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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS

(ACNW&M)

182nd MEETING

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TUESDAY,

SEPTEMBER 19, 2007

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VOLUME I

The meeting was convened in Room T-2B3 of Two White Flint North, 11545 Rockville Pike, Rockville, Maryland, at 10:00 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:

CHRISTOPHER BROWN

LATIF HAMDAN

DEREK WIDMAYER

NEIL M. COLEMAN

ANTONIO DIAS

FRANK P. GILLESPIE

YOIRA DIAZ-SANABRIA

MICHAEL LEE

BRITTAIN HILL

TAE AHN

BRETT LESLIE

GENE PETERS

MIKE FLIEGEL

ALSO PRESENT:

DARRELL DUNN

CHARLES INTERVANTE

DONALD COOL

VINCENT HOLAHAN

RALPH ANDERSEN

DIANE DeRICO

A G E N D A

P R O C E E D I N G S

(9:59 p.m.)

CHAIRMAN RYAN: The meeting will come to order. This is the first day of the 182nd Meeting of the Advisory Committee on Nuclear Waste and Materials. During today's meeting, the Committee will consider the following, Corrosion of Waste Package and Drip Shield Materials in a Repository Environment, Mechanisms for Estimating Juvenile Waste Package Failures, Dissolution Processes for Commercial Spent Nuclear Fuels in a Repository Environment, Discussion of the NRC Role in the International Committee on Radiological Protection, Nuclear Energy Institute Briefing on Low-Level Radioactive Waste Minimization Strategies, and the NEI Executive Committee Views on Commercial Low-Level Waste Management, Observations from ACNW&M Members and Staff on recent activities, particularly our field visits, a discussion of ACNW&M Letter Reports.

Chris Brown is the Designated Federal Official for today's session. We have received a request by Mr. Joseph DeCamello, General Counsel for Studvic to include a written statement to today's presentation on low-level radioactive waste

minimization strategies. Should anyone else wish to address the Committee, please make your wishes known to one of the Committee staff. At the appropriate presentation, we will provide the letter from Mr. DeCamello as part of the record. We will also have copies of it available for other members of the public who would like to have a copy of that letter.

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

Feedback forms are available at the back of the room for anybody who would like to provide us with their comments about this meeting. Thank you very much.

Without further ado, I'll turn our meeting over to the cognizant member for these next two briefings, Dr. Weiner.

DR. WEINER: Thank you very much, Mr. Chairman, and our two speakers, Dr. Tae Ahn from NMSS, and MR. Darrell Dunn, who is Manager of Materials Performance and Characterization at the Center at

Southwest Research Institute. And they will be introduced by Dr. Britt Hill, who is the Senior Technical Advisor for Repository Science. And before I turn this over to Britt, we do have people from the Center on the bridge. Would you like to introduce yourselves, say who is there.

CHAIRMAN RYAN: And who is there? I'm sorry. You all going to have to either get closer to a microphone, or have one person introduce all the attendees, because we can't hear you.

(Introductions made.)

PARTICIPANT: That's all I have right now.

CHAIRMAN RYAN: Okay. Thank you. If anybody else joins, please just announce them at an appropriate time.

PARTICIPANT: Okay. Thank you.

DR. WEINER: Go ahead, Britt.

DR. HILL: Thank you. Good morning. My name is Brittain Hill. I'm with the NRC's Division of High-Level Waste Repository Safety.

CHAIRMAN RYAN: If you stand up, you've got to use a lapel.

DR. HILL: I'm Brittain Hill. I'm with the NRC's Division of High-Level Waste Repository

Safety, and I just want to provide a couple of very brief opening remarks to sort of set the stage for the following presentations.

It's been about a year since we've been in front of the ACNW&M to talk about corrosion and other engineered barrier system processes, so today we'd like to provide an update of some of our current publicly available information to the Committee in the areas of waste package drip shield corrosion, juvenile failure of waste packages, and waste form dissolution. Essentially, most of the engineered barrier system for post-closure repository performance.

Dr. Tae Ahn will be giving a presentation on Corrosion and Waste Form Dissolution, and Mr. Darrell Dunn from Southwest Research Institute will do the Juvenile Failure of Waste Package. We have a number of technical staff in the audience today to help answer any questions that the ACNW&M Committee may have, including Mr. Keith Axler, the Center for Nuclear Waste Regulatory Analyses Project Manager. So without much further ado, I'd like us to focus on the goals for today.

In addition to talk about our current understanding of key processes and information that

we'll be using in our review, I'd also like to talk about some of the most important uncertainties that are associated with that information, and how that combination of process level understanding and uncertainty gives us insight on the risk-significance of these issues to repository performance.

The overall strategy today is to provide the Committee with important information that we believe will be useful for the following discussions in October about changes to our TPA modeling approach.

Just a quick insight on risk associated with these key processes. All the things that we'll be talking about this morning, the one that has the most significance to post-closure repository performance is the stability of passive film associated with Alloy C-22. Other important, but somewhat less significant processes concern localized and crevice corrosion on waste package, the integrity of the drip shield, and also the degradation rate that waste in contact with water may experience.

And, finally, although it's an important topic, it does have an apparently low significance to risk for the juvenile failure of waste packages. In other words, the waste packages that may be in state

of failure at the time of repository closure. So I'd like everybody to keep these overall risk insights in mind. We've tried to structure our presentations to give the most information, and the most discussion to the highest significance topics, and still give an appropriate level of discussion to the lower significance topics.

The next steps for us following these presentations is we plan to approve and release our TPA 5.1, the revised TPA code, by the end of next week. That will include both the updated code, as well as an expanded and updated user's guide. The current plan is to discuss a number of these changes, and more importantly, how we're going to be using the TPA code in our licensing reviews. We'll be doing those discussions during the October ACNW&M Committee meeting.

So without any further ado, I'd like to turn the presentations over to Dr. Tae Ahn, also from our Division of High-Level Waste Repository Safety.

DR. HINZE: Madam Chairman, could I ask a quick question?

DR. WEINER: Please.

DR. HINZE: Could you give us some insight

into how you determine the risk importance of those elements?

DR. HILL: Those are discussed in our risk insights baseline report. We have not updated it.

DR. HINZE: It is not updated?

DR. HILL: No.

DR. HINZE: So there's no new information on how significant these really are since when? When was the date --

DR. HILL: These would be from our 2004 analysis.

DR. HINZE: So you have not changed your -- none of the research that you've conducted has in any way changed your risk insight into this.

DR. HILL: At the level of risk-significance that I've outlined, no, we have no change in --

DR. HINZE: Okay. Thank you very much.

DR. HILL: -- high, medium, and low of those topics.

DR. HINZE: Thank you very much, Dr. Hill. Thank you, Madam Chairman.

DR. AHN: Good morning. As Dr. Hill introduced, my name is Tae Ahn of Division of High-

Level Waste Repository Safety. I would like to talk about corrosion of waste package and drip shield materials and danger in repository conditions. As you know, waste package and drip shield are important component in the engineered barrier systems in the high-level waste repository, high-level waste management.

I would like to acknowledge my co-workers of the NRC, as well as Center for Nuclear Waste Regulatory Analysis in San Antonio, Texas for their contributions to this presentation.

The outline of this presentation is first, the purpose. Second one, I would like to show the illustration of engineered barrier system, including the waste package and drip shield. Then I would like to describe some more study results, and illustration of waste package environment, and the corrosion mode.

Waste package environment could include temperature and the relative humidity with the times, and the corrosion mode includes general corrosion. The waste package performance is relying on very low general corrosion rate. This low general corrosion rate is dependent on the persistence of protective passive film, about five nanometer thickness.

Persistence means stability of passive film over a very long period of time.

Then when the temperature becomes above about 110 degrees C, after the repository closure, there will be no seepage of water. However, the waste package will be deposited with dust in the tunnel. Under those conditions, the dust deposited will absorb moisture from the environment, that leads to an aqueous closing condition, which is called dust deliquescence corrosion. When temperature is decreased below 110 degrees C, there will be seepage water at the failure. Because the temperatures are still higher, therefore, the seepage of water will be concentrated, become brine. Under those conditions, localized corrosion, such as crevice corrosion will be initiated. There are other corrosion processes, such as microbial-induced corrosion, or hydrogen-induced embrittlement of Titanium. Those will be discussed after that.

The purpose of this presentation is to summarize key processes affecting corrosion in waste package, and the drip shield at the potential Yucca Mountain Repository, and discuss clear understanding of potentially significant uncertainties in corrosion

processes for Alloy 22 and Titanium alloys.

This is cut-away views of engineered barrier system in drip area. As you see, there are two types of waste package containing either commercial spent nuclear fuel, or glass log and DOE and Navy spent nuclear fuel. On top of that, we have drip shield protection of ground water. A drip shield is made of Titanium Alloy grade 2 and 29, about .2 percent Palladium or .04 Palladium respectively, and 29 has 6 Aluminum and 4 Vanadium alloy element. Basically, drip shield prevent contact of seepage water with waste package, prevent rock fall impact on waste package.

This discussion will focus on only corrosion. However, drip shield may be subjected more readily to mechanical failure, which will not be discussed this year.

The waste package is made of Alloy 22, with about 22 Chromium. These two alloy elements are very important to assess the persistence of passive film, as well as other localized corrosion modes. Waste packages basically prevent the water contact and controls radionuclide release. The primary failure mode of waste package is corrosion; therefore, we will

discuss more extensively on waste package in this presentation.

We have a good understanding of potential corrosion mechanisms with some residual uncertainties. This is environmental conditions is very important. As you see, Y axis is either temperature or relative humidity. Temperature will be low before the repository closure, then it will go up after repository closure, then would go down. This time scale is in log; therefore, before the closure we will have dry system. And when temperature is above 110 degrees C, as I mentioned, there will be dust deliquenscence corrosion. This is Region I.

After about 2000 years, we will have seepage water coming in. At that point, the seepage will be -- water will be concentrated at high temperature. It will go up to 10,000 years. This is Region II potential brine period. This figure is from the modeling studies, yet, it is an illustration. For instance, the outer range is more -- it's a likelihood it can vary further extended.

The persistence of long-term passive film needs to be considered all in these three regions. On the other hand, the dust deliquescence corrosion needs

to be considered in Region I, and the seepage water brine crevice corrosion needs to be considered in Region II. MIC, microbial-induced corrosion needs to be considered only at the lower temperatures in Region II, and for the period. Likewise, Hydrogen effect in Titanium needs to be considered from Region II and longer period.

Other corrosion modes were also considered by modeling, and some limited testing, and not seen as risk-significant. For Alloy 22, for instance, just for tracking Hydrogen embrittlement of any corrosion and dry oxidation are not considered as risk-significant. In Titanium alloys, localized corrosion, stress corrosion cracking, and MIC of any corrosion, and dry corrosion are not considered here.

This is general corrosion. It's of high risk-significance, as Dr. Hill introduced, because once you lost the passive film, basically, you lose the container releasing much radionuclide. Therefore, persistence of passive film is of high risk-significance.

This picture shows Alloy 22 corrosion product, a cross-section view, solution annealed Alloy 22 substrate. This green area is Chromium Oxide

protective against faster corrosion. This one is metal. Other black and white is mapping of each element. And it is very important to have persistence of passive film to have low general corrosion rate is long period of time. Uncertainties of passive film stability affect the long term general corrosion rate. And this passive film stability is primarily affected by changes in the chemical composition, for instance, some impurity element that can accumulate at interface of film. And the microstructure can change from amorphous to crystalline, and the thickness may be overgrown posing some stress due to the spallation of oxide films. And I give you a couple of these uncertainties in general corrosion persistence of passive film. The first one is chemical composition, microstructure, and thickness. It's called the conformance of Chromium Oxide. Model, analogue information, and the limited laboratory data suggest that a Chromium-rich oxide layer is responsible for persistence of passive film. This is called conformance.

Model include a point detect model. Finite thickness is also postulated because outer layer is joined, and the inner layer is formed in a

steady state. Also, some more formation was formulated significantly. However, uncertainties include long-term changes in chemical composition and microstructure because models are based on ideal system. Long time natural analogue also gave us inference that passive film protected the metal a long period of time, such as Hydrogen silica ionoxide.

Uncertainties, obviously, the analogue does not have Chromium in their elemental compositions. Other limited laboratory test shows general corrosion rate decreases with time. However, we need more extended testing in various environment.

Another example of uncertainty is mechanism for breakdown of passive film induced by enrichment of the Sulfur at metal film interface. When the corrosion occurs, impurity level about 10 to 100 ppm sulfur remains here, and accumulate at interface, causing breakdown of passive film. This could happen a very long period of time, such as 500 years; therefore, it's not easy to detect in the laboratory testing. Nevertheless, this alloy has substantial amount of Molybdenum, which can dissolve the sulfur, and the Chromium, which can stabilize the passive film. Therefore, this cyclic behavior doesn't

seem to give -- shorten the respective lifetime from our preliminary sensitivity analysis.

Nevertheless, we have uncertainties, the dissolution rate of segregated Sulfur with Molybdenum, and the repassivation rate in Chloride solution with Chromium and oxyanions. In Chloride solution, generally will form reducing environment to cause the sulfur-induced class violation; however, we have also oxyanions, such as Nitrate, Sulfate, and Carbonate, which can stabilize the passive film.

DR. WEINER: Excuse me. Where does the Sulfur come from?

DR. AHN: It's impurity from the manufacturing process.

DR. WEINER: Thank you.

DR. AHN: Next one is dust deliquescence corrosion above 110 degrees C. That deliquescence corrosion is potentially important for approximately about 2,000 year after closure. Dust may form brines for deliquescence at elevated temperature, and some deliquescence brines can induce general or crevice corrosion.

Our testing at the Center in Sodium, Potassium Chloride Nitrate mix salt solutions indicate

that general corrosion at elevated temperature on the order of 1 micron only during an approximately 2,000-year period, and the extent of corrosion depend on distribution of dust and the duration of corrosion formation. We did not identify low present corrosion, for example, crevice corrosion. Current uncertainty is extrapolating short-term test results to repository time scales.

Next one is seepage water brines, crevice corrosion. Brines that form by evaporation of seepage water are mostly benign to Alloy 22, but some composition less than approximate 10 percent could initiate crevice corrosion. This is a window of the crevice corrosion. X axis is the ratio of inhibited to Chloride. The higher this number of concentration, the Nitrate, Sulfate, the Carbonate, it will be -- alloy will be immune to crevice corrosion.

As you see, alkaline and neutral brine is an immune domain, only about less than 10 percent of Calcium Chloride is in the window of susceptibility of localized corrosion. Contact of seepage water may be prevented by drip shield. The susceptibility of crevice corrosion decreases with time, with decrease in temperature. Uncertainty associated with seepage

of composition, currently experiments are going on to confirm our current database.

Seepage water, crevice corrosion, another important point is in addition to temperature and water chemistry, tight contact environment is necessary to initiate crevice corrosion, so contact area is very restricted. Also, weld area is needed to initiate crevice corrosion more readily. And, also, crevice corrosion propagation is very limited in a tiny pit inside of the crevice, so the overall open area from the crevice corrosion will be very restricted from these three considerations.

Additional corrosive processes include MIC, models, and the limited laboratory data indicate low potential for MIC. Some uncertainties include --- localized corrosion is difficult to be detected from MIC. And Hydrogen effect, again, preliminary analysis suggests that some minor effect on long-term distributions uncertainties. Mostly Hydrogen sorption kinetics, as well as a fill diffusion process begin base metal and weld metals.

In summary, long-term chemical or structural changes in passive film stability strongly affect uncertainties in Alloy 22 general corrosion

rate. And the current information indicates that crevice corrosion by dust deliquescence does not affect waste package performance significantly. Crevice corrosion from seepage water, less than about 110 degrees C, require tight crevices and aggressive brines. Also, susceptibility decreases with decreasing temperature.

MIC, microbially influenced corrosion appear unlikely because of short induction time, and no evidence of long-term pitting in the crevice corrosion. Hydrogen effects on Titanium alloy integrity appear to be of low significance. Uncertainties in persistence of passive film appear more significant than uncertainties in other corrosion processes. Information from laboratory investigation, numerical models, and analogue materials is available to support staff review of corrosion processes.

DR. WEINER: Thank you. Dr. Clarke.

DR. CLARKE: Thank you. Just one quick question. The stability of the passive film was believed to be the most important contributor to risk. I guess in the original risk baseline report?

DR. AHN: Yes.

DR. CLARKE: And that is confirmed by your

work.

DR. AHN: Yes.

DR. CLARKE: Now did your additional work modify any other conclusions with respect to corrosion in the original baseline report?

DR. AHN: Mostly the same, yes.

DR. CLARKE: I'm sorry?

DR. AHN: Mostly the same, yes.

DR. CLARKE: Thank you.

DR. WEINER: Dr. Ryan.

CHAIRMAN RYAN: Not at this time. Thank you.

DR. WEINER: Allen.

VICE CHAIR CROFF: Yes. What can you say about the effect of radiation on all of these corrosion properties on the chemistry of the water in deliquescence, or seep water, or anything like that?

DR. AHN: We considered that, we assessed the product, because we have a thick layer of stainless steel inside the outer Alloy 22, most downgraded will be reduced at a very low level, reduced significant radiolysis product.

VICE CHAIR CROFF: What are the dose rates on the outside of the package? I know there's some

steel there, but a lot of radiation inside.

DR. AHN: Yes. There's expertise at the Center. Nedda is on the phone.

PARTICIPANT: No, Nedda is not here today.

DR. AHN: Yes, I would defer that answer to you.

VICE CHAIR CROFF: Okay. Thanks.

DR. WEINER: Dr. Hinze.

DR. HINZE: I just would like to --

PARTICIPANT: This is Orin Poretta from the Center. The dose rates on the outside vary, of course, depending on the white form, but on the order of thousands hour per hour.

VICE CHAIR CROFF: Thank you for that answer. And those radiation levels don't affect the water chemistry?

DR. AHN: Not significantly. Actually, we also tested significant changes with adding Hydrogen Peroxide was incorporated in our assessment.

VICE CHAIR CROFF: Have your experimental studies been conducted, at least some of them, in radiation fields on the order of 1,000R?

DR. AHN: I don't think we did that. It's all simulation.

VICE CHAIR CROFF: Thank you.

DR. HINZE: I just --

DR. WEINER: We have some responses.

DR. LESLIE: This is Dr. Brett Leslie from the NRC staff. There are two aspects of it. Oleg touched upon it, and Tae touched upon it. The gamma radiation, while high early on, those gamma emitters are primarily decaying fairly rapidly, and so you asked the question, the interaction of that gamma ray with water. And the figure that Tae was showing shows that in terms of when water might be present, there's a substantial delay. And so, you're right, there's going to be very high rads on the surface, but the question becomes, do they overlap when water is expected to be present? They don't overlap.

DR. WEINER: If you have a comment, please come up.

CHAIRMAN RYAN: You need to tell us who you are, what your name is, at a microphone, if you want to make a comment.

DR. WEINER: If you have a question, yes.

DR. INTERVANTE: Dr. Intervante from SFST. I'm just wondering what your answer was?

DR. LESLIE: And the answer is that the

potential radialis effects aren't necessarily overlapping with the time in which water is present.

DR. WEINER: Following up on that briefly, if I could, what about alpha hydrolysis? Are you assuming that there is no alpha hydrolysis during the time, during the whole repository period?

DR. AHN: And I understand that the alpha penetration depth is so narrow, this -- we are talking outer layers.

DR. WEINER: But are we expected to have outer layers beyond, say several thousand years, ten thousand years? Is there going to be -- how long do you expect the waste package to persist in the -- and, clearly, you won't get any alpha hydrolysis as long as you have a waste package. You're quite right. But how long do you expect it to persist? Will you ever get any contact between alpha emitters and any kind of seepage water, or water that comes in through a crevice?

DR. AHN: I would like to defer that question to -- answer to your question later. But, briefly, we are considering intact waste package, not insides.

DR. WEINER: Okay. Thank you.

DR. HILL: Britt Hill, NMSS. We're looking at a waste package lifetime that under a nominal scenario would be on the order of tens of thousands to hundreds of thousands of years. By the time that we have any consideration for alpha hydrolysis, it means that waste package would necessarily be breached. And that's where we sort of stopped the corrosion investigations, once we have a breach in the waste package and it's open to water or any diffusive effects, the concern with generalized corrosion pretty well ceases. We don't go mechanistically into exactly how many, and how extensive those corrosion failures may be on an individual waste package.

DR. WEINER: Thank you. Excuse me, go ahead. I didn't mean to interrupt.

VICE CHAIR CROFF: I think I'm finished.

DR. HINZE: I would like to make certain I understand. Are we really talking about Alloy 22 and Titanium grade 7 and 29? When I read these things we hear nominees, that these are nominated metals. Is there any chance, is there anything from your discussion with DOE that would indicate that we will have some other metals brought to the Commission in

the license application?

DR. HILL: Britt Hill, NRC staff. We've had no indication from the Department of Energy that any other materials are being considered for the corrosion-resistant parts of the waste package or the drip shield.

DR. HINZE: Thank you. Let me ask you, if I may, about where we might expect this corrosion to be on the waste package. I assume that from dust deliquescence, and from the seepage that this will occur somewhere in the upper half.

DR. AHN: Yes.

DR. HINZE: So have you thought about that at any further --

DR. AHN: As I mentioned, deliquescence or seepage-induced localized corrosion could lead to limited opening of waste package surface. One of them is from the consideration of seepage on to a certain portion of the waste package, weld, tight crevice, all are considered in our assessment.

DR. HINZE: So then if we have seepage of the water into a breached canister, we can expect this from the upper portion. And so we could expect to find, then, water to collect in the base of the waste

canister.

DR. AHN: Yes.

DR. HINZE: I have heard nothing about consideration of corrosion from inside the waste canister, because this has to escape. And, certainly, the mode of escape would be much accelerated if it had a through path in the waste package.

DR. AHN: Yes. This presentation focused on total containment. The failure of the waste package will be discussed in the coming TPA presentation next month.

DR. HINZE: What about the processes involved in a saturated situation? If we have saturated conditions in the base of the canister, what are the processes that are going to be most effective in developing corrosion?

DR. AHN: We'll have a similar type of corrosion, including the radiological effect. However, in our proponent's assessment, we chose different schemes. I will not go into details, but it will be discussed next month.

