonable potential for radioactivity to be associated with the materials

and equipment, then it is considered not impacted or non-impacted. And the way that those decisions are arrived at are using visual inspections, historical records, process knowledge, or sentinel measurements.

The disposition option can take several forms. It can be a release, a different level of control, or interdiction, as we mentioned earlier.

Moving on in the logic flow, the decision rule development includes selecting the radionuclides of concern, identifying the action levels, and the action levels are the quantitative values that upon which a decision hinges. It can be, for example, 5,000 dpm for 100 square centimeters would be an action level.

Parameters of interest, an example of that would be gross counts. This is what we are interested in measuring.

The survey units are identified and the inputs for measurement method selection are also part of the decision rule development. The development of the theoretical decision rule is an if-then statement. For example, if the mean count is greater than the action level, then the survey unit will be dispositioned to Option A.

Designing the survey, the first step is to

evaluate existing survey designs. And here there is an emphasis on standard operating procedures. If there is a standard operating procedure that meets the quality objectives and the materials and equipment meet the conditions of that standard operating procedure, then it may be used. One does not have to develop a survey design each time materials and equipment are made. But rather we try to orient the users towards the development of qualified standard operating procedures.

If one does not exist, one develops the survey statistics and the operational decision rule, classifies the materials and equipment. Classes 1 means that some counts are expected to be above whatever the action level are. But statistically they may not be enough to drive the mean above that action level.

For Class 2, no measurement is expected to exceed the action level. And Class 3 means that radioactivity is not thought to be associated with the materials and equipment, however, there is not enough confidence to classify the materials and equipment as non-impacted. And so this is the graded approach to the measurements based on the classification.

Select and optimize the survey types,

scan-only surveys can be made or in situ spectrometry or a MARSAME-type survey which involves sampling and scanning for the elevated measurements test. And finally the survey design should be documented.

The survey design includes choosing the null hypothesis and the decision error rates. In a sense, the scan-only surveys are different from MARSSIM. We'll focus on them for this presentation.

And here is where your familiarity with the approaches of MARSSIM and MARLAP will come into play. And that is for a given width of the gray region, the relative shift can only controlled by controlling sigma, or the standard deviation.

And that may have a measurement component and a sampling component. For example, the sampling component variation, $sigma_s$, would be differing amounts of concentration of the radioactivity on the materials and equipment; whereas the measurement component is a compounding source of uncertainty. Segregation and classification may help in controlling the sampling component of the uncertainty.

For scan-only surveys, if it is a Class 1 materials and equipment, 100 percent of the materials and equipment needs to be measured. For Class 2, the percentage can range from 10 percent to 100 percent.

And for Class 3 scan-only surveys, the scan percentage could be ten percent or less.

The uncertainty of measurement denotes the values that could be reasonably attributed to the measurand. Now this statement derives from the guide for expression of uncertainty known as the GUM. And ISO and NIST documents use this approach.

And the overall uncertainty is well known as the propagation of uncertainty. And this is an abbreviated form of that equation. The full form would have an added term that would take into accounts the contributions of covariances to the overall uncertainty. In typical situations that are considered for a measurement of radioactivity, those covariance uncertainties are negligibly small compared to the uncertainties of other components of the measurement.

In this equation, this portion is the sensitivity factors. And the function would be the theoretical model of how you convert the measurements to an activity. A common one would be the number of sample counts divided by the sample time, minus the number of background counts, divided by the background time for counting. And that difference divided by the efficiency.

And so each of those five variables that I just mentioned would be one of these Xs. And then there's the uncertainty of each of those multiplied by the sensitivity factor and summed. And then giving you the combined standard variance.

There's a graphic that follows this slide to illustrate the concept. So it is information intense. But the minimal detectable concentration is the concentration at which the probability of detection is one minus beta. And when the detection criteria is such that the probability of a false detection in a sample with zero concentration is at most alpha.

This illustrates what that statement said. And it is an adaptation of Curry's illustration. The adaptation part of it is that we have unequal beta and alpha to illustrate that those do not have to be the same. And it is important to note that on the ordinate is the frequency of the measurement at the net counts. And the net counts means that it is the count of the sample minus the background.

And so naturally if you measure background and you subtract background, you would expect a mean of zero net counts. And what this illustrates is that with a choice, this is something that the designer of

the survey makes is they choose alpha and beta. And at alpha, if there is a true but unknown background count that results in this level, as illustrated here, then it would be counted as a sample count. That would be a Type 1 error.

Beta is chosen as its small -- the sample, true but unknown could provide a count in this area -- the darker shaded area -- and that would be a Type 2 error.

Beta determines where the critical level is. And we're going to follow on to that. The mean of this is also known as the minimal detectable concentration.

MEMBER HINZE: Well, excuse me, but S_c, this is just a sample count --

DR. MECK: It's called a critical level. And it corresponds with the setting of data or the Type 2 error. So if one -- let me go back -- so when one sets up the survey design, then a true but unknown quantity of radioactivity would be right on the cusp of -- or right in the center of whether it was detected as a sample count or it was considered a background count. I hope that helps.

What MARSAME offers here is -- and it was discussed by Stapleton and Strong also -- that if the

total background count is about 100, the Poisson distribution assumption works pretty well. And for these special conditions that are illustrated up there, you see the familiar 2.71 plus 4.66 times the square root of the background count.

However, if the total counts of background are less than 100, the Stapleton approximation works better. And for these same conditions, the significant difference of those two forms is that this constant term for determining what is called the minimum detectable concentration is about double that of the Poisson assumption.

The Stapleton approximation can be generalized. It is more complicated, as illustrated here. And we can move on from that to approaching the question is radiation or radioactivity detected? And this is intended to show you the relationship -- again we have net counts on this scale and up here is the MDC.

The net counts would have a mean of zero for background. For true but unknown amounts of radioactivity that correspond to this critical level, the mean would be at that critical level. And the relationship to the MDC is at a greater true but unknown amount of radioactivity.

Now the minimum detectable value or the MDC should be used only as a measurement quality objective for the measurement method. This is a tool to determine is a method appropriate for the action level that you are matching it to. To make a detection decision, a measurement should be compared to the critical value and never to the MDC.

If the action level is a quantitative amount as opposed to a detection criterion, the minimal quantifiable concentration, MQC, is defined as the concentration at which the measurement process gives a result of the specified relative standard deviation.

Now what does that mean in a little bit more lay terms? And that is for a given instrument and measurement method, a true but unknown amount of radioactivity equal to the MQC will give a distribution of net counts with a mean equal to the MQC and a standard deviation equal to ten percent of the MQC. That's when we -- in MARSAME we talk about ten percent. And we'll come to that and discuss that a little bit more.

This show the relationship of the concepts that we've talked about and are explained in MARSAME. This is a power curve drawn through here. The

critical value is here. And here is the minimal detectable concentration at the upper bound of the gray region.

The MQC is considerably greater than the minimum detectable concentration. If fact, it is in the order of ten times the multiple of the uncertainty of the measurement.

The action level, the important thing is the action level for a quantitative action level such as 5,000 dpm for 100 square centimeters will be even further out here because this is the amount that you can quantify. And so the action level, if it is a quantity of a concentration or activity, it should be greater than the minimum amount that you can quantify with a certain amount of confidence.

Well, this is the equation for the MQC. And the eta here is the efficiency of the detector. And the distribution -- this ten percent of the MQC that I just mentioned is really driven by the value of K_Q.

There is a reason that it is chosen as ten in MARSAME and that is to provide comparability to other studies of MQC and it also is a reasonable distribution to quantify with -- you know, you are controlling the uncertainty. It can be changed to

some other percentage by changing this K_Q in this equation.

This is another way of saying that the MQC needs to be greater than -- or less than rather the action level. It is a complicated thing to read but in lay terms, that is what this means. We can come back to this if you want to.

Once the survey is designed, segregate the materials and methods as necessary, set the measurement quality objectives, determine the uncertainty, detectability, and quantifiability. And select the instrumentation and the quality control that are needed.

Once the data are obtained, the survey results are assessed. And you conduct this data quality assessment and compare the survey results as appropriate with the upper bound of the gray region, the upper confidence level, the sign test, the Wilcoxson Rank Sum test, the Quantile test.

