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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE & MATERIALS

(ACNW&M)

186th MEETING

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VOLUME II

+ + + + +

WEDNESDAY,

FEBRUARY 13, 2007

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, Rockville, Maryland, at 8:30 a.m., DR. MICHAEL T. RYAN, Chairman, presiding.

MEMBERS PRESENT:

MICHAEL T. RYAN, Chairman

ALLEN G. CROFF, Vice Chairman

JAMES H. CLARKE, Member

RUTH F. WEINER, Member

NRC COMMISSIONERS PRESENT:

PETER B. LYONS

GREGORY JACZKO

NRC STAFF PRESENT:

LARRY CAMPER

NEIL M. COLEMAN

ANTONIO F. DIAS

BOBBY EIDS

DAVID W. ESH

FRANK P. GILLESPIE

JAMES KENNEDY

DEREK A. WIDMAYER

ALSO PRESENT:

RALPH ANDERSEN

JOHN GREEVES

RUTH McBURNEY

THOMAS TENFORDE

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(8:33 a.m.)

6) OPENING REMARKS BY THE ACNW&M CHAIRMAN

CHAIRMAN RYAN: Good morning. The meeting will come to order, please. This is the second day of the 186th meeting of the Advisory Committee on Nuclear Waste and Materials.

During today's session, the Committee will consider the following. We will have a discussion with Commissioner Peter B. Lyons, where we will discuss ACNW letter reports. And the ACNW working group meeting on managing low-activity radioactive waste will begin shortly after lunch.

The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mike Lee is the designated federal official for today's session. He's not here. So Antonio Dias will step in as designated federal official.

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

It is requested that speakers use one of

the microphones, identify themselves, and speak with sufficient clarity and volume so they can be readily heard. It is also requested that if you have cell phones or pagers, that you kindly turn them off or place them on mute. Thank you very much.

Also, feedback forms are available at the back of the room for anybody wishing to provide us with his or her comments about this meeting. Thank you very much.

And, without further ado, Commissioner Lyons, let me welcome you to the Advisory Committee on Nuclear Waste and Materials. We are pleased to have you with us this morning. Thank you.

7) ACNW&M MEETING WITH

NRC COMMISSIONER PETER B. LYONS

COMMISSIONER LYONS: Thank you very much, Mike. And good morning to all of you folks. When I woke up this morning and heard that there was a two-hour delay on federal government, I debated for about two seconds as to whether that would delay your Committee.

My guess was that it would not delay your Committee, knowing both your dedication and that you probably were already in the area and probably staying very close by. So I went ahead and braved the roads.

I am glad I did. I am glad to see you folks here. And, actually, the roads weren't quite as bad as I had feared.

I will also apologize, although I think you are sitting far enough away from me. I have been working on quite a cold or flu or whatever this week. I think I'm almost over it. Again, I think you are at a safe distance. I am prepared, throat lozenges, water. And hopefully I can manage to talk for a few minutes.

I don't plan to talk very long. I would like to leave most of the time for questions and thoughts that you folks may have. And I thought I would focus my comments on the planned merger.

I am the one who proposed that merger to my colleagues. It was certainly a decision or a proposal that I pondered over. But I do think it's the right thing to do. I would like to talk a little bit more this morning about why I thought it was appropriate to move in that direction.

But I don't want that proposal or the fact that that proposal has been accepted by the full Commission to in any way undercut the admiration and respect and appreciation that I have for the work that this Committee has done.

I hope it has been obvious by my interest in many of the topics and subjects that you have been involved with that I truly believe that you have been performing a very, very important function, a very valued function for the NRC and for the American people. Just to mention some of the areas that I have been particularly impressed with your contributions over the last year or so, the low-level waste study, certainly very important. And there are likely, as you know probably better than I, to be continuing challenges in the low-level waste, in how the nation handles low-level waste, as we look into the future.

You provided invaluable support as we have moved ahead perhaps to get closer to a license application for Yucca Mountain. The seismic work, package design, the dose modeling, all of those have been important areas on which you have contributed to the Yucca Mountain issues.

I think all of you are well-aware of my interest in the linear, no-threshold model for low-dose radiation effects. I have been one of I think many who has truly sought to place low-dose radiation effects on a more solid scientific basis. And the work that you did -- I am thinking particularly of the work with the French Academy of

Science -- I think was very important.

I am very much looking forward to the workshop that you have scheduled. And I will be making some comments at that workshop, where you will be exploring this subject in greater detail, also looking, as you have in the past, at the DOE low-dose program.

Again, my interest here is very much focused on my belief that given the amount of resources that this nation invests in protection of our citizens from low doses of radiation, I think it's simply vital that we have a much more solid scientific basis on which to determine those health effects and protection criteria. That work is certainly very important.

You are also aware of my interest in the moderator exclusion. The recent paper that you folks did I think you'll note was reflected very directly in my vote on moderator exclusion. I think you raised very important perspective on moderator inclusion. And I was persuaded by your arguments that before moving ahead with moderator exclusion, we should do a better job of understanding what can be done with burnup credit. And hopefully that can lead to some renewed emphasis on getting the data for burnup

credit. But I know that has been another source of frustration for certainly the Commission and also the Committee, I think, over a long period of time.

But getting to why I felt a merger was appropriate, it is very likely that sometime -- we certainly don't know when but sometime measured in months probably -- the Department will submit an application on Yucca Mountain.

That is going to change the role of this Committee very dramatically. You will certainly still be asked to provide advice to the Commission, but that will greatly limit your interactions with staff whenever that application is filed.

In addition, I see that several of the areas of focus for this Committee, while they are not going away, are also maturing a fair bit. I already mentioned that the low-level waste issues are not going away. Those are almost certainly going to continue in some fashion. But I think the work that you have already done provides a basis in that area. Decommissioning would be another area where you have done a lot of work. And I think we have a pretty mature approach now to decommissioning.

Putting all of these together with my additional feeling, I believe shared by the rest of

the Commission, that the challenges that ACRS is facing are increasingly intertwined or intermixed -- I don't know what the best word is -- with the specialties that you folks have, whether it's MOX, whether it is different aspects of GNEP -- and I certainly can't speculate what will happen to GNEP, but as we look into some of these future areas, I can see that ACRS is going to constantly be needing to draw upon the expertise that you folks have, certainly in the health physics area, certainly in the radiation response, radiation dose effects area. And I think there is going to need to be or there would have needed if they weren't merged to be more and more interchange between the Committee, between the two committees.

For that reason, also recognizing the ACNW, now ACNW&M, was envisioned, I guess is one word, was fissioned out of ACRS, it seemed to me that it was an appropriate time to ask the question about what are the odds of fusing, of fusion back into ACRS. That is the con that I put in. And the Commission has now agreed to move ahead with that.

I think that I am very much hoping that you folks view this as I intended it to be, as, frankly, a recognition of the way events have been

moving over certainly the time I have been on the Commission, maybe even longer, but I viewed it as a logical progression, absolutely did not mean it as anything negative towards the Commission or towards any of you. The contributions you have made, as I have already indicated, have been greatly valued. And your contributions in varying ways through the ACRS are going to continue to be very valued.

We are in a situation at the moment -- and Frank may need to correct me if I am wrong, wherever Frank is. I'm sure he's here someplace.

MR. GILLESPIE: I am over here.

COMMISSIONER LYONS: Frank. Okay. I knew you were sitting someplace. Frank, you are in the midst of developing a transition plan. And as that comes together, I'm sure all of us will be getting a chance to look at that and comment on it.

As part of the SRM that came out of this proposal, it was clear that there were a number of ongoing activities that we look forward to either your completing or in some way merging in with ACRS. But that remains for the transition plan.

That is really the extent of what I wanted to say. I think it is obvious in my comments that I really don't want there to be any doubt that the

Commission is going to continue to need your expertise and is going to continue to value that expertise. I think that in the merged arrangement, we can probably find greater efficiencies for everyone and continue to address certainly areas in which you were working and also increase your contributions in the areas of focus at the ACRS.

With that, I said I wasn't going to talk long. I meant it. As long as my voice holds out, I'm happy to try to take questions or discussion on any of these areas. And maybe I will advance your schedule a little bit today.

With that, Mike, back to you.

CHAIRMAN RYAN: Commissioner, thank you very much. We really appreciate your vote of confidence and the work of the Committee past, present and future.

We have faced this challenge a couple of times in the history of the Committee. Just a couple of years ago, Dr. Garrick and I, the previous Chairman, went through the same exercise. And that's kind of when we said, well, now that the license application for Yucca Mountain seems more eminent, we began to add to the agenda on the things that you mentioned: low-level waste, GNEP, and some of the

other issues that we have addressed in the last couple of years.

I think we are all very pleased that, you know, in the area of decommissioning, we have had an impact. In fact, our advice led to a second rulemaking on the subject of decommissioning on the instruction to staff to consider a second rulemaking. So we are pleased with that.

On some of the other areas that you mentioned, like low-activity waste, which as a working group we are going to have today and tomorrow, in addition to the low-level waste, where we are trying to explore that lower end, very low-concentration waste, in fuel cycle, we now have what we hope is a tool for knowledge management, which is a really encyclopedic review of fuel cycle information from, say, the last 50 years. So we are pleased that that is in place now.

So I think the one change we can be sure of is that change will come. And we are pleased that we are going to move into a different role and our advice will still be needed there.

Many of the issues, as you have mentioned, are mature from the standpoint of our agenda. We have got the half a dozen or so things we are going to

finish up. And I'm sure that the way things go, we will evolve as we go back with ACRS. And there will probably be an evolution somewhere down the line beyond that.