DR. HILL: Britt Hill, NRC staff. If I could provide just a little more background for that question, Dr. Hinze. We have two alternative

approaches to evaluating this condition in our existing TPA code, which are being carried forward. We have what's called the bath tub model, which essentially allows the waste package to fill up to a range of heights before any release can occur through a evective process. We also have a flow-through model that would assume that when you have one breach in the waste package, you could have multiple breaches, and one of those breaches would occur lower down in the waste package.

For example, when we talk about crevice corrosion, the waste package is sitting on a series of supports, and we think about there would be an impact from say rock fall that causes the drip shield to impact the upper part of the waste package. Well, you'd still be inducing stress in the lower part of the waste package, as well. We don't go into a real mechanistic detail to try to analyze the state of stress in every realization of our TPA code, but we do have these alternative conceptual models for either, you have to have sufficient fill-up of the bath tub-type waste package, or you have breaching that allows flow-through in the waste package, to address this very point of uncertainty in exactly how many and

where the breaches will occur through the corrosion processes.

DR. HINZE: That's very helpful, Dr. Hill. I'm wondering from either of you, are you considering the corrosion from both sides then during this period that you have, if you will, the bath tub, or even the flow-through effect? Because what you have is corrosion from both sides, and that'll accelerate the real breaching of the waste canisters.

DR. AHN: In my next presentation, I will show you drip condition versus the immersion condition, as well as the affect of iron corrosion on spent fuel dissolution. That all covers the container corrosion.

DR. HILL: Britt Hill, NRC staff. Let me clarify one point. I think when we're looking at corrosion of the waste package, and the presence of water within the waste package, we would anticipate those corrosion rates inside to be much lower, because you're dealing with a very dilute solution. You're not having the surface evaporation contact, you're not having the dust available.

Our TPA code is looking at essentially a state of failure of the waste package, without trying

to forecast exactly where that failure is occurring. We think given the variabilities that you have, that would be very difficult to use in a review capability.

DR. HINZE: But, also, it would be subject to a higher degree of radiation if, as Dr. Croff's question related to radiation-induced damage.

DR. AHN: Yes, that's right.

DR. HINZE: And that may accelerate the whole process, especially on the inside.

DR. AHN: Right. That's why we've considered flow-through mode, as well as immersion conditions, depending on how fast corrosion would occur to the container.

DR. HINZE: Are we going -- is there a -- are you preparing a NUREG on this, or a Center report? How is this -- how can we get into a little more detail on this?

DR. LESLIE: Brett Leslie, NRC staff. Tae is right, and Britt is right in terms of describing that there are two modes of water treatment, or water egress, ingress and egress. That's described in our user's guide, which we'll be making public very shortly.

When he says "flow-through", when the

waste package is failed, that is -- there's no hold-up time, so it assumes that the water can escape in the bottom. So once there's -- if you're modeling a closed system, and you have to start to fail it from the outside, once it's failed on the outside, it's assumed that that entire waste package is allowed to have releases. So we don't go that step and say well, we have to figure out how fast it corrodes from the inside out. We make a simplified assumption for the flow-through model, in essence.

DR. HINZE: That seems to be a pretty conservative assumption.

CHAIRMAN RYAN: Bill --

DR. WEINER: Excuse me. We really are running -- we're already over time.

DR. HINZE: Oh, my, that's too bad. We're just getting started.

DR. WEINER: I understand, and I'm going to limit myself to one question, and that is - and I have many more, let me tell you - that is, this is going to be -- the results of this work are going to be an input to the TPA. Correct? I mean, I'm assuming this is an input, one of many. How does your work on corrosion compare with DOE's work on corrosion, which

is going to be an input to the TSPA? And let me tell you the thrust of the question.

You're going to be reviewing the Department of Energy's license application. As part of that review, I assume you're going to be reviewing their estimates of corrosion rate, passive film stability, and so on. What if there's a difference? What criteria are you going to use to make judgments about their inputs?

DR. AHN: I would like to defer that question to Dr. Hill.

DR. HILL: Britt Hill, NRC staff. We're going to be -- in part, the reason that we're doing a TPA code is to provide us with a perspective of how much these differences may or may not matter. But let's make no mistake, we're not establishing a position or basis that somehow this work defines what corrosion is. That's never been the intent of our independent investigations. It's to provide an independent view of how these processes and associated uncertainties may or may not affect repository performance.

What we have is helpful for our review. It's not a baseline for the Department to measure

itself against. They will present their information that they've marshaled over the past decades of work, and we will review that information in light of our independent investigations, as well as in light of the state of the literature that's relevant to this investigation.

DR. WEINER: Well, let me give you an example. I have some questions about this humidity deliquescence, and my question is, have you ever actually done an experiment in the tunnel to see if dust - to what extent the dust in the tunnel absorbs water?

Now let us suppose that your estimate of the effect of humidity deliquescence differs from the Department of Energy's, and that in your case it has -- the TPA is sensitive to this, and in the Department's it is not. How are you going to -- what is your reconciliation path?

DR. HILL: Britt Hill, NRC staff. That would completely depend on the basis that DOE presents for why they developed these numbers for dust deliquescence, and their understanding of the process. There's no way I can speculate about how we would resolve this, without knowing the technical details

that the Department has brought forward in their license application, and how they may or may not be different from the information that we have available for our review, including our own information. So it's unfortunately a rather open-ended question that I can't answer, except to inform the Committee and members of the public that our information is one piece of the information that we'll be using during our review. It does not establish the baseline for reality or truth, but it is an informed, independent look at potentially risk-significant processes that we're going to have to review and make these sort of decisions.

DR. WEINER: Thank you very much. I'm going to, at the risk of cutting staff off, I'm going to move to our next speaker, because we're already behind schedule. And that is Darrell Dunn from the Center. Please go ahead, Darrell. And please let's hold all questions until the end of Darrell's presentation. And I'll do the same.

MR. DUNN: Thank you very much. My presentation today is Evaluation of Waste Package and Drip Shield Juvenile Failure Rates. Again, my name is Darrell Dunn with Southwest Research Institute.

Before I start, I'd like to acknowledge my many contributors from both the NRC and the CNWRA.

The outline of my presentation is shown here. I'll go over our definition of what is considered a juvenile failure, and then go over some factors that influence juvenile failure rates. This is mainly information that's collected from the literature, from industrial examples. Then talk a little bit more about industrial failure rate data, and what parts of that are applicable, and what parts of that are not applicable for this particular application. And then talk about some uncertainties for the waste package and drip shields mainly associated with the manufacturing of those components that may affect juvenile failure rates. And then, finally, a summary.

Juvenile failure in this context is defined as penetration through the waste package, or the drip shield during the pre-closure period, so it's some type of perforation that completely compromises the integrity of the waste package or the drip shield. There may, of course, be defects that do not penetrate the waste package or the drip shield, and they may exist at the conclusion of the pre-closure

period.

In the TPA code, juvenile failures are conservatively estimate to occur at the start of the post-closure period, so at time equals zero. And the TPA code contains models to evaluate other degradation modes, such as stress corrosion cracking, or localized corrosion, that may depend on, or be associated with those defects that do not penetrate through the waste package, or the drip shield, so those things may act as initiators for subsequent failure processes.

From our review of the literature, there are a number of factors that influence juvenile failure rates. Certainly, design codes and requirements. The more stringent design codes and requirements tend to, of course, decrease juvenile failure rates. Much of that is associated with experience during these manufacturing processes. Material selection, of course, has an impact on juvenile failure rates. The appropriate selection of the material, the incorrect use of materials in given applications, incorrect weld wires, for example, can alter juvenile failure rates.

Fabrication processes, most of the initial defects that are found that are associated with

juvenile failure rates are associated with some fabrication processes. That's not to say that all of the juvenile failures are associated with the fabrication processes. For boiler and pressure vessels, for example, only about 30 percent of those failures are really associated with a defect that's induced in the fabrication processes. Other parts of those failure rates, those failure data really point to operating parameters and conditions, so things like pressure, temperature, thermal cycling, and fatigue contribute to failure rates of those components.

Non-destructive examination and inspection, there is good data in the literature that shows that the increased use of non-destructive examination and inspection reduces juvenile failure rates. There are data sets where the high integrity vessels that have been subjected to more extensive non-destructive examination during the initial fabrication, or during inspection, have demonstratively lower failure rates. And, of course, human reliability considerations. That really spans a range of processes, everything from incorrect use of material, incorrect weld wires, for example, incorrect operations for boilers and pressure vessels, for

example, running a boiler or pressure vessel dry, obviously, contributes to failures.

The information that we learned from reviewing industrial failure rate data is that the failure rates from industrial experience are not really directly applicable to waste packages or drip shields, and there are a number of reasons why this is the case. There is some similarity in the materials of construction, the fabrication processes that are used, and the design code requirements. There are, however, large dissimilarities in the operating conditions, and inspection criteria.

If we look at boiler and pressure vessels, for example, the failure rates of those particular components go up significantly if we're looking at higher pressures, or higher temperature operations. And, also, the fatigue, and fatigue cracking is also a big component of failure of those particular components, which wouldn't necessarily be associated with the waste package, or drip shield.

Some of the industrial data experience over time demonstrates that the failure rates actually decrease with time, as a result of increased operating experience, improvements in non-destructive

evaluation, improvements in design codes. Two of the industrial data set examples that are probably most applicable, as I've mentioned, are boiler and pressure vessels that use similar fabrication processes and design codes. And there are actually quite a few literature out there on the failure rates of those components. And, also, fuel rods, and storage casks, which are examples from the nuclear industry.

One interesting set of data that's probably most applicable is dry storage casks for spent nuclear fuel. At the present time, or at least the information that we currently have, is there has been no reported failures of dry storage casks in-service, and they've been licensed since 1986. There have been some cases of weld defects found during post-weld inspection of some casks. And, in particular, there was some VSC-24 casks, four of which had weld defects, and there were 19 of those casks in service in 1998 when this particular data was reported. I want to point out, though, that these defects were found during the post-weld inspection, and those casks were not placed into service.

With that said, there are some uncertainties for the waste package and drip shield.

There's some information that really needs to be -- additional information that needs to be obtained in order to make an assessment of the probability for initial failures, or initial defects. One of those is the weld defect density, and the non-destructive examination methods that are going to be used for the fabrication of the waste package, and the drip shield. There is some information out there, but it's not fully developed.

One of the processes that has been proposed for both the waste package and the drip shield has been residual stress mitigation, and this is to reduce the probability for stress corrosion cracking. For the waste package, after the disposal container is produced; that is, the shell of the container, and the bottom lid, the disposal container is proposed to be heated to a temperature of about 1,150 C for solution annealing, and then quenched in order to impart compressive residual stresses on the outer surface of the disposal container. That process would serve to prevent stress corrosion cracking by imparting compressive residual stresses, but there are some uncertainties associated with that process, particularly in terms of the non-uniform heating and

cooling during that process, process variability. And another process that's proposed is laser peening or low plasticity burnishing for the outer closure weld, because solution annealing cannot be used after the waste package is loaded, and so, again, the uncertainties associated with the process variability and how you inspect that process to determine its correct application is still somewhat uncertain.

Handling procedures and placement processes are another uncertainty for both the waste package and the drip shield. This may impart damage to either the waste package or drip shield during the emplacement or installation process in the emplacement drift. And, finally, the process of both producing, loading, and emplacing waste packages and drip shield is a complicated process, and really a thorough task analysis is necessary to evaluate the human error rates associated with this process.

So my summary here, industrial failure rates are really not directly applicable to waste package and drip shields. However, we can get some information about the industrial failure rates, what types of process contribute to industrial failures or initial defects. For the industrial components

considered in our study, failures early in service due to fabrication defects, deficient non-destruction evaluation and inspection, and human error are common sources of failures.

The decrease in industrial failure rates has been noticed in several industries, particularly nuclear fuel rod production, and also boiler and pressure vessels. These decreases in failure rates are attributed to increased experience, increased use of non-destruction examination, and improvements in design codes. And, finally, the uncertainties that I've identified for the waste package and drip shield manufacturing and emplacement processes, we expect to be addressed.

DR. WEINER: Thank you. I'm going to ask one question, ask the members to limit themselves to one each so that we stay somewhat in time schedule. I take it from your summary, and from the Center report that you did not look at transportation packages at all to see what kind of failure rates they have. And these are packages that are used under all kinds of conditions to carry very radioactive materials. And they have been in use for 33 or more years. Why didn't you look at those?

MR. DUNN: I didn't have data on the transportation cask. And if you're looking at the Center report, I believe you're correct, that the transportation casks were not looked at.

DR. WEINER: My question is why you didn't. Were you unable to get any data?

MR. DUNN: That's a good question. I would have to get an answer for you. I really don't know the answer to your question.

DR. WEINER: I would suggest that they do make a reasonable analogue to look at for this type of package.

MR. DUNN: Sure.

DR. WEINER: Dr. Hinze.

DR. HINZE: Are there any welds on the drip shield? And if so, is there any welding being done at the site?

MR. DUNN: There will be plenty of welds in the drip shield. I do not know if there will be welding done at the site. I don't -- my current understanding of how the drip shield will be constructed in segments suggests to me that there will not be welding at the site, but there will certainly be plenty of welding in the drip shield.

DR. HINZE: There will be an interlock connecting them?

MR. DUNN: My understanding was that was going to be mechanical, not welded.

DR. HINZE: Thank you.

DR. CLARKE: I'm going to pass, Ruth, too.

DR. WEINER: Good heavens.

DR. HINZE: Can I ask one question?

DR. WEINER: Yes, please.

DR. HINZE: The third slide, the third bullet. You're conservatively estimating these to occur at the start of the post-closure, yet we're talking about pre-closure period. I assume that that's some mechanics of the TPA code that's making that conservative assumption necessary?

MR. DUNN: Right. So there is a distribution of failures that is assumed in the TPA code. That distribution is assumed to be carried through to the post-closure calculation, so you have a distribution of juvenile failures that's used basically as an input to the post-closure performance.

DR. HINZE: Okay. Thank you.

DR. WEINER: I'm going to allow staff one question each. All right. Having done that, I'll

turn this over to Dr. Clarke. Dr. Ahn, we're going to turn to you again to tell us about Dissolution Processes for Commercial Spent Nuclear Fuel in Repository Conditions. Thank you.

DR. AHN: Thank you very much. I would like to talk about dissolution process for commercial spent nuclear fuels in repository conditions. The focus is on the commercial spent nuclear fuel because over 90 percent of radionuclide inventory is extracted from commercial spent nuclear fuel. Also, I would like to acknowledge my co-workers of the NRC, as well as the Center for their contribution to this presentation.

The outline is purpose, and then commercial spent nuclear dissolution process. I will talk about why dissolution process is important in terms of release mode. And then I will discuss the principal factors for matrix dissolution. Matrix here means irradiated Uranium dioxide. Those factors include the in-package water chemistry where the failed waste package inside the water chemistry is important in assessing the impurity of the solution. And then conditions of spent nuclear fuel before water contact. For instance, prior oxidization or prior

hydration will play a role in assessing the dissolution process.

Groundwater contact mode is another important factor, as you mentioned. It could be drip, it could be immersion. I will discuss that affect on dissolution of waste form.

The purpose is present an overview of key processes for the dissolution of commercial spent nuclear fuel at conditions representative of potential Yucca Mountain Repository, and discuss the significance of uncertainties in important processes that affect spent fuel distribution models in package water chemistry, spent fuel characteristics, and the groundwater contact mode. The basis established here will be used in model, component assessed models. The basis of the component model will be presented here.

This is a cartoon of commercial spent fuel in the dissolution process. This is drift area, and waste package drip shield is failed, and the seepage water will get into the commercial spent nuclear fuel. And the fuel will dissolve, and the radionuclide will migrate in the geosphere. Why UO2 dissolution is important, because UO2 dissolution is congruent with the release of Technetium 99 and Iodine 129. Those

two elements are important to those in the early stage of repository performance. There are other two types of radionuclide release considerations. Second one is a proton released from Plutonium, as well as limited release Neptunium. Those two release modes will be discuss in the coming TPA presentation to you.

Principal factors for matrix UO2 dissolution are reaction products of UO2 with H2O depend on electro chemical conditions of UO2 for dissolution, and the hydrolysis of dissolved species. Usually, start with UO2 plus X, UO2 plus three three, and then hydrolyzed to become share products. And the controlling principal factors include impact with water chemistry, including the concentrations of carbonate/bicarbonate ions, oxygen, iron, iron corrosion is one example affecting the dissolution Dr. Hinze mentioned. And other cations, such as silica and calcium ions. pH is also an important factor, as well as temperature.

The conditions of the spent nuclear fuel before water contact; for instance, the extent of pre-oxidation. That means pre-oxidation and pre-hydration could increase the surface area of fuels that could increase the dissolution rate leading to higher

radionuclide release. And the grain-boundary characteristics are also important because grain-boundary contains more radionuclide than the matrix. That's one reason. Also, radionuclide release is very fast. Also, in many testings, people observed grain-boundary could open up, increasing the total surface area waste form to be dissolved, increasing the dissolution rate. And the third one is groundwater contact mode, where the seepage rate is very low under potential repository conditions. Therefore, the variation of seepage rate versus the total surface area waste form is very important in determining the dissolution rate.

Depending on internal corrosion of waste package, you could get the scenarios for immersion or the drip conditions on waste form. And extent of cladding protection is also discussed in this presentation.

This is a cation impact in water chemistry case. The Y axis is the solution concentration with time in X axis. It started with adjacent to well water. The Y axis is in log scale, and when the solution changes the pure carbonate solution, the dissolution increased by a factor of 10. Then adding

the culture and silica, the dissolution rate dropped in a couple of other major ways. Later on, temperature increased, that decreased the dissolution rate further. Therefore, in this figure after Wilson and Gray, cation in the silica tend to decrease the matrix dissolution rate by two order of magnitude or more at room temperature, compared with those in pure carbonate solutions.

Primary uncertainties, this effect may disappear at the lower pH. We don't know the contact information here. Rate of cation depletion, because seepage water is very small amount, therefore, cation may be depleted shortly. Nevertheless, the formation of Schoepite without cations still can inhibit the dissolutions.

A second one is pH effect in package water chemistry. As you see here, dissolution rate, Y axis in linear scale, and a typical pH. In the lower pH range, you could see the dissolution rate increase substantially. Data under oxidizing conditions matrix dissolution rate increased by a factor four to ten, greater than ten at pH3 compared with pH below 5. Metallic cations, such as Chromium, from internal corrosion could decrease the pH to affect the

dissolution of spent fuel. And the primary uncertainty here is the magnitude of pH variation from the internal corrosion of the waste package.

Next one is Oxygen and Iron Concentration. The corroding steel from the inner container corrosion may decrease the local oxygen concentration, which in turn decrease the matrix dissolution rate at least by a factor of ten. Also, when secondary phase forms UO2, the gap between secondary phase and UO2 still may form a depleted oxygen, that will decrease the dissolution rate, too. And radiolysis here you can see there, oxygen is in air-buffered repository is sufficiently abundant to offset the production of accident by radiolysis.

Temperature effect, we have very big uncertainties here. Activation energy ranges from zero to 47 kj/mol. It's mainly from the formation of secondary phases. Under immersion conditions, in the literature, 24-33 kj/mol assessment model.

And pre-oxidation and hydration, two things are important here. When you pre-oxide, say U3O8 from volume expansion you would have either inter or intra granular spallation, increasing the total surface area of fuel, increasing the dissolution rate,

increasing the radionuclide release. Hydration, too, UO3xH2OX.203 could cause brine powder, too. This dissolution would occur under seepage water conditions. However, if prior condition give this kind of oxidation and hydration, it will increase the dissolution rate. There is some database presented here.

In addition, when fuel is subjected to dissolution, a continuous hydration and oxidation could penetrate through the grain boundaries, and continuously increasing the fuel surface area. Grain boundary inventory is very important. In the TPA exercise, grain boundary inventory is considered to be released instantly. On the other hand, matrix dissolution is considered as a long-term release of Technetium or Iodine 129. Nevertheless, in actual testing, it is very difficult to distinguish whether radionuclide is from grain boundary, or a matrix dissolution. For instance, here total release is this time scale is almost a thousand years, and from grain matrix, and grain boundary. You see even in thousand year, the release is dominated by grain boundary. Therefore, for instance, tests with fragment from dripping flow-through, immersion tests show

substantial amount of grain boundary radionuclide. Actually, that was used in determining matrix dissolution rate. Actual true matrix dissolution is very much lower when it's used in TPA, any performance assessment.

And when waste packages fail, you form perforations, cracks from corrosion, stress corrosion cracking, et cetera. And, therefore, the dripping rate is very small amount. Seepage water is 1.550 liter per year, and if you normalize with respect to total surface area of fuel, it's very small amount water will come in. Therefore, varying the seepage water drip rate changed the dissolution rate. For instance, increasing drip rate by 10 times, increase the dissolution rate 10 times. And actual drip rate testing in the literature are mostly much higher than the repository drip rate normalized with respect to fuel surface area. Therefore, dissolution rate could go down further. Uncertainties here are in extrapolating test to repository condition. Most data were obtained from small amount of fuel testing in the lab.

Failed cladding protection from stress corrosion, cracking, pinning, et cetera, you could

have holes, pinholes, or micro cracks. Tests conducted to simulate the affect of those holes and cracks, they made a slit or hole defect to the cladding and observed 10 to 100 factor changes of release. This Iodine and litmus are indicator of the matrix dissolution; therefore, it could inhibit the release substantially.

Nevertheless, if you have complete failure, like 50 percent fuel exposure, the affect diminishes. However, here significant uncertainties is in times, and extent of the cladding defect, how far it could propagate, how much the surface could be exposed from the cladding failure are not very well known.

In summary, spent fuel dissolution rates are more sensitive to variation in temperatures, and Calcium and Silica ions could decrease spent nuclear fuel dissolution rate more than an order of magnitude. And release from grain-boundary/gap inventory is substantial component of effective release rate by a factor two to ten of the long-term true matrix dissolution rate.