Those survey results are then evaluated and you select the disposition -- where are the materials and equipment going to go depending on the options that you set out in the plan. And document the results for disposition.

This is the final slide. The MARSAME

Manual status, the manual went out for public review and comment on January 16th. It was scheduled for a 90-day review. Events in the last two weeks indicate that we are going to extend that review period one more month until May 16th.

In the summer of this year, the EPA Science Advisory Board and Radiation Advisory Committee, which is a subcommittee of the Science Advisory Board, will conduct a formal peer review of the document. And once we get your comments, the public's comments, and the SAB's comments resolved, then we'll publish the final MARSAME.

Thank you very much.

CHAIRMAN RYAN: Bob, thanks.

Ruth?

MEMBER WEINER: Thanks very much for a very enlightening presentation. I really didn't know --

CHAIRMAN RYAN: There's going to be a test on the statistics. You'd better be careful what you say.

MEMBER WEINER: Yes, there's going to be a five-minute quiz at the end of this.

CHAIRMAN RYAN: Oh, no, it's a full hour exam.

(Laughter.)

MEMBER WEINER: I just have a question. You've given a very clear explanation of counting statistics. Could you also apply that -- this refers to counts -- could you also apply that to any measurement technique? In other words, would you suggest applying this generally to techniques where you measure any sort of radioactive emission, direct dosimetry, anything like that?

DR. MECK: I believe so. The statistics here are derived without the requirement that it be radioactivity or even radioactivity on materials and equipment. I believe that this math is generally applicable.

MEMBER WEINER: The reason I asked the question is we very commonly cite some kind of dose standard. And the question is -- and you've answered it -- are these statistics -- do these statistics support that dose standard and to what extent to they? I'm not asking you to answer --

CHAIRMAN RYAN: That's apples and oranges.

MEMBER WEINER: Well, that's my question. Is it apples and oranges?

DR. MECK: Is it?

CHAIRMAN RYAN: My comment, Bob, was it is

apples and oranges. This is to make disposition of materials decisions.

MEMBER WEINER: Yes.

CHAIRMAN RYAN: Everybody involved is wearing a badge or some kind of dosimetry. And that is a separate issue.

MEMBER WEINER: Well, I was thinking more of -- not so much of dosimetry. Perhaps I used the wrong word. But we have a number of dose standards that we apply. And I am fairly certain that they are not backed up by any statistical analysis.

And I just am generally asking -- and you've answered the question -- when you have a standard like that where there is uncertainty in the measurement that you're making, that you're basing that standard on --

CHAIRMAN RYAN: Let me offer you a thought.

MEMBER WEINER: -- if this kind of statistics applies?

CHAIRMAN RYAN: Every dosimetry program out there is backed up by an inter-calibration program either under DOE lab or, you know, some version of the laboratory accreditation program for dosimetry. So there are a lot of statistics in dosimetry.

DR. MECK: Yes. I can give you a generalization that applies across mathematics. And that is if you comply with the assumptions that you start out with, then the rest of it should follow and applicable. And so without, you know, seeing if there is a good fit for the assumptions that are behind these statistics, then it is hard to answer very broadly.

But, you know, in general, given the assumptions that the statistics are based on --

CHAIRMAN RYAN: The real advantage to me, Bob, is along those lines. But it boils down to the same advantage of MARSSIM. And that is that if two analysts go into two different rooms with the same sample results, they are going to come out with the same answer or the same disposition decision.

DR. MECK: I really believe that the power of MARSSIM and MARLAP are that the multi-agencies agree that if you do it this way, it is technically defensible.

CHAIRMAN RYAN: That's the key.

DR. MECK: And it's not just --

CHAIRMAN RYAN: And reproducible.

DR. MECK: And reproducible. It's not to say that there aren't other ways of doing it. But we

can at least use this as a landmark of processes and methods.

MEMBER WEINER: Thank you.

CHAIRMAN RYAN: Let me follow up with one other question if I may. This gets the stuff in the box ready to go. And it could be low-level waste. It could be solid material that has nothing detectable. Or it could be in that gray area where the steel recycler is going reject it at the gate.

I guess you don't get into that I'm guessing. I just want to make it clear for the record, you're stopping at putting it into its final characterization for sending it somewhere.

DR. MECK: This is a way to measure the radioactivity associated with the materials and equipment. Or the absence of radioactivity associated with materials.

CHAIRMAN RYAN: But what you do with it after that analysis is a whole new question?

DR. MECK: Exactly.

CHAIRMAN RYAN: I just want it to be clear. You are stopping at that point.

DR. MECK: Yes, yes, yes.

CHAIRMAN RYAN: Okay.

DR. MECK: This is a technical manual and

only a technical manual.

CHAIRMAN RYAN: And, you know, if it is half as good as MARSSIM, in my view it is pretty good.

So, John?

MEMBER CLARKE: Thanks. I have some familiarity with this from looking at non-radionuclides in environmental media. And as you noted, the statistics are the statistics. But I did have a couple questions.

For example, if you are trying to quantify the concentration of arsenic in soil, what we would call the gray area would be between the minimum detectable concentration and what the EPA calls the practical quantitation limit, which is your MQC. And that would depend on the matrix. That would depend on if they were in water or air or a nasty oil sludge or whatever because of the degree of difficulty in getter there.

So the practice in that arena would be that you really shouldn't quantify in that range. You should be above that MQC. Although labs routinely extrapolate calibration curves into that range.

The question I had is is there an effect of sample size or the number of measurements? Because it would seem that some of the constants in your

equations would come from that. Is that correct?

DR. MECK: Certainly if in the survey design there is what we would call a MARSSIM-type of survey, there is a calculation that you would do to see what is the sample size that you would need to get the power in the statistics that you require. And, in fact, in MARSSIM we say make it a little bit bigger because invariably, some of the data that you take will be disqualified when the quality assurance or assessment comes along or something will go wrong.

MEMBER CLARKE: Life, for example, if you were using small sample sizes, you'd be into t-statistics and not, you know, normal distributions.

DR. MECK: Well, you may not end up with the power that is required to make the decision.

MEMBER CLARKE: Thanks.

CHAIRMAN RYAN: Allen?

VICE CHAIRMAN CROFF: No, thanks.

CHAIRMAN RYAN: Bill?

MEMBER HINZE: Well, following up on Dr. Clarke's question, it seems to me it is not only the sample size but it is the sample distribution. And that comes into play in the survey design. And what kind of guides do you provide within this report in terms of survey design?

I notice that you have 100 percent scan for this Class 3-type of material. What is --

DR. MECK: That's Class 1.

MEMBER HINZE: Class 1, okay. Well, what is 100 percent scan mean? And how is that involved in the survey design?

DR. MECK: All right, 100 percent scan means that if you are looking at or measuring radioactivity associated with surfaces, that you look or you measure all of the surfaces. You may have to -- if you've got flat pieces, you may have to turn them over.

MEMBER HINZE: Is that one measurement? Or do you move the detector? I mean --

DR. MECK: The detector can move. In the scan-only survey design, the detector or the material say on a conveyor belt could move past the detector. The one is moving relative to the other. Yes, that's possible. But the 100 percent means that all of it is measured, whether it is volume or surface.

MEMBER HINZE: Sometimes these materials that you describe here are not regular in their geometry.

DR. MECK: Correct.

MEMBER HINZE: And therefore, a single

measurement or even a few measurements may be totally misleading. So in the survey design, is there a built-in for this, your guidance?

DR. MECK: Yes, yes. The key would be -- let me for illustrative purposes say that suppose that there is a situation where you've got pieces of scrap metal and you've got concrete rubble. While the guidance says segregate those out because your uncertainty is going to be so great if you try to mix those together that you will have to have a very action level to make a decision on that.

But if you segregate it out, you can start narrowing down the uncertainties or the standard deviation of the measurements so that it will be a smaller standard deviation. Another way of doing that is process knowledge. And this is part of the visual part that we were talking about.

If you know that, you know, some subset of all the materials and the equipment were exposed to a certain part of the process, then -- and they are likely to have about the same associated amounts of radioactivity on them, then it is reasonable to expect that that may decrease the standard deviation so that you would have a lot more success in terms of making a decision about your action level.

MEMBER HINZE: Dr. Ryan pointed out that an objective of MARSAME is if you have a set of data and you put it into the hopper of DoD or DOE or whatever, that you would come out with essentially the same decision.