So I think we have engaged with the staff. And I want to really emphasize our work is successful, really, because the staff and many parts of this agency come in and offer their information and thoughts in a free, open, and honest fashion. And it's those insights that help us formulate the independent advice we offer to the Commission.

So we're not here alone. We're here with the staff providing us the information in an open and honest forum and in a public forum, which is an excellent way to do it, to give you the advice we give you. So we feel that's really an important part of our activity here, is to be in the public and to be available for the public to offer their views as well.

So, with that, I would ask members to offer any comments. Allen?

VICE CHAIRMAN CROFF: I don't know whether to go with a comment or a question. I share Mike's thoughts that he has expressed. I really appreciate your coming down and sharing with us sort of how you got to where we are, I guess, if that sentence makes

any sense. I have certainly enjoyed the experience and look forward to whatever happens in the future with the ACRS.

I guess by way of more of a question, I have been and I think Mike has been interested for a long time in this whole waste classification ball of yarn, I guess, is about all I can call it. And that ranges from the high-level issues that have come up and the waste incidental to reprocessing associated with it, low-level waste issues that have been mentioned already, the greater-than-Class-C that we're facing, and possible implications of an advanced fuel cycle and what that would do to waste classification.

I was wondering at this point what your thoughts were on the whole waste classification issue and where you thought it might go or where it needs to go.

COMMISSIONER LYONS: Well, I would start, Allen, by I think agreeing with probably all of you that we have a waste classification system in the country based largely on origin or at least partly on origin, which I don't think makes very good technical sense.

Having said that, maybe because I spent some time on Capitol Hill on the staff there, I have

some feeling for how difficult it will be to change it. And a change probably requires that some members of Congress take a very strong interest in this particular area. And I think it will be very difficult to generate that level of enthusiasm among members of Congress for a subject that while it is certainly of substantial importance around this table, to this agency, to many other areas of the country, I don't think it exactly commands the -- it's not likely to command the front pages is I guess what I am trying to politely say.

I do think there would be strong benefits from a re-look at the waste classification approaches in the country, but I am not optimistic that we would see the impetus for that change.

You mentioned reprocessing. I think you did or at least came close to it. If GNEP in some form, if reprocessing in some form does become national policy, a fort for commercial spent fuel, that is clearly going to -- I mean, maybe that will be what forces a re-look at some of the waste classifications.

Some of the same issues that you are already dealing with with waste incidental to reprocessing in the defense community are then going

to come to the fore in the commercial sector as well and will continue to present challenges.

I am not giving you a good answer, Allen. I don't have a good answer. I have no doubt that a reclassification would serve the country well. I am not optimistic that we will see it. Maybe a move toward reprocessing will help to push in that direction.

VICE CHAIRMAN CROFF: Do you foresee, I mean, say, the possibility perhaps of trying to fix some of the problems? Let me call it at a lower level; in other words, not in law but possibly in regulation, in guidance -- the Committee has had a considerable interest in 10 CFR 61.58 if memory serves.

CHAIRMAN RYAN: Yes, it's the one.

VICE CHAIRMAN CROFF: -- as possibly helping out and fixing some of the warts, if you will. Is that in the doable stack?

COMMISSIONER LYONS: I think that is in the doable category. It's always going to get weighed by the senior staff and the Commission relative to other priorities. And it's probably not at the level of the squeakiest wheel today given the overall challenges facing the agency. But, yes, I think it's

in the doable category, and I think it's something that needs to at least stay on the horizon as something that would be a positive step.

VICE CHAIRMAN CROFF: Thanks.

CHAIRMAN RYAN: Ruth?

MEMBER WEINER: Well, again, I want to thank you for coming to talk to us and for explaining your role and what you see as the future and past of the Committee. And I wanted to ask about a topic you didn't mention.

Transportation is the poster child for micro doses to mega populations. I mean, you have a tiny dose. And then you multiply by the number of people on the road and the number of shipments and you get some enormous person, amount of person, rem, which translates to a completely unrealistic LCF. What can we do to change the fact that there is an insistence on assessing the environmental impact this way, which is to my way of thinking completely wrong?

COMMISSIONER LYONS: Well, Ruth, the whole issue of collective dose is one that I have found extraordinarily frustrating, probably for decades. I've greatly appreciated the very strong statements that ACNW has made, recognizing that I would say there is no technical scientific foundation for collective

dose and that it is grossly misused.

I have found it interesting that even -- I should be careful how I say that. Well, no. Even some of the recent studies which I wouldn't say they endorse LNT. They at least recognize it as a plausible approach, such as ICRP and BIER VII. I believe I'm correct that both of those studies emphasized the dearth of scientific underpinnings for collective dose.

And the question was, how do we stop people from using collective dose? I don't have any idea because at least for some groups, it may serve their interests very well to use collective dose. I think we simply have to continue to stay on the highest possible road of pointing out that there is no scientific validity to collective dose. And you can truly get absolutely ludicrous results.

I may not be able to quote this accurately, but I am remembering that the range of fatalities attributed to Chernobyl depending on the group that did the analysis as varied from the observed -- I want to say less than 40 or so -- fatalities, various extrapolations in the perhaps few thousand to numbers that I have seen published of approaching -- I'm remember a 600,000 number, but you

can play amazing I'll say games because I think that is what they are with micro doses to mega populations.

As a scientist, that bothers me, but all I know to do, Ruth, is that we have to continue to say that there is no scientific backing for collective dose applied that way, applied as a measure of fatalities. You have pointed out, others have pointed out that there are valid ways of using collective dose in terms of assessing alternative approaches to perhaps a remediation strategy. But that's in my mind the limit of the use of collective dose.

The whole issue of transportation is one that I think is unfortunate from many standpoints, transportation of waste. Certainly the collective dose is one aspect, but I think, in addition, in some of the debate that has gone on over the last few years, the fact that high-level waste has been transported around the world safely in -- you would know the number -- thousands and thousands of shipments, perhaps millions of miles, the fact that that has all been done safely somehow doesn't get the same publicity.

If someone asks me if transportation of high-level waste is hazardous, I'll say, "Sure, it's hazardous." Like a lot of things in life that are

hazardous, it needs to be done right. And if it's done right, as has been demonstrated by the record, it can be done very safely. It has been done very safely.

So I am personally sorry to see some of the rhetoric that has gone on surrounding transportation. And, again, to me is it a risk? Yes. Do we understand it? Yes. Can we manage it? Yes. And that's to me where the important facts are.

MEMBER WEINER: Getting back to your response to Allen's question, since a number of members of Congress have given the opinion that this is the most dangerous part of the whole spent fuel complex, is there any point or would there be any possibility in bringing this question to the Congress, to some committee?

COMMISSIONER LYONS: I may not be following what you're suggesting as to what we bring to Congress.

MEMBER WEINER: Well, would there be any point. You worked on Capitol Hill for a long time. Would there be any point in trying to have some sort of congressional hearings on this question, somebody? I'm not suggesting that the Commission do it but somebody generate this.

COMMISSIONER LYONS: Well, there might be some benefit to that. As you said, it's not going to be the NRC that probably would propose that.

MEMBER WEINER: No.

COMMISSIONER LYONS: We would participate. I'm smiling just because we don't really have a mechanism of proposing that. If members of Congress want such a hearing, we would, of course, support it.

I may be wrong, but I'm not aware of suggestions of a hearing in that area. There are certainly suggestions for hearings in various areas right now, but that's not one of them.

MEMBER WEINER: Thanks.

CHAIRMAN RYAN: Jim?

MEMBER CLARKE: Commissioner, I, too, appreciate your presence and your willingness to share with us how we got to where we are. And I appreciate the kind words and recognition very much.

Probably a couple of years ago, I think shortly after I joined the Committee, I was struck with the challenge of taking decommissioning, as you mentioned, decommissioning lessons learned and bringing them into the front end of the process and taking that knowledge forward in the design of new facilities.

I do think we have made some progress. I think as a Committee, we feel good about that. And I am not convinced that we are totally there as far as closing the loop, but I do feel good about what we have been able to do. And I think the process has matured, and I appreciate your comments.

Serving on this Committee is probably one of the most rewarding things I've ever done. And I look forward to continued service as appropriate. Thank you very much.

COMMISSIONER LYONS: I appreciate your comments, Jim. And you're very right about the decommissioning and the suggestions from this Committee to try to take a more forward-looking view at decommissioning far earlier in the life history of a project.

I think that the suggestions that you have made trying to avoid what may eventually become legacy sites, trying to avoid some of the challenges that we currently face today, trying to make sure that those are not recurring challenges decades in the future, I think those are very important contributions. And I very much appreciate the Committee's role in that.

MEMBER CLARKE: Thank you.

CHAIRMAN RYAN: Commissioner, I would be

remiss if I didn't mention Professor Bill Hinze, who was here yesterday to finish up a letter on seismic questions that came forward. As you know, Professor Hinze formally retired from the Committee in December, but he promised that that was contingent on getting this letter finished. So he was here yesterday but had other commitments today.

I'm sure he would want me to extend his thanks to you for your support of all of the areas that he has been working in over the years and the Commission as a whole. So I would be remiss if I didn't mention that.

COMMISSIONER LYONS: I appreciate that, Mike. And please convey to Bill that I specifically mentioned his work on seismic at Yucca Mountain.

CHAIRMAN RYAN: Yes.

COMMISSIONER LYONS: I am anything but a seismic expert, but I found his alternative points of view to be very, very useful and I believe the staff has found it useful, too, to frame different approaches to viewing the seismic issue.

CHAIRMAN RYAN: In looking ahead, I think we see challenges as we go back as part of the ACRS. I think clearly there will be seismic issues for nuclear power plants. Every application will have

chapters on environmental issues and questions on radiation protection issues and questions and other elements where I think we have had some overlap already. For example, we have worked with ACRS already in the MOX facility at the Savannah River site. And other interactions have occurred.