Other factors that potentially decrease dissolution or release rate are low drip rate of

seepage water, and the small opening of cladding, and the presence of ion compound forming reducing environment. And other factors that potentially increase the dissolution rate are low pH increase the release rate, and the pre-oxidation and hydration increasing the surface area of the fuels to increase the area for dissolution. And a range of information and analogue primarily from a laboratory experiment to support staff review of commercial spent nuclear fuel dissolution models. Thank you.

DR. CLARKE: Dr. Ahn, thank you. We appear to be somewhat back on schedule, but I'll ask the Committee to be sensitive to the time so that we can stay on schedule. I just have one question, and please correct me if I'm wrong in my assumption.

The work that you have presented to us today, along with a lot of work that's in the literature, I believe, is using unirradiated fuel. The materials that might go to a geologic repository, could go to a geologic repository. On the other hand, they're clearly irradiated, and much of it could be high burn-up. And I guess my question is, do you feel that you have a technical basis to manage the uncertainty associated with that difference?

DR. AHN: Yes, we have some uncertainties. For instance, coming from high burn-up fuel. It's rather increasing the surface area than the radiolysis in this cell. As I indicated, we have oxidative repository compared with the rest of the world; therefore, we have abundant oxygen available to offset the radiolysis effect, if you draw the dissolution rate versus radiation effect. The oxygen buffer is in the end, actually, so it will offset. On the other hand, as I indicated, other effects, such as area increase need to be considered further.

DR. CLARKE: So within the context of a probabilistic approach?

DR. AHN: Yes. A range of --

DR. CLARKE: Okay. Thank you. Ruth?

DR. WEINER: First of all, I'd like to make a comment. I hear you just mentioned, and I hear it frequently, that because there is iron in the repository, you will have a reducing environment. I suggest you look at the work that was done on the waste isolation pilot plant, because we could not predict with any kind of certainty whether the iron would dissolve, whether it did, indeed, create a reducing environment. And that's a very questionable

conclusion to draw.

When you have fuel rods, you have fuel rods sitting in fuel pools under all kinds of chemical conditions, and you're talking about the dissolution rates of spent fuel rods. What kind of comparison can you draw with what sits in the fuel pool?

DR. AHN: Actually, some of this testing and literature used fuel from fuel pools.

DR. WEINER: And what did they find?

DR. AHN: Actually, they didn't notice any specific effect of the pool water there. I don't think they reported that, as far as I know.

DR. WEINER: So if you don't get dissolution -- the dissolution rates in fuel pools ought to be at least comparable to what you're looking at, wouldn't you say?

DR. AHN: Yes. Actually, we analyzed the chemistry of pool water. Most of fuel rod there is in tact; therefore, very -- release fraction is very small compared with dissolution rate here. Here we consider very long period of time after the cladding failure; therefore, dissolution rate is higher than what we observe in the pool.

DR. WEINER: One of your Center reports

mentions using temperature as a time surrogate to try to reproduce what would happen at lower temperatures over longer periods of time by accelerating the process by heating. What kind of results do you get? Can you do this?

DR. AHN: Yes. It's activation, and in performance assessment. We'll talk more in detail next month, so actually it's time-dependent, also temperature-dependent dissolution is used, rate is used.

DR. WEINER: And I have one final question. Could we go back to Slide 5 of your first presentation? Would that be possible?

DR. AHN: First presentation.

DR. WEINER: Yes, your earlier presentation on corrosion of waste package and drip shield, if you could do that.

DR. AHN: Yes.

DR. WEINER: Okay. Aren't you making some assumptions in your dust deliquescence region there that the water will actually be more in contact with the waste package than with the dust? In other words, you're going to get -- water has surface tension.

DR. AHN: Yes, that's --

DR. WEINER: And you're going -- the surface tension is going to keep it bound to the dust, rather than water. So it seems to me that your dust deliquescence, that will affect the dust deliquescence, and when you go to the brine period, by this point, your solution is very dilute, and so it wouldn't be so much brine corrosion. How do you reconcile those?

DR. AHN: Actually, that's a very good point. Yes. Actually, the deliquescence period will continue to this area, too. However, the dominant corrosion failure is from seepage water. That's why we made distinction. You are absolutely right, this will go on continuously here, but it will be dominated by seepage water. Again, here, yes, the deliquescence -- you could assume several different assumption of capillary holding of water, either dust or on to the metals. Brett Leslie may --

DR. LESLIE: This is Brett Leslie. In fact, the Center has conducted two new studies being presented at the Materials Research Society, and I think Materials and Metals Society meetings. One was a modeling study, because one of the questions, and one of the things that DOE has suggested for screening

out dust deliquescence is the capillarity of the dust particles. So modeling studies suggest mo may or may not be possible, given the actual forces involved, so they've done some modeling to that effect.

The second aspect is the Center has conducted some studies using salts mixed with silica, I mean, basically ground up teff as a surrogate to dust, and assessing whether that -- whether you get localized corrosion on carbon steel, because you can easily see the corrosion there. And so those presentations are out in the public right now, just as a way of background.

DR. WEINER: Thank you.

DR. AHN: One more addition, this is from modeling studies; however, still schematic. As I mentioned before, this line could go further, so it's illustrations.

DR. WEINER: Are you planning NUREG from these studies?

DR. AHN: Yes, this one. I'm not sure. I should ask Britt whether it will be or not. It's not certain at this point.

DR. HILL: Britt Hill, NRC staff. In addition to the information that we presented today,

of course we have a number of ongoing studies in this area, and we anticipate one or two additional reports sometime during the coming fiscal year.

DR. WEINER: Thanks, Ruth. Dr. Ryan.

CHAIRMAN RYAN: Looking ahead to October, I guess you're going to give us some insights as to how this all factors into estimates of release of radioactive material. Are you going to kind of carry this story forward to the next step then?

DR. HILL: This is part of the story that we'll be discussing. It wasn't one of the particular focus areas that the Committee was interested in. I think the goal for October was to look at the most significant changes between 4(1)(j) and the current release.

CHAIRMAN RYAN: So as these things filter into that story, we'll hear a little bit more about it.

DR. HILL: Yes.

CHAIRMAN RYAN: Okay.

DR. HILL: They are filtered into the story, but I'm not giving anything away by saying we haven't completely redone our approach, or our mechanistic basis for evaluating corrosion. This is

an approach that we've used for many years.

CHAIRMAN RYAN: Certainly. That's helpful. Thank you.

DR. CLARKE: Allen.

VICE CHAIR CROFF: I'd like to come back to a theme that Drs. Clarke and Weiner picked up on, and put a maybe even sharper point on it. This concerns the radiolysis effects and oxygen. And I'm puzzled by, I guess, a couple of things. One, the statement, oxygen in an air-buffered repository environment, this is Slide 8 in your other presentation. Oxygen in an air-buffered repository environment is sufficiently abundant to offset the production of oxidants by radiolysis. I'm not entirely understanding how oxygen offsets oxidants.

DR. AHN: The dissolution rate of the UO2 is very sensitive to oxygen concentration in dissolution. In other words, eh conditions. It can change the dissolution rate many order of magnitude, as tested in overseas reducing conditions. However, there's a common factor both in reducing and oxidizing condition is that reducing conditions, radiolysis will produce oxidant. However, they change radiation strengths, and they tested without radiation in pure

oxygen environment, and the dissolution rate increased things, and finally saturated at the level of free oxygen available, which is our repository case.

VICE CHAIR CROFF: Okay. That sort of brings me into my second. Well, I think I understand that. But on the presence of the steel components and reducing versus oxidizing, I'm -- as I understand what literature I've read, even though there's a lot of oxygen in the repository, the issue is what's present at that last fraction of a millimeter --

DR. AHN: Exactly.

VICE CHAIR CROFF: -- with a representative amount of alpha radiation, in particular. And the experiments I thought I read about sort of said basically right near the surface the oxygen isn't there, but there are acid species produced.

DR. AHN: Yes. Actually, that's why I presented one slide, the effect of oxygen and iron. And two aspect, steel corrosion could consume the oxygen locally. Also, the secondary phase formed on top of UO2, that will block the oxygen in-flow. On the other hand, as you indicated, there will be alpha and gamma radiolysis, too. Therefore, in our

performance assessment model, we considered all those factors as treating the uncertainties.

VICE CHAIR CROFF: And have you got experiment to back that up?

DR. AHN: We are more based on the literature at the present time.

VICE CHAIR CROFF: Okay. I wanted to come to one other thing. This is -- well, we don't have that one up. One of your last slides where you're looking at failed cladding protection.

DR. AHN: Yes.

VICE CHAIR CROFF: It says relative to unclad spent fuel, release decreased by a factor of 140 for Technetium, 700,000 for Iodine, and 65 for Strontium. I thought the initial assumption was congruent dissolution, so how come Technetium and Iodine are so different?

MR. AHN: Oh, it's dependent on the absorption properties. Clad is something that is very long. You have a hole there, or slit there. Depending on the water intrusion mode, as well as absorption inside a gap, there are a lot of complications that, therefore, nobody uses such high numbers. Just showing you, it could affect the

release rate substantially.

VICE CHAIR CROFF: And have your experiments shown that if you just use fuel matrix, that the release of Technetium and Iodine is congruent?

MR. AHN: Generally. There is some uncertainties there. Some people argue Technetium could form a phase that may not represent fully, but generally, Technetium and Iodine are considered as marker for the UO2 matrix dissolution.

VICE CHAIR CROFF: Okay. Thanks.

DR. CLARKE: Dr. Hinze.

DR. HINZE: Well, half a question. In your purpose, you talked about investigations under the conditions representative of the potential Yucca Mountain Repository. I'm wondering if you've looked at any of the possible extreme conditions, and I'm referring particularly to ore deposits that may occur within the Yucca Mountain region. I recall that this Committee back in the early 90s held a working group meeting on the impact of mineral resources on Yucca Mountain as a repository. And one of the comments that came out of that kind of stuck with me, and that is that a Vice President of Expiration for one of the

major companies in the U.S. stated that if Yucca Mountain was open to them, that they would be out there doing mineral expiration. It seemed like a very fertile area. And I know that Dr. Hill has an experience in ore deposits, and is very knowledgeable of the extreme chemistries in terms of fluorine, in terms of chlorine, and a number of other elements that might occur.

What happens if this deposit, if this repository encounters an ore deposit? And have you looked at kind of the extremes of the chemistry that you might have?

DR. HILL: Britt Hill, NRC staff. Could we try to understand more what sort of a deposit we're talking about?

DR. HINZE: Well, we're talking about deposits of hydrothermal deposits. We might be talking about silver, we might be talking about gold, like we have right across the plat, and some of those deposits, going back to my ore deposit days, they're certainly high in fluorine, they're high in chlorine, they're high in sulfur, they're high arsenic, et cetera, these hydrothermal deposits. Have you looked at this at all?

DR. HILL: Again, Britt Hill, NRC staff. There's been quite an extensive site characterization program, as you're aware of, carried out over this block for many years. I'm not aware of any evidence of any sort of epithermal or hydrothermal mineralization that's resulted in large changes in mass balance with the rock, such as you'd normally see in a gold-type deposit.

DR. HINZE: Well, they're very limited penetration of the mountain, as you well know. Very limited penetration of the mountain, and ESF and a few vertical holes. There has been very limited induced polarization studies to look at any possibility of mineralization. I'm coming off the wall, and purposefully. Is there a chance that we're not looking at the complete range of chemistries?

DR. HILL: Again, I could tell you from an exploration geologist perspective that there's no pathfinders, there's no indication that such a condition of mineralization is occurring in the upper 300 meters of the repository. There has been a number of investigations focused on looking for such pathfinders, mainly back during the early 90s in the site characterization program. I can't eliminate such

a possibility completely from consideration, but it appears to be a very unlikely condition given our current state of knowledge.

My colleague, Gene Peters, also from NRC would like to add a comment.

MR. PETERS: I'd like to build on what Britt said, and that although the exploration in the area has been limited, perhaps as you say in a spatial extent by the sheer volume of rock versus that explored by the ESF and ECRB, but the down-gradient water chemistries that should serve as an integrator of any large-scale area-wide phenomena do not show any extreme chemistries. The J-13 well water cited by Dr. Ahn and the results, for example, the Nye County early warning drilling program wells do not indicate any large-scale extreme chemical excursions from what we would expect.

DR. CLARKE: Okay. Dr. Ahn, thank you very much. At this point, let me turn the meeting back to our Chairman.

CHAIRMAN RYAN: Thank you very much. We'll look forward to October for Part 2 of this, and other interesting areas you'll be working. I really appreciate the detail of your briefings, and thanks a

lot.

DR. HILL: Thank you.

CHAIRMAN RYAN: Okay. Without further ado, we'll turn our attention to our next briefing, which we'll take a minute to set up. Dr. Don Cool is with us. Dr. Cool will talk to us about the discussion and role -- the NRC role in the International Commission on Radiological Protection.

(Off the record comments.)

CHAIRMAN RYAN: Okay. Could I ask everybody to come to order, please. We're going to go ahead and get our last briefing of the morning started.

MR. COOL: We'll see if we can get the electronics to catch up with ourselves in a moment. Then I will use those. In the meantime, I know that there are handouts in the back of the room. I think you have copies of the slides, so with your agreement, we'll go ahead and get started.

CHAIRMAN RYAN: Please.

MR. COOL: I'm Donald Cool, Senior Advisor for Radiation Safety and International Liaison, FSME. I don't even try to say it all out. What our hopes to do today with you is to very, very quickly walk you

through some of the interactions that we are currently engaged in in international radiation protection.

Going ahead to Slide 2, simply note that this is a multi-faceted area. There are lots of players, there are lots of different activities that are going on, so there are lots of opportunities, as well as challenges in the process of trying to stay aware of the activities that are going on, and trying to influence those.

Understanding that part of why we're having this discussion is because you have a little SRM item that you need to write a letter on. Most of this presentation will be focused on things related to ICRP, but in order to give you some context, we'll talk briefly about some of the other things.

Okay. So who's got control of the slides?

MR. HAMDAN: You do.

MR. COOL: No, I don't. I'd like to go to Slide 3. Okay. To briefly introduce the whole area of international radiation protection, there are three fundamental areas of play, the first being the technical basis area, particularly health effects studies and otherwise, the United Nations Scientific Committee on Effects of Atomic Radiation, the United

States Biological Effects of Ionizing Radiation set of reports which provide the underpinnings for radiation effects on the body. That gets translated into recommendations. Internationally, the International Commission on Radiological Protection, ICRP's last set of recommendations in 1990, Publication 60. The NCRP also has some recommendations that parallel those. And then those get translated into actual standards and guidance. The International Atomic Energy Agency, the European Commission, various member states, lots and lots of people get involved in that.

An organization that you don't see here because they publish a different sort of style of document, and have a somewhat different focus is the Nuclear Energy Agency of OECD. They are an organization of more developed nuclear programs, and they have a more forward-looking focus exploring what's coming along the lines, rather than a specific focus of actually drafting guides and standards for use by various member states. They are a very important organization, and one of the vehicles that we use to try and continue our participation. Go to the next slide.

So with a technical basis, just simply to

note so that you've got it on your record, UNSCEAR and BEIR. There are, of course, the DOE low-dose programs that the Committee has been looking at very closely, a variety of other activities which all feed into this type of work. Go ahead to the next slide.

The International standards, the International Atomic Energy Agency, and they're basically safety standards, Publication 115. Also, the European Commission has a set of basic safety standards which are, in fact, mandatory for member states of the European Union. There is a very active process that's involved in trying to develop an international standard, if you can go ahead to the next slide. I, by no means, intend to actually try to walk you through all the details that are actually on this slide. Hopefully, they'll actually show up. There we go, just sort of keep looking at it for a moment there. It actually comes up in several segments.

Suffice it to state for your purposes, that there are multiple places in which there can be interactions. There are the efforts to actually draft the documents, there are the efforts to review the documents through the safety committees, that's the

material that you actually have here. There is actually a U.S. individual, which is the U.S. government representative, or co-representative on each of the review committees, there are the actual member state comment opportunities which will eventually come up on this, where we formally get those documents, and we, as the U.S. government, actually provide formal comments to IAEA, et cetera. So there are many opportunities in this process to try and express our views, and to try and assure that the IAEA standards have some measure of consistency, or at least do not have significant differences that could cause problems with the U.S. regulatory program. Let's see if we can just go ahead to the next slide. I had no idea that was going to take that long to draft through.

The next slide, Slide 7, simply to note for you that there is currently a revision underway for the International Basic Safety Standards at IAEA. The process has already been ongoing for about a year. I expect a draft of that Basic Safety Standards to actually be available on IAEA's website soon. You ask me what soon is, and I will tell you that it was originally supposed to be posted on Friday, and it

wasn't there when I last looked a few minutes ago, but they've promised that it will be there so that we can look at it before the Radiation Standards Committee meeting the third week of October. That sort of provides a boundary on what soon will be.

We have been participating in the development of the document preparation profile and the background, in the drafting with the technical meeting that occurred in July, as well as supporting efforts in the Joint Secretariat of the International Atomic Energy Agency, and other international organizations that will eventually sponsor these recommendations. Go ahead to the next slide. We'll get ourselves to ICRP.

The International Commission on Radiological Protection provides recommendations for radiation protection community. It is one of the bases that we use in looking at 10 CFR Part 20, and others, as DOE, and EPA, and other federal agencies look at it. NCRP provides a similar activity here in the United States, and we try to use both of those sets of documents and reports. Next slide.

Just by little bit of background, because this is, in fact, one of the differences that

influences the extent to which we can influence and participate. ICRP is actually an international charity. They are not an international organization of the United Nations or something like that. Membership is independent of any organizational representations or otherwise. Individuals are invited to participate on the main commission or the committees on the basis of their expertise and background. So unlike when you go to IAEA and you have official USG representatives that have been nominated by the State Department, there's no such chance to influence this. There's no such chance that the United States can say we want thus-and-so or an individual to be participating at this particular point. Now the United States has been fairly successful over the years, because of the number of individuals that we have here, so we have members from the United States on the different committees and the main commission. Go ahead and go to the next slide.

As a reminder of background, the main commission of ICRP has now five committees, Radiation Effects, which examines the work of UNSCEAR, BEIR, and others developing the underlying relationships of radiation and biology. The doses from radiation

exposure, these are the folks that develop the various models for the biology and translate it into conversion of doses from internal and external sources. Protection in medicine, which is actually where ICRP got its start back in the 1920s. It's focused on medicine, because the radiologists were busy frying themselves back in those days. The application of the ICRP recommendations translate the philosophy into some practical documents and support, and the newest of the committees started just two years ago, which is protection of the environment. Next slide.

ICRP has become increasingly engaged with a variety of stakeholders and organizations as they develop their document. Over the last several years, they have moved to a fairly consistent policy of putting drafts on the website, the ICRP website, for public consultation. Comments can be submitted directly to ICRP, and those are considered as the various task groups continue their work. So there is one direct opportunity for providing comments. This is only over the last couple of years.

So what's currently ongoing and on the horizon? This is, by no means, a complete set. First

of all, the long anticipated new recommendations. We do expect to be published this year. I think the Elsivier site, Elsivier is the publishing company that actually publishes the annals of the ICRP, is saying October. We shall see. I actually thought it was going to be a little sooner than that, but I think they're still trying to sort out some of the details in editing. Of course, as with any international organization, when you get 12, 13 different people from countries all over the globe with all of their native languages, and then you try to get everybody to agree, and you get down to the nitty-gritty of particular words and terms, it can go back and forth for a while.

We expect reports to be coming that we would have an opportunity to comment on related to emergencies in existing exposure situations out of Committee 4. I expect that there will be another draft of the Reference Plants and Animals document out of Committee 5. We have seen one earlier version of that document now almost two years ago. I understand that the Committee will be considering in Berlin a version which they would then hope to make available again for public consultation. I have not seen the

detailed agendas for the other committees in the meeting coming up in late October, so there may well be some other documents that will be available for comment over the next few months. The ICRP main commission and committees meets the fourth week of October in Berlin, Germany. Go ahead to the next slide.

Do we have a strategy for influencing them? Yes. Active engagement at each of the opportunities that we can engage in might be a bit satiric, but at some times it's sort of like the old Chicago politics; vote early, vote often, get your fingers in whenever you can in the various process of the drafting to provide comments. We try to provide both direct and indirect opportunities to get our views, and the staff supplies comments directly to the ICRP.

We have taken sort of two-pronged approach to that. For the general recommendations, we actually develop those comments, and got specific commission agreement, so they became commission comments to the ICRP. On the various draft documents of supporting materials and others, they have been submitted by the NRC staff as staff comments, and informed the

Commission, but not actually trying to get the Commission looking at some of the technical details. Go ahead and have the next slide.

Currently, our participation looks a little bit like this. I am, in fact, a member of Committee 4, at least for the next year or so until they re-up the committees. That occurs every four years, so we shall see. As I said, we try to provide direct review and comment on the ICRP documents. We have an excellent opportunity in the international forums through the Nuclear Energy Agency's Committee on Radiation Protection and Public Health, and their various expert groups, where we have been able to participate, and have our comments represented within international comments that have been provided to ICRP.

We work with our other federal agencies, EPA, DOE, OSHA, et cetera, through the Inter-Agency Steering Committee on Radiation Standards to try and coordinate and develop views, and ISCORS itself has submitted comments on a number of the documents. And we try to give them some money here or there, various grants. The NRC, in fact, does provide a grant each year to the ICRP, and supports a fair bit of their

work. We can go to the last slide of this.

In addition to trying to actually influence the development of the documents internationally, we are about to start the process of figuring out what we want to do in the United States. Back several years ago, back around 2000, in fact, the NRC staff provided a paper to the Commission that suggested various approaches for possible revisions, options for 10 CFR Part 20. At that time, a conscious decision was made not to start a revision, and to wait for the new recommendations of the ICRP to come out, so that we wouldn't end up in the same place that we did in 1990, where we had finally gotten through a rather long public process, and gotten something out, and then a new set of recommendations hit the street within a few months. So we are now about to go back and start to revisit that process. The staff has an obligation to the Commission to examine the options based on the new recommendations and other information, go to the Commission roughly this time next year. Have sort of a bit of a sliding scale, of course, because until we get the ICRP recommendations, and we actually know the bits and pieces that are in there, it's a little bit difficult to engage in some

of those discussions.