But I guess what I'm getting at is you really start before the data is collected. And you've explained that. And so what I'm trying to investigate is how certain are we that DoD, DOE, EPA is going to end up with the same data after evaluating rubble or containers or waste? And are the protocols for the survey design, the instrumentation, et cetera, are these specific enough so that we would end up with the same decision out here?

DR. MECK: MARSAME stops short of developing standard operating procedures. But they tell you how to develop a standard operating procedure. And it is, you know, conceivable that other agencies may have slightly different operating procedures.

But the underlying statistics and the decision about whether something exceeds or does not exceed an action level should come out to be the same.

MEMBER HINZE: You also mentioned that you had some case histories. Can you give us some idea of

what case histories you've used? And what you have found from them? And what are the lessons learned? And what are the lessons learned for the reader of MARSAME?

DR. MECK: Well, it was an interesting and difficult exercise to do a front-end loader with uranium and --

CHAIRMAN RYAN: Start with an easy one, Bob.

DR. MECK: There are easy ones in there but I don't think you want to hear about the trivial cases.

MEMBER HINZE: No.

DR. MECK: And so the first cases in our hypothetical facility, a front-end loader is rented from a rental agency. And you say well, do we accept it on the site? And this is an interdiction design. In a sense, we don't want any extra radioactivity come in our site due to this front-end loader that may have been used at another site. And so there is an interdiction survey there.

And then after its use on site, then it has to be cleared to be returned to the rental company. And so this was a challenging one. The lesson learned is that you can subdivide something

like a front-end loader. And you can take the front-end bucket off and use that as a separate survey unit. And make a decision on that as opposed to trying to take the elephant all in one bite so to speak.

MEMBER HINZE: So the moral of the story is that you have to break these into measurable units? Physical units?

DR. MECK: It is to one's advantage to -- it is analogous to the segregation that I talked about earlier. It is to one's advantage to keep that standard deviation of your measurements small. And in so doing, it may be easier to make the decision.

The other part of it is there may be different decisions for different parts of the same piece of equipment.

MEMBER HINZE: I'm taking too much time but let me ask you a last question if I might and that is these are -- MARSSIMs are very useful documents and all and I use them. And one of my concerns is what about their updating? Are there protocols? Your Committee? Do you evaporate into thin air once it is published and you have a website? You know what about the user in terms of keeping things up to date?

DR. MECK: I'm glad you asked that. MARSSIM, from the outset, was designed to be a living

document. And, in fact, it has undergone a couple of revisions since it was first published. And the last time we published it, we published it as a looseleaf so that we could do individual page changes as opposed to having to reproduce the whole document.

The development of MARSSIM and the statistics, especially the Stapleton approximation, should find its way back into MARSSIM. It's not in there. And it would be an improvement in an updating to MARSSIM.

The MARSSIM work group is, in a sense, a grassroots work group. There were technical staff that said, amongst themselves, that we can provide technical information and provide technically-defensible ways to measure radioactivity in various arena. And so we have a charter. Is there a steady budget item on any of the author agencies? I think the answer to that is no.

And so in terms of long-term measurement and upkeep and update, that is a concern. And we have to, year by year, appeal to our managers to say this is our project. This is what we need. We would like a hunk of the budget.

MEMBER HINZE: Thank you, Dr. Meck.

CHAIRMAN RYAN: Bob, thank you very much.

And thank you, participants, on the phone.

With that, we are finished with our morning session. And we will take our lunch break and reconvene at 1:30. Thank you all very much.

(Whereupon, the foregoing matter went off the record at 11:37 a.m. to be reconvened in the afternoon.)

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

1:29 p.m.

CHAIRMAN RYAN: Let's see. This afternoon's session we're going to hear about the scope and methodology of the Government Accountability Office, GAO's, ongoing review of the Global Nuclear Energy Partnership (GNEP) effort.

Cognizant member is Allen Croff. Allen, take it away.

VICE CHAIRMAN CROFF: Thanks, Mike.

10) SCOPE AND METHODOLOGY OF THE GOVERNMENT ACCOUNTABILITY OFFICE (GAO)'S ONGOING REVIEW OF THE GLOBAL NUCLEAR ENERGY PARTNERSHIP (GNEP) EFFORT

VICE CHAIRMAN CROFF: Our speaker today is Joe Cook. He's a senior analyst at the GAO. And, with that, I'll let you take it away and introduce the rest of your team members and then go for it.

MR. COOK: Well, I thank you for having us here today. In addition to myself, there is Chris Kunitz over here and Dan Feehan in Denver. And we're all working on this review of GNEP.

When I was thinking about how I opened this today, I recalled a meeting that we had at DOE a little while ago. And someone compared a GAO review to a root canal. I have had a root canal. So I

thought that was a pretty good analogy.

The reason I bring it up now is because it's sort of communicates why I think that we're here today. We're at the beginning of our review. And we have had a patient referred to us who might need a root canal. And we have taken some X-rays. We don't really know what to do or, actually, we do have a good idea, but it's an important tooth and we don't want to screw up.

And you all are our experts on this particular tooth. So we want to share our X-rays with you and get your ideas before we move ahead. So hopefully my presentation will sort of generate questions and comments.

And I am going to drop that analogy now because it brings back a lot of bad memories. So, anyway, I will say --

MEMBER HINZE: Not if you're a dentist. Not if you're a dentist.

MR. COOK: My dentist had a very good experience out of it. Yes, that's true.

I have attended two of your previous meetings, where you talked about reprocessing. And I think Dan listened in on one as well. And we have reviewed some of the previous transcripts from last

summer. And it's all been very informative for us. This is really a complex area. And it's been really helpful to be back there and just listen and learn about the complexities of reprocessing.

So it is really an honor to be here today. I have prepared a presentation. I think it will last about 20 or 30 minutes, which hopefully will allow for comments and questions. I should emphasize it is preliminary. We don't have any findings or anything of the sort to share it. It really is a scope and objectives of the review. So, with that, I will get started.

The source of the review is the Senate Homeland Security Permanent Subcommittee on Investigations. This is who we are working for. A request came in I would say about a year ago. Obviously we get a lot of other inquiries from the Hill, but right now this is basically our client.

Let's see. As far as the time frame for our review, we're in what we call the design phase. Typically a review lasts, I would say, about a year. So that means that since we started approximately last November, that we would have something finished by the end of this year.

We have assembled a team, an immediate

team, which includes Dan in Denver, myself, Chris, and another person. And among all of us, we have quite a bit of experience reviewing DOE programs, whether they be nonproliferation, nuclear energy, Yucca Mountain, a wide range of stuff; and then previous work experience, for example, dealing with low-level radioactive waste.

So we are not technical experts, but I think in the immediate team, we definitely have a head start on doing the review of this complexity. Then we also have an extended team. For example, we have GAO's chief technologist, who we're very lucky to have. He actually previously worked at Lawrence Livermore and knows quite a lot about reactors. So that's good. And we also work, for example, with an economist. And obviously GNEP raises a lot of issues related to economics.

The original request from the Committee was really broad. And I've listed just a few of the things. I mean, of course, there are always concerns about costs and technical challenges of any sort of program involving R&D. And in this one, of course, there are proliferation issues. And with GNEP, there is a domestic component and an international component.

And when we looked at that, we pretty quickly determined that for purposes of our review we would have to scope it down and make it manageable, possibly leaving whatever we don't address right away for a follow-on review.

And the key decision that we have made so far is to say, "Okay. You can roughly divide GNEP into a domestic technology development component and international component." And it made sense to us to look first at the domestic technology development component, in part because, you know, that's what's really on, you know, the plate right now in terms of DOE going forward. And also to a large degree, the way GNEP appears to be structured, the international component would depend on developing domestic capability to reprocess and burn transmutation fuel in a non-fast reactor.

Obviously when you scope something down, there are potential limitations to that. So, for instance, something that might make sense when you are looking at the whole broad program, if you just look at one part of it that touches on maybe just a subset of the objectives, you might be able to draw some conclusions. But then you step back and you say, "Well, there's another important component to this as

DOE has put this together." And we want to keep that in mind.

So that's the case here, at least in terms of how I look at it. So, with that, so far we have developed three objectives. And I have slides on each of these in more detail. Before I get into that, there's in my mind a logic to the order of these objectives.