So I am sure as we go back and get more engaged on their agenda and as we finish up our agenda and remain available for those issues that were sort of the ACNW agenda, I'm sure we will have lots of good work to do. So we appreciate you coming today. We appreciate the other commissioners' support of, you know, having one unified voice in this plan. And we're looking forward and hope that our good work continues.

COMMISSIONER LYONS: Thank you very much.

CHAIRMAN RYAN: Thank you.

COMMISSIONER LYONS: Give you some extra time in your agenda.

CHAIRMAN RYAN: Okay. With that, we will pause the record here and take a short break and reconvene in about 20 minutes. Thank you.

(Whereupon, the foregoing matter went off the record at 9:05 a.m. and went back on the record at 9:23 a.m.)

CHAIRMAN RYAN: We will reopen the record. I had a request from one of our visitors, from members of the public. Dr. Thomas Tenforde from the National Council on Radiation Protection and Measurements is here. He wanted to hear Commissioner Lyons, but with weather-related travel, it was not in the cards today.

So, Dr. Tenforde, if you would like to come up and announce the annual NCRP meeting and provide that information to the members and the members of the public who might be here, we would appreciate hearing from you. That microphone right behind you will work.

MR. TENFORDE: Well, thank you, Dr. Ryan.

I think that the Advisory Committee will be very interested in the topic of this year's NCRP annual meeting on low-dose and low-dose rate radiation effects and models.

The meeting has, really, three main components. The first is a review of up-to-date laboratory-based research on molecular, cellular, and tissue responses to very low-radiation doses, where we're defining that as less than ten rem. And in many cases, the studies were done at even far lower levels of radiation.

And then the second session is on what we have learned from epidemiologic studies on individuals who were either exposed occupationally or accidentally.

And the third session will be, I think, of great interest to many of you. It's on potential future regulatory implications of findings on low-dose radiation studies. As you know, there are many different and diverse populations of people that have been exposed over the years or are currently exposed to low doses. And of great interest to us, which was the topic of this year's annual meeting, is the use of medical diagnostic techniques, like CT, that expose people to relatively low doses. And that is an ongoing study.

So I have some copies of our press release. The meeting will be on the 14th and 15th of April at the North Bethesda Marriott, very conveniently located across the street for those of you at NRC. And we would like to invite you to visit the NCRP Web site. It's just ncrponline.org. And it's got the full program now for the meeting, along with the registration information. And for any of you who are not local, it has information on hotel accommodations.

If I may, I would also like to say that the 2009 meeting will be on a subject of great interest to all of you. It will be on the future of nuclear power: Safety, health, and environment.

We are putting together a steering panel, which will hopefully include Commissioner Lyons and people of similar stature within government to help us plan this meeting and put together a formal program committee. That will be during the first week of March next year. And it will be at the Hyatt in downtown Bethesda. So look forward to that, please. I think that will be a fascinating meeting.

We want to bring every aspect of the nuclear renaissance into focus at that meeting with an international group. We are inviting for the steering panel people from IAEA, NEA, and from Japan. So we hope to have a very international set of participants and speakers.

So I would like to just mention that for your thought. And I will leave these press releases on the back table here. Thanks again for giving me an opportunity to say a few words about this year's meeting.

By the way, we have a lot of registrants already. I think it's over 400 now. So I encourage

everyone who wants to attend and hasn't registered to please do so. We always have to fight the fire marshall, and it's not our auditorium. But, fortunately, we have a nice facility at the North Bethesda Marriott.

CHAIRMAN RYAN: Thank you, Dr. Tenforde. I might also mention that registration is free.

MR. TENFORDE: Yes. Thank you very much. That's one of the bonuses of the NCRP annual meeting. We do support all costs out of various sources of funds.

CHAIRMAN RYAN: I didn't want to leave that unsaid.

MR. TENFORDE: Yes. That is very important. A lot of people look for that.

CHAIRMAN RYAN: That's great. And, again, I think it will be a real robust meeting. As you know, we have coordinated a meeting on similar topics related specifically to the NRC for this year's meeting.

And we do not conflict. In fact, we are going to have the benefit of your meeting as we begin ours. So I think it will be a robust set of speakers at both meetings. And we will look forward to seeing what good information comes out of those efforts. So

we appreciate you being here.

If I may, I will just have one copy of that. And I will make sure that is part of our formal record so that that will be distributed as our record is distributed.

Thank you, Dr. Tenforde.

MR. TENFORDE: I'll leave some on the table there.

CHAIRMAN RYAN: That would be fine. And we appreciate you being with us. Thanks, sir. Thanks for coming up.

MR. TENFORDE: Thank you again.

CHAIRMAN RYAN: All right. Thank you.

Okay. With that, I believe we can close the record at this point. We're going to go to our letter-writing session. So we will close the record here. Thank you very much.

(Whereupon, the open session was concluded at 9:28 a.m.)

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

1:05 p.m.

CHAIR RYAN: Good afternoon. I'd like to call this meeting to order. This is the afternoon session of ACNW&M. My name is Michael Ryan. I'm Chairman of the ACNW and we're on Item 9 of our agenda for this week.

I'd like to turn to that agenda and identify that the ACNW undertook an evaluation of the issues impacting on the National Program for the Management of Commercial Low-Level Radioactive Waste sometime ago. As part of that examination, the Committee conducted a working group meeting in May 2006 and issued a letter report summarizing key findings from that the working group meeting later that August.

The Committee also issued a white paper as part of that evaluation. That white paper was published as NUREG-1853 in January of 2007. Both the Committee's letter report and the 2007 white paper have been distributed and copies are available here today if you haven't received one.

In the white paper, the ACNW examined the

history of low activity waste albeit briefing. This class of waste are recognized using several common titles, LAW, NORM, NARM, TENORM and perhaps some others. But regardless of how they are described they are those radioactive wastes whose concentrations are greater than background and yet occupy the very low end of what is the 10 CFR Part 61 Class A concentration table.

To start us off on this working group session, I'm pleased that Commissioner Gregory Jaczko is here to offer his introductory comments and thoughts on this topic. I know it's an important topic to him and, Commissioner Jaczko, without further ado, I'll turn the meeting over to you. Welcome.

COMMISSIONER JACZKO: Thank you. I appreciate that introduction and I want to thank the Committee for inviting me to today's meeting as you begin a dialogue on this important issue of low-level waste management and disposal.

Over about the past 20 years or so, there have been several reports and people have talked about these issues and written reports dealing with low-level waste disposal and recently the Commission has issued, the Commission staff has issued, reports including a strategic assessment of low-level waste

that was done back in October of 2007. And all of these reports and assessments have really concluded the same thing that we need solutions to better manage and dispose of low-level waste. I think that's something that everyone really can agree on.

The question then becomes how do we go about doing that and right now, I think we're at a very opportune moment because we don't have a crisis, but we have an obvious need and a need into the future and a need that will materialize with sufficient time for us to make real progress on how we address some of the challenges with this issue.

One of the things that I've seen as a commissioner here is that so much of this low-level waste disposal is tied intimately with decommissioning activities and that in many ways these two issues go hand-in-hand. Whenever we deal with decommissioning, one of the big obstacles to decommissioning becomes disposal options and costs for some of the low-level waste materials that are generated through decommissioning and it's perhaps an obvious fact that all the facilities that the NRC licensed and even some that we never licensed have to be decommissioned and that is an important point.

At some point, we will be decommissioning

a large number of power reactors. We will be decommissioning fuel cycle facilities. We will be decommissioning materials facilities. So there is a large number of facilities that will ultimately need to be decommissioned and, with that, will be large amounts of low activity and low-level radioactive waste, in particular, large volumes of Class A waste.

And the Committee I know is familiar with the potential closing of Barnwell in July of this year and the coming need to dispose of large quantities of, as I said, power plant and materials facilities decommissioning waste and, even as I said, some of the new enrichment facilities that we are currently licensing today. They will be generating waste and generating materials that will need to be decommissioned.

So as I looked at this situation, I began to look at some of the challenges that we currently have with siting low-level waste facilities and as I think is obvious to everyone probably in this room, that has been a challenge and will continue to be a challenge for a long time. So one of the things that I think we have to do is take a look at sites that exist currently that might be able to be licensed more easily and more quickly than siting a brand new

facility. And the obvious potential for that would be other types of hazardous waste disposal facilities.

As I was looking into this issue, it was brought to my attention that in the State of Colorado which is an Agreement State there was a license issued by the State of Colorado for a RCRA Subtitle C facility and so they issued a license for radioactive materials under their Agreement State Authority to a site that was already permitted under RCRA and I think is an intriguing option as we go forward. And one of the reasons why I work with the Commission to encourage them to begin examining this issue to see whether there is a relationship from the technical side between the requirements for a RCRA hazardous materials facility and an NRC low-level waste facility and the requirements for licensing and permitting and to see where there are similarities, where there may be differences and how we can address those differences. So the Commission asked the Committee to use their expertise and to look into this issue and I think this meeting is really an important first step in taking a look at alternative ways to get new low-level waste facilities licensed and in operation for the future.

One of the things that I really want to

stress, I think, as this meeting commences and as this issue continues to be discussed is that I think the first and most important thing to do here is to look at this from a technical perspective and to really analyze what are the similarities for facilities that, for instance, could be permitted under RCRA and facilities that would be licensed under Part 61 or under Agreement State equivalents and to see how those technical requirements compare. I think if there is a nice overlap or there's a nice interrelationship between those that then we can begin the hard work of looking at how we could go about in the licensing process get some of those facilities licensed to accept low-level radioactive waste or other subsets of low activity waste.