I will note to you that simply changing Part 20, the Basic Standards for Radiation Protection, is only one small piece of the puzzle, because, in fact, there are radiation standard in other portions of the regulations, in Part 50, Appendix I, Part 61 and other places. Some of those were not modified during the last round of revision, which culminated in Part 20's revision in 1991. So some of those actually go back to ICRP Publication 2. And results, in fact, if you look at the entirety of the various radiation protection programs overseen by the Commission that we're implementing at least three different sets of recommendations at various points and pieces, so it is just a bit convoluted and complicated. A desirable goal would be to move everything to have a consistent basis. That will be a lot of effort, because the rulemaking itself for the regulation is only the smaller piece of that puzzle.

In addition to that, we don't have just NRC that we need to try and watch care, but the other direction that we try to pursue is to work with our other federal partners, EPA, DOE, and others, so that the entire federal family could move forward towards a

new consistent basis. Just as you have within NRC, within the federal family, you have everything from implementations of the ICRP Publication 60, to things like the current OSHA standards, which are ICRP Publication 2. So we have a great set of challenges set out for us over the next couple of years.

And with that, Mr. Chairman, I'll stop talking, and let you ask questions. Thank you very much.

CHAIRMAN RYAN: Thanks, Don. Other than this list of things you've got, there's not much to do, I guess.

MR. COOL: Yes.

CHAIRMAN RYAN: The challenge to us is to advise the Commission on -- advice to the Commission on how the Commission can become more engaged in the ICRP recommendations internationally. What are your thoughts on that, specifically? You've listed a number of the activities where you and other NRC staff are engaged not only with the ICRP, but with other international recommending and guidance organizations, and nationally with ICRP, NCRP and so forth, and all the inter-agency work that goes on. What do you think that request for guidance is really focused on?

MR. COOL: I think this is primarily focused on continuing to look for and find each of the available opportunities. I would note, for example, I didn't include here, that we actually hosted an international workshop on the recommendations about two years ago. I would note that when the ICRP Chairman is in town, he has met with the Chairman and Commissioners of the Commission. Things like that continue to be important.

Because the ICRP is an international charity, there are, in fact, some limitations to the kinds of places where we can engage for further influence. The staff is trying to pursue each of the available opportunities, and continue to look for those. We welcome your support in continuing to do that aggressively, because this is an agency with constrained resources. And while there are clearly relationships to new reactors and otherwise, we oftentimes run into a bit of a crunch on the resources, and the priorities of what can and can't be done at any particular time.

What we have discovered is that the most effective way to try and influence not only ICRP, but the various IAEA standards, is to be in from the very

beginning, to be involved in the early drafting before the words get settled down, because they are much more difficult to change and influence once you get to the review stage, which is why we have tried, particularly for things like the basic safety standards, to be involved in the early drafting processes.

CHAIRMAN RYAN: One of the things that struck me in thinking about all this, and reviewing the situation that you presented to us today, is that we're not necessarily behind the curve, we're probably right on the curve in terms of being contemporaneous with what's going on. I mean, the Committee and the staff have looked at documents literally as they've come off the website into our hands, and had very short turnaround times to effectively advise the Commission, and subsequently get their views in a letter, and get something back that met the deadline from ICRP.

It strikes me that that's an ineffective process, because you're, like I say, not necessarily behind the curve, but you don't really have a whole lot of time for detailed analysis, and thoughtful development of ideas; although, I think you guys do very well at that, and we're happy to help as we can.

Is there any merit to thinking about how do we become more strategic and forward-thinking?

MR. COOL: Well, the obvious answer is, of course.

CHAIRMAN RYAN: And I guess my --

MR. COOL: The issue becomes the mechanisms by which we might have an earlier view of some of the documents, so that we, in fact, have more time to look at the agendas, and other things.

CHAIRMAN RYAN: And I guess that's kind of what I'm thinking about, is how can the NRC, or perhaps even other agencies in the U.S. as a whole, get an earlier and more meaningful involvement in the drafting process?

MR. COOL: I will offer you one specific suggestion. I know that a number of countries in Europe have periodic interactions with the ICRP Secretariat. Now ICRP, simply by nature of the individuals and where the Secretariat is, is sort of a Euro-centric-type organization, so the travel has something to do with that. But one of the ways in which we could potentially try to get a bit more strategic is to try and find a mechanism on some periodic basis to invite ICRP Secretary, Jack

Valentin, based in Sweden, to actually come and talk about the programs of the Commission so that we can understand the things that are coming before they hit the plate on the website.

CHAIRMAN RYAN: Yes. And I think if the NRC was the lead, and some of the other agencies are invited to hear that, that might not be a bad thing, because then maybe ISCORS could take up the issues of those kind of things. I'm just thinking about suggesting that something that is more strategic and more forward-looking in terms of activities like that, and perhaps others, is a way to get ahead of the curve a bit. I'm sure the criticism will be levied that we are also, as you pointed out, using a range from ICRP-2 to ICRP-60, and why did you let it get like that, would be the question levied at us.

MR. COOL: Yes. We get that question rather constantly, and reminded that the U.S. is rather well behind other countries who have adopted the ICRP-60 recommendations.

CHAIRMAN RYAN: Well behind is a two-edged sword. We're well behind in terms of being in conformance with that guideline, but I guess we could also raise the question, does changing a lot of what

ICRP comes out with improve radiation protection practice in the U.S.?

MR. COOL: That is the key question.

CHAIRMAN RYAN: And if it doesn't, then maybe we shouldn't be. But whether we make a decision to adopt or not adopt is kind of a different question from being engaged or not engaged ahead of the bow wave, so I would want the critics who would offer that criticism to us to separate that question from being engaged. I don't think it's fair to say because we didn't adopt it, we don't get to play any more.

MR. COOL: And, in fact, I don't believe the latter scenario is the case.

CHAIRMAN RYAN: Yes.

MR. COOL: We have been able to effectively participate, and our comments have been very well received, and have been influential in trying to move things forward, and structure things. In part, the fact that the new recommendations, as we understand they will come out, won't have a lot of significant changes. And, in fact, clearly, align with how the U.S. system actually functions, if you can't always necessarily trace line-to-line for a particular piece of regulation. It shows that, in

fact, the system that we have here in the United States for radiation protection is providing adequate health and safety, is providing the job of radiation protection. And the questions then really do become the question of what are appropriate adjustments to achieve a better alignment with international organizations to be able to show that.

This is becoming increasingly important in the reactor community, and otherwise. We know we have vendors for some of the new reactor designs who have, in fact, gone to IAEA asking for the comparison, because they wish that as part of their marketing strategies. Those factors, which are not part of a typical backfit analysis that we would use in a regulatory forum, will become increasingly important in the global community.

CHAIRMAN RYAN: So how do we capture all these strategic, and that's a much more forward-looking strategic issue. How do we capture them? Is this something that there ought to be a task force to do, or a staff group that takes a look at emerging guidance and regulation development in the world, and says this is what might be for an impact on the U.S.? And keep that an active group?

MR. COOL: I think a staff group at two levels. We, Vince and I, are currently in the process of preparing to reinvigorate what was called the Steering Committee on Radiation Protection, which functioned as a series of managers from the major program offices to oversee various radiation protection activities. With a number of departures over the last year or two, that as a formal group had decayed just a bit. We are planning to put that back in process, both to do the sorts of things that you're talking about, and in preparation for the staff's examination of Part 20, and other activities.

In addition to that, there has been, and continues to be while not a formally documented staff group, a well-functioning, more informal group of the senior staff in the various offices who use each other in the various reviews and the development of issues and interactions. That will, I think, translate, at least in part, more formally into an actual working group that will start the examination of Part 20.

Part of what I think we're going to need to do to add a bit of reflection is avoid having those groups become so focused on the revision, that the other activities that are ongoing do not get any

visibility.

CHAIRMAN RYAN: Fair enough. That's a hard balance, though. Jim?

DR. CLARKE: Thank you for the information. No questions.

CHAIRMAN RYAN: Ruth.

DR. WEINER: Thanks again for a very good presentation. I notice from your Slide 12 that they're still worrying about radiation damage to living species other than people. You still have a task group on Reference Plants and Animals, that hasn't died? It goes on. Does it have support? Are they really going to do this?

MR. COOL: It goes on. It has support particularly outside of the United States. Most of that support is focused on developing the scientific information and understanding necessary to assess the situation. I think there has become a greater distinction between whether or not there is protection, and how you show it to somebody who asks the question. And so, for example, the Reference Plants and Animals effort is, at least, viewed by ICRP and a number of other people as the parallel, 30, 40 years later, to the effort over the years to develop

the reference, the various anthro promorphic models that allow you to do calculations, to do some dosimetry, in order to understand what's happening in the environment and various potential vectors, and be able to make some demonstrations.

We have, in fact, been fairly successful thus far in keeping the focus on the modeling and the demonstrations that might be used in environmental impact statements, rather than on a perception that there is a need for a new separate or additional standard.

DR. WEINER: Thank you.

MR. COOL: But it will go on. You fight the battle each day.

DR. WEINER: Thank you. That was my question. I'm sorry, Ryan.

CHAIRMAN RYAN: I just point out, in addition to Ruth's comment, that there is no -- that the herein example, even from Lars Coleman, I asked him at an NCRP meeting, for examples where a non-human species is not protected by the principle we've used for 50 years. If you protect man and his environment, you protect everything in it.

MR. COOL: Right. I believe that the

draft recommendations, there will be a chapter on Protection of the Environment. If, in fact, it will have no recommendations in it, unless it has changed since the version that we saw last. It's rather more a plan of work that lays this out. It includes the statement that protection is being afforded, but that there is increasing need for the demonstration.

CHAIRMAN RYAN: Even in his presentation to us, he talked about this as a logical construct that may be empty in my view, but I don't know how logical it is, frankly, but that's an argument for another day.

DR. WEINER: I have another totally unrelated question, and that is, is there any effort on either side to reconcile the A2 values, A1 and A2 values between IAEA and Part 71?

CHAIRMAN RYAN: That's a different story. Let's save that for another day.

DR. WEINER: Okay.

CHAIRMAN RYAN: That's a transportation issue.

DR. WEINER: It is a transportation issue, and I notice that Don had other agencies.

CHAIRMAN RYAN: Let's let Allen and Bill

get a couple of questions.

MR. COOL: I would simply note that it's an ongoing saga. The IAEA is currently starting its examination of the issues to take up in its next revision of the specific transportation standards, which would then be looked at in terms of the DOT and NRC standards. That's one of the key pieces of the puzzle, and it's more complicated than your statement would imply.

DR. WEINER: I'm sure it is.

CHAIRMAN RYAN: Allen.

VICE CHAIR CROFF: First, very helpful presentation for me to sorting out all of these organizations and agencies, or whatever they're called. Sort of to take maybe the other side of the coin in the dialogue you were having on strategic initiatives with the ICRP, which is sort of an offensive kind of a thing. On the defensive side, I'd observe that from a distance, the ICRP can sometimes be, let's say idealistic to maybe ranging on to impractical, or a little bit off the wall. And does that lead to the need for sort of a defensive strategy in the form of maintaining participation in, let me call it organizations that interpret what the ICRP

does? And I'm thinking about the IAEA, which you mentioned, and maybe I sort of sense that the NCRP in this country is a little bit more. They start from fundamentals of ICRP usually, and sometimes get over into practicalities, and that's where I'm putting the IAEA. But is that involvement sort of in a strategic sense a sort of defensive position against something that might be a little bit wacked out?

MR. COOL: How do I answer that question? I think the answer is yes. In fact, we try actively to participate. Part of that is to take our knowledge and expertise, and influence the things that would go into the various international standards, so that it has the advantage of the things that we've been able to do here.

Clearly, another part of it is to look at the things that are being proposed, and to try and make sure that there is not a significant discontinuity that would cause us problems, should it become part of an international standard. There are any number of things that we could talk about separately, where we are in somewhat of a defensive mode to make sure that that inconsistency can't come back to haunt us, if you will, in various forms.

The international standards, such as the IAEA, we view as a point of reference, and I choose those words very cautiously. This has been an extremely major issue in the Joint Convention on Spent Fuel and Disposal of Waste, as well as the Joint Convention on Nuclear Safety. The IAEA would wish that their standards were the international set of standards, and the "benchmark", put that in quotes, by which various programs were judged in terms of their effectiveness, and whether or not they're dealing with the issues.

We do not believe that that's appropriate. They are a good point of reference. We want to make sure that there's a great deal of consistency, but as you can imagine, in the United States, and in many more developed countries with a very carefully constructed public participation process, Administrative Procedure Act for rulemaking, and otherwise, there is not the possibility that something that was written as an IAEA standard would, in fact, be adopted verbatim exactly as it's seen. There are unique situations and attributes that have to be developed and involved in our process. So not only are we defensive in the sense of looking to make sure

that there are not inconsistencies, but we are defensive at the State Department, and ambassador level to try and avoid an ongoing effort to make the IAEA and other types of international standards more of a grading benchmark, and to keep them as the point of reference, and a useful thing for adoption by smaller countries that have no regulatory infrastructure, and they need something to write in. So we have to constantly walk that tightrope.

VICE CHAIR CROFF: Thanks.

MR. HOLAHAN: If I may, Vince Holahan from the Office of Nuclear Regulatory Research. We have a number of things that we do on a continuum of activities. As Don mentioned, there was this very involved slide for IAEA, a number of committees the agency is actively participating in. The way the process should work at IAEA is the ICRP documents are published. Then they reflect as to how the basic safety standards should be updated. Things have gotten a little out of wack with time, but we have at least three different offices in the agency that are involved in the review of these documents, and of those standards, and those are, again, actively discussed and coordinated with our other federal

agencies.

In addition to that, the NEA does sponsor forums to look at the recommendations. In fact, there will be a fourth regional forum in the Pacific, in Tokyo I believe it is, where they're going to look at the ICRP recommendations, and how it affects their regulatory programs. I believe that's going to be in November of this year. A similar forum could be conducted here in the U.S. with our U.S. partners, as well as the Canadian, and maybe the Mexican authorities. And, again, we have active participation with NCRP. We fund a number of different programs. When the recommendations come out, the question would be, is should there be an update of Report 116? And we will work with the Executive Director, and the President of NCRP and discuss whether or not there should be a review there in the interpretation of those recommendations, and whether or not it should impact our regulatory programs, so we've got a broad range of things that I guess you would say we also do defensively.

VICE CHAIR CROFF: Thanks.

CHAIRMAN RYAN: Bill?

DR. HINZE: Well, briefly, I would suggest

that one of the points that we might make in our advice goes to the third bullet of your Slide 15, and that is that we change the challenge to achieving consistency among the various agencies, but as really an opportunity, because I think that -- I would think that we would have a much louder, and a more effective voice if we could be speaking in behalf of many of the groups in the U.S., many of the agencies. And that would mean that we would try to achieve this at an early stage. And you're talking about these committees, and I'm not certain how all of those are constructed, but it seems to me that liaison with these agencies very early in the game is a very important element. Thank you.

CHAIRMAN RYAN: Thanks, Bill. We are on a short time schedule to finish a letter, so we will be apprizing you when we're going to schedule a draft letter to be looked at in open session here, so that will be coming this week, but we'll be in touch. So this has been a real helpful briefing to shape our ideas.

With that, we are just a few minutes over time, which is fine. We'll reconvene on schedule at 1:00 for our afternoon session. Thank you.

(Whereupon, the proceedings went off the record at 12:12 p.m., and went back on the record at 1:01 p.m.)

CHAIRMAN RYAN: Come to order, please.

This is our afternoon session of the first day, and we have a presentation scheduled from Ralph Andersen from the NEI who will brief the committee on what nuclear power plants are doing to reduce the volume of Class B and C commercial low level radioactive waste.

Welcome, Ralph. Thanks for being with us.

NEI BRIEFING ON LOW-LEVEL RADIOACTIVE WASTE MINIMIZATION STRATEGIES

MR. ANDERSEN: It'S a pleasure to be here as always.

First of all I want to point out that from the cover slide I hope you have concluded already that I'm neither Sean Bushart nor Phung Tran.

Sean and Phung are my colleagues, counterparts, at Berkeley. We work very closely between NEI and EPRI and INPO, so actually we have a very integrated program.

And among other things we work so closely together that it gives us the opportunity to cover for

each other on coast to coast. So Sean and Phung cover for me for most West Coast interactions, and I try to cover for them on East Coast interactions. So although they are here today, what I would like to mention is that we have scheduled a technical meeting with NRC FSME staff on October 4. That meeting is, I believe, from 1:00 o'clock to 4:00 o'clock, and will actually have a much more detailed discussion of some of the things that I'm going to touch on today. So I certainly encourage ADNW staff to attend that meeting. We'll actually be bringing in our contract researchers that are advancing the work that I'll be talking about. And I think you will find it a very good follow on to the discussion that we have today.

So I'm actually going to hit two topics on the agenda. One is to talk about our technical program aimed directly at the primary issue before us of dealing with the B and C low level waste. Be happy to take questions on that. I hope I'll be able to field most of them, but if I can't, I'll take those down and we'll have EPRI follow up and I'll get an answer back to you on any of those. And then again we'll have that opportunity in early October to do some follow on with that.

And then behind that I would like to talk about an effort that we're undertaking now to firm up our policy perspective, our principles, and our strategies as an industry for dealing more broadly with the low level waste topic in conjunction with radiation safety and environmental protection. And that's scheduled as a 2:00 o'clock presentation.

So we'll do them back and to back, and I'll be again happy to take questions as we go along or when we conclude.

This is a graph that kind of lays out the landscape. We've used this graph on a number of occasions derived from nuclear industry, and more specifically nuclear power plant waste trends. And what it simply depicts is that the bulk of waste is generated and disposed of in conjunction with decommissioning of the plant. So you really could look on it as an operating timeline for the existing fleet, 104 operating units.

Several units shut down or waiting decommissioning at a future date for example, the Zion plant, are also included in that.

But what it really tells us you is that beginning around 2035 the whole nature of low-level

waste disposal on the civilian side in the United States will change dramatically in that relatively large volumes of waste will be generated in fairly short periods of time, both volumes of class A waste, as well as volumes of class B and C waste.

What we say here is that disposal options should exist through 2035. What we mean by that is that by nature of the licenses at the existing facilities, and our understanding of what other facilities may come online in the interim, we believe that Class A waste disposal is fairly well assured through 2035. And when I say that, that's always subject to political and sociological changes that can change that overnight, and then suddenly that's not the case.

My recollection is for example that the licenses - oh, I should add one other thing, this also takes into account a consideration of capacity available at the sites. So we really believe that things are somewhat less certain out beyond 2035. And that really is what is conditioning our thoughts on long term strategies, is that we need to be thinking out on a horizon that extends not only through decommissioning in 2035, but startup of new plants,

and the lifetime of those plants.

But our emphasis is very very much on what are all the important things that we need to do between now and 2035. So that's our horizon.

The difficulty with that is you've always got those problems that are staring you right in the face. So what you'll see as I talk through these two presentations is trying to deal with those near term issues that we have to come to grips with immediately while still trying to keep or eye on a very, very distant horizon.

I'm going to talk about the EPRI research program in three parts. I'll talk about the operational strategies to reduce waste. I will talk about what we are doing with the subject of onsite storage. And then I'll talk about what we are doing to help with more risk-informed approach to classification of waste.

In the operating regime, basically, we have generated reports starting in about 2004-2005 what lay out both best practices and now move towards an integrated strategy towards generation of less B and C waste.

The first two documents that are shown

here are really more reflective of best practices than they are of an integrated approach. As we've moved into this last document which is under development now, it really is an integration of the previous work in addition to taking advantage of some more recent research.

Where its focus really lies is in how to change the actual use of various cleanup media, primarily filters and resins, that have the effect of either moving towards an elimination of concentrations of activity that become classified as B and C waste, or alternatively to concentrate the critical nuclides that caused that classification as B and C waste to be in much smaller volumes of waste.

So it's changes in run times, it's changes in the way that you sequence filtration. It's selection of very radionuclide specific media, and so forth. But it is an integrated approach that leads you at the end of the day to have much less B and C waste than we are currently generating.

The difficulty is that not everyone's design or operating regimes are configured to adopt one universal approach. As you might know every plant represents almost a whole different design approach.

So for that reason there are a lot of challenges associated with how to translate the guidance into practice. There is no one-size-fits-all. Just do it like this and you'll have 50 percent less B and C waste by next Thursday.

Rather these will be stepwise, probably somewhat trial and error within specific plants to head towards some optimizing approach given the design and operating regimes at that plant.

So what we plan to do next year is have a workshop to bring people together and discuss how we might go about that, and also how to capture that people gain going through this, and then reflect that back to folks.

I'll mention now, I'll talk about this workshop in another context. We've already made a decision that we would welcome several staff from the NRC to attend this as observers. It's not intended it would, quote, be a public meeting. But we feel it's entirely legitimate if folks want to come and observe and understand what our thinking is.

Moving on to what we're doing in the storage area, and I should mention that we will have a much more detailed discussion on some of the technical

options that are presented in our guidelines at our meeting on October 4.

In terms of storage we actually have been hitting this topic for some time, and actually in parallel with NRC's consideration of the same subject earlier in this decade. And if you look at the second report, actually the third report listed in this timeline, which is interim storage of low and intermediate low-level waste guidelines for extended storage. At the time that was intended to be our somewhat penultimate document on extended storage onsite of low-level waste.

And that paralleled NRC's activity also at that time to develop guidance on that subject.

With the changes in the situation, continued access to Barnwell and so forth, the urgency for that went away.

What we actually are engaged in today in the last item, guide for operating an interim onsite low-level waste radioactive waste facility, is for taking that previous guidance and updating it substantially to reflect changes that have occurred, and experience that has been gained.

One good example of those changes, that

really are still a work in progress, is the heightened focus and development by NRC of how one overlays security thinking and security requirements on the subject of accumulating, storing and safeguarding low level waste.

But other changes also go to issues like anticipating possible changes down the road to what you might be able to dispose of, what form it should be in and so forth. So it represents a very good approach that is relevant in 2007, and may become decreasingly applicable and useful and relevant over time. If we have changes in the external environment with low level waste facilities, and where their thinking goes on what they will accept.