And the logic is basically a time line. For the first one you can think about "Okay. GNEP was announced in February 2006. Before that, there was AFCI. And that, in turn, evolved from some other DOE programs." And under AFCI, DOE was evaluating a number of different options as alternatives to the status quo, advanced nuclear fuel cycles.

So then you get to February 2006. What's the basis for narrowing down from all of those options and choosing GNEP, which, you know, is a real very specific strategy with specific technologies that they're proposing or at least focusing on referenced technologies, for instance, with regard to reprocessing and having decided to focus on a sodium-cooled fast reactor.

So that is the first objective. The second objective is saying okay. Right now what can

we say about the technology maturity and then the third objective looking forward, how is DOE planning to advance that technology maturity nd in general advance GNEP?

Okay. So the first objective, this idea of evaluating alternatives, to me at least, if you look at the Energy Policy Act, which authorized the advanced fuel cycle initiative, what it says to me is, you know, it's pretty clear, evaluate different strategies as an alternative to the once-through fuel cycle.

And then if you look at various congressional direction and committee reports and whatnot over the last several years, there are variations of that and one including, I think, directed DOE to actually select an alternative. And I think it was by 2007, but I could be wrong.

So that's really the basis for this objective asking what is the basis for a genome. And how I see we could go about getting an answer to that question is there are a number of ways. You know, is there a systems analysis that DOE did looking at the different alternatives in terms of their long-term implications for the fuel cycle.

Obviously there are policy decisions in

the one that comes to mind, I think we have probably all heard quite a bit, is no separated plutonium. And that's one example and then an analysis of trade-offs and risks because obviously with this program having multiple objectives, just from a logical standpoint, you would think that it would be hard to maximize achieving all of those objectives.

So the idea here is to look at whether DOE had a reasonable basis for selecting GNEP from among all of these alternatives. And to me reasonable, that's a real potentially dangerous term. But I just contrast it with optimal, that you're not necessarily looking for something that is the best because that would be hard to define but reasonable, sort of like you know it when you see it.

Okay. On technology maturity, this is actually a report that Dan has worked on and came out last month. What we did is we looked at 12 DOE projects, major projects or projects that were close to being major projects and looking at the schedules and the costs and found that nine of them had exceeded their original cost or scheduled estimates.

So, in addition to ineffective project oversight and poor contractor management, which comes up a lot when you hear about DOE, one of the findings

of the report was that -- and you'll have to excuse me because I didn't write this report. So I'm not familiar with it. But the DOE does not consistently assess technology readiness to ensure critical technologies will work as intended before construction begins. And that lack of technology readiness can result in cost overruns and schedule delays.

So the report recommended that DOE consider using some type of system to assess technology maturity similar to a nine-point scale that is used by NASA and DOD, one being the least mature and nine being the most mature.

So I don't know if you all are familiar with that, but, as it turns out, AFCI, the advanced fuel cycle initiative, even before this report had started using these technology readiness levels. They had adapted it from NASA and DOD with modifications to fit AFCI.

For example, one thing that I think might be unique to AFCI is that they divided it in threes, so one to three, four to six, seven to nine as a more general approach, with one to three being concept development, four to six proof of principle, and seven to nine proof of performance.

And then if you look at some of their

public reports, they have gone one step further. And you'll see how they'll talk about it in terms of fuel development, for example.

So our objective here is to get more detail about exactly how is DOE planning to use technology readiness levels under GNEP. And you can imagine there are a lot of details when you start scratching a little bit beneath the surface.

For example, to what extent has DOE applied TRLs to the full range of technology that would need to be developed under GNEP is one question. And then there could also be a question of consistency, both within the program and also consistency with DOD and NASA because you could imagine where if everyone is using a nine-point scale and a seven at DOE means something different than a seven at NASA or DOD, that would create confusion for people like us on Capitol Hill who might want to use this type of metric for evaluating a program.

So in talking about this with DOE so far, I mean, it's clear that there are limitations to TRLs. One that has come up is that assigning a TRL doesn't necessarily, for example, tell you how much effort or time is required to get from, let's say, five to seven or whatever the case may be.

Another case that has come up is you could have an artificially high TRL, an example being the sodium-cooled fast reactor, which has been built in the United States, but it has been along time. So you have to then look at the infrastructure, both in terms of people and just industrial infrastructure.

Okay. Our third objective deals with the plan for advancing GNEP. I have listed just in this first bullet here a few of the things that fall under planning. This is really sort of bread and butter for GAO.

You look at budget and R&D plans, in this case leading up to the June 2008 decision. This is a date that has come up a lot. I think you all have probably heard it as being the next major milestone in GNEP.

There is also the schedule for designing construction of facilities and ultimately for achieving the objectives of GNEP. We can also think in terms of planning for NRC licensing. And we have heard that there is a lot that goes into that as well in terms of regulatory development rulemaking.

In terms of what we look for in a plan, there are certain criteria. A really important one is DOE order 413.3. This is the project management order

that all DOE projects, as far as I know, certainly major projects, are managed under. And it's pretty detailed. They have five milestones ranging from basic initiation to start of construction. And it's really geared towards, obviously, design and construction of facilities.

And then there are other things, like what I have listed here, the OMB R&D criteria, which is on their Web site. In looking at these, what we have to do is say, "Okay. Well, where is GNEP in this process?" because that really will determine what criteria apply. In this case, GNEP has passed the first of five milestones, what they call CD-0, critical decision zero, approval of mission need. And they are heading toward CD-1.

Well, when you think about planning, they are not required to have a detailed schedule and cost estimate until the third milestone, which is CD-2, critical decision 2. So that's not something that when we're looking at this and looking specifically at planning, that we necessarily expect to see.

That said, you know, we have seen sort of notional time lines showing the R&D and schedule leading up to the start-up of facilities. So that's something we're clearly interested in because that

makes a difference when you think about GNEP, is how do all of these facilities come online, how is it phased, you know, the reprocessing plant, the advanced burner reactor, and the advanced fuel cycle facility.

So I thought since you all are the Advisory Committee on Nuclear Waste that you might be interested in, well, what does all of this mean for radioactive waste.

For objective one, one of the things that you might think that DOE had analyzed looking at all of the alternatives is the volume of waste, the treatment and disposal options. We have heard a lot about cesium and strontium and a lot of other things.

So that's the type of thing that we're looking at here, not to necessarily get answers to what is GNEP going to produce but how did DOE compare all of this, specifically with regard to the waste streams for reprocessing?

CHAIRMAN RYAN: Do you mind if I ask a question here?

MR. COOK: Go right ahead.

CHAIRMAN RYAN: That is where the rubber meets the road because if you don't know what is going into what waste, you don't know if the system makes any sense.

MR. COOK: I agree.

CHAIRMAN RYAN: Okay. We'll get them all later, I guess.

MR. COOK: Okay.

CHAIRMAN RYAN: The patient is now anesthetized, and we're ready to drill.

(Laughter.)

MR. COOK: Yes. We hope they have some anesthesia.

(Laughter.)

MR. COOK: So technology maturity, this is another example. You know, waste forms, you can think of this technology bringing a system being applied to waste forms and think about, "Okay. Iodine or technetium." I'm just throwing out things that I've heard about that -- what is the maturity of the technology that you would need for that, not that, again, we're necessarily going to determine that, but how is this factoring in to DOE's planning? And that leads very much into objective three. So okay. Now, if this is the maturity of this waste form, what is the plan for conducting R&D? What are the plans for waste storage?

You know, again, cesium and strontium, we have heard about that being stored for something like

300 years. Where would that take place?

This is a fourth objective that we have only recently started thinking about, but I should say thinking about in terms of including in this review.

We have all heard a lot, I think, probably about the economics of reprocessing. And there has been at least one hearing on the Hill looking at exactly this issue. And so it's a really complex area.

A lot has been written about it. And initially it seemed like something, okay. This might be a little too much to take on in an initial review. But then getting into it a little bit more, we have been considering, okay. Well, may be there is a way we could include this in this review to at least find out, well, how is DOE using economic modeling in its decision-making on GNEP and what are the assumptions that they are using as part of their modeling. And that would seem to me to be pretty illuminating.

So, you know, I don't think it would answer necessarily the question of, you know, what are the economics in terms of does it cost more than the once-through cycle definitively. That would be, I think, a little bit beyond the scope of what we're talking about here.