I think throughout this the challenges I think are obvious and that it is to ensure that we maintain public confidence and public involvement in the ultimate decisions because that is one of the big challenges right now with siting any new low-level waste facilities is ensuring that the communities in which these facilities would be situated are accepting and confident that these facilities would continue to provide adequate protection for public health and safety. And that's why I think it's so important to

look at this first from the technical side to see what are the technical overlaps and see where are the differences and how do we address those differences then that may exist in the technical permitting and licensing requirements.

So I'm very excited to see the Committee taking on this issue and very interested to see what your meeting, what information you're able to gain and learn from this meeting and how you see these issues being related and what kind of technical information we can get that we can then use to look in the regulatory process.

I look forward to hearing how your meetings go and see what conclusions you're able to come to. And I'll be happy to answer any questions if you have any. If not, I would look forward to hearing your meeting.

CHAIR RYAN: Let me just give you a short brief outline of the agenda.

COMMISSIONER JACZKO: Sure.

CHAIR RYAN: And tell you who we have here. We're very fortunate that we have a broad spectrum of regulators both here from the NRC, the EPA, states, state organizations that have dealt with the issues that you mentioned in your summary. We

also have, I think, a very good array of practitioners, people who deal with this on a day-to-day basis for real waste for real disposal at real facilities. So it's that body of their experience that we hope to bring to the record that we can then do the analysis that you asked about, just exactly that, what were the technical issues, how would you address them, how would you find solutions.

I think one important feature about very low activity or low activity waste disposal is it's not new. It's been going on for some time in lots of places around the country and one of our goals is to assemble all that evidence in one place, do the analysis and do the thinking, the critical thinking, to say where there are good technical synergies and where are the technical issues where further work needs to be done. So that's in a nutshell the exact goal that we're hoping to achieve for this working group meeting.

With that, I'd ask my colleagues if they have any other comments or questions and, if not, it's time to go to work.

COMMISSIONER JACZKO: Well, good. I look forward to seeing what you're able to learn and produce.

CHAIR RYAN: Thank you very much.

COMMISSIONER JACZKO: Thank you for the opportunity to introduce it.

(Off the record comments.)

CHAIR RYAN: Without further ado, I'd like to invite James Kennedy up to give us the alternative disposal options for low activity waste, an NRC regulatory perspective. Welcome, Jim.

MR. KENNEDY: Okay. Thank you, Mike, and the rest of the Committee for inviting me to speak today on low activity waste disposal and to give our regulatory perspective on them.

(Off the record comments.)

MR. KENNEDY: Okay. Once again, thanks for having me today.

CHAIR RYAN: Jim, excuse me. We just want to go into the display.

MR. KENNEDY: I see.

CHAIR RYAN: There we are.

MR. KENNEDY: Good. Today, I'm going to cover the two main provisions in our regulations under which these types of disposals for low activity waste occur. They are 10 CFR 20.2002 which allows us to approve disposals not otherwise authorized in the regulations and 10 CFR 40.13(a) which exempts

unimportant quantities of source material, that's source material that's less than 0.05 weight percent from Atomic Energy Act regulations and which enables our licensees to dispose of these types of materials in unlicensed sites. In addition to addressing current practice in authorizing these disposals, I'll discuss our plans for the future to better inform stakeholders about the criteria that we use and the processes that we have in place to review these requests for disposals, low activity waste disposals.

I know your task is focused on RCRA hazardous waste sites and so while I'll be addressing all kinds of alternate disposals including landfills, regular municipal landfills, I'll highlight the use of RCRA Subtitle C facilities as I go through the presentation.

This is a chart showing our NRC regulatory framework associated with the disposition of solid materials, all types of solid materials, except high-level waste. It starts on the lower left with the no-detect policy for releasing materials from an NRC license that NRR has in effect for nuclear power reactor licensees and as you go around the circle, the hazard of the waste increases and the type of disposal facility and the measures that they have to control

the hazards increase as well.

But beginning on the lower left, NRR has a no-detect policy for releasing materials with slight contamination or no contamination at all from their licensed controls. No-detect, if radioactivity cannot be detected by a licensee using certain instruments with certain sensitivities, it may be transferred by the licensees to unlicensed persons for any use.

Now above that on the chart, the next circle is Reg. Guide 1.86. Our office, FSME and NMSS endorse Reg. Guide 1.86 which contains in its surface contamination limits for releases of solid materials. Again, these materials can be released for unrestricted use and generally, they aren't considered to be low-level waste not when they're released for unrestricted use.

Now for volumetrically contaminated materials, licensees can request any kind of disposal under 10 CFR 20.2002 that's not already authorized and specified in the regulations. 10 CFR 20(k) identifies specific types of disposals that are authorized. Obviously, those include 10 CFR Part 61 disposals in a licensed disposal facility. They also include such things as incineration and release of materials into the sanitary sewer.

10 CFR 20.2002, we can authorize these disposals providing a safety case can be made and I'll talk more about that later. Licensees can also transfer unimportant quantities of source material as waste to unlicensed persons and disposal sites and I'll describe more about that later.

Moving around the circle, we have Part 61 low-level waste disposal sites. Most low-level waste is sent to a conventional Part 61 facility. All of them, of course, are licensed by Agreement States at this time. Most of the volume is sent to Part 61 facilities and also the vast, vast majority of radioactivity as well.

And finally, at the bottom of the circle is the highest hazard of waste, greater than Class C, which is presumed to go to a geologic repository, although DOE who is responsible for disposing of it could also request other disposal alternatives as well such as bore holes.

Just real quick, these are current regulations that I mentioned as I was explaining that chart in the front, 10 CFR 20.2002 and I'll describe that in more detail in a bit and the two provisions in Part 40 that enable licensees to dispose of unimportant quantities of sources material, 40.13(a)

which contains the exemption for unimportant quantities of source material, meaning that it doesn't have to have a license, and 10 CFR 40.51(b)(3) which says that the licensee can transfer license material to any person exempt from the licensing requirements of the Act to the extent permitted under such an exemption. In any case, the licensee can use both of those provisions there to transfer unimportant quantities of source material waste to RCRA hazard waste site.

And, Mike, I know you appreciate this. I've heard you mention it before. The unimportant quantity basis stems from the regulations that were adopted nearly 40 years ago. The 0.05 percent weight limit for the source material in that exemption was chosen on the basis of concentrations that are necessary to be a useful sources of fissionable material, not health and safety. And that has implications for our process and I'll describe those a bit later.

Here is a brief summary of what 10 CFR 20.2002 says. It says that the staff, NRC, can authorize alternative disposals of licensed material not otherwise authorized in the regulations like Part 61. It's been around since 1959. It can only be used

by a licensee or a license applicant. That's come up a number of times in the past because we have some of these legacy sites where the license has been terminated and organizations, companies, are cleaning up the sites without a license just for efficiency reasons, but with NRC oversight. The material has to be generated in the licensee's activities. The application must include, among other things, a description of the waste and how it's going to be disposed of and dose analyses and finally the staff as a matter of practice for many years has used a dose standard in approving these of less-than-a-few-millirem-per-year exposures to members of the public. We could actually go up to 100 millirem of year, the public dose limit in Part 20, but staff for reasons of conservatism has used that dose standard for many years.

As far as past implementation of low activity waste disposals under 20.2002, we've had more than 100 requests in the last 30 years. Two-thirds of them have been for on-site disposals. The trend recently has been towards off-site disposals and I think the reason for that is our decommissioning program has tightened up the guidance on on-site disposals and we're paying a lot more attention now

than we used to, say, more than ten years ago or 15 years ago to what's been disposed of on a site in terms of what needs to be cleaned up at the time of discommissioning and we've put out some guidance in NUREG 17.57 on that. I think it's become clear to licensees that on-site disposals are probably much less desirable and useful than they used to be and so they're just not asked for as often as they used to be.

Typically, 20.2002s occur in solid waste landfills, that is, not hazardous waste landfills. Most are below clearance levels. Some are right at clearance levels. Some appear to go a little bit above, but the concentrations are extremely low. And, in fact, clearance levels, and when I say that I mean the standards that have been defined by IAEA in its safety guide, at those levels, of course, materials could be released for unrestricted use, but licensees are conservative and are using them to dispose of material in landfills.

And you can see a listing of all the requests from 2000 to 2006 as an enclosure to a SECY that we wrote a couple of years ago. That enclosure has the licensee, where it went to, a description of the waste, the amount of the waste and so forth.

As far as RCRA hazardous waste landfills, I was unable to find any in the recent past, that is, the last eight years anyway that have actually gone to a RCRA hazardous waste site. Now back in 2005, we did approve a couple of 20.2002 requests for large amounts of decommissioning waste to go from a reactor in the northeast. I think it was Connecticut Yankee, Adam Neck. We approved those requests. They were to go to two different hazardous waste sites. I think Waste Controls Specialists was one and U.S. Ecology, Idaho was the other. And even though we made that approval for a variety of reasons, I'm sure I don't know all of them, but economics I think was a factor, the licensee chose not to send the waste to either of those facilities.

And so my example here of a 20.2002 request, if I had an example for a RCRA hazardous waste site, I would give you that. But I don't. So I'm giving you this alternative which was an important one and one that you may have heard about already. It has to do with the Big Rock Point Nuclear Power Plant in Michigan. That license was terminated about a year ago, but they requested approval to dispose of 42 million pounds of concrete debris from their nuclear power plant which they were decommissioning over the

last few years.

They added about three million pounds of low activity, PCB-contaminated waste a year or two later. We approved that 20.2002 request. Part of review looked at the radiation doses to a truck driver, a landfill worker and a post closure resident farmer. The doses were very low ranging from 0.002 millirem per year to 0.4 millirem per year.