Our intent however is to provide this document in draft to the NRC staff, share it with them at the October 4th meeting, discuss it. And then following that we will actually be submitting it formerly to NRC for review and endorsement as a method acceptable to the staff for extended storage of low level waste.

And our horizon that we're thinking of right now is, the guidelines ought to be suitable if necessary to support storage all the way through and

into decommissioning.

We at the same time are going to conduct a gap analysis in 2008 to do a survey of experience gained in other arenas, from both in processors in the United States, which is the first bullet under tasks, as well as international experience, but for the purpose of really beginning to set the stage for supplements to this basic storage document.

One area of focus that we know we need to pay particular attention to is irradiated hardware. A good example would be control rod blades and rollers. Hardware doesn't lend itself easily to changing its physical characteristics in a way to make it easy to store. It tends to pose particular problems associated with external radiation fields and handling and so forth that make it kind of a unique challenge for us.

And quite candidly, it's sort of our defined test case for doing storage right. You know everything else is somewhat malleable, and you can do a lot of things with it. But the hardware you've got a limited number of options as to where you can store and how you can store it. So that is where we're going to put our emphasis for our next phase of doing

storage safely and securely.

Then finally I'd like to talk about what we are doing in the arena of classification, you know, just setting as a baseline for us 10 CFR 61 was put in place. The number of assumptions were made at that time. Experience was what it was at that time. We've gained an awfully lot of experience since then.

There are differences in the way disposal facilities are designed today, where they are located. There are differences in front end capabilities for people for processing and packaging waste.

So we're making sure we have a good sense of where we came from to figure out where we need to go.

The research activity that we are taking on at the highest level really, one, is to know a lot more about what we generate as it relates to ultimate classification for disposal.

Two is to really go back and make sure that we understand why things are the way they are in both the regulations and the guidance, which is primarily the branch technical positions.

And then this is very deliberately for the idea of coming up with alternative approaches. You

will recall that in a presentation earlier this year, I mentioned then that our intent really was to take full advantage of 10 CFR 61.58, which provides that flexibility to propose alternatives to the commission.

So that's exactly the window that we're aiming at with our current line of research, which has matured considerably since I met with you earlier this year, and we'll do a very very detailed report out at the October 4th meeting.

I think we've talked before about some of our background that we had already covered. But one comment that I want to make is that we have a view, which we are going to want to confirm even more with the staff, while we still have that staff available by the way that can tell us the answer directly before they retire, that our take on this whole approach to classification, what one can do within that realm, was primarily to guard against people throwing sealed sources or other high activity materials in the midst of relatively low activity materials, and therefore, although you might meet some extremely liberal concentration averaging scheme, you are not necessarily helping the performance of the facility to which that material is directed.

But our understanding that we've gained and interactions that we've had is that some of the things that were in there weren't really just put in there as great ideas, but they were aimed at some very very specific terms.

If that's the case - and that's why it's important for us to understand that - we'd like to have the opportunity then to suggest that there are other ways to have those types of prohibitions in place and still allow a much more flexible approach to concentration averaging and classification that maintains the integrity of the performance of the facility which really is the objective, keeping public doses below the performance criteria that are set in 10 CFR 61.

So our conditions for our research is we want to stay within the existing regulatory framework at this point; ideally we'd even like to stay within the existing branch technical position. But we're also looking at options, if we reach that point, of where we might suggest changes to technical positions.

But I will tell you, skipping down to the last bullet - I always like to ask a question, okay, what does our alternative look like. We're slowly

coming to the point where we believe it's just some additional clarification of what is already there more than actually changing substantively things that are in the branch technical position.

But generically what we see is that the classification of waste generated should properly be more aligned with the issue of the performance of that waste when it is displaced at an actual site. But that is the end point.

And so that's where our focus has been. We've done a tremendous amount of data gathering. WE continue to do so. We think we've got a fairly comprehensive database. We cover somewhat more than 50 percent of the plants; actually just shy of two-thirds of the plants with the data we've gathered.

We work through Waste Management Group for a couple of reasons. Their Radban software is employed by a number of facilities as indicated by the numbers. Additionally it is also amenable to manipulation of the data. So it just turned out to really be a great tool for us.

I will mention that where ever we talk about industry totals it is just a straightforward extrapolation of the data to the full number of

plants. It's not particularly sophisticated. It's taking BWR wastes and multiplying them by the appropriate ratio, and BWR waste by the appropriate ratio. So there is that uncertainty where we have extrapolations for the total industry.

So looking at the overall waste profile on an annual average basis for the industry, this is what we really concluded, that 90 percent of the waste is actually dry active waste; that 1 percent of the waste are clean up filters; and that 90 percent of the waste are resins.

And then what you see in the right hand corner are the totals extrapolated from the actual values from our study that are reflected in the pie chart. So for instance, the 612,465 cubic feet of dry active waste really was the actual sum for the facilities for which we had data, and then the extrapolation is 938,000 cubic feet for the entire industry.

In terms of waste classification, if you look at the pie chart on the left that deals with resin waste for the 65 plants that we looked at. And the pie chart on the right is for the filter waste that we looked at.

And again what you see is that the bulk of the wastes are in fact class A waste, and you kind of get a couple of things out of looking at the BNC classifications. One is that they are a relatively small fraction of the volume, that is, 14 percent of the overall waste is actually BNC waste.

And two is that the bulk of that volume that is BNC waste are actually the resins, and there is an extremely small volume represented by the filters.

A comment from an economic point of view is that 14 percent of the waste accounts for about 40 percent of the annual waste disposal costs; $40 million a year for disposal is about 40 percent of the $105-110 million we are currently spending.

Now that cost is at the burial facility into-the-ground cost. That's not transportation, processing and other things that go before that. That differential is entirely the actual disposal costs into a shallow land disposal facility.

CHAIRMAN RYAN: Ralph, just a quick question.

MR. ANDERSEN: Yes.

CHAIRMAN RYAN: Where does hardware fit in?

You don't have that on your list.

MR. ANDERSEN: The - a couple of reasons for that. Much of the hardware ends up being greater than class C. That's one reason.

Second one is, we're still - we put our focus on this, and we are still finalizing the data for that, for the hardware that we have disposed of.

CHAIRMAN RYAN: Because that will shift your pie charts a bit because the action in terms of curies is in the hardware.

MR. ANDERSEN: Yes, and one of the reasons we're trying to look at it separately, it doesn't lend itself quite as easily to a cubic foot type approach. Unfortunately it just doesn't occur in a nice volume.

But we are - we will have that data available in the future, and when we do, I'll find a way to make sure we get it available to you.

Because like I said we're beginning to see that that is the one we really need to put a lot more resources into.

As a preview of coming attractions in later slides, we talked about radionuclides driving overall classification, so we'll jump right into that topic.

So I always like to give the answer first and then walk through how we got there. But nevertheless, when you look at Table 1 and Table 2 sum of fractions, what we find throughout as you'll see is, we really don't have issues with the alpha emitters and the long-lived radionuclides. Our issues are really with the products under Table 2.

And I just want to see - I apologize that the darkness of the graph doesn't do justice. But the large part of the pie on the right for average Table 2 sum of fractions is cesium-137. I'll keep reiterating that as we go through it.

That's a relative contributor to exceeding unity on the sum of fractions to the tune of about 57 percent of the time. That's the way to look at it, that that's the driver.

Nickel-63, you know, in the cases that we looked at, this line, this line, nickel-63 was the contributor, and strontium-90, 7 percent of the time.

Looking at BWR resin streams -

CHAIRMAN RYAN: Can I just back you up and ask another questions?

MR. ANDERSEN: Yes.

CHAIRMAN RYAN: It's very interesting that

cesium is driving the bus as opposed to strontium.

MR. ANDERSEN: Yes.

CHAIRMAN RYAN: Two reasons. One, that tells you what is an artifact of the intruder scenario.

MR. ANDERSEN: Yes.

CHAIRMAN RYAN: Cesium is, from an internal dose perspective, not nearly as important as strontium, and it's only the gamma ray that causes the intruder scenario to further restrict cesium over strontium by quite a lot. I think it's a factor of three or four if my memory serves me right.

So it kind of further points out to me the kind of artificiality and maybe the over-conservatism in the intruder scenario.

MR. ANDERSEN: Yes, and that is part of the insights that I think we shared in one of our previous discussions. This is really enforcing that. You are exactly right.

CHAIRMAN RYAN: Okay, thanks.

MR. ANDERSEN: And that's where we see opportunities.

You know thinking about it a different way too, and I just like to do these things in my mind is,

looking at the fact that the exceedance of the sum of fractions is 2.1, that tells me that in those cases where cesium is really they driver, that something on the order of 30 to 45 years it's no longer class B and C waste.

CHAIRMAN RYAN: Right.

MR. ANDERSEN: Because one half life will get you there. Those are the kinds of things we're starting to think about, okay, what does this mean? How might we approach these in alternative ways if at the end of the day we really can't change the structure substantially, and at the end of the day we really are not able to substantially modify what's available for options in removable waste disposal.

So just taking that as a simple example, that is not a time horizon that is undoable.

I'm going to move through these a little bit quickly. One thing I want to point out, BWR resin streams aren't an issue, generally speaking. You know there are some isolated cases where we do have BNC wastes generated at the BWR, but in relatively small fractions. But when you go and look at the data overall, BWR filter streams and the BWR resin streams, as well as the - excuse me, it's the BWR resin and

filter streams that are really our issue on a large scale.

So relatively speaking the BMC wastes from the BWR resins and filter streams are less problematic in terms of overall volume. Conversely, BWRs tend to have more irradiated hardware that they have to deal with. Unfortunately, there is always another side of the story.

In this table all we've simply tried to do is look at what would happen if there were simply hypothetically no prohibition at all in being able to burn waste in some fashion in terms of maintaining performance of the facility. So this doesn't go into how easy is it to do this. This just simply says, well, what if I could.

And an interesting number is the one actually in the far lower right corner of the Table 2 table. If you took it all and blended it, it actually collectively is not B and C waste in the hypothetical.

So in terms of facility performance, if you took - and again this excludes irradiated hardware - if you took all of the dry active waste, resin waste and filter waste generated by the nuclear power industry and put it in the largest possible container

and homogenized it within the rule of 10 concentration averaging, in theory all you would need is one big giant hole to put it in on the Class A side.

So that's a premise we kind of keep looking at in terms of alternate approaches to classification, as well as alternate approaches to processing of wastes in the first place, and how it becomes characterized, and how it becomes classified, is that as a starting point we are not that far off from not having BNC waste in the first place.

CHAIRMAN RYAN: It raises an interesting notion that the French have in their system. They have an inventory limit, and it points out, and what you are pointing out is another way to come at the same issue, that it is the quantity of radioactive material, not the concentration, which determines the long term performance risks related to a site.

I think that is often missed as a key issue.

MR. ANDERSEN: I agree, and we're there. And that is exactly where we keep getting to, Mike, is that we are perhaps spending our time on the things that don't matter either nearly as much or in some cases don't matter at all. And yet we are all jumping

through huge hoops to satisfy a scheme.

I'll mention - and I know you were at the same meeting - the first reaction of our colleague from the IAEA is how complicated our scheme was to arrive at a fairly simple straightforward answer. And it was exactly along those lines you're talking about, how much radioactivity ultimately goes into the site, much more than whether it comes to the door Sunday or it comes to the door next Thursday, which really is another way of saying concentration average.

In terms of our progress, as I mentioned we pretty much complete the technical work with the exception of the irradiated hardware that we intended to do under the scope of this project. We will be talking out in some detail the results of that at our meeting, which actually will be at the beginning of October. And then we intend to publish our report at the end of this year.

From that you will begin generating ideas for near term actions that we might take in terms of either under 6158 or in the context of branch technical position as well as actions that we can take on our end.

We are engaged very directly with the

major processors and the major disposal facilities. They are already publicly announcing potential alternative approaches to do with processing and storage at centralized sites and so forth.

So there is a lot of dialogue going on there, and what our real intent is to get our thoughts straight on a long term strategy that is viable, and also that is acceptable. At the same time that we come up with these innovative approaches, we recognize that we need to help people understand that we are not trying in anyway to circumvent what the underlying objectives of the current regulatory framework is. We are just trying to understand the criteria that gets you to those objectives, and suggest that there are other ways to get there.

What we have in mind right now, we're beginning the subject - the discussion on the subject of changing Part 61. So we're just doing some peripheral things that kind of go with that. I will comment to you that one option that is certainly on the table, and I will talk about this in the next presentation, is petitioning a change to 61, simply write it ourselves and say, here we are, this is what we think it should be, to push the ball along.

That isn't tomorrow; that isn't next week; that isn't next year. But like I said, all options are on the table with us right now.

But in support of that a couple of things that we are doing is, we really want to understand the original cost-benefit bases underlying the existing Part 61; how were certain values arrived at; where did the thinking come through on that. And then additionally we have made a conscious decision that the issue here is low-level waste disposal, not nuclear power plant low-level waste disposal. It's one big integrated system. So we are committing ourselves to gaining a much better understanding of the nonreactor waste.

We are not prepared to go beyond commercial into the private sector. I don't envision that NEI is going to try to lead the charge for DOE or anybody else. We need to coordinate even more closely with them, and we intend to do so.

But what we'd like to do is get a handle on waste that is generated by our membership, which includes a lot of universities, hospitals, research labs and other folks; and make sure that the approaches that we are considering are suitable across

the whole spectrum of people that generate radioactive waste.

One thing that we are looking at very very closely, we're very engaged in, and we've stepped up our interactions both with the international utilities but also with the IAEA, is to understand the emerging updated scheme for waste classification and waste disposal model that accompanies that being generated by the IAEA and primarily out of the conference last year in South Africa.

We had a preview of that, or I guess an advanced preview of that, in the meeting that was held a few weeks ago out in Las Vegas, and we want to continue talking along those lines of how we might be able to have a more straightforward and simplified scheme for waste disposal, particularly by the way since when you look at the Clive site and you look at the potential site of Andrews County in Texas, frankly the way those sites are located, and especially the way they are designed, goes well beyond the sites that we've been dealing with previously.

Just a simple difference between burying things two or three meters deep at Barnwell versus burying things five meters deep out at Clive. I mean

there are a lot of factors that start to come into play to say, well, what really is the model that we need to be looking at against which to weigh a more appropriate scheme for disposing things.

And I will say, given that DOE has its EIS out, scope document out for review, that includes looking at greater than class C waste too, and alternatives for disposal of that.

So with that I'll be happy to take any questions on this phase. And if it's your pleasure Mike, I could also go through the next presentation and take them all at once.

CHAIRMAN RYAN: Yes, why don't we go ahead and just have you do the second presentation, and then get an integrated conversation if that's okay.

MR. ANDERSEN: Okay.

MR. DIAS: It specifies the other presentation is going to start at 2:00. And there may be people calling in to hear that.

CHAIRMAN RYAN: Are there people calling in at 2:00?

MR. DIAS: There may be people calling in.

CHAIRMAN RYAN: There may be, or there are people?

MR. DIAS: Well, the way the agenda now is, they provide the number and the access code. So some people are going to find out if they are calling -

CHAIRMAN RYAN: Why don't we do the questions then.

MR. ANDERSEN: Okay, that's fine.

CHAIRMAN RYAN: I guess it's very intriguing that the 6158 idea has really kind of taken root with NEI. I think that is good.

And if you look carefully at this whole notion of integrated inventory in terms of quantity disposed versus the concentration metrics which we use for transportation, we use for operational health physics and handling the materials and all that, it's really two separate issues.

You know, 6158 also says that as long as the principal protection criteria are met, which we know well. And I think that's in essence what the French have done. They have looked at this integrated system and how is it going to perform over the long haul, recognizing there is this operational bubble where lots of stuff gets built, and all these disposal cells get loaded and so forth.

So I was intrigued by your comment about

sealed sources, and considering those kinds of things, and some of the other things. What do you think is the role of waste form and waste packaging and waste disposal site technology for lack of a better word? Do you see giving credit for those things?

MR. ANDERSEN: I think not to at this point say that I readily endorse the idea of a national plan for radioactive waste storage which I think was in the most recent GAO report, I really think that it's a good time to involve a large group of stakeholders in formulating what the whole waste disposal system should look like moving backwards from its ultimate disposition.

It seems like, more often than not, we start at the early end. And I think if you do that, then you end up looking at those kinds of things in a really different way.

For example, given the overlay that we have of emerging security concerns and criterion requirements, one might just deem at the outset that some process for a more controlled, and perhaps that is a federal approach to sealed sources, and also the capability for greatly enhanced recycling and so forth, might be more appropriate.

Maybe that's not even a screen you want to mess with through some of these processes. So I'll just take that as one simple example.

Looking at irradiated hardware is the one that I keep coming back with. I mean if I were to sit down and conceive of the best possible matrix in which to have radioactivity, I think I'd like to say, well, how about if I take a relatively impermeable matrix in terms of it requiring a great amount of time to disperse, and if I could just take it atom by atom and just distribute it somewhat through that matrix, sounds pretty good to me.

And then when I say, well, gee, how would I do that, I've got two different ways. One is to build it from the ground up atom by atom, and the other way is to irradiate the hardware.

So looking at that for instance, and treating it substantially different.

So long story short is, yes, I think credit needs to be given for those, but I still think the idea is to work backwards from the performance criteria and what that implies about options within site design, and then move right back through the chain right back to the source of generation.

CHAIRMAN RYAN: And I would add not only site design, but site and site design, because each site will have different things that will be pluses or minuses based on the geohydrology and all the rest.

MR. ANDERSEN: Absolutely.

CHAIRMAN RYAN: You haven't talked much about decommissioning waste, and by that I mean the low end very dilute rubblized concrete or soils or those kinds of things.

Do you see that fitting into this screen too?

MR. ANDERSEN: I do. I kind of skipped through that first overhead. Let's see. We do make the comment that looking at different approaches to this topic of very low activity waste, meaning waste that might be disposed of in some fashion other than what we conceive of now asa 10 CFR 61 waste site, drawing on the French as an analog for one example, and drawing on EPA's ideas on use of RCRA hazardous waste facilities as another example.

We rarely are in the neighborhood of 50 percent or even more of the decommissioning waste could easily be dealt with that way. It's waste that is not dissimilar from the existing natural background

that we live in in terms of concentrations of radioactivity. Which is the way I like to think about it.

So we believe that in regulatory space - and that will again come out somewhat more in the next presentation - that it's very important to pick up on themes that have been echoed by at least one commissioner, that it really deserves looking at those options.

Our personal thinking is that a major option that ought to be available to all licensees, not just nuclear power reactors, our regulatory system that facilitates going to greenfield if that is the decision you want to pursue.

So in my mind anything that gets in the way of that is something that the regulator needs to be looking at. They ought to be making it as easy as possible for the easiest thing you can do is go to greenfield.

And if you have other reasons for not doing that, then you need regulations that help you figure out how to do that part right.

But I see this low activity waste, very low activity waste, whatever name we're going to hang

on it, as a very very important issues. And we know it touches on a lot of hot buttons. But it's one we nevertheless work through.

I will tell you right now, we have not, we do not, and I doubt if we ever will, advocate complete deregulation of licensed radioactive material in the form of solid waste. What we are asking for over and over again though is regulation that is appropriate to the risk, so contrary to what our opponents like to say a lot of times, we don't view - and we said this in comments that we made on the clearance rulemaking packages put out, we don't advocate that. We don't advocate just an absolute, okay, pretend that it's no longer radioactive.

What we've learned from our experiences over the years, and most recently with this issue of treating the groundwater, it's not about the quantity. It really isn't. It's more of an accountability when people say, you generated it, you're responsible for it.

So we don't see that that responsibility terminates. We'd just rather see it regulated appropriate to what the risk is, hence, RCRA sites and other types of options we think need to remain viable.

CHAIRMAN RYAN: Thanks.

Bill?

MR. HINZE: Going back to one of those things you were remarking about, Mike, are you thinking about these siting changes being brought up in a revision of 61? Under my recollection of the siting requirements, what Mike is talking about you'd need a lot more flexibility than is provided in 61.

MR. ANDERSEN: Yes.

MR. HINZE: I just want to make that clear.

MR. ANDERSEN: That's the long view. We don't see that as a short term issue.

MR. HINZE: Is the location of the low level waste sites important? I recall, and maybe it was a presentation you made regarding the costs that are involved in the transportation as being a dominant factor. And of course there is also risk in that.

Is there - are you and your colleagues thinking about any aspect of this in terms of the siting of the low level waste sites near the center of the nuclear waste plants?

MR. ANDERSEN: Although a partial answer to that is yes, I think from a practical point of view what we are considering is the possibility of more

regionally or a centralized base processing, consolidation.

MR. HINZE: Off site?

MR. ANDERSEN: That is - rather than the sites themselves perhaps being closer to the generator there might be opportunities to do things - I suspect that the ideal locations for the sites are going to remain the direction that they are going, the relatively drier and less populated areas.

So our focus instead is to say yes, but what if again, there were no prohibitions against loading waste, against focusing yourself on what's the best possible form to put it in for ultimate disposal at those sites, and gaining cost efficiencies in regard to transportation that way, where it is brought together, consolidated, and repackaged.

MR. HINZE: Along that line, when you speak about averaging, are you saying mixing?

MR. ANDERSEN: Yes.

MR. HINZE: Physically mixing?

MR. ANDERSEN: Yes.

MR. HINZE: And what kind of problems does that lead to in worker exposure? Are there some tradeoffs here?

MR. ANDERSEN: Well, it depends on how and where it's done. If that were to be attempted, if the constraint were that that had to be by a licensee - let me make a comment to sort of set up what I want to say.

We've gone to great pains to make sure that this atom doesn't get mixed with that atom, because this is Joe's atom and that is Jim's atom, until we get to the waste site where it matters. And then we say, hey, throw them both right there.

My thinking is, why can't Jim's atom and Joe's atom come together a lot before that, whenever it makes sense.

So if we were to try to do that process at our facilities, if you just take a nuclear power plant as an example, but a university hospital or anybody else would fit the same bill. It's not why we went into business. It's not a waste processing facility.

But if you had a centralized facility of assisted engineering, we do that at reactors all the time. That's why our occupational doses are so low.

I don't want to say it's a piece of cake. I just want to say that's some time, money and engineering time.

MR. HINZE: Well, it's been I think almost 20 years since I've been to Barnwell, but aren't B and C waste separated from A waste?