So that pretty much sums up my presentation. I would say that the scope of our review is intended to focus on areas of immediate significance, the technology development. The specific objectives are intended to provide information about the rationale behind GNEP, the technology maturity, and DOE's plan going forward.

And, with that, if you have any questions, I would be happy to answer them. And Dan is also here by phone. And Chris is here as well.

VICE CHAIRMAN CROFF: Okay. Thank you.

Dr. Hinze?

MEMBER HINZE: Well, my question is pretty well focused on nuclear waste. So let me focus on that for a bit. We have had presentations in which a considerable driver in the whole GNEP process is the minimization of nuclear waste. Yet, we also hear and perhaps only hear anecdotally that the volumes of waste may not be decreased as a result of GNEP. So the question that I have is, where is the waste concerns in terms of the priorities in the objectives of GNEP?

And let me put a corollary on that. If waste is not important in terms of minimizing waste through GNEP, what does that do to GNEP as a whole and

to the schedule for the GNEP?

MR. COOK: Well, I would say that from our perspective, that the waste is very high priority in terms of what we want to look at. There is a limit to what we can do. We're not experts on that. And we've even considered doing a separate review potentially as a follow-on review, depending on how all of this progresses, specifically on waste, from GNEP or whatever other strategy DOE decides to adopt because that seems like it could be a review in and of itself. And maybe that's what you're looking at in your white paper. I think those issues are really important. And, if nothing else, it should be clear what we're getting out of the bargain, so to speak.

To me, I don't see it as a silver bullet. What I have learned about it and just common sense says that you can't make waste disappear. There is a price to be paid.

And I think we need to recognize that and will recognize that in our review. Nevertheless, it seems to me to be worthwhile looking at and saying, especially when you are looking at alternatives, to UREX-1A and recycling in fast reactors, to say, well, what are the waste streams that are coming out of this?

And what are the waste streams that are coming out of the alternatives, whether it be -- I mean, one thing that we have heard about is the potential for thermal recycle. And perhaps that goes against what GNEP is all about. But it still seems to me that you would want to look at all of the alternatives from every standpoint, including waste.

I don't know if that answers your question, though.

MEMBER HINZE: It starts to approach it. Certainly I think that anything that you could do to focus on this problem and focus DOE on this problem will be helpful to this nation. And speaking about nation, let's discuss this a bit from the international standpoint, which I also understand you are thinking.

Obviously right at the first word, it's global.

MR. COOK: Right.

MEMBER HINZE: And my understanding is that one of the reasons for this is that we would be a reprocessor of fuel that is used by other nations. If I were a congressman sitting here, I would ask you the question, does that mean that we're going to be collecting other people's waste and having to store

that on our SUS? Is that a problem?

MR. COOK: I completely agree, not that that is an issue. In fact, we went to one of the public scoping meetings for GNEP that have been held around the country. And that is one of the things that people are very concerned about in those communities. It's not the maturity of the technology or the economics of it. It's we don't want our -- this is something that you'll hear. This is just a personal observation based on one meeting. We don't want to become a nuclear waste site.

And, you know, that's for our own domestic spent fuel. So then --

MEMBER HINZE: Yes. Thank you very much, Joe.

MR. COOK: Yes.

MEMBER HINZE: I appreciate it.

VICE CHAIRMAN CROFF: Jim?

MEMBER CLARKE: Yes. I was going to follow up on that, too, and ask you more about the international piece. I was going to approach it from the technology readiness standpoint. There's a fair amount of history out there with some of these approaches that are being considered, fast reactors and their use in other countries.

I was wondering when that would feature in to your analysis. That will be part of your analysis?

MR. COOK: I'm not sure I was completely clear. I mean, in terms of scoping this down, at least for now -- and this could change. I mean, this is a preliminary scoping methodology, but we're looking at the domestic part. And that's just for practical purposes.

But clearly in assuming that GNEP goes forward -- and I'm not saying this because I know anything in particular, but that could change. I mean, there could be a new administration that says, "No. We don't want to do this."

But at that point, I would imagine that a review of the international component would be almost the next logical thing that we would want to do. That's not a decision that I would make on my own but it seems to me just logical.

And you mentioned technology readiness. I think you could apply some of that same methodology there as well because one of the things that they're talking about developing is this new type of grid-appropriate reactor, which, from what I can tell, doesn't exist right now. And conceptually some of the objectives they have for that sound to me to be pretty

ambitious.

I have heard like, for example, you know, refueling may be sort of in a battery approach, where it's just very, very infrequent. So I don't know a lot about reactors, but I imagine that can be difficult.

MEMBER CLARKE: The other question I have heard and I think the Committee may have heard, although I'm not clear on that -- I suspect I heard it somewhere else -- that Russia is pursuing a similar kind of a venture. Is that correct? It may be a different scale.

MR. COOK: I have read about that. Really, I don't have a lot of information, but I think there is something called -- well, it's almost the same acronym, GNPI I want to say.

Well, you mentioned Russia. There's another issue there

scoping that reminds me that, even for the domestic part, the technology development from everything we have heard really depends on international collaboration.

The example that we have heard more often than anything else is that the United States doesn't have access to fast neutrons. And we're going abroad

for that, now into France and then maybe later someplace else, because the reactor in France is due to shut down in 2009.

So. even as we scope this review, looking just at the domestic technology development component, there is an international aspect to that. And it's very important.

MEMBER CLARKE: That really gets at my first question. I think there's a fair amount of history and a fair amount of information with using these technologies in other countries and what worked and what didn't work. I'm just wondering how that would fit into your analysis.

Your slide does say "domestic and international components," but it seems like what you're saying is that might be in the next phase.

MR. COOK: Well, at least for the fuel leasing past of it, I would say. But in the technology development part in terms of developing fuels for an advanced burner reactor, clearly there is cooperation and collaboration required based on what we have heard from DOE with France and Japan and others.

And how that factors into our review, I don't know that that is a criticism of DOE. It's just

a fact. It's something that we need to recognize and take into account.

MEMBER CLARKE: Thank you.

VICE CHAIRMAN CROFF: Ruth?

MEMBER WEINER: I have a number of questions. The first is that you're looking at technological maturity. And I'm sure you and GAO are aware that the United States had a perfectly good operating fast flux sodium-cooled reactor and it would shut down.

You may not be able to answer this now, but many of us have always wondered why.

MR. COOK: Why it was shut down?

MEMBER WEINER: Why it was shut down, dismantled, is in the process of being dismantled and is basically gone, yes. Why?

MR. COOK: I don't know. I was ignorant of all of this at that time. But my understanding is that -- and I could be wrong -- that it was intended as part of the development for the Clinch River breeder reactor. Maybe I'm wrong. So I'm not going to go any further.

I will say what I do know. DOE has gone through a round -- this is public information, I believe -- the public scoping studies. They have

funded different groups. One of them is in Washington state. And I believe that they have proposed restarting the fast flux test facility.

How realistic that is I really don't know.

MEMBER WEINER: Go ahead. My suggestion would be that in looking at the technological maturity, this is just one example. A number of these techniques have been or are being used as part of the weapons complex. And I would suggest, you know, that that is a place to start.

We have had a number of experimental reactors at INL.

MR. COOK: Right.

MEMBER WEINER: And the fast flux test facility just comes to mind immediately.

The second question is, these are technical problems, really, the problem of making GNEP a reality. What is the technical depth of your review capability?

I mean, you mentioned you had some connections with Lawrence Livermore. Well, how broad a technical base do you intend to use for you reviews?

MR. COOK: We don't have backgrounds in nuclear engineering or on the immediate team nuclear physics. We come from diverse backgrounds. They are

certainly relevant. And we recognize that this is not a technical review.

I would say to me this raises a lot of policy issues and planning issues and management issues where we can bring expertise. We need to understand these technical complexities. And that's partly why we have made a point to come to previous meetings, because that helps us get up to speed.

But we're not in a position to review the intricacies of it. I think that's better left to you all and the National Academies and other groups like that. That's my opinion.

MEMBER WEINER: Well, then, do you have any -- and this may be an unfair question -- idea to what extent you are going to make use of technical groups like ours, like the NRC itself, like the National Academies, and so on? Are they going to be heavily involved in this, slightly involved? Do you have any sense of how much such groups would be utilized in your review?