Let me talk about unimportant quantity transfers for disposals which occur under a different set of regulations. We also do these like 20.2002 under case-by-case approvals using as I said earlier 10 CFR 40.13(a) and 10 CFR 40.51(b)(3), the latter which enables licensees to transfer to exempt persons.

As I mentioned earlier, again 40.13(a), the exemption for unimportant quantities of source material is based on the amount of fissionable material that's in an unimportant quantity and it wasn't developed based on health and safety. And for that reason, in 1999, the Commission when it was faced with a couple of requests to transfer unimportant quantities of source material to unlicensed disposal sites, they addressed the issue. The staff wrote a Commission paper, 98-284. At that time, we had proposals from Shieldalloy Metallurgical Corporation

to dispose of large amounts of waste, unimportant quantities, from their Cambridge, Ohio site and their Newfield, New Jersey site. So the staff wrote a Commission paper. It analyzed or described the proposed disposals and the potential doses that might occur.

The Commission in responding to the Commission paper gave us some criteria by which we could evaluate in the future any other proposed disposals of unimportant quantities of source material and what they said basically ended up in a proposed rule in August 28, 2002 *Federal Register* and what it says is we can approve these or the staff can approve these if it can be shown that a dose to a member of the public is unlikely to exceed 25 millirem per year. They also said the dose could go up to 100 millirem per year. If it's between 25 and 100 millirem per year, they ask that the Commission be informed. They also said they were even open to higher doses under particular cases based on unique circumstances, but that there would be a Commission review if we received a request like that and the staff recommended approving it. And, finally, the Commission said until the rule was promulgated, the Commission would continue to approve on a case-by-case basis.

Now we proposed that rule six years ago, five and a half years ago, and since that time it's been put on hold. It's been a low-priority rulemaking and there's been no action on it since. What that means in effect is that we continue to use the criteria that the Commission defined and we do it on a case-by-case basis.

Now here's an example of an unimportant quantity approval. Actually, it just happened a few weeks ago. It's the Homer Laughlin China Company. I'm sure a lot of you know that they used to manufacture Fiestaware. I think they actually still manufacture it. But back in the old days when they manufactured the Fiestaware, the red glaze had uranium in it as well as the ivory glaze, too. So they had uranium compounds at their facility up in West Virginia.

The waste involved here included things that they were using to handle the uranium glaze, wood block, concrete blocks, and so forth. It was less than 0.05 percent source material and therefore exempt. There was about 30 tons of it. They provided a performance assessment to use which included analyzing doses to a transport truck driver, a disposal facility worker, an off-site resident during

operations and an on-site resident after site closure as well as an intruder. They proposed to send it to the Waste Control Specialists facility down in Texas. We analyzed it on the staff. The doses we came up with and they came up with were around three millirem per year to a truck driver and worker and 4 X 10^{-5} millirem per year to a future on-site resident and an intruder. And, like I said, we approved that on February 1, 2008. I give the ADAMS numbers there in case anybody is interested.

I just thought I briefly summarize a few rulemakings that have addressed disposal of low activity wastes. I know Dan Schultheisz is going to be discussing the EPA rulemaking or advanced notice of proposed rulemaking in 2003. I just thought I'd summarize it real quick. You all know or many of you know that it was published as an advanced notice of proposed rulemaking in November 2003. They were sort of laying out conceptually what the proposed rule might look like. They asked a lot of questions, but generally the idea was that concentration limits would be specified for disposal of low activity waste in a RCRA hazardous waste facility.

They discussed, too, some potential NRC regulatory approaches as a companion to the EPA rule.

They could have ranged or could range in the future if we go ahead with it from a specific license for a RCRA Subtitle C facility to a general license to even something like the current practice where when something is sent to a RCRA hazardous waste cell now as licensed material it becomes exempt and no longer subject to NRC regulation. But generally, their idea for some simpler NRC process, regulatory process, than what's contained in Part 61.

They also mention, too, that there was some possibility of certain radionuclides, anyway, going all the way up to Class A limits based on the dose, groundwater movement and worker in public exposures. So it appears conceptually anyway that their idea was to expand the range of low activity waste that could be disposed of at these types of facilities because right now, you know, we're having alternate disposals at clearance levels and for exempt quantities of source materials that 0.05 percent which is at the very low end and it appears that they were thinking potentially much higher concentrations of low activity waste.

Two other proposed rules, I mentioned the one that the Commission asked us to do back in 2002 to promulgate a rule that would codify the dose criteria

that they specified for us in 1999. That also envisioned transferred disposal in RCRA Subtitle C facilities. The rulemaking is on hold because of other higher priority rulemakings.

Sort of a related rulemaking, it doesn't have to do with hazardous waste sites, but the disposition of solid materials rulemaking or the so-called "clearance rule," the proposed rule was sent to the Commission in March of 2005 and in June or July of 2005, the Commission also put that rule on hold because of other higher priority work.

I didn't want to go without mentioning the strategic assessments and where this falls in it. Low activity waste disposal was a topic of great interest when we got public comments on the strategic assessment. About half of the commentors had a view on it. A number of them felt we needed to be better specify what our internal procedures were. A number of them thought we ought to be working with EPA to go ahead with the rulemaking and do what we could to encourage EPA to go ahead with their rulemaking on low activity waste. There were also a large number of stakeholders who were opposed to any additional work or any additional disposals of low activity waste in landfills, RCRA hazardous waste sites and so forth.

So it was quite controversial.

In any case, using the criteria that we had for the strategic assessment and the NRC's strategic goals, we ranked the development of an internal procedure and the Standard Review Plan as high and that's something that we're just beginning to work on. We have practices for reviewing these requests that have come in to us. Our documentation of it needs to be better, both for the staff, the understaff in particular, and our documentation also needs to be better for licensees so that they understand well what the expectations are and can submit something to us that we can review efficiently.

Well, just to conclude, we respond to licensees' requests for disposals in hazardous waste sites or landfills using those two regulatory provisions that I mentioned earlier. The requests that we've received in the past have involved very low concentrations of radionuclides typically at or below clearance levels or exempt levels in the case of source material. There have been a number of rulemakings that have been initiated to address low activity waste disposal. All are on hold at this time. And we're in the process of making our procedures and our standards and our expectations more

transparent than they have been in the past.

At the end here, I have a couple of citations that have a lot of good information in them. There's the 19 -- Let's see. I think it was the 2005 NCRP meeting slides which are available online. You have to pay $10 for them, but there's a lot of good information in those. As far as staff's approval of 20.2002, we did a Commission paper a couple of years ago and that has a lot of information on the criteria and past approvals and so forth.

And then on July 25, 2000, Carl Papierella of NRC testified at a hearing on FUSRAP program. At that time, there was a lot of controversy about disposal of FUSRAP waste in landfills including the Button Willow landfill out in California, most importantly, the Button Willow landfill, and there are, gosh, probably 500 pages of testimony and information on low activity waste disposal of all kinds all over the country including oil field waste in Louisiana and some of the hazardous waste sites and so forth. In any case, it's a good source of information.

I thank you for your time and be happy to take questions.

CHAIR RYAN: Jim, thanks very much.

You've gotten us off to a great start with an overview of the NRC regulatory perspective. We'll hear from states, I think, in a little while, but any questions for Jim? Jim Clarke.

MEMBER CLARKE: Yes, thank you. Could you put up slide six, Jim, the Big Rock Point slide? I'm wondering if you could help me. I'm trying to recall. I think Big Rock point is a good example of a site where everything was eventually taken off-site.

MR. KENNEDY: Yes.

MEMBER CLARKE: The initial plan was to contain it on-site, I think, or some of it on-site. Did the off-site disposal not go to a RCRA facility?

MR. KENNEDY: It went to two local landfills in the State of Michigan about 100 or 200 miles away.

MEMBER CLARKE: So Title D?

MR. KENNEDY: Yes. Not Subtitle C.

MEMBER CLARKE: And the PCBs probably went to Utah. Is that right?

MR. KENNEDY: No. They also went to a local landfill that was permanent. I don't think it was under Subtitle C. Ralph is back there. Maybe he knows.

MR. ANDERSEN: Yes. It was also under

Subtitle --

CHAIR RYAN: Ralph, if you could just come to the microphone and tell us who you are for the record. Thank you, sir.

MR. ANDERSEN: Ralph Andersen with NEI. Yes, I believe it was not a Subtitle C site.

MR. KENNEDY: Right. That's my understanding as well.

MR. ANDERSEN: But it was specifically permitted for PCBs waste disposal. Yes. So it's just simply been evaluated for that type of disposal.

MR. KENNEDY: And actually they had to send it to a separate facility for the PCB waste. The first facility which took the majority of the waste and was a Subtitle D facility, that is, a landfill, solid waste landfill, was not authorized to take the PCB waste but the second was.

MEMBER CLARKE: The second was. Okay.

MR. KENNEDY: Yes.

MEMBER CLARKE: Okay. Thank you.

CHAIR RYAN: Ruth.

MEMBER WEINER: I'm fine.

CHAIR RYAN: Okay. Allen.

VICE CHAIR CROFF: No.

CHAIR RYAN: Again, Jim, thanks for a

great start. It's a great overview.

MR. KENNEDY: Thank you.

CHAIR RYAN: And stick around. We might have some questions later on. Thank you.

Next on the agenda is Ruth McBurney from the Conference of Radiation Control Program Directors who will give us the perspective of Agreement States.

While Mike is getting the slides set up, I will announce an administrative matter. With such a large group of folks I know checking in is sometimes problematic if you have to wait in a line. If you would let Mike Lee know your name, he'll make sure that you're logged in so that your log-in will be a little bit more efficient and easier tomorrow. Just if you weren't logged into the system today, make sure you see Mike Lee and he'll make sure that's a little easier tomorrow. Thank you all.