MR. ANDERSEN: They are, but my comment is, that's because of the way we do business today. We throw B and C waste - throw the hot stuff in a big lead-lined cask and ship it down the road.

CHAIRMAN RYAN: Bill, let me add, that was a choice based on the soils engineering and occupational radiation exposure of workers. It had nothing to do with the requirements.

You can segregate B and C waste from A waste in the same disposal cell under the regulations. That's not something you are required to do; that was a particular choice.

MR. HINZE: It wasn't regulation driven.

MR. ANDERSEN: See, my comment though is that there wouldn't be a particular choice. That's the purpose of the mixing. Then you are not dealing with that you don't need one thing I would say right now, I no longer believe we need those classifications. I think there is low level waste that needs to be protected at a particular level which from my point of view encompasses just about

everything we generate from a nuclear power plant. And then there are other things.

But I don't envision that from an exposure point of view that that needs to be a problem if that's accommodated on some central basis at a facility that is set up for that purpose.

CHAIRMAN RYAN: Bill, if I may, there's an important point, and I think you could maybe expand on it. The wastes that were being generated when the 10 CFR 61 was analyzed and put into place were very different, particularly in the nuclear power industry, than the wastes that are being generated today in the nuclear power industry.

I can remember the days of just huge volumes of solidified concrete and other things which now, that's not used all that much. You know, use dewatered resin and even some more sophisticated techniques that clean water systems and produce very low solid volume in high activity concentration.

But the same amount of radioactive material got buried. So that's an important aspect. There's been I think a huge shift isn't an overstatement in what people are actually generating.

On the DAW side, again, there's been quite

a shift in what's being generated, and how it's being packaged and treated and prepped and disposed and all that.

Is that fair enough?

MR. ANDERSEN: I will say that personally I was in that business in `73 - `75. We actually made about 60 percent of all waste shipments in this country during that time, because we owned all the casks. And that was exactly the problem.

And you are exactly right. I go out to a plant today, and I see what we are generating, and how we're packaging it. It's just a night and day difference.

But those always have to be in consideration, because at some point you need to handle that stuff. And so my simple comment is, great. Let's figure out in our facilities that are designed to do that specifically instead of trying to do it in the open air in a burial trench, or at the far end of a transportation route.

MR. HINZE: A final question. It seems to me that your graph there tends to be conservative. You haven't considered anything in terms of new plants coming online, and what we are hearing is that they

will be coming onlne.

MR. ANDERSEN: It's even more fundamental than that. What I hope for fervently, and what I'll lay a dollar on the table for right now for anyone that takes the bet, that 2035 mark on there really should be 2055 for the existing fleet. So that's step one.

I'd like to see the plants operate for an additional 20 years. But secondly, you are absolutely right, we haven't factored in the impact of bringing new plants online, because if we have another pig in the python type of graph like that, then that bulge would be out in theory 60 years from about 2015 through 2025 when those plants start coming online.

And that's why we are really trying to take that view of, we need to figure out a system of services for 100 years. And think about the fact that we actually have a considerable amount of time available to us if we are willing to work at it. We don't have to solve this in three or four or five years.

So that is the horizon that you will see reflected in my next presentation. We've reconfigured our approach to the issue at an executive level to put

that view in place. And we need to consider larger alternatives for much longer timeframes.

Because like I said, one answer you might come up with is, there is a lot of stuff that maybe I shouldn't be putting in shallow land disposal. Hospitals and universities decay stuff everyday because they have relatively short half-life stuff. The point I was trying to make with the cesium-137 is by the same rationale putting some of this stuff above ground regionally, it might go to a different site than it would if you shipped it somewhere today.

If you were willing to say, hey, I'm fine with a 100-year timeframe for decay.

MR. HINZE: Thanks very much, Ralph, I've taken more than my time.

CHAIRMAN RYAN: One of your, I guess maybe it is the last slide, you talked a little bit about this IAEA disposal model. And I'm assuming you are referring to this - they are working on some kind of a proposed waste classification system.

MR. ANDERSEN: Yes, it's an updated approach to waste classification that will be in a report. I think their target was about the end of 2009, or maybe it was early 2009.

In their scheme, they actually do work backwards from ultimate input. But in very simplistic terms you've got something analogous to very low activity waste, for which disposal is somewhat analogous to other day to day hazardous trash that we deal with.

So I'll call it sort of shallow land disposal light. You've got stuff that would be classified as, quote, low level waste that would go to something analogous to our current shallow land disposal approach.

And then you have intermediate level waste, which just for simplicity I'll say is probably more analogous to our B, C and greater than class C waste that simply goes to an enhanced shallow disposal, somewhat deeper, somewhat larger cap, perhaps some other engineered features. Certainly nothing like a geologic repository.

And then all that's left is what we today call high level waste, used nuclear fuel. And that's the stuff for deep geologic repositories.

But the key is that it envisions that you have the bulk of your waste, a very large fraction of it, going to sites that are designed and regulated to

the level today that we use for - we call them landfills, but actually they are subtitle D RCRA facilities. They are regulated, and there are standards.

You don't treat them uniquely because this happens to contain some radioactivity.

CHAIRMAN RYAN: Basing a waste classification system on disposal technologies and destinations seems to make a lot of sense. But when we, meaning this committee, last saw the IAEA proposal, which goes back probably a year at this point, it was very - when you drew it on a piece of paper or graph it was very complicated.

And it looked to be almost unworkably complicated.

MR. ANDERSEN: Their cartoons have gotten better.

CHAIRMAN RYAN: By better you mean simpler?

MR. ANDERSEN: Yes. I share your concern. And I think they have been taking those kinds of comments on board.

They are not there yet. I think they will benefit from a lot more input from Larry Kemper and his folks from NRC and others. But they clearly are

getting the message that there needs to be a much more simplified scheme.

CHAIRMAN RYAN: Okay, and separate subject. At the outset you were talking about operational strategies or tactics. And if I understood it, one was to not generate as much or any B and C waste by altering for example, just not leaving a resin in as long so it doesn't get loaded up to B or C levels.

But isn't that maybe not in the spirit of risk informing, of what we have been talking about most of the time? Because the total inventory ultimately is the same.

MR. ANDERSEN: That's right.

CHAIRMAN RYAN: It's just spread out over a bunch more resins. So what you end up sending has higher volume, same curies.

MR. ANDERSEN: What you ended up sending was waste that's in conformance with current NRC regulations. So my criticism is of the regulation, not the person that is trying - I know that you are not trying to be -

CHAIRMAN RYAN: I understand that you have been given the rules, and you are doing the best you can in the interim.

MR. ANDERSEN: Yes. Because you are exactly right, you are generating larger volumes of lower activity waste. That is - now what I'll tell you, though, and that was what I was hoping to highlight in that earlier slide, we are taking a much more sophisticated approach to that, to simply not being doing that.

That is a part of the strategy, but that's not even the key part of the strategy. It really is a lot more in how you arrange the actual filtration media and sequence. Plus that you are, one, tending to use things that tend to distribute the waste more uniformly over a larger volume. And secondly, that you also employ strategies that filter out, for example, the cesium-137 on the front end, in a relatively small volume, just accepting that, hey, I'm going to have some higher activity waste in a much smaller volume.

So I agree with the spirit of your comment, and I want to be responsive to that. We don't want to just take that solution of dilution.

CHAIRMAN RYAN: Okay.

Mike, I think you may have someone on the bridge.

VICE CHAIR CROFF: We have somebody on the phone. I don't think we signed you in when you signed on. Could we find who's on the phone, please?

MS. DeRICO: This is - am I the only one?

VICE CHAIR CROFF: So far.

MS. DeRICO: It's Dianne DeRico, Nuclear Information and Resource Service.

And I guess to two or three of the staff, if the documents could be emailed or faxed, I haven't received them, but are being discussed.

But I did have a question if I could?

CHAIRMAN RYAN: Well, not at this moment. Let me just say that we'll sure get you the documents somehow some way, but we're working on that now. And we'll come around for questions, probably at the end of Ralph's second talk, if that's all right. Because we have a little bit more time in our schedule there. We didn't want to be out of schedule too much for the other presentation.

Okay?

MS. DeRICO: Okay.

CHAIRMAN RYAN: Great, thanks.

Ruth.

DR. WEINER: Thank you.

Would it make sense, since you are drawing out a very long timeline here, would it be possible for some of your irradiated metal to simply be stored on site that's dry, and just allow it to decay to class C?

MR. ANDERSEN: That may end up being the answer. You know, the good news about bad news is that it's bad news, so you have to respond to it.

Obviously it's desirable to be able to process and ship waste relatively expeditiously. As I mentioned our business is generating electricity, not becoming a waste management facility per se.

But given the options that are going to be available to us after July of next year, it incentivizes us to look at those other alternatives to actual alternative disposal, rather to look at things like that.

And that is where we see it going with the irradiated hardware issue, is to step back and say, well, I don't necessarily have to limit myself to how can I dispose of this soon. If I'm going to have the site there anyway all the way through decommissioning, why not look those kind of alternatives.

But that's one of them.

DR. WEINER: Thank you. That was the only question I had.

CHAIRMAN RYAN: Thanks. Dr. Clarke?

MR. ANDERSEN: Let me couple that with something else. It's also in recognition of the fact of where we are with the existing used nuclear fuel, and greater than class C waste. One would have to weigh out in that timeframe when and if we are going to be able to really totally decommission the site. So there's that consideration as well.

CHAIRMAN RYAN: Dr. Clarke?

DR. CLARKE: Just two quick questions, Ralph.

I think you answered one of them. In generating the curves on that first slide, did you go with just license renewals that are in place now? You didn't make any assumptions about license renewals?

MR. ANDERSEN: We assumed that 100 percent of the plants would renew their licenses to generate the curve. Whether they do or not, the curve is probably still reasonably representative of where you would be.

And yes, for one 20-year license renewal.

DR. CLARKE: Okay. And then another quick

one, have you looked at the topic of low activity waste in RCRA subtitle C landfills came up and it has come up before, I wondered if you looked at where those landfills are compared to where the reactors? I think you've got a very favorable disposition with respect to reduced transportation cost and risk. I just wondered if you had mapped that out. There are a lot more of those, and they tend to be in industrial areas.

MR. ANDERSEN: We have, but we recognized a couple of things. One is, it may not be desirable to try to make that shift generically across all sites. It might also be preferable to not start with the premise that it would have to be, quote, an existing RCRA subtitle C facility.

The way I view the title, subtitle C facility, is its descriptive of a type of facility. It doesn't necessarily have to be referent to those 20 or 21 facilities that exist today, nor does it mean that you necessarily should be commingling al different types of waste.

Those are questions one would need to answer going through. But the real notion was a site that doesn't have to be licensed and designed as a

Part 61 disposal site that can also take DNC waste.

And a good analog is Clive itself. It's a class A disposal site. It's not intended to be a class B and C disposal site. So it's adjusted in theory to what it wants to be.

So if you had some other intermittent category then you could begin thinking in terms of criteria that are suitable for that level of radioactivity that might still be called a 10 CFR 61 supplement 27 low level waste disposal site.

So wherever I use that phrase, take it as descriptive of a type of site rather than specifically one that is licensed under those criteria.

DR. CLARKE: I understand. Thank you.

MR. ANDERSEN: Okay. Diane, we have time for you to fit in a couple of questions if you have them at this point.

MS. DeRICO: It's still a little hard to hear, so I apologize if I'm repeating something you have already explained. But I wanted to know how much the processing, different processors will be utilized to maybe change the classifications of wastes to enable them to meet acceptance criteria at various types of facilities?

MR. ANDERSEN: You want me to -

CHAIRMAN RYAN: Sure.

MR. ANDERSEN: Actually, Diane, a considerable amount of -

MS. DeRICO: And is that Ralph?

MR. ANDERSEN: I'm sorry, it's Ralph.

MS. DeRICO: Okay, I thought so. I just wanted to be sure.

MR. ANDERSEN: Okay. Actually a large majority of our waste is actually processed today. So it's not a substantive change to the infrastructure that is already in place.

It would be changes in terms of coming up with products that better support the performance characteristics of the low level waste site. Because today the prohibition really is that I can't mix waste A and B together, even if it gives me a better waste form for disposal.

MS. DeRICO: I also wanted to ask, I understand that resins are being incinerated, or not incinerated, that's not the right term, but thermally treated. Does that change it from a class C to greater than C, or what is the purpose of doing that treatment?

MR. ANDERSEN: The purpose of doing that treatment is volume reduction, and also, it creates a more stable matrix for the materials, so that the radioactive material is less dispersable.

Think of it as a very high temperature melting. It is definitely not incineration.

MS. DeRICO: So does it like reduce by half? Or what's the -

MR. ANDERSEN: The volume reduction ratios for the different technologies range anywhere from about 50 percent to about 75 percent.

MS. DeRICO: But it still stays within class C?

MR. ANDERSEN: Yes, in fact as it's used currently it actually concentrates - if you think about it, if the volume is less and the radioactivity is the same, you've actually got a somewhat higher concentration.

MS. DeRICO: Right. So I was just wondering if it ended up being maybe greater than C sometimes after the -

MR. ANDERSEN: Not to my knowledge.

MS. DeRICO: Okay, right.

CHAIRMAN RYAN: All right, thank you.

I will mention that we did have a letter that was submitted, and it'll become part of the record and is available now from Studwick, Incorporated. A letter signed by Joseph P. Camillo, addressing volume reduction and related issues.

And I believe they actually do the resin treatment that you mentioned. So this will be available as part of the record as well. And I just wanted to make mention the fact this is available to participants in the room. And Diane, I'm sure this will be in the things that get faxed to you.

MS. DeRICO: Thank you.

CHAIRMAN RYAN: You're welcome, my pleasure.

With that, Ralph, round two. Do you want to take a stand-in-place two-minute break? Or are you good to go?

MR. ANDERSEN: No, I'm good to go if you are.

CHAIRMAN RYAN: Let's go.

MR. ANDERSEN: All right.

I'm probably going to need a little assistance here to get to my other presentation. I'm not sure.

(Off-the-record comments)

MR. ANDERSEN: Okay, for this presentation I will be myself. Again I compliment the EPRI staff. They put together a great presentation. And once again emphasize that you'll enjoy seeing the technical depth presented in early October.

What I'm going to talk about now quite simply is how we are restructuring our approach within the industry to evaluate not only the low level waste issue but several other issues on a much more strategic footing.

And especially in recognition of the extended operating lifetime of the current fleet, and the increasingly likely onset of new plants being brought online.

So with that I had mentioned previously the trouble you always when you want to look at the far horizon as things keep getting in the way. So I labeled those near terms issues, the issues that really are knocking on the front door are exemplified by the scheduled restriction of access of the Barnwell facility in July of next year, at which time I think approximately 80 percent plus of our plants and really a very considerable fraction of all licensees in the

country will not have a specific place to dispose of DNC waste as it is currently classified.

Another issue that accompanies that is the issue of the need for extended storage of the material. I labeled it here onsite storage, because that is the option that is immediately available to us, and potentially for the long term.

And then finally another artifact of the Barnwell site restricting its access that I think keeps getting overlooked is that it does represent a decrease in the options overall for low level waste disposal. We will be going from three sites that accept commercial class A low level waste to two. And one of those two, namely the one in the state of Washington, really only services a limited number of states as well. And I misspoke myself in a way. We will be going from two nationally accessible sites to one, and we will be going from three existing sites to still having three sites but two of them will be very restricted. Economically we will have to see how that plays out with the Barnwell site.

So there is a lot more vulnerability to ending up, in effect, with a single low level waste site for practical purposes.

I'll just comment as an aside though that we recognize that there is another potential site on the horizon, but that site also is being designed to be quite limited to servicing two states at this point.

So I mentioned the issue of it's always good news or bad news. But we do see some opportunities because of this. It's really heightened the awareness and attention of our industry, within our regulatory agencies, among the public, members of our governments, both state and federal.

So we - what we see is that whenever you've got the attention, make the most of it. And that's kind of the approach that we are taking.

So the opportunities that we see are listed here, but just to highlight a few. One that I talked about in a previous presentation, or actually two of them, are a much more aggressive approach to B and C waste reducing as well as innovative approaches to storage and processing; things that frankly folks just didn't want to spend the time on previously, because economically there really wasn't a driver for that.

Along with that we think that it allows

people to think much more broadly in terms of what we might mean by reform in the regulatory framework. I will say additionally that I think previously we talked more in the context of risk informing within the current model of waste disposal in this country. And additionally of simply updating a lot of the criteria.

Now one can step back and say, yes, but what if I were to change really the basic model? And that's where we see the opportunities are.

And clearly we've got a lot more access and engagement with a very wide range of stakeholders.

But what we decided to do is, we recognized that we have similar emergent type of change issues coming at us in other areas, so we've actually formed an executive working group on radiation safety low level waste management and environmental protection.

For your information, that working group is chaired by the senior vice president and senior nuclear officer from Comanchee Peak Luminant Power by the way is their new company name; it used to be Texas Utilities. Mike Levins and the president of Entergy operations, Mike Hanson.

So it's at a fairly high level. And then we have a group of industry executives, and also program managers on the working group.

Their focus is strategic. It's to be proactive. And it's really to look out on the full expected life of the nuclear industry, and to consider what are things that we need to do to have the necessary infrastructure in those areas to be able to operate safely throughout that entire timeframe, safely and economically.

Then within each of those three areas we've formed technical task forces, primarily of program managers in those respective areas.

And then finally we have several peer groups of folks where the whole industry gathers periodically, usually about once a year, to talk about other issues in each of those areas. So we utilize all of those in concert for the purpose of developing industry policy principles and strategies.

There are a lot of things that come up quite obviously all the time where when you really look closely you find that the industry, and for that matter even others, don't really have a well defined, well articulated consensus. You might start off by

thinking, oh, I think we all think this. But you realize you have not gone through a process to make sure of that.

So our intention over the next six months is to reach closure in all three of those areas. What do we think? What do we advocate? What do we think needs to be done? So that when we present those views we are speaking collectively for the entire industry.

And in fact that's how our advisory process works as you know in other areas. A good example is use of nuclear fuel. However complex and difficult that issue is, at least the industry has ve3ry well articulated approach to the issue, a very well articulated policy, so that folks don't have to kind of wonder, well, what do they really think.

That's the same thing we're trying to accomplish in these other areas.

The summary on our thinking is, right now, so I'll call it our near term strategy, is that we are making preparations at all of our facilities that will be affected, to safely and securely store the B and C low level waste. So that work is underway right now.

So what we are looking at as a group is what do we need to put in place now and in the near

future to support that. And we are implementing operational changes as we speak to reduce the generation of B and C waste.

And again although we are proposing to have a workshop on these topics next year, nevertheless be aware that people have been making these changes for the last couple of years, and are making them very aggressively now, especially as they approach July of next year.

And then the other thing that we are engaged in actively now is evaluating long term options.

In the near term, we are reforming our industry research program, which has primarily been an operational support program up until the last couple of years ago. What we have done is try and put it more and more on a strategic footing.

I will say that it's just the nature of how we do business that we, especially in our R&D program, we have tended to think of it as kind of a year-to-year zero budgeting approach. For those of you that have been involved in those efforts you know how limiting that can be.

So now we are trying to come up with much

longer time horizons for project planning and resource allocation.

Another issue that certainly has come to the fore is the onsite storage guidelines. Again our intent is to discuss those in draft with NRC in October, and then we'll submit them formally and hope for NRC endorsement, which will probably involve some RAI type process, and issuance of an RAS or some other document to do that.

I've got other things listed here. I've talked about those at various times, so I'm not going to go into them in great detail.

But one thing I'll say is that we are very much looking at a lot of options. And I'll say now and I'll say in the future, as we interact with this committee, with the Commission, with the public, and others, don't get confused that we are looking hard at an option, or that we've already made a decision that that is the option and we are advocating it. Everything is on the table. That was the decision that we made at a meeting that we had last week.

And at this point we are not going to take any option off the table. And I will make a few exceptions to that.

We are not pursuing deep seabed burial of waste, and we don't intend to rocket it into the sun. So when I say every option is on the table, there are some qualifiers on that.

Most importantly, what we surfaced is a starter set of questions that as an industry we need to develop answers to, where do we stand. At first blush some of these people kind of laughed and said, well, gee, some of these questions are kind of obvious. Do we really need to spend the time on it.

So we just decided as an exercise, well, let's spend a little time on it and just test that out. What we suddenly found was, they all needed to be on there, because truthfully, people's views were all across the landscape.

I'll take a real simple one: access to federal disposal options, access to DOE sites, whatever. I was one of those for instance that thought in the discussions that we had last week that we could just very quickly take that off the table.

As we talked more and more about it, what we understood is, no, we shouldn't take it off the table. What we really need to do is evaluate it thoroughly and completely understand the implications

of that whether or not it comes off the table at the end of the day.

Now it's interesting, because when I had that same - made that same comment in a meeting last week, a reporter came up to me at a break and said, wow, this is really great news. So the industry supports access to the DOE sites. So again, I put that caution in there.

These are questions in the making, not answers. That's why I went back through my presentation and put a question mark after each one. Maybe that's where the confusion was.

But to go through these, I just want to highlight a few of the considerations that we look at.

You know one is this notion that creating simple processing, packaging, even storage, those are options that have already been surfaced publicly. Clearly the things that we want to understand from that are unintended consequences associated with how long and responsibilities, possibility that waste need to be returned to the generators, that kind of thing.

So there's - although the ideas are springing up already, we want to be very cautious about just immediately jumping on and saying, oh yes,

that's great. Let's go do that.

The DOE sites, one of the concerns we have there is that even if one concludes that that's worth pursuing and that's a viable option, something you ought to worry about is a chilling effect on the marketplace.

Will the commercial marketplace develop innovative solutions to some of these problems if what they believe is that ultimately people are going to pursue a federal solution? It costs money to develop alternatives. Would they want to make that investment? Would they want to suffer any exposure that they have to suffer in carrying out ideas? Do they really want to invest in a campaign to get people invested into some of those options.

So we've looked at one like that as something that we need to figure out that the answer is probably not yes or no. It's probably a structured answer that takes into account a desire to continue to have a marketplace look for solutions.