MR. COOK: Well, certainly to some extent. I wouldn't say to a great extent, although I wouldn't rule that out either. Sometimes what we'll try to do in GAO is convene expert panels. And that is something that I had considered. And maybe that is

something that we could do in the future.

And so, you know, I don't know if that is what you're getting at. If it is, that's part of the purpose of this discussion, for us to take back ideas and say, "Okay. Is this something that we might want to do?"

But certainly, for example, if the white paper that you all are working on comes out in a time frame that can help us, that would be sort of a minimum, where we would review that and incorporate any of the findings or recommendations if that is what it will have into our review and reference that.

Another good example is DOE has a nuclear energy research advisory committee. And they put their reports on the internet. And we have reviewed those. These are people with technical backgrounds. And we can review those and maybe even meet with them.

So I guess the answer is not definitive but --

MEMBER WEINER: I would encourage you to make use of expert panels, --

MR. COOK: Absolutely.

MEMBER WEINER: -- particularly in this area.

MR. COOK: Okay. Expert panels.

MEMBER WEINER: Yes. And I think this would be a fruitful area.

My final question deals with nonproliferation, which has been used as a rationale for one or another GNEP directions. It seems to me that it's a little late in the proliferation game to use nonproliferation as a rationale for developing GNEP, not that it couldn't help but that there's a difference between that and rationale.

And, in particular, as I understand it, part of GNEP is to say that the United States is going to recycle the fuel and sell or give or somehow trade back the fuel to other countries that have nuclear power. Do you honestly think that any country that has a nuclear establishment is going to go for that?

MR. COOK: Well, I have my personal opinion. And, actually, I don't rule it out personally. Clearly it's ambitious. In terms of our review, at least initially I don't know that we can address that.

I think it's a really interesting question. And it would be interesting, too, for us, if we could, to go to other countries or meet with them in some forum, maybe if there was a conference at IAEA or something like that, and talk with them.

I would love to do that. I don't know if we will be able to.

MEMBER WEINER: Thanks.

VICE CHAIRMAN CROFF: Mike?

CHAIRMAN RYAN: Joe, I am going to give you an award for the most colorful introductory comments that got everybody's attention we've heard in a long time.

(Laughter.)

CHAIRMAN RYAN: Thank you for a great presentation. It really was great.

MR. COOK: Well, thank you.

CHAIRMAN RYAN: Having had a root canal, I was a little sympathetic there at the beginning.

I'm going to try and give you some ideas, instead of asking you a lot of questions.

MR. COOK: Okay.

CHAIRMAN RYAN: I go back and refresh on 1979 and the stopping of the reprocessing at Barnwell, the commercial plant that was going to operate that Carter stopped operating, and then look at what the landscape was at that time.

There were 18 months of storage tank capacity at Barnwell with no outlet defined for the liquid waste that was going to be in those tanks. All

the reprocessing waste in the United States, defense, now in tanks, what are we going to do with all of that?

So the waste to me is the driver of the bus. We had a presentation from someone at DOE where they talked about "Well, these would be the wastes. And uranium oxide will be class C waste." And uranium oxide is class A waste.

Why is it class C waste? Well, there is TrU in it. How much? We don't know. Well, that means it can be class A, class C, TrU, or spent nuclear fuel based on how much of what TrU radionuclide is in there.

So without a definition of what radioactive material is in what waste reaction, you don't know what is going to land where in the existing regulatory scheme.

Now, I am not absolutely positive of this, but I think I am right. Every country that deals with reprocessing now -- I know it's true in France and Japan -- has an intermediate waste category. We do not. We have a low-level waste and a high-level waste.

I'm not saying that's necessarily not overcome-able, but that is a big difference in the

regulatory framework for how to manage a reprocessed system. So I would think a little bit about that and try and capture some of that, which leads me to kind of maybe a different category.

How about regulatory challenges in your list there in the first bullet on slide 3? You've got subcommittees requiring cover a broad range of issues. I think you need to think about the regulatory structure and is it there.

The other thing that wasn't around in 1979 so much was mixed waste. That's much more mature 30 years down the line. When you take chemicals and mix radioactive material, you've got mixed waste. What's the outlet and process for all of that? What is going to happen in plutonium oxide? Is that fuel or is that waste?

Is France using all the MOx they're producing? You know, I have not seen a balance sheet that tells me all the numbers are going to work, even at a gross level. And I always get a little nervous when I see a GANT chart that has milestones down to the month and it's 40 years long.

So I would urge you as best you can to use panels, as Dr. Weiner said, or other technical resources to maybe bore into some of these technical

areas, particularly on tell me the constituents of the waste, where they're going to be, what's going to be in them, and where are they going to go.

You could end up with waste that have no home at the moment and would have to go into a tank. I don't think that would be a popular thing so much. So that's one thing I would think about.

The fast reactor that Dr. Weiner mentioned is a test reactor. It was not a production reactor. France is the only one that's really and Russia, I guess, but they're shutting them down.

Big material science questions we need the fast reactors. So have they been solved? At every step along the way, I leave at least a placeholder in your thinking process and in the structure of your analysis. What are the technical challenges at every box along the way so you can at least, you know, have a place to bin these questions as you go through?

And I really appreciate the fact that you're looking at a giant apple, you know, and you're trying to take a bite at what is an absolute flat surface at this point to you. It's just a huge complex kind of process over many decades.

So I'm very sympathetic to the challenge, but I would dial out your structure a little bit and

leave some placeholders, particularly on the questions of waste, where it's going to go, how is it going to be treated, how is it going to be disposed, and then what are the flows through the system.

You know, if something doesn't come on line for 20 years, 10 years, is that a big deal or is that a showstopper or, you know, if we can't build a fast reactor that meets everybody needs and specifications, is that a problem or where are the pitfalls?

Again, this is sort of hearsay. I heard it as a comment that there was one proposal to skip the detailed engineering step for a reprocessing plant, the largest one ever made on the planet. And we're going to skip the detailed engineering step? Wow. That's special, I think. That's just me.

You know, when I'm going to do a little carpentry at home, I mark it five times before I cut it. I just don't see that as being a way to go forward. So that would be a placeholder for me. No detailed engineering? Big question.

So can you capture all of those things as you go along? I think if you do, you're doing a really good, honest job of raising issues that to policy-makers as well as technical people would be

helpful.

MR. COOK: Yes. I agree with pretty much everything you were saying. In this slide number 8, where I used the examples as --

CHAIRMAN RYAN: Could you flip to it so everybody could see it, please?

MR. COOK: Sure.

CHAIRMAN RYAN: Thank you.

MR. COOK: Okay. So this is how these issues relate, our objectives relate, to waste. This was not just something that I thought up because I am coming to meet with the Advisory Committee on Nuclear Waste. These are things that we have really thought about and would really like to know. I mean, I think this gets at what you were saying.

CHAIRMAN RYAN: That's a big piece of it, but add the regulatory structure piece. That's a separate question.

MR. COOK: Yes.

CHAIRMAN RYAN: You don't know the answer to that until you know the answer to objective 1. I mean, they're interrelated.

MR. COOK: Yes. So the regulatory structure is something that we have to think about.

CHAIRMAN RYAN: Again, the key difference

is mixed waste is under the EPA side.

MR. COOK: Right.

CHAIRMAN RYAN: NRC has high and low-level waste.

MR. COOK: Yes.

CHAIRMAN RYAN: Agreement states basically take care of low. There is no intermediate category.

MR. COOK: I will say that we are very lucky to have on our team someone who worked with the low-level radioactive waste forum for something like 13 years.

So, from that standpoint alone, we're not ignorant of this. Dan Feehan in Denver has done a lot --

CHAIRMAN RYAN: Yes.

MR. COOK: -- on reactive low-level radioactive waste. I realize that there is this, actually, from coming here that I think that has been raised before this issue of not having an intermediate level and --

CHAIRMAN RYAN: I'm not saying it's necessarily a problem. I just think that without thinking it through carefully, are you leaving anything on the table that doesn't have a home?

MR. COOK: Right.

CHAIRMAN RYAN: And my problem is I don't know enough about what radionuclides are going where to know. Maybe it's all doable as low-level waste. I don't think so, but do you then have to expand the category for high or does it really make sense to make it intermediate? I don't know.