MS. McBURNEY: Good afternoon and thank you for inviting me to come and give the national perspective on what's going on in the states with regard to low activity waste regulation.

I'm really going to give an overview of the perspective of state regulation of exempt material and other releaseable material, what criteria are used in state programs, some waste that's been allowed to

be disposed of other than in a licensed low-level waste site. By rule both AEA material and technologically-enhanced, naturally-occurring radioactive material or TENORM, also some perspectives on alternate means of disposal and some of those types of allowances that have been given and also to touch briefly on some of the license low activity waste sites throughout the country. I'm sure you'll be hearing from the people representing those sites more in-depth later in the session.

Just to give you a perspective on the regulatory framework, there are currently 34 Agreement States and 16 non-Agreement States, meaning that 34 have entered agreements with the Nuclear Regulatory Commission and have for the AEA material, their regulations are compatible with those of NRC.

All the states also have jurisdiction over NORM or TENORM. Right now, there are specific regulations for TENORM in about 12 of the states. All of those states are Agreement States that mostly are in the states where there are TENORM issues such as for phospho-gypsum, pipe scale in the oil and gas industry and some of the mining tailing that are not considered AEA material. So there are regulations regarding those in about 12 of the states.

The Conference of Radiation Control Program Directors provides suggested state regulations for all radioactive material. We have working groups working on those that are also similar to those of the Nuclear Regulatory Commission for AEA material and we make sure that the suggested or model state regulations do meet the compatibility standards of those of NRC. But also we have developed suggested state regulations for TENORM and, as I'll mention later, we address some ways of disposing of that material as well.

For exempt material for disposal, I think Jim Kennedy mentioned that the source material less than 0.05 percent by weight. Some of the states have regulations that would allow that to be disposed of without regard to its radioactivity under certain conditions and some do it on a case-by-case basis. But all have the same regulations on the unimportant quantity of source material and the transfer of unimportant quantities as NRC's. And then, of course, all the exempt items and materials that are in 10 CFR Part 30 are in the equivalent Agreement State rules and those types of things can be disposed of as non-radioactive if they are an exempt item.

Waste that's generated after meeting site

decommissioning standards are considered, I guess, if something goes on on those sites and that material is disposed of, it can be disposed of without regard to its radioactivity. This particular standard varies from state to state and I'll get into a comparison in just a minute.

For exemption of TENORM, the exempt concentrations for disposal of that varies from state to state as well. Currently, some states that have TENORM rules exempted at the 5 picocurie per gram radium level and some go as high as 30 picocurie per gram. The suggested state regulations or model state regulations have a 5 picocurie per gram radium as an exempt level for radium in theirs.

Several years ago -- Well, about a year ago, a survey was done of the Agreement States and the State of New Jersey which also had an active program in this area to see what criteria they used for release of equipment and surface-contaminated areas, also if they placed any conditions on those releases such as release for disposal only rather than for recycling or reuse. They were also asked if they have adopted some sort of dose criteria for decommissioning and, if so, what is it? If not, what is the basis for the unrestricted release of facilities in those

states?

On the equipment and facility release limits, 18 of the states surveyed stated that they used the Reg. Guide 1.86 or the NUREG-1556 criteria and two of the states used 10 percent of that limit that was in Reg. Guide 1.86 and those two states actually had that limit in their regulations rather than as guidance. Some other used a 200 dpm per 100 square centimeter and this question was not addressed from some of the respondents. We got 27 respondents out of the 35 that were surveyed.

We also asked if there were additional restrictions on that equipment of facility release. Twenty of the states said no. Once they met those limits, that was it that could be released for disposal or in any manner or for reuse or whatever. In five of the states there were additional restrictions. Some of those restrictions would be it's not releaseable to an unclassified or a Class 3 landfill. One respondent said that. Disposal or reuse only was expected of those facilities that had been released under the limits and one state said that it was addressed on a case-by-case basis.

Regarding the decommissioning standards, most of the states had adopted the 25 millirem and it

was in their regulations. One state -- No. Three of the states still used a 10 millirem decommissioning standard and one non-Agreement State used a 15 millirem standard. One state had not adopted, said that they had not adopted, a decommissioning standard in rule, but it was done on a case-by-case basis not to exceed 25 millirems.

What we learned from that survey was that the states and NRC do have some sort of de facto de minimus level below which waste is disposed of as non-radioactive in accordance with these release limits. Most of the states are consistent with NRC with release of equipment and facilities and standards for decommissioning, although there is some variation still among the states on that.

Some of the states or most of them have some sort of rules that would allow other disposal of certain radioactive material by other than to a low-level waste site. For AEA material, of course, you have the liquid scintillation and animal carcasses rule for tritium and carbon-14 in certain concentrations and that's in 10 CFR 20.2005. Some states have added the iodine-125 which is also used in laboratory use and medical use and in liquid scintillation and also in animals and so have added

that isotope to that list of that that's able to go to landfill or in the case of liquid scintillation if it's hazardous to a hazardous landfill.

The State of Texas has adopted, has had in place, since the mid 80s a rule that would allow certain concentrations of short half-life material that's less than 300 days in Class 1 municipal landfills or if the material also contains hazardous material, it could go to a Subtitle C hazardous waste landfill.

Some states allow emission controlled dust from arc furnace smelting of gauges, the inadvertent cesium-137, the ash from that, to be disposed of in Subtitle C hazardous waste landfills that allow the KO-61 flue dust to be disposed of there. Once again, the State of Texas had included that in rule. I think some states do it under the or NRC would allow it under the branch technical position under the Alternate Disposal Rule and use the branch technical position as guidance. The State of Texas used that guidance and actually implemented it into a rulemaking.

Tennessee, and I'm sure you'll hear more about this later, allows certain bulk waste in municipal landfills under the Bulk Survey for Release

criteria. Pennsylvania, and I don't have this on the slide, also has through rulemaking legitimized some of the inadvertent disposal of contaminated material at local landfills as well.

With regard to TENORM, technologically-enhances, naturally-occurring radioactive material, the suggested state regulations that have been developed by CRCPD membership and have gone through the approval process from the Federal agencies as well allows the disposal of that, of TENORM, at a permitted solid or hazardous waste disposal facility, that's supposed to solid, not sold, provided that it's not prohibited from disposal at those facilities. So those facilities would have to be permitted to take it or allowed to take it, could be disposed of through an injection well approved for such disposal or, in certain concentrations, a land application might be allowed, some sort of dilution or dispersion as a land application if there was a small amount on, say, a large land lease for oil exploration.

Some of the -- Right now, the TENORM regulations vary from state to state and we haven't had the suggested state regs. in place long enough for all the states to actually adopt the new SSRs in that area. So right now, there's quite a bit of variation

in how states are regulating TENORM and the disposal aspects of that.

CHAIR RYAN: Ruth, just a clarification there. The states aren't required to adopt that SSR, are they?

MS. McBURNEY: No.

CHAIR RYAN: Okay.

MS. McBURNEY: Because this is not a Federal standard and the states that have TENORM issues they usually tailor their regulations to that specific issue. Like in Florida, it might be toward the phospho-gypsum in industry.

CHAIR RYAN: As opposed to oil and gas in other states.

MS. McBURNEY: Oil and gas states.

CHAIR RYAN: Yes. Okay. Thank you.

MS. McBURNEY: Also I wanted to make mention that the suggested state regulation for TENORM does prohibit dissolution to make the waste exempt.

Regarding alternate means of disposal, as you heard earlier, the 10 CFR 20.2002 does allow application for alternate means of disposal for low activity waste. Some states do have this regulation and some do not for various reasons. Some have legislation that only allows waste to be exempted by

rule or other types of disposal to only be done by rule.

It is a compatibility level D meaning it does not have to be adopted by the Agreement States since it is a procedural rule for obtaining an exemption from other rules and not a standard in itself which some compatibility levels such as for your basic dose standards must be adopted. But this particular rule is at a much lower level and does not have to be adopted by Agreement States.

For TENORM, the suggested state regulations do provide for alternative means of disposal, those that are authorized by the permitting agency for the disposal site upon application or upon the agency's initiative and consistent with public dose standards. Those alternate methods must also be consistent with the Safe Drinking Water Act standards and other EPA requirements for disposal of such waste.

Several of the states do have licensed or permitted low activity waste facilities. Of course, the U.S. Ecology facility in Idaho is a hazardous waste permit that's been amended to allow certain concentrations of radioactive material. You heard earlier from Commissioner Jaczko about the Colorado facility that was a hazardous waste facility that's

now been licensed under the Colorado rules for low-level waste. It's limited to NORM or TENORM, uranium or thorium decay chain material less than 2,000 picocuries per gram and radium at less than 400 picocuries per gram, the Energy Solutions facility in Utah which is licensed for low activity waste and TENORM and Waste Control Specialists facility. The current facility is a hazardous waste facility that is permitted to accept exempt material including exempt TENORM and the unimportant quantities of source material. They do have an application pending for (11)(e)(2) material as well, but that's not been licensed yet. And I haven't even mentioned (11)(e)(2) or pre-1978 (11)(e)(2) material which the states are treating like they would TENORM for that material that was pre-1978 uranium tailings.

In summary, the states and the Nuclear Regulatory Commission do have a sort of de facto de minimus level below which waste is disposed of as non-radioactive in accordance with release limits.

Most states are consistent with NRC for the release of equipment and facilities and standards for decommissioning, although they do vary somewhat.

States vary in their regulation of TENORM waste, but CRCPD has provided model regulations for

the exemption of certain concentrations of that material for licensing material while it's in possession and then giving some disposal options for TENORM.