Likewise with the issue of a federal title, and the real thing we looked at there, and I'll say this with confidence here now, we've recognized that not everyone is positioned the same way we are to

deal with storage of class B and C radioactive waste materials after July. We recognize that that landscape is getting defined, but is not yet defined, in terms of other types of licensees.

So one of the things that we want to talk amongst ourselves about is, be prepared to respond rapidly to supporting federal attention where it is needed, making it clear that we are not trying to be the camel's nose under the tent. That is not the idea.

So we want to articulate ourselves clearly in an area like that to say, hey, we want to be supportive of helping solve those problems without the notion that once they get in the door we're going to try to crash in right behind them.

Encouraging development of other commercial sites: at first blush you kind of think, well, we should, but if you think back to the graph that I would show every time, there is not a marketplace for that.

But if you suddenly think in terms of long time horizon, what you see is, you will need more than one commercial site at some point in time. So again that is not - that doesn't turn out to be a yes-no

question.

The petition rulemaking to Part 61, I already mentioned that. That will be a big topic for discussion for us over the next several months. But in essence it's recognizing the limited resources available to NRC and making a very conscious decision to make the major investments necessary within our industry, not just to send in the three page letter petition. I'm talking about sending the rulemaking package to the NRC.

The alignment with international standards, totally agree. I don't think there is an immediate impression that it's ready for prime time, but starting at the top is there a general notion that we ought to be - that there are advantages to a consistent framework between countries? You know, an issue that comes up from time to time and causes different types of reactions is this idea of, are there - I'll say it this way. What are the reasons why waste can't cross international borders for disposal?

Now there are reasons why that isn't happening, but what are they? And should they be?

So I don't want to start with the premise

that the U.S. will always dispose of its own waste within the U.S. Because frankly we can't find the hard stone tablets that said that will be so.

Conversely, we also believe that there is value in being able to explain our frameworks in a way that makes sense nationally and internationally. So we start with the premise that there is value in harmonization at least in the frameworks. Right now there is no connection at all.

And frankly there are a host of countries right now that if we follow suit like we did so well in the radiation protection world, it would be a them-and-us situation.

Here's how we do it on the planet earth; here's how we do it in the United States, which is another planet altogether.

So we'd like to take a look at the opportunity to possibly avoid that.

And then finally the big question that looms out there over and over again is, are changes to the low level waste policy act. Our simple premise there is, be careful what you ask for, you might get it.

But that's something that although

initially we were kind of inclined to say, no, that's not where we're at, again, if one overlays a horizon of 30, 40, 50, 60 years, that's the way to ask that question. Is the low level waste policy act we have today expected to service the nation adequately in 2065? We really need to take a look at it in that context.

So this was of necessity kind of a brief conversation, because I hope we have more time for discussion than we do. And I'll be happy to take questions. In fact maybe what I'll do is just leave that up there.

CHAIRMAN RYAN: Jim.

DR. CLARKE: I just have one question. I guess it's your slide four, you don't really need to go to it unless you want to.

But you mentioned an EPRI conference on low level waste management decommissioning that has taken place, or that will take place?

MR. ANDERSEN: No, that meeting is actually the third full week in October in Vienna. It's cohosted by the International Atomic Energy Agency.

DR. CLARKE: Okay, thank you.

MR. ANDERSEN: Its focus really is on waste

management related to decommissioning. Then next summer, and in fact every summer, EPRI hosts a U.S.-level meeting, although we do have some international participation. The focus is more on waste management in general.

But this particular meeting is usually every fall on a more international basis. It's really waste management coming out of decommissioning. But again as you see, that's the big waste management project.

DR. CLARKE: Thank you.

CHAIRMAN RYAN: Ruth?

DR. WEINER: Where does transportation fit into your consideration?

MR. ANDERSEN: It's being addressed. It just doesn't happen to be addressed in the context of this working group. We recognize, you know there has been an ongoing effort there really driven by some security considerations, and also with changes being made in our national - and what we have on our plate right now is for the two groups to nominate a few people to get together and figure out how to coordinate those two efforts.

Sorry I didn't have more on that. But

you've seen Felix Killar I believe previously in front of your committee. Felix had some of that particular area. And he and I have agreed that we've got to integrate these discussions.

DR. WEINER: That's the point I was going to make. Because invariably what happens with transportation is that it's the last thing anyone thinks of, and it's always an add-on, and that's always ineffective for one reason or another.

My other question deals with your very last point on your very last slide, if you could go back there. And that is, changes to the low level waste policy act. It's very clear that the whole compact idea has not borne fruit. Are those the changes - is that the change that you're thinking of? Or are you thinking of - that it would be a good idea to scrap the whole business and start over?

I just would like you to expand a little bit on that if you could.

MR. ANDERSEN: Not to dissemble, but it's really both. One is to look at whether there are ways to make the contact process, which really is a state authorities issue process, work more - work. I want to say work more something.

It's interesting to me that there are different sectors that I encountered that sincerely tell me that isn't it a great success. And there is a lot of justification for that point of view.

By the way those groups aren't people that generate low level waste. But nevertheless, I kind of understand the gist of what they are trying to get at. But that's one way we want to look at it, is how could we make it work from our point of view better?

The other point of view will have to come from where we envision we need to be, and that's why I mentioned that long term horizon. What would the legislation be that would enable a vision of where we need to be? That's really doing a magic slate on the legislation and saying, okay, now, what would I replace it with in the long term?

And we are not - like I said, we have started thinking some of these were no brainer questions. As we began talking about them, we understood, no, every one of them needs a lot of work to really come to the right answers, and that we are going to be dumb if we step right out of the box and throw some yeses and noes on these. We will create blind spots in our thinking, and I think the

unintended consequences, we are going to influence other stakeholders in ways that we didn't intend. We will influence the marketplace in a particular way. I mentioned some examples of that. We'll influence probably thinking in a particular way, where again, it wasn't intentional. It would just come out that way.

So that's one that's really going to take a lot of thought on our part, especially because it's so politically charged.

I do think it's both, though. We really need to look at if there are legitimate changes that can make the existing process work better in the near term, we need to be willing to think hard about carrying that forward, despite the concerns that once we open the act, that something bad will happen.

DR. WEINER: Thank you.

CHAIRMAN RYAN: Allen.

MR. HINZE: Very briefly if I can, Ralph, it seems to me that in terms of these near term actions that you had on the list, with the two-year window that you have available, that you must be doing some thinking about the onsite storage other than ending it to the moon or deep seabed storage.

What kinds of thinking do you have in

place? And you are going to need the NRC endorsement of those procedures. And do you see the two-year timeframe here as a problem in getting that - those guidelines approved?

MR. ANDERSEN: Well, not really. The - I've shown a slide in the other presentation that actually showed we've been focusing on this issue since about 2002. So really they draft guidelines that we currently have are a product of a number of years of thinking and interacting with the NRC in meetings over time.

So that's the first thing, a fairly mature guidelines. They take into account uncertainties about acceptable waste forms in the future. They take into account the possibility of biological growth in media. They take into account the very extended time frames dealing with the packaging and containers you choose to use for storage.

They take into account the types of events that might occur.

Where we are at in terms of the NRC staff, on July 1st, 2008 there will be 83 plants if my memory serves me right of the 104 operating units that will cease on that day shipping B and C waste. So they

will start storing waste on that day.

MR. HINZE: So it's less than a year.

MR. ANDERSEN: So they are going to use the guidelines. And what I commented to NRC is, endorsed or not, they are going to use the guidelines. That's not permission to store; that's just a standard approach to it, really to facilitate a congruence between what we're doing and what they are overseeing and inspecting.

So it's not critical that by that date that they have already endorsed those guidelines. But what I see happening between now and then, and where I really think it's valuable, is with interactions that we will have sharing views where we say, ah-ha, modify something, be responsive to that.

So what I'm confident of is in that timeframe we'll touch on any of the bigger issues, even if we'll all arrived at a point where they have issued a piece of paper that says we formally endorse this guideline.

But I also believe in talking to them this is something that they can do in the 2008 timeframe, and that's what we'll be asking for.

MR. HINZE: That's great news. What kind

of onsite storage do you have in mind?

MR. ANDERSEN: There's two very simple basic types. One is a fab-based storage which is probably not the right answer for the extended long term.

And then the other is actually within a building. We published guidelines previously dealing with outdoor types of storage and considerations that go with that. These guidelines are more for the premise of storage for very extended periods of time, so on the order of 10, 20, possibly even 30 years.

MR. HINZE: Barrels?

MR. ANDERSEN: What they envision is facility operation, inspections, surveillance, that type of thing. It's really how - they really are guidelines for how to operate through waste storage program, for a very, very long term, where you have to be aware that the day somebody says you can start shipping again, the form in which you stored things may be different than the form in which they would like to receive it.

So it's looking at recoverability if you will in some of the forms that you might select. It's looking at day-to-day surveillances that make sure

that the integrity of the containers is satisfactory, and that you are not getting in growth of biological media. And it's also treatment and processing options that are available to you to prevent that as well.

But it's really the whole gamut, crane safety, fire protection, all those thing.

MR. HINZE: Build barrels that are latched, that come with the covers latched?

MR. ANDERSEN: Suitably for some forms of waste, but not many to put it candidly. Remember we are talking the B and C waste primarily at this point. And the focus that we have is not for massive storage of all of our waste. The focus that we have is for B and C waste, which really is resins and filters.

MR. HINZE: Thank you

MR. ANDERSEN: And irradiated hardware.

CHAIRMAN RYAN: There's a bigger question, it's a little bit beyond just the nuclear power industry, and that is, all our storage becomes extended because of the lack of B and C disposal as well. So that is a broader issue overall.

Could you come back to your last slide again?

MR. ANDERSEN: Yes.

CHAIRMAN RYAN: That recent meeting you mentioned, I pointed out the low level waste policy act and its amendments exist because the states asked for it, three states in particular, and they got it.

I just wonder what the will of Congress would be to take it up again.

MR. ANDERSEN: Yes, and I think that that what will be difficult, especially when we're thinking about the long term, is to distinguish our view on how doable something is from what we believe is needed.

CHAIRMAN RYAN: That's going to be a hard dynamic.

MR. ANDERSEN: And that's really where I saw us, when we began that discussion last week with this group. We really started thinking about what's doable, and so there wasn't much there. Then we kind of slapped ourselves upside the face and said, wait a minute, if we are looking at a 50-year horizon, that's a lot of different congresses, that's a lot fo changes in national priorities. In theory the ice age is happening by then, and we got icebergs floating down the Mississippi River, whatever.

But the point is, we stepped back and said, we're asking the wrong questions. We're

developing a political action plan instead of saying, where do we need to be, and what kind of legislation is it going to take.

So I do think they are two different discussions. In the short term I have a hunch that we're going to gravitate to no changes to the low level waste policy act for reasons of doability, not for reasons of desirability.

CHAIRMAN RYAN: Well said.

It kind of sums up that you're really focused here on a national strategy, particularly for the power industry, but not - with an ease of extending it to other generators of radioactive waste as well.

MR. ANDERSEN: We see a need - we have an obligation by our membership, which again I want to reinforce includes a lot of those other generators, not in sheer numbers, but especially organizations that represent them.

So the question we put to ourselves is, our obligation to take leadership for all of them rather than just narrowly for the plants. And I think we have already decided that we need to take leadership for the whole community.

CHAIRMAN RYAN: Great. Any other questions? Latif?

MR. HAMDAN: Yes. In Las Vegas two weeks ago the guy from IAEA started his second presentation by, as you mentioned, criticizing the U.S. system of classification and so on and so forth. Then he proceeded to draft the proposed IAEA system, which to me seemed even maybe potentially more complicated than the U.S. Instead of three classes, there were five or six and so on and so forth.

So the question I have is, how would the industry feel about having just two classes of waste, high level waste and low level waste coming standard with disposal.

MR. ANDERSEN: I think that is an option that would have - I wouldn't discount that. It's just that I still think that within any scheme like that you are going to end up with radiations.

MR. HAMDAN: Probably in treating each category you can have radiations. But from the standpoint of let's say the regulations or of the big picture, it seems to me that just having two classes of waste might do it.

MR. ANDERSEN: Well, for starters, that

exit sign over there is radioactive, and eventually is thrown away as waste. I'm not sure that the answer is that it become grouped within the same category as reactor wire cleanup resins from a nuclear power plant. I mean that would sort of be my intuitive response that.

There is an issue associated with that. NRC has a letter from the governor of Pennsylvania associated with that exit sign, or at least its brothers and sisters.

But it just keeps suggesting to me to try to resist that simple gradient between the two, somewhere I keep sensing that rather if we look at logical categories of these facilities, if we're thinking about disposal, rather than decay as the answer. And then associating the classification of waste with those specific categories and facilities available as an endpoint.

That is what is embedded in the IAEA scheme. And although - that's why I say to me it doesn't look as complex now, because I'm able to first look at the types of facilities they're envisioning, and then work backwards and figure out how the classification lends itself, why these kinds of things

are suitable for that kind of facility.

And to me that's a start in the right direction. My historical recollection is that we did the opposite when we did rulemaking on waste disposal. We talked about the type of wastes we had, and though exactly like you're saying, if they all go to the same place, what is the facility going to look like?

And so I'm suggesting we have to step back from that.

MR. HAMDAN: Can I ask you another question about Barnwell? When Barnwell closes in July of next year -

MR. ANDERSEN: Remember, I want to say for the record, Barnwell is not closing in July of 2008. In July of 2008 it is restricting its access to two states.

MR. HAMDAN: Right. Could you expand on that? Who is not going to have access to disposal sites for just B and C, and who will? Because you say most - expand on that a little bit.

MR. ANDERSEN: I'll try to do this somewhat from memory, but it's not as hard as it seems. The states of South Carolina, New Jersey and Connecticut will have access to the Barnwell site. The states in

the Rocky Mountains, and I'll leave that a little undefined, and the Pacific Northwest, have access to the Washington site.

Everybody else doesn't have access, and I believe that is 36 states, to a site for B and C waste. And everybody has access to the Clive Concept for class A waste.

But all those states also have access to their respective sites for class A as well. So some people will have two options for class A. Some people will have one option for class B and C. And all of us will have one option for class A.

MR. HAMDAN: Thank you.

CHAIRMAN RYAN: Any other questions?

Okay, with that, Ralph thank you for a very informative first part of our afternoon. We really appreciate it.

Any other comments by any of our phone participants?

Hearing none, we will adjourn until 3:15. Thank you very much.

(Whereupon at 2:45 p.m. the proceeding in the above-entitled matter went off the record to return on the record at 3:15 p.m.)

CHAIRMAN RYAN: I'm going to take the prerogative of going first because I have an appointment at 4:00 o'clock I have to keep, so --

MS. WEINER: That's fine.

CHAIRMAN RYAN: On the agenda there are two reports. The Committee went in two different directions.

One group went to visit the TMI plant, of course, in Pennsylvania and the Hematite site in Missouri, which is -- to a fabrication plant that's entering it's decommissioning or continuing with it's decommissioning.

So I guess we'll start with those. I think TMI, and again, I ask the other members that were -- and staff that were involved in that visit, to chime in.

It was an interesting tour of TMI-2, we got a very thorough review of the TMI accident from `79 and all the steps that were taken thereafter and the current status of the plant.

And we were also updated, although we did not tour, in Unit 1, on their current state, they're entering into an outage where they're going to replace, I believe, it was two steam generators and

one pressurizer.

And so they have a -- kind of an extensive outage that they've got well planned and seemed to be ready to engage on.

It was 2009 or `08, late `08 or early `09, I forget what date, but they're well into the planning phase and implementing phase and it was a very thorough, and I think very professional tour that really gave the Committee some insights in the areas of decommissioning which was our principal objective to learn about ongoing work and decommissioning activities that are planned into the future. So we appreciated their time and efforts to provide a very comprehensive tour.

Now the second site was an interesting site. At the Hematite site was a fuel fabrication facility used from the `50's on through the mid-`70's for highly enriched uranium fuel fabrication.

And they had some on-site waste disposals of some enriched uranium materials and they're well along in decommissioning -- I think the surface facilities is the best way to say that.

But they have some disposed material and some underground disposal pits that contained enriched

uranium and by the quality of the records, they're not sure if they're looking at less than values.

Some packages say one gram of uranium-235, but it's not clear if it's less then a gram, or how much less or right at a gram or what

So they're wrestling what are in essence, some licensing issues around how much SNM could be exhumed at any one time and whether they're, from a, you know a, securities point of view, a Category 1, 2 or 3 facility, according to NRC regulations.

The requirements change with each level of those regulations, so they're developing strategies and working with the NRC staff on plans to how they -- if they license themselves as a Category 2 facility, how do they remain 1 and not go to a 3 or if they downgrade to a 1, how do they stay a 1 and not go to a 2, based on their exhumation plans.

So, it's a pretty classic issue of using very old records and detailed information that's not detailed by today's standard to make an assessment of what their requirements need to be.

Again, I thought they were extremely thoughtful, they had worked through all the options, they were thinking about all the options in a very

skilled way and provided us with a thorough review and tour of the site and insights into what their licensing challenges might be.

MR. HINZE: Are they using MARSIM to study the site? Are they using any of those protocols?

CHAIRMAN RYAN: I think -- I think the plan right now is to get the waste exhumed and then go into the assessment phase of what, you know, what the residuals might be.

I think at this point, they're still -- they had done quite a lot of demolition inside buildings and were planning on some more of that, I think, in the near future and we didn't discuss any final surveys of final, you know, performance assessment kinds of calculations.

I don't know if they've done that, they may have, but we didn't discuss that.

MR. HINZE: Is the state involved in this at all? Or how, I mean in terms of monitoring and what's going on?

CHAIRMAN RYAN: Yes, they talked about their interactions with several of the state agencies, mainly those responsible for groundwater and surface water and so forth, so they have -- they have routine

and detailed interaction with those state agencies, yes.

VICE CHAIR CROFF: I was going to say a couple of things, if -- I mean add to --

CHAIRMAN RYAN: Sure.

VICE CHAIR CROFF: Okay. On the Three Mile Island, they appear to have a pretty good understanding of their groundwater behavior, out on the island, fairly extensive efforts, wells, modeling of it and seem to, based on a non-geologist, seem to have a decent handle on it.

To expend on a point Mike started on, this steam generator replacement and pressurizer, raises the question, okay, you replace them, what do you do with the old ones?

And what came out of this is they plan to store the old ones on-site until they decommission Unit 1, the operating unit, which is going to go into life extension, so we're talking 25 years maybe -- 30 years -- and they do not propose to decommission Unit 2, parts of which are really messed up and a few parts of which are totally inaccessible.

In other words, they're rooms that they have no idea what is going on in them because they --

the radiation levels, they just can't get to them.

That -- I guess, you know, there was a little bit of polite discussion back and forth concerning, gee, that's a long time to wait and we've had discussions in this committee about, you know, trying to have decommissioning sooner rather then later, but, they're -- seem to be pretty adamant on that course. But I think it's just a benchmark.

CHAIRMAN RYAN: One other point on the ground water was they also had some tritium leakage questions that came up from earlier -- an earlier pipe break and so a lot of, you know, geohydrology work was on the very near surface detractor -- the tritium issues and, you know, that's part of the -- and you know, I think a very competent geohydrologist gave us a very detailed booking on all of that.

MR. CLARKE: Mike, can I say a couple things?

CHAIRMAN RYAN: Please.

MR. CLARKE: I have a trip report here, I was going to speak to it, but maybe I don't need to now.

But in any event, we received copies of all the presentations including a very nice

presentation on the tritium issue.

And as Allen said, their plan is to not complete the decommissioning of Unit 2 until they decommission Unit 1. And they plan to go through 20 year license renewal for Unit 1, so they --

MR. HINZE: How far did the plume of tritium --

MR. CLARKE: Well, it's an island --

MR. HINZE: I know, but did it get into the river?

MR. CLARKE: Yes.

MR. HINZE: And how far did the plume go down the river?

MR. CLARKE: I don't think they've detected it in the river.

CHAIRMAN RYAN: Once it enters the river, it's gone.

MR. CLARKE: Yes, it's gone.

PARTICIPANT: It wasn't great enough to be seen.

MR. CLARKE: The slides though have some nice characterization maps. They also, at the Westinghouse site, they gave us some lessons learned that I -- I'll say they weren't necessarily new

lessons learned to us, but they certainly reinforced, I think, very well some of the things that we've been talking about and, you know, I could, you know, give you some information on that.

The trip report, we hope to make available to you before the meeting's over. Westinghouse requested an opportunity to review it, they're reviewing it now and as soon as, you know, we hear from them, we can make it available.

But in addition to some of the things that have been said, we do have seven attachments that have virtually all of the presentations that were made to us are available and will be attached to the report.

CHAIRMAN RYAN: Great. Sorry, at about the fact that you all the other -- that's great.

MR. CLARKE: We have to leave --

MR. CROFF: Is Jim done?

CHAIRMAN RYAN: Are you all set?

MR. CLARKE: I think so, Derek, would you want to add anything?

MR. WIDMAYER: I guess the only thing I'd add is that I asked each of the organizations to give us a feeling about the public involvement that they have and both of them gave us some information, one

over lunch and one as part of their formal presentation.

What they did with the public that was around and that was pretty interesting and enlightening also. So --

CHAIRMAN RYAN: I think it's fair to say that TMI has had a fairly comprehensive program since the accident in `79 and on through it's -- it's life since then.

VICE CHAIR CROFF: I think for Ruth and Bill, a couple of other things about this Hematite site, they said they had 40 known pits which on their order of 40 foot by 20 foot by 12 foot.

They're not very large, but possibly as many of 25 more that they don't know about, but they don't know exactly where they are. In other words, this site goes back to almost antiquity and the record keeping was not so good.

So there's a little bit of feeling the way along and the characterization of the waste in the pits is not good to say the least. One of the issues they brought up and, you know, Mike eluded to the, you know, the highly enriched uranium, is that Hematite wanted to do a demonstration on one pit.

In other words, go into it, dig it up to see, you know, sort of what kind of waste is in there and how well they -- how good the records were or not and then to formulate the final plans for sort of doing D&D on all of them, based on the experience learned.

But the way they posed it is the -- under NRC rules, that isn't allowable. In other words, you've got have all the plans in place before you can even do the first one, you can't do a demo, which complicates life greatly.