MR. COOK: Okay. Well --

CHAIRMAN RYAN: The experience in the world tells you that if they've got reprocessing, they've got an intermediate category. Again, I'm not saying that's the answer. I'm just saying that without the detailed information, you don't know. You're kind of without a rudder.

MR. COOK: Well, that sounds like another good idea for us to take back and mull over, the expert panels. Thank you.

CHAIRMAN RYAN: You're welcome. Thank you.

Have at it.

VICE CHAIRMAN CROFF: Okay. I would like to pick up on a few things I've heard around the table. And, like Mike, I'm maybe going to stick more to commentary than questions at this point.

First, to put a finer point on something that Ruth said -- this is in response to one of your

questions, Bill, and comes from my reading of all of the GNEP literature and working on the white paper -- the stated intention of GNEP in terms of its international structure is that countries like the United States, so-called fuel cycle states, will make low enriched reactor fuel, presumably LWR fuel for a while but maybe others in the future. And that will be leased to other countries for their reactors. When it's burned, it will be taken back to the United States and reprocessed, which means at the bottom line that the wastes are going to end up here.

That's sort of part and parcel of it because for the waste to end up there, you've got to either reprocess it there or leave it there. I mean, there are not too many ways out of that box.

You know, the debates ensue about who is a fuel cycle state, who is not. And there is the Russian IAEA thing and then the U.S. thing. And I'm told there's a lot of dialogue there, but I don't know what is happening. But the waste take-back or spent fuel take-back I think is an integral part of it to achieve their proliferation objectives.

Secondly, on the minimization of waste, that is a quick or shorthand phrase for something that can be interpreted more than one way. Most people

when they hear it think of minimizing waste volume, but in the context of GNEP, that's not where DOE is going.

What they basically want to do is minimize the amount of troublesome radionuclides going to the repository. And troublesome can either be long-lived/toxic or heat emitters or a combination of the two. And that's what causes them to want to go after cesium and strontium and more of the actinides for one or both of those reasons.

CHAIRMAN RYAN: And mobility.

VICE CHAIRMAN CROFF: Mobility has something to do with it, too, yes. That's why they want neptunium and technetium.

So what they are trying to minimize is a set of impacts but not necessarily volume because for the most part, volume isn't a problem for them. In a repository, the heat is a problem. The heat causes volume if I may call it that. I know that sounds sort of crazy.

I'm glad the slide came back up. I wanted to make a couple of points along the lines of what Mike did, but I think I am going to come at it from a slightly different vantage point. Looking at objective 2 on technology maturity and using

technology readiness levels, in order to assess technology readiness, you have to maybe have a technology, but you have to understand what it's required to achieve, the goal, if you will.

And in a lot of cases, a number of cases, concerning reprocessing and recycle, we don't have the goals. Let me give you an example: iodine removal from an off-gas stream. Are we going to have to remove -- is the decontamination a factor of 50, a factor of 100, a factor of 300?

Depending on what that goal is, maybe your technology is in hand from previous experience three decades ago or you've got to go your way back down the food chain and you've got to do a lot of development work.

And, coming back to what Mike was talking about, until you have a regulatory structure, which means standards, EPA standards and/or NRC regulations, you don't know what those limits are. And those were not fully developed at the time. So you have got this problem.

And, similarly, with respect to the waste types, if you -- and there is sort of a chicken and egg problem here. You know, one, you sort of know things that might come out of the plant, but you can

affect that by combining things or processing things, separating things, different waste forms depending on where it is going to go, the disposal technologies you have.

And right now, as Mike was saying, we don't have a complete set of disposal technologies for the so-called intermediate or greater than class C is probably what a lot of it would be called in NRC space. There is an EIS ongoing, but I don't think they're thinking about these kinds of wastes right now. They're thinking more about what currently exists.

And, again, the disposal technologies and acceptance criteria or waste classifications affect the waste that the plant could produce and might go back and a plant designer look at that and say, "Well, gee, if this is my disposal options, you know, I'm going to combine this with this and separate that and keep these apart" because that works out very efficiently for me. So there's a circularity to it. And, again, the waste disposal technologies really aren't set up in anticipation of this.

Now, more specifically, on your sub-bullet on objective 1, how did DOE analyze, Mike referred to that one-page PowerPoint slide that's been shown many

times about the showing uranium is class C and some other things that sort of raised my eyebrows at least.

In a briefing last week, a representative of GNEP, I guess, came in. And he was asked specifically to address what they were doing about waste. This is GNEP now. And I was expecting the same slide that we have all seen but got something very different. It was a half-hour long, but the bottom line of it is that the GNEP program is now in the initial stages of developing an integrated waste management strategy for GNEP.

In other words, I think that what we have seen before was a placeholder. And they have heard a lot of discussion of it and a lot of questions about it.

And they have recognized the need to do something systematic on the waste. So they have gone back almost to square one and said, "Okay. What are the wastes coming out of this? And how are we going to manage them?"

And in response to question and answers, what I heard was almost all options were on the table in terms of what waste to combine with the forms of the waste and this kind of thing. So it wasn't nearly as specific as even that one viewgraph we have been

seeing.

From what I heard, it sounded like they want to have that analysis finished around the end of this calendar year, which might be particularly inconvenient for you, I would guess. That is where they were going.

So at the end of the presentation, there was a plan to prepare a strategy but no specifics whatsoever on what would be in it or any of the answers. So that is where they left us on it, which is a very recent slice of input.

I think, finally, concerning schedules, I suspect you may be hearing from the Academy sometimes over the summer, let's say, on their ongoing study. And we are targeting our white paper to be complete around the end of the fiscal year. And I'm certainly going to strive to do that because going into the next fiscal year gives us some problems.

So that is where we are headed. And, you know, stay tuned. I think someplace in the summer, we will probably have another session on GNEP to hear comments on the draft white paper. And, of course, a lot of the same old gang will be here, if you will. And we will see what they have to say about it. So I am sure that will be of interest to you.

I don't think I have anything else. John, do you have a question?

MR. FLACK: Yes. I have got two questions.

VICE CHAIRMAN CROFF: Identify.

MR. FLACK: Yes. John Flack, ACNW staff.

Yes. Getting back, I guess, to the discussion, probably one of the objectives on this list would be regulatory maturity. Of course, that could drive the technical maturity. So you will be looking at that as part of this study.

That was my one question. And I think you said you were going to that to some extent. The second question I have is, is there a relationship between GNEP or how you look at GNEP with respect to other initiatives that DOE, like Gen-4, like NGNP?

I mean, we are developing a technology, sodium technology. And there's gas-cooled technology being -- can this country afford to develop these two separately.

Maybe one of the things would be to stay with one technology and then sort of be on the coattails of that technology. And do you take credit for that when you rank it so that you're getting synergism between some other program?

Although the technology still needs to be developed, it can essentially capitalize on that development. Is that part of your program as well, to look at that?

MR. COOK: To compare with NGNP and --

MR. FLACK: Right, exactly. Fast gas, for example, technology that keeps gas cooled.

MR. COOK: To me, it fits in this way. And I'll go back to this slide here, objective 1. If you look at -- and this is public. I'm not revealing anything that any of you all can find out -- AFCI documents, they have done for the past couple of years something called a comparison report.

And one of the items, one of the strategies compared on that report is the very high temperature reactor, which is what they are planning for the next generation nuclear plant.

So I look at it not so much as because that is beyond the scope of our review to say, can DOE support two development efforts? That's not what we're looking at.

Maybe that's what the National Academies are looking at in their review of the Office of Nuclear Energy. But certainly the very high temperature reactor is one of the options that AFCI,

from what I can tell, at least at one point was considering.

MR. FLACK: It's out of the scope of your study at this point, I mean, with respect to taking credit for other things going on and in your study that you may rank things higher because of that, rather than doing them independently.

MR. COOK: Yes. That's an interesting question. Right now it's out of the scope, but, again, these comments were maybe that will change. Maybe that is something that we need to look at.

CHAIRMAN RYAN: Joe, it might be useful in your report to have a section or appendix or something that says, "Things we didn't consider and why," at least "Things we didn't consider."

MR. COOK: Absolutely. We won't have --

CHAIRMAN RYAN: You probably ought a little bit more formal and thorough view of that so that people won't say, "Well, they didn't think of this" and you can give them why and tell them why things were included. That would probably enhance the report, I think.