Some states have provided for ultimate disposal options for low activity waste, that's specific rules, or through implementation of rules similar to 10 CFR 20.2002 and are providing by rule and by licensing some actual or other permits, some way of disposing of some of this waste.

With that, I'll close and be able to answer any questions that you might have.

CHAIR RYAN: Ruth, thanks. That's a great overview of the states' perspective. I'm pleased to note that all the facilities you mentioned in your list are here on the agenda.

MS. McBURNEY: Yes.

CHAIR RYAN: And we'll hear some of the details from them. So that's worked out very, very well. Any questions, Jim?

MEMBER CLARKE: No. No, thank you.

CHAIR RYAN: Ruth.

MEMBER WEINER: Yes. I had a couple of questions. Given the variety of regulations and implementations that the states have, would you see

from your perspective would there be a benefit to standardizing everything? Would there be a detriment to standardizing everything? How would you see that?

MS. McBURNEY: I think it would be a benefit to have a national standard for how to handle low activity waste and for setting some initial minimal level for doing that because it would give better guidance and better standardization for that. I think back as far as in the background document, back as far as the 1970s, the states were asking for some sort of national standard on this.

MEMBER WEINER: Well, if that were to happen, would you see that as happens with other Federal regulations that the states could get more restrictive but not less restrictive and that then some states would do that and we have the same situation we have now?

MS. McBURNEY: That could happen. That very well could happen because in some states the politics is such that they want even tighter standards than the Federal standards and then it puts the states that do accept the Federal standards in the position of those people in the states with the tighter regulations sending their waste there to the other states. So there are several issues that would have

to be addressed on that.

MEMBER WEINER: Thank you.

CHAIR RYAN: One of the things you covered, Ruth, was the kind of array of bases and histories of what formed a regulation or a requirement. The short version of the question is if you were a king or queen of the world or a king of the world or creator of the world, would you pick dose as the basis for regulating or concentration.

MS. McBURNEY: I think dose because -- Well, then the concentration could be implemented as an implementation.

CHAIR RYAN: Derived from the dose.

MS. McBURNEY: Right. Derived from the dose.

CHAIR RYAN: By performance, assessment, that kind of thing.

MS. McBURNEY: Yes. Having been involved in the rulemaking for the short-lived material in Texas, the rule lays out concentrations, but the risk assessment on the basis on which we did the rulemaking was a 1 millirem criteria, but then we actually put the concentrations of the various isotopes --

CHAIR RYAN: Still based on a specific criteria.

MS. McBURNEY: Still based on the other.

CHAIR RYAN: I think that was interesting note from Jim Kennedy's talk is that if you look across his circle of regulation, some were instrument-based, I mean, based on specific instruments. I guess, somewhere there might be a dose criteria, but the transparency of those isn't as clear whether that's just the concentration. Because in a different, say, geo-hydrologic setting the same dose could end up with a different concentration.

MS. McBURNEY: But, yes. But it would be for a typical -- I think that dose basis was based on atypical municipal landfill.

CHAIR RYAN: Yes.

MS. McBURNEY: And the dose criterion of the 1 millirem and then from that all these concentrations.

CHAIR RYAN: Again, I think one of the things we're trying to learn in these couple of days is if you do pick a dose it's fairly clear and uniform to everybody, but then the burden of performance assessment goes with that.

MS. McBURNEY: Right.

CHAIR RYAN: But if you do that for them, you may end up with something that's more restrictive

in one case than in another.

MS. McBURNEY: Right.

CHAIR RYAN: So we're trying to learn as much as we can about that and you've given us a great start.

Allen, do you have any questions at this point?

VICE CHAIR CROFF: I had one. You talked a lot about TENORM and NORM. What about accelerator-produced materials?

MS. McBURNEY: Of course, that is now AEA material. So it's regulated now like lab product material is.

VICE CHAIR CROFF: But in the past, was it -- Before that relatively recent change, was it treated the same as, I mean, what you describe for NORM and TENORM basically in terms of exemptions and the rest?

MS. McBURNEY: Most states regulated it like they did byproduct material. It was licensed like byproduct material. The difference in ARM and ORM is that the NARM in ARM, accelerator-produced material, was actually possessed for its radiological properties, just like byproduct material is used medicine and industry for its radiological properties;

whereas, TENORM is used in -- I mean, it just happens in industries that they're not really wanting it there. It just occurs. It's naturally-occurring material that is a byproduct of oil exploration or of the phosphate industry or whatever.

VICE CHAIR CROFF: Okay. Thanks.

CHAIR RYAN: Ruth, thanks very much. You've gotten us off to another great start, so we appreciate that.

Our agenda shows that we are due for a break. However I think I'll split up the afternoon floor sessions and ask Allen Croff to provide us with his summary and a risk-based classification system for radioactive and chemical hazardous wastes, coming as recommendations to the National Council on Radiation Protection and Measurements, in Report Number 139.

I may be incorrect but I think this is one of the first really comprehensive assessments of radioactive material and chemical waste analysis with regard to risk assessment and ultimate disposal of these kinds of material.

Allen, thank you for giving us this briefing?

RISK-BASED CLASSIFICATION SYSTEM FOR RADIOACTIVE AND CHEMICALLY HAZARDOUS WASTES - RECOMMENDATION FROM THE

VICE CHAIR CROFF: I think you are right, Mike. We certainly couldn't find another one to help us along.

I'm going to come at the waste classification and waste disposal issue from I guess a very different perspective than the two talks you just heard.

What you just heard is talks about - at the level of regulation, and how the system is working from a pragmatic standpoint I guess to put it in a few words.

I am going to more focus on a history and the status of hte waste classification system at the higher levels, which means I'm going to primarily be talking about things that are codified in law, not in regulation or guidance and this kind of thing.

First, the title says a brief history, and it's going to be like that movie title, Part One of a Brief History of the World.

These were initially classified based on operational and design considerations. If you go back to World War II and shortly after it, great demand for the product, in particular of plutonium from production reactors, which was meant for processing;

and then various secondary wastes.

And the people running those plants needed practical solutions today on how to handle them today. So whether they had penetrating radiation or not, whether htey generated a lot of heat or not, those were the most important considerations, and the wastes were segregated on that basis and managed on that basis, not for the most part disposed of on that basis, certainly for the higher activity waste.

As a practical matter this translated from how much heat is it generating to the process that generated the waste. There were only certain processes and certain places in these facilities that could generate a high-heat waste or a waste with penetrating radiation or high alpha. So it became attached to the source or hte origin of the waste if you prefer.

And as time went on this what I'll call an idealized source basis was adopted, and codified into the waste definitions which are the boundary of the waste classes. And basically that's what persists today. That's sort of how we got to where we are.

And you will note the word, idealized, here. I use that deliberately. If the process was running right and as intended, they knew where the

waste would go. And I'll get back to this a little bit later.

And as I said the primary waste definitions come from law. This is from the NCRP, Report #139, and it was our attempt to sort of summarize the hierarchy of waste classification in the United States, first splitting it into fuel cycle waste, or Atomic Energy Act waste, and then non-fuel cycle waste.

And I should say, the report goes back a few years, and it precedes the change in law which brought some of the non-material back in as AEA materials. So this diagram is a little bit off in particular as it concerns some accelerated produced, and some of the more concentrated norm sources.

But focusing on the left you see the four major waste classes. All of these are defined in law. I'll spare you the torture of reading the definitions here, because some of them are indeed tortuous.

But basically high level waste is the lynchpin. It is defined on its source as the waste from nuclear fuel reprocessing, which has been somewhat refined to be the waste from the first cycle of nuclear fuel reprocessing or equivalent.

Transuranic waste and low-level waste are

defined by exclusion. Transuranic waste is waste that's not high level waste and has more than 100 nanocuries per gram, and low level waste is waste that excludes high level waste, spent fuel, uranium and thorium mill tailings.

There is essentially a definition for uranium and thorium mill tailing in the law.

Beneath this you start to get, from these basic waste classifications and go into waste sub-classifications, transuranic waste has the contact and remotely handled; and that's applicable to the DOE system, not the civilian system.

And of course under low level waste we have hte A, B and C that come from Part 61, and then by difference I guess I'd call it the greater than class C.

At this point I think I'll make one other comment. Let me go on for just a little bit; I'll do that a little bit later.

Given some of hte frailties of this system that have been well described, and some of the challenges it creates, and I'll get to these a little bit later, there have been some alternatives proposed, and I'll describe them for the U.S. and then talk a little bit about the international situaiton.

In the U.S. over decades literally a number of authors have tried to propose systems with a goal of making waste classification more related to risk as opposed to the source of the waste.

A very typical approach is usually a two-dimensional approach where the waste is categorized on one hand by its activities - that's activities, something like curies or power density - and on the other hand by longevity, in particular, the concentration of long-lived isotopes, and whether it makes it unacceptable for near-surface disposal or not.

To my opinion these have had very little impact in the U.S. They have just barely been considered for adoption. There have been a couple fo attempts that didn't last very long. And they just simply haven't gone very far.

I guess I should at this point comment on the NCRP Report #139. What it attempted to do was to set forth a risk-based waste classification system, one that was essentially literally based on risk, and to do so and have a unified classification system for chemical waste and radioactive waste.

The essence of it if you bore down into the middle of it is to compare the radionuclide

concentrations to acceptable - quote, acceptable limit - for various disposal facilities for the waste, either a near-surface facility or have an exempt class of waste.

And there are numerous challenges in doing this. In the chemical system and the way they approach risk, and the RAD system and the way it is approached on a risk basis, are not the same. The same words mean different things in the two systems.

In the radiation world, threshold effects are essentially unimportant to us in most cases, certainly concerning waste disposal. But they are of significant importance in the chemical worlds, so that added to the account. So it got to be a rather complicated exercise. The proposal came forth for a three-tiered system: exempt, low hazard, and high hazard. But again to my reckoning I don't think it's going any place in the near future.