So that was one of the issues foremost on their minds and was confounded by the fact that Westinghouse is owned by Toshiba, which at least, as the way they characterized it at the time, was not a U.S. company, therefore, that limits their access to classified material and introduces other complications.

Now this morning, Frank in PNP said that, I guess there had been some determination that Toshiba was a U.S. company.

I don't, maybe that's gone away, but, anyway, there was a, you know, there was the, you know, the circular argument thing, confounded by the

international ownership I guess was the -- one of the foremost things on their mind.

Because they wanted to go and do this demonstration just to see what was going on. What seemed to me and their circumstances was a reasonable thing to do, I mean, they know about where the known 40 trenches are and not where the 25 are, nor what's in them, it seems to me to be a recipe for an experiment.

CHAIRMAN RYAN: The one thing I think we talked a lot about at Hematite that was probably the most interesting point to me is that the curity levels in the regulations of 1, 2 and 3, increase with increasing special nuclear material.

And it makes perfect sense for operating facilities where there's a known inventory -- a very exactly known and you're above or below and all of that.

But it was interesting to think about, for a decommissioned facility, where there's been some on-site disposal, let's say I'm a Category 1, just for the sake of argument and I find out that -- and whatever my decommissioning activities are, I'm accumulating an inventory.

I've got some in the hardware, the dirt and you know, whatever piles I'm creating, and at some point, I'm going to be 75%, lets say, of Category 2.

Well it would seem to me that there's got to be some way to address, how do you get, you know, how do you go up in a Category before you say, well I have to stop and either ship waste off or reduce my inventory or go to Cat. 2.

That's one decision and the second one is, what if I open one package and find, you know, a bag of something with a higher quantity that kind of shoots me over the limit?

So for a decommissioning situation, it would seem reasonable, to me anyway and I don't know if it's possible, but it seems reasonable to think about, is there a way to deal with this, you know, either by administrative limits, or by approaching a limit, but some kind of scheme where, you know, when the inventory is not known, how do you deal with that in terms of these levels of categorization?

I mean theoretically, if I open one drum and found an amount of material that put me from Cat. 1 to Cat. 2, I could immediately re-bury it -- it's back where it was and you know, just cover it back up,

that simple.

And see -- but it seemed that -- be relatively inflexible to me as we talked through it -- although they were working through it, they really -- it was really an interesting conundrum they were in.

MR. WIDMAYER: Part of the problem, Bill, is that it's sort of an oxymoron what Mike was just describing that you have unknown quantities of special nuclear material and that's troublesome for the NRC regulator to be dealing with, so, typically --

MR. HINZE: Unproven might be a better word, I mean there was an inventory of record, but, you know, there wasn't anybody around that said, yes, I put those in that drum and that's what they had -- it was strictly going by paper record.

MR. CLARKE: But suppose they didn't have disposal records --

MR. HINZE: Right --

MR. CLARKE: They had inventories --

MS. WEINER: Yes.

MR. HINZE: Right.

MR. CLARKE: Just say they don't --

CHAIRMAN RYAN: It wasn't robust enough to get a full, comfortable decision, so, I just found

that particular problem in the decommissioning area with SNM to be an interesting one to think a little bit more about --

MR. HAMDAN: But Mike, strictly from a security standpoint, could you not, in this case, give it the highest classification possible until you --

CHAIRMAN RYAN: Well the highest classification -- well no, because, well you could. But that's an extremely expensive, time consuming option.

Everybody for example in Cat. 3, would have to have clearances. And you'd have to have the highest level of security forces and all that.

VICE CHAIR CROFF: And being foreign owned, the clearances were --

MR. HAMDAN: I understand.

PARTICIPANT: No matter which way they went, they were in a trap.

PARTICIPANT: They violate their license.

MR. HINZE: Is the site in the St. Francis Mountains, is it at the geology?

VICE CHAIR CROFF: I don't whether the St. Francis -- 50 miles south of St. Louis.

MR. HINZE: Southwest?

PARTICIPANT: Directly south.

MR. HINZE: Hematite aura occurs at the St. Francis Mountains.

MR. CLARKE: That's why the town is called Hematite --

MR. HINZE: Yes, okay, oh, it's in the Town of Hematite?

MR. CLARKE: Yes.

MR. HINZE: Okay. All right, now, I know the geology of that -- okay, all right.

MR. CLARKE: Just a few miles from the Welcome to Hematite sign.

(Off the record comments.)

VICE CHAIR CROFF: Ruth, go ahead with your report.

MS. WEINER: Bill and Latif and I, and I wanted to thank Latif for making all the arrangements, except the first motel which he got me to make, which we'll never do that again, I'll tell you that --

MR. CLARKE: But Ruth, did it have free internet?

MS. WEINER: It had free internet, yes.

(Off the record comments.)

MS. WEINER: We met the first day with --

at the Department of Energy Complex in Grand Junction and the director there -- of that office had really put together a large group of people, we had representatives, clearly of the DOE Office of Legacy Management, which is there in Grand Junction.

They're contractors, representatives from the State of Colorado, Department of Health, which is the Colorado agency that oversees uranium extraction processes and the Wyoming Department of Environmental Quality, which is the Wyoming department that oversees uranium extraction and we also had a representative from the Navajo Nation and a representative from the Hopi Nation.

So we had a lot of people there. The next day, we drove to Moab and visited the old Atlas uranium milltailing site, which is just north of the Town of Moab, and we had a very, very productive tour of the site, saw where they were going to move it and I'll get to that in a moment.

The third day we went to Rifle, where we saw again, a closed up milltailing site and we saw a very interesting research project on cleaning up groundwater on basically bioremediation of groundwater, talk about that in a moment, and then we

went into the mountains, north, northwest of Rifle and saw their really gigantic tailings pile.

I mean this is enormous and it's stabilized and they've a settling pond and drainage --

PARTICIPANT: The tailings pile's been moved.

MS. WEINER: Yes, it was -- I'm sorry. The tailings pond was moved to that site. And it's just -- it's huge.

A number of issues came out and I want to first of all, emphasize something that doesn't come first in the trip report.

The representatives at our meeting in Grand Junction agreed very much with the public representation at -- in Albuquerque that NRC should think very carefully about a GEIS for in situ leach mining because the issues -- there are site specific issues --

MR. CLARKE: As opposed to a generic --

MS. WEINER: A generic, yes, there are site specific issues as opposed to generic issues and I think if NRC is going to go the route of a GEIS, and I know that this is what the Commissioners want, save you a lot of money, a lot of time, they should really

identify the generic issues because there are many site specific issues and the public is very much opposed to a generic EIS because it's the people that live around the sites who care.

MR. HINZE: Could I -- could I raise a point there?

MS. WEINER: Yes.

MR. HINZE: I think you've said it just right, Ruth, but I'm just wondering if there isn't a compromise position that where the GEIS could be performed on all things except for groundwater?

MS. WEINER: That's a possibility that we might consider. I don't know that that -- that a compromise position has come up before, but it certainly --

MR. HINZE: -- exception because, you know, thinking back to what those people had to say, you know, that's where their concern is.

MR. WIDMAYER: Hey Bill, I can -- I can tell you there is one concern with that and I don't know that much about it, but, it's -- you can't -- you can't partition the environmental impacts from a --

MR. HINZE: I think it's a good idea if we got a little bit of flexibility into there.

MS. WEINER: I have another compromise suggestion which is that you don't -- the alternative to a GEIS is not a full Environmental Impact Statement on every site. There may well be sites where an EA and the FONSI would suffice. I mean they're --

MR. HAMDAN: Oh, that's always the case.

MS. WEINER: That's -- which is always the case so it's not necessary that the fear that you have to do a full EIS on every site with everything that that entails --

MR. CLARKE: Do you have an assessment on which --

MS. WEINER: Yes. We need to do an assessment on each site, but it doesn't have to be in EIS.

MR. CLARKE: True. Depends on what you find.

MS. WEINER: Anyway, moving right -- yes?

MR. HAMDAN: Mike is shaking his head, I want to explain to him, what we're saying is, on every site, you are going to do an environment assessment, is that not correct?

MS. WEINER: Mike, would you come up here, please?

MR. HAMDAN: Just we have agreement on basic --

MR. FLIEGEL: This is Mike Fliegel from Uranium Recovery Branch. The requirements and regulations is Part 50 --

MR. HAMDAN: 51 --

MR. FLIEGEL: 51 for EIS, require an EIS for a uranium recovery facility.

MS. WEINER: Okay.

MR. FLIEGEL: And OGC told us that we would meet the requirements by doing a GEIS and then an E -- and maybe only an EA for each individual.

MS. WEINER: Okay. Now the, you might -- why don't you keep sitting there, because you can add to this.

VICE CHAIR CROFF: Remember this is a trip report.

MS. WEINER: Yes, this is trip report --

VICE CHAIR CROFF: Okay --

MS. WEINER: Mike ought to hear this.

VICE CHAIR CROFF: Yes, he should hear it but --

MS. WEINER: He doesn't -- but thank you for that clarification.

Okay, other points that came up, we talked in the meeting in Grand Junction about multiple agencies regulating ISL sites and regulating uranium recovery sites and what we heard, especially from the states -- especially I might say, State of Colorado was that's not necessarily a bad thing that if you have cooperation among the agency -- different agencies, that it actually works very well.

So that it is not a, you know, dual regulation is not the bugaboo that at least I once thought it was.

And it says -- and there's another point which is all of these sites -- tailing sites run into land use regulations.

And land use regulations are always local. I mean local people decide, unless it's federally preempted land of some sort. And the point was made repeatedly that regulatory agencies can and have been observed to work productively together.

Financial surety is for aquifer restoration at recovery's facilities, there is the downside is that the financial surety can be underestimated.

And the -- at least one site as an example

of that and if it is -- the financial surety is underestimated and unrealistic, you get yourself into a world of hurt because the operator goes bankrupt and there's not enough money and then NRC has to go to Congress for the money.

NRC, what we thought -- what we might discuss is that NRC issue -- consider issuing guidance for determining financial sureties that include -- that allow for inflation, allow for the operator's possible financial difficulties and recognize stakeholder concerns.

There was a lot of discussion of the implentation of groundwater protection standards of ACL's, where do you put the point of exposure, do you put it at the boundary, do you allow a buffer zone and what size area should be dedicated to remedial action?

Locating at the -- at the permit area boundary might not be protective of groundwater off-site in the long term because of the uncertainties, I mean your modeling all these things and setting the ACL with the model and there are inherent uncertainties.

There are other potential contaminants like vanadium, commonly found in uranium ores that are

not being regulated under part 40.

And potential contaminants that are not currently listed in the regulations, really do need to be identified and considered in remediation and in monitoring.

Wells and exploratory bore holes can act as important conduits for cross-contamination among different aquifers. And by the way, the -- the concern with uranium recovery is groundwater contamination.

That is the primary concern, that's the concern everybody has, so that it -- this is a good focus for any change in regulation, any new regulations.

The regulations -- the point was made that the regulations need to identify and/or include acceptance criteria that will ensure proper well construction and bore hold plugging.

Sampling an analysis -- there are some concerns about the sampling and analysis protocols and verification of lab results and again, the feeling was that regulations or guidance should address that issue.

There's a big question raised about how

much background data do you need before you open a new site for either surface mining or ISL? For most pollution control -- for pollution control that I'm aware of, usually a year at least is needed to determine background and baseline conditions.

But, in some cases, more may be needed. Establishing baseline conditions can then be used to determine restoration and that's why it's so critical that you establish the baseline conditions appropriately.

There was a lot of discussion about the rate of restoration that is required and a provision -- a suggestion was made that a provision be included to specify the minium rate of groundwater restoration at contaminated uranium recovery sites. Finally, and this little brown water section --

MR. CLARKE: What do you mean by that, Ruth? Do you mean at the rate of contaminate removal or --

MS. WEINER: Well, the rate at which you restore to either --

MR. CLARKE: You may not restore it.

MS. WEINER: Yes, or to restore to whatever you're restoring to.

MR. CLARKE: The rate at which you're removing contaminants?

MS. WEINER: Yes. The rate at which you're removing contaminants, the rate at which --

MR. HINZE: Bringing it back to --

MS. WEINER: Bringing it back to whatever baseline you're bringing it back to.

MR. HINZE: They're very concerned about this in terms of --

MS. WEINER: Yes. And yes, they -- these are areas where they're very concerned. Now, there is a -- we found a really good role for research in this.

We visited a site where -- which is a research site -- an intra-university research site for bioremediation of groundwater where they are really training bugs to eat uranium in the groundwater and it was just a fascinating sight. These are ongoing experiments --

MR. CLARKE: There is a wealth of experience --

MR. HAMDAN: Actually they remove oxygen --

MR. CLARKE: Are they trying to do this with other --

MS. WEINER: Yes, they remove the oxygen -- that's true. They use the oxygen and they incorporate the uranium and that takes it out of the water.

MR. HAMDAN: No, they use it --

MS. WEINER: Okay, stabilize it.

MR. CLARKE: Reduce it --

MR. HAMDAN: They use the oxygen and so the uranium --

MS. WEINER: Uranium precipitates and reduces --

MR. HAMDAN: I'm sorry.

MS. WEINER: -- but they have a huge site at Rifle and they --

MR. CLARKE: They're doing this at field scale?

MR. HAMDAN: Yes.

MS. WEINER: Yes.

MR. CLARKE: The trick was getting the bugs to survive.

MS. WEINER: Oh and that is their trick, they -- they have to do a very careful balance between what is the limiting nutrient for these bugs and what is the limiting nutrient for other bugs --

VICE CHAIR CROFF: What happens when they stop feeding them?

MS. WEINER: So far they haven't. That -- this is part of the research project.

VICE CHAIR CROFF: I think I know the answer, continue.

(Laughter.)

MS. WEINER: Well they don't.

VICE CHAIR CROFF: It's at the Colorado River --

MS. WEINER: In fact the site is right next -- you can see the Colorado River from the site, but that does not necessarily mean that the river is contaminated.

VICE CHAIR CROFF: It is, but not from the pile so much. Go ahead.

MS. WEINER: I was going to say the -- nobody drinks the Colorado, the atlas filed by the way is 750 feet from the Colorado, but they have a hydrologic barrier and a number of other barriers there.

MR. CLARKE: But the barriers come close to the pile though. After letting it bounce --

MS. WEINER: Yes, but they're moving the

pile. That's another -- whole different story.

There was discussion, in order not to take -- bore everybody to death, there was a discussion of demonstrating compliance with groundwater standards and they talked about the -- talked -- spoke about the need to include provisions in a regulation on how the licencee is going to determine compliance with groundwater protection standards.

In addition to meeting a concentration standard, at some point of compliance. They -- there's also -- there was also a concern about what period of time does compliance with the standard have to be maintained before a license can be terminated?

In other words, how long do you have to show it? There was a lot of discussion about when are we done? And to put it in exactly that -- that tone and there was discussion of surveillance and monitoring and what role the states play in aquaforestroation and facility -- facility closure.

Let's see, I talked about the GEIS and we included in our trip report, thank you Latif, some suggested committee follow on actions.

We visited this subcommittee of three people has visited Shadron, Grand Junction, Moab and

Rifle and we suggested making a similar visit to uranium recovery sites in New Mexico and Texas.

That way will have covered the waterfront and there are differences -- the states play a major role is this.

And there are differences in the way the states look at this in the sites, of course in the sites themselves. There's also, and I plan to go to the next public hearing in --

MR. HAMDAN: Gallop.

MS. WEINER: -- Gallop, New Mexico, which is right near a potential ISO site. It's -- Gallop is just outside the Navajo reservation.

It's only -- it's a few hours drive, just a couple of hours drive from Window Rock, Arizona, which is the Navajo Nation Headquarters.

And it might be a good idea sometime to go, I'm sorry, at -- their at Crown Point, New Mexico and it might be a good idea for a subcommittee to visit Crown Point.

The Committee might benefit from a wrap-up meeting in Washington with selected stakeholders.

We found -- one thing we found that when we were in the field and we made very certain that

they knew, the people we were meeting with knew that we were not NRC staff, that we were an advisory committee, that we're not regulators, we found that they really opened up -- this is a slightly intimidating atmosphere.

These are people who live out in a rural area and they -- they open up very -- those field trips are good because they really opened up. I don't know whether that was your experience at Hematite and TMI also.

MR. CLARKE: One question I had, Ruth, you said there were a number of people at the meetings in Grand Junction, was anyone from headquarters there?

MS. WEINER: No.

MR. HINZE: And really, at Shadron we did have someone.

MS. WEINER: Yes --

MR. HINZE: And it made a difference, I think. There was a much more open atmosphere at Grand Junction in that discussion then there was at Shadron.

I don't know whether it was because of the people or what, but the difference was that there were NRC personnel at the Shadron meeting and I would suggest that as Ruth has commented that any further

meetings be held as just the advisory committee.

MS. WEINER: Yes.

MR. HINZE: Seems though there's a lot more, hey, you may be on our team type of thing.

MS. WEINER: Yes, there was this -- a palpable relief when I told -- when I said to the assembled group, we are not the regulators, we are an advisory committee and we are independent of the regulators. Sorry, Mike.

(Off the record comments.)

MS. WEINER: No, there was no one from DOE Headquarters. The Office of Legacy Management is headquartered in Grand Junction.

MR. CLARKE: Yes, but there are people in --

MS. WEINER: But there are people --

MR. CLARKE: -- Washington bay guys --

MS. WEINER: Yes, they were not present there.

MR. CLARKE: Okay.

MS. WEINER: And we left the arrangement up to the people in Grand Junction, who they wanted to invite.

And since it's a little tricky to get to

Grand Junction anyway. So this, let's see, I've talked about the GEIS issues and concerns and the committee, it would be valuable for the committee ACDM and review the current state of technology and the practices used in aquifer restoration.

Aquifer restoration is a significantly technical issue. It is probably the most significant technical issue that we have and we also thought that this may be an area that is fruitful for further research. Bill, would you like to add any more?

MR. HINZE: I think you've said it well, very well.

VICE CHAIR CROFF: Latif, you have anything?

MR. HAMDAN: No.

MS. WEINER: Okay, end of trip report.

VICE CHAIR CROFF: Is there any questions from anybody?

MR. DIAS: I'm sorry, I came in a little under half way. Would you, the ACNW&M would like to maybe have a meeting on this aquifer restoration?

MS. WEINER: Yes, that's exactly what we suggesting --

MR. DIAS: Not exactly a working --

but maybe just a little --

MS. WEINER: One of the recommendations that we've made --

MR. DIAS: Okay.

MS. WEINER: -- is --

MR. DIAS: So they can put in the PNP next time and see if --

MS. WEINER: Yes. You have a copy of this?

MR. DIAS: I'm sure I do -- please send it to me.

MS. WEINER: It's the last recommendation.

MR. CLARKE: Ruth, let me just add that there -- there's a great deal of work that has been done on this subject, not unnecessarily dealing with radionuclides, but dealing with chlorinated solvents and --

MS. WEINER: Yes.

MR. CLARKE: -- it's mass transfer limitations -- it gets into the ground, you know, try to get it out, you know, it's not, you know, those issues are fairly well understood, not what to do about them, but, you know, the processes

that are causing it and, you know, you may want to consider opening it up to others that are -- tried to restore aquifers --

MS. WEINER: That --

MR. CLARKE: -- similar reasons --

MS. WEINER: That's a good suggestion. I think we do -- the chemistry of in situ leach sites and actually you get -- it's the same chemistry you get if you -- when you take the uranium ore out of the ground --

MR. CLARKE: It's really not the chemistry, it's the mass transferant that's causing the problem.

MS. WEINER: Well, again, we have -- we have the -- a uranium leach site, the transfer of uranium -- uranium is the product and that's what they want to get out and then the restoration deals with -- deals with exactly what you're saying.

Then the restoration -- after it's no longer economical to get material out of the ground, to get to -- continue to leach the ore body, then what do you have to do to restore it and restore it --

MR. HAMDAN: Because -- because the ground -- this issue is probably the only major technical issue when we have discussion of that in a session of some sort --

MS. WEINER: Yes.

MR. HAMDAN: -- we can air all these concerns.

MS. WEINER: Yes. But it's nothing but oxygenated water.

MR. CLARKE: Ruth, you know the problem is where it is, if it gets loose in the subsurface.

I think pump and treat systems other ways of trying to bring it up, always run into limitations because of the mass transfer.

MS. WEINER: Yes.

VICE CHAIR CROFF: I think if you want a session in the future, you know, you've got some ideas, but need to sort of think through, I don't even want to say a prospectives, but, how it's going to help us do our job, if you will --

MS. WEINER: Exactly.

VICE CHAIR CROFF: -- inform all the rule making that's going to go on and recognizing

the parallel experience and we'll see what's there and take it up in a PNP whenever.

MS. WEINER: Yes, I think though there's no rush. I just wanted to bring this to the committee's intention as our trip report.

VICE CHAIR CROFF: Is there anything else?

MR. HINZE: What is the timing on this, Ruth? Is it -- do you think that this is important for us to try to do something about this in the --

MR. HAMDAN: You know, in connection with what -- this morning that we owe the commission a letter by February 29th.

MR. HINZE: Yes.

MR. HAMDAN: So we have to do one of two things. Either do everything before that time so we can write the letter or postpone.

VICE CHAIR CROFF: Let's come back to specifics. We've got a briefing in December meeting or session --

MR. HAMDAN: Yes.

VICE CHAIR CROFF: -- on the ISL --

MR. HAMDAN: Technical basis.

VICE CHAIR CROFF: Technical basis, okay. I'd say that you're going to have to focus on that right now.

MR. HAMDAN: Right.

MS. WEINER: Yes.

VICE CHAIR CROFF: And any further discussion is going to have to come after that.

MS. WEINER: Yes.

VICE CHAIR CROFF: Because this -- remember we don't have a January meeting, so December leads right to February.

MS. WEINER: That -- that's fine. Because the -- I would say the issue gets broader and anything that we want to take up after December, we can do that. But we should have a letter before February.

VICE CHAIR CROFF: All right. I think -- we're at the end of the trip reports here, thank you very much, Ruth. And with that, I think we're going to move on to letter writing and with that, I think we're off the record.

(Whereupon, the foregoing matter went off the record at 3:55p.m.)