VICE CHAIRMAN CROFF: Latif?

MR. HAMDAN: Yes. Thank you very much. That was good.

At the risk of repeating some of what has been said, I, too, think that objective number two has more to it. The technology maturity has to do with technology that works.

You have recycling. But it also has to look at the implementation and applications of the fuel, transferring the fuel, to a frame concept, teaching people how to do it there, at not just economics but maybe cost as, you know, because maybe economics will not do it.

You want to be in touch with a course and, of course, they think about the waste, be it volume of the waste or the waste the way Dr. Hinze and Dr. Croff mentioned. So there is more to it, to mature technology, than just reprocessing and creating the fuel.

There is the application part of the technology transfer and so on and so forth that you will want to consider also. This is what it's for. In other words, I didn't see it. You cannot really completely evaluate the maturity of the technology without considering the goals or the end products that you really want to accomplish.

And that is in foreign countries, and that involves transferring of fuel one way, transferring

the waste back. There is cost involved. There is impact of the waste, be it volume or impact. All of these things need to be considered, it seems to me.

MR. COOK: Okay.

VICE CHAIRMAN CROFF: Ruth?

MEMBER WEINER: I just wanted to expand a little bit on several comments that have been made. And I would hope that your report would include or your study would include a comprehensive look at the pieces of this that DOE and others have done in the past.

I mean, we have had high temperature gas-cooled reactors. The EBR-2, the processing of the waste from EBR-2, is a very unique and interesting process. And I would think that you have at your fingertips a whole area of technology that has already been investigated. And I would encourage you to look at that as part of your technological maturity review.

I have to agree with what Latif said. There's a whole lot that goes into it besides just developing the technique. There is, what do you do then?

VICE CHAIRMAN CROFF: Okay. Anybody else?

CHAIRMAN RYAN: One last thought. Somewhere along the line, somebody is going to ask

about, what does this all cost?

MEMBER WEINER: Yes.

CHAIRMAN RYAN: And so far I've heard a big, huge number, probably more money than is on the planet. I don't know, but, like I said, 40-year GANT charts are usually pretty expensive.

So somewhere along the line, somebody has got to scratch a pencil on a paper and say, "Does this make any economic sense?" I'll just leave you with that thought. That's one of those things that you're going to leave in that list of stuff you didn't report on perhaps. Maybe you are.

MR. COOK: Okay.

CHAIRMAN RYAN: Fair enough.

VICE CHAIRMAN CROFF: Anybody else?

MR. FEEHAN: I had a question from Denver.

VICE CHAIRMAN CROFF: Go ahead, Dan.

MR. FEEHAN: If you guys can hear me? I guess a question that I anticipated but I didn't hear was something that sort of stuck in my mind. If you look at the schedule for GNEP, mostly what they talk about is fulfilling the mission.

They talk about when they would bring an advanced burner reactor online, for example. But they sort of leave it at that. And they don't talk about

they need 18 advanced burner reactors. And they probably wouldn't start transmuting any fuel until 2050, something along those lines.

So there are a lot of out years that are not on that time line. It already goes out 40 years, but it doesn't go out far enough. So I guess the question that I anticipated was if you look what they have in mind for Yucca Mountain in terms of dragging spent fuel out to the repository and then they start putting it into a repository, how did that match with now you've got to drag it all back out of the repository because I'm going to start transmitting the actinides from the spent fuel, which now resides inside the repository?

CHAIRMAN RYAN: Good question, Dan. We wish you luck trying to answer it.

(Laughter.)

MR. DIAS: What Ward Sproat mentioned here yesterday is that if you think of the fleet of reactors they probably plan to have -- and I think DOE is talking about maybe three reactors to burn -- he doesn't see, you know, the capability of actually going back and retrieving this stuff out of the mountain.

You're probably going to be busy enough

just with what is currently being produced or what will be then produced. That's what he mentioned yesterday.

CHAIRMAN RYAN: The concept, all that's doable. In principle --

MR. FEEHAN: The question is that one of the objectives with GNEP is to minimize the burden on the repository.

CHAIRMAN RYAN: And you're asking when they're going to do that.

MR. FEEHAN: That's the repository filling up before you start burning oxidizers. You know, there just doesn't seem to be a connection between the two programs.

VICE CHAIRMAN CROFF: Dan, let me elaborate just a bit. We did have Ward Sproat in. And he was very forthcoming. I asked a question about the connection between GNEP and the repository. I mean, basically at this point they're incredibly focused on the license application next year. I mean, they know GNEP is out there potentially, but they're just not thinking in that direction.

MR. FEEHAN: Right.

VICE CHAIRMAN CROFF: And my sense is if it comes to that, you know, that's such a radical

departure from the present course. It's going to be sort of a whole new set of documents and ball game and that kind of thing.

But they're just not focusing on it. They've got this other thing. And it's pedal to the metal to try to make it for them. So that is it. They're very focused.

MR. FEEHAN: Well, it seems like this is getting into our technical background and our lack of our technical background. I think one thing that the committees that we talk to on the Hill would probably be interested in from our perspective is just a scheduling question because if the people who are trying to license the repository aren't really paying much attention to a new plan to start transmuting the actinides, then that's probably something that we could contribute to without having a technical background.

CHAIRMAN RYAN: Well, a couple of points we have touched on that are relevant and one skipping detailed engineering design for the largest reprocessing plant that has ever been built, so maybe not a first choice for me.

MR. FEEHAN: Yes.

CHAIRMAN RYAN: Second, I think the allure

of GNEP is every bit of it. Every piece, transmutation, fast reactors, reprocessing, has been done somewhere in the Earth to one degree or another, generally with a pretty good research record, pilot-scale record, and even some production-level record. But now we're going to take all of these parts and pieces and stitch them together into a suit. You know, that's a whole big other question.

So I wonder if we've got to be just starting to think about it now as a system. How is this going to work as a system? And that's your question, Dan.

MR. FEEHAN: Yes.

CHAIRMAN RYAN: What is the systematic behavior of lightwater reactors, reprocessing, fast reactors, burner reactors, more reprocessing, fuel manufacturing with actinides in it?

That's not a trivial matter. Is it doable? Sure. Have we done tests? Sure. But how much? Where?

MEMBER WEINER: If I could add a small footnote. The schedule that we heard about for the repository, which is, admittedly, already an optimistic one, doesn't have the repository even accepting fuel until 2017.

And as long as the repository is open and at least until a fair amount has been filled up, the material is retrievable. In fact, that's part of the regulation is retrievability. So I think we're not looking at suddenly on one day this stuff is put into the ground never to be seen or heard from again.

I would encourage, as Dr. Ryan says, a systematic approach that takes into account what exists, including the plans for the repository.

MR. COOK: We haven't gotten into this a whole lot with DOE, but my understanding is they have a national technical director for systems analysis, which, not having met with this person, I don't know what it is. But I would imagine that this is exactly what that person would want to be looking at, how many fast reactors do you need, when do they need to come online, how long is it going to take to transmute the transuranic --

CHAIRMAN RYAN: What's the efficiency of transmutation?

MR. COOK: Yes, exactly.

CHAIRMAN RYAN: What are the wastes that come out of it, all that sort of stuff? So, you know, all the questions about waste, all the questions about efficiencies, all the questions about cost are every

single piece of this.

I mean, again, don't take my views as negative. I'm trying to challenge it because somebody somewhere along the line is going to ask for all of these details.

VICE CHAIRMAN CROFF: I think at this point we have run 15 minutes beyond our allotted time. So I would like to thank you and your colleagues for attending or listening in, as the case may be. And we look forward to seeing you in a future meeting.

MR. COOK: Likewise.

VICE CHAIRMAN CROFF: Thanks.

CHAIRMAN RYAN: Thank you, Joe. It's a really interesting session.

VICE CHAIRMAN CROFF: Thanks, Dan.

MR. FEEHAN: All right. Thanks.

VICE CHAIRMAN CROFF: Back to you, Mike.

CHAIRMAN RYAN: We are going to take a short break, come back at 3:00 o'clock. And the Committee will consider its letter writing and other activities. So we will see you at 3:00 o'clock. And we will close the record for the day here. Thank you very much.

(Whereupon, the foregoing matter was concluded at 2:45 p.m.)