Internationally, I'm certain not going to try to address every country in the world, but concerning the International Atomic Energy Agency, this summarizes their presently recommended, I'll guess I'll say, waste classification. It has an exempt waste class based on dose; a low and intermediate waste level class, which is sort of a

collage of what we would call low-level waste in this country and the transuranic waste, the long-lived - of the low and intermediate level long-lived waste is something that we would probably call a transuranic waste.

And you will see in that middle block, especially for the non-long-lived, a number of disposal destinations are impossible. It's sort of - it's up to you, country, is basically what they are saying.

And then high level waste. And in this case it's - it is based on the power density in the waste. So you bring in that factor as well as the concentration of long-lived radionuclides, in particular the alpha emitters.

So I can't make a direct connection but possibly some of hte early work in the U.S. might have influenced the IAEA, since there are similarities between some of the proposed systems.

And then as a separate matter, the basically norm waste that they recognize because of the volume need to be considered separately.

This is what's on the books now and official.

Going beyond it, they are working on a

revision to this, and this is the diagram if you will that shows how it lays out.

And I should say, fortuitously or not, just last night I got emailed to me an updated version of this which I have not had a chance to digest yet. Based on a cursory scan it does not appear to differ much, but I haven't had a chance to read the words.

What you see in this diagram is an elaboration of their system. The VSLW waste on the left is very short-lived, and it's basically decay to innocuous levels. It's that short lived.

At the bottom you see the exempt waste category which has been retained at clearance levels. Very low level waste would correspond to the kinds of things we have been talking about here today. This is waste that might be disposed of in a landfill, but not a near-surface disposal necessarily designed for low level waste, the higher activity low level waste, which is the LLW block or band above it.

Intermediate level waste has been retained, and this is something probably more akin to the transuranic waste. So they have taken their previously block in the middle, and separated it with the target destination there. They have mentioned things like deep bore holes. But something

significantly below the surface.

And finally high level waste destined for repository disposal.

A couple of other features you see here. These little red dots scattered around. They went and looked at typical isotopic sources raising from some very short-lived ones, ytrium-90 and irridium-192, which are the As on the left, to cobalt-60 and tritium are the B's, and then to cesium-137 and strontium-90, the Cs, and finally plutonium and americium and radium sources, which are the D sources on the right.

I just wanted to show where they would fit into these things, and of course some of them become intermediate waste and far more stringent disposal.

You also see a very broad band of where the norm might lie, and thus it's challenge and why they chose to put it in a separate classification.

Talking about the risk basis of the systems, I don't know that htey have been described. The U.S. classification system believe it or not is qualitatively or indirectly related to risk in ways that are similar to the ideal.

To pick an example high level waste, if you've got high level waste coming out of a potential commercial reprocessing plant, maybe something like

one of the LaHague plants or THORP, it's very active, radioactive. They are running the plant and producing material that meets up to the ideal of high level waste. And it should be treated as such.

On the other hand, if you look at the Department of Energy situation where they have taken waste from that same source many years ago, diluted it with neutralizing chemicals, processed it, removed things, blended things, it moves away quite a bit from the ideal depending on exactly what little piece of that waste you might be looking at on any particular day.

So in a qualitative sense it does relate, but. There are a lot of ways differing from the ideal. High level waste, I just mentioned, at what point should it not be mentioned as high level waste? The Congress has come up with this waste incidental to reprocessing construct based on a lot of earlier work here in the Nuclear Regulatory Commission for deciding that.

But the nature of the definition raises this question, and the need for I'll call it exceptions in some cases.

Low level waste, the very dilute and very concentrated edges of the spectrum of low level waste.

In this meeting today you've already talked and will talk a lot more about the more dilute and whether that should be acceptable.

At the very concentrated end you get into isotopic sources where if you start to take very literally the concentration even though it may be a millicurie or some very small amount of radioactivity, its concentration can be very high.

And so it just doesn't fit into the tables of concentration, and the concept of low level waste will help special consideration, and often that consideration has gotten into the concentration averaging business which has been interesting for many years, and I think we are going to hear more about that right after the break.

And then there is non-fuel-cycle wastes, which are separate and have been and are sometimes treated separately, and not necessarily same way as the fuel cycle waste, but even though they may be similar to fuel cycle waste.

The IAEA waste classification system would seem to be mostly risk-informed, and I'm referring to the existing one. And I can't really make heads or tails at this early juncture out of the new IAEA system because it hasn't been quantified to a very

great extent in terms of exactly where the boundaries would be. But it looks to have some promise, although it is very complicated.

The proposed U.S. waste classifications have generally been mostly if not entirely risk informed. As I said before, similar to the IAEA waste classification system.

Finally some of the central problems that these definitions involve have caused as I mentioned high level waste and the need for this WIR process that is costly and distractive I think, I would say, at a minimum; contentious at worst.

There is no lower boundary for low level waste. You have heard quite a bit in the previous two talks about regulations and otehr provisions in guidance that are - and including state regulations - that are allowing it to occur. But in the classification per se, in the U.S. there is not an exempt waste class.

That has led us to things like mixed waste and no clearance or case-by-case clearance of materials, depending on where you are.

At this point we have no system for I'll call the intermediate level non-defense waste, or greater than class C wastes. As Jim Kennedy noted,

the DOE is working through some kind of a process with I guess the expectation of an EIS that will propose some path forward on this.

But at this point there is a lot of greater than Class C and equivalent DOE waste that is awaiting some destination.

Finally the concentration based boundaries as I said get you into difficulty at the ends of the spectrum and have led to our discussions here today as well as those that preceded it, as well as at the other end the concentration averaging protocols and the need for those to make sense out of the system.

I believe with that I'm done. I include a few references here to the two IAEA documents and the NCRP report for anybody that is interested.

Questions?

CHAIR RYAN: Jim?

MEMBER CLARKE: No thanks. Nice job.

CHAIR RYAN: Ruth?

MEMBER WEINER: That was a very good job.

One of the - this is just to add to your very excellent presentation - one of the very confusing things was the notion of transuranic waste, at least a quarter of which is the same sort of stuff as low level waste. And the remote handled

transuranic waste is physically indistinguishable from high level waste. So it's a completely artificial distinction.

VICE CHAIR CROFF: Yes.

CHAIR RYAN: There's an aspect of waste classification that we have talked a little bit about, I think Ruth talked on it, and you did, Allen, and that is that many wastes were defined not only by their origin but also by how they were handled operationally.

Ruth gave an example: contact and non-contact handled waste has absolutely nothing to do with its disposal risks; everything to do with its operational risks.

If you look at the DOT requirements for moving waste or radioactive materials around the country, you've got dose rates on contact with the shipping container, and dose rates at distances away, and all that stuff; the driver's position. And those are all radiation protection for worker kind of criteria.

Again, you know, the risk for an accident is handled through the accident requirements and design requirements so that material is controlled in the accident situation.

But again it's about waste. You know some folks have tried in the past to say that if you don't have to placard it, it's not radioactive waste. We all know that's wrong. We have this confusion out there.

Again, I wonder what, from your past work, your insights are, how do we at least pick a couple of things? I mean concentration I think people can understand in the middle range. And over a fairly broad range is a useful metric.

The very dilute, the very concentrated, you have explained very well how that sort of becomes not representative of the risk.

In disposal concentration doesn't really relate to risk. Quantity disposed in the system is what determines the risk. So for example that leads me to think about averaging. We now have guidance on averaging for irradiated hardware; it's a times 10 rule.

I just throw out a number: what about a times 30 rule? Would that change the risks once disposed?

Could you offer any insights? I mean if you had to pick, I kind of ask you the same question I asked Ruth McBurney, if you have to pick a couple of

metrics to try and work with as the criteria to deal with low activity waste in a way that was consistent with low level and some of the other categories you mentioned, what would you pick?

VICE CHAIR CROFF: Let me first go back to where you started. You're right, the definitions even current ones come from operational things, and in the old days high level waste was somethign that boiled. It was just about that simple.

I think ideally first a waste classification system should be tied to a disposal destination at its most fundamental level. And then below that you can get into subclasses of, is it radioactive? Does it have handling problems? Get into the engineering stuff.

But if it's waste your ultimate objective is to get rid of it so you should be focusing on disposal destinations.

In my view having seen everything from concentration base, which we have a lot of, having tried a risk-based, and what we tried to do in the NCIP report was very close to risk based, I think the right answer - and Allen would agree with Ruth McBurney - is dose.

Because from dose you can get

concentration limits. If it's at the fringes, then you can become case specific, and you've still got your dose criteria that you are supposed to meet.

And that would seem to solve an awful lot of problems if we could get it headed in that direction.

CHAIR RYAN: Thanks. With that we will take - I'm sorry? Bobby, did you have a question?

MR. EIDS: If you allow me.

CHAIR RYAN: I'm sorry?

MR. EIDS: If you allow me.

CHAIR RYAN: Sure, yes, please, I'm sorry I didn't see your hand up.

MR. EIDS: This is Bobby Eids, deputy general, waste management.

Just two things, just to update, because you mentioned the DS-390. It was posted, you are correct, it was posted on the 11th which was two days ago. And I looked quickly.

And if you look at slide #6 of your slides, so there is some correction. So if you see that figure was changed. So the norm was removed as an example of the waste.

So and this is one of the comments that we made about the norm. And IAEA did respond to our

comments and the norm now was removed from that figure.

So if you look on the current verison on page six, figure one, actually the norm is not included, and the example is given, they are not included.

So if you update that slide, which is what I would do.

VICE CHAIR CROFF: Let me if I could ask you a question back then. What does the IAEA proposal say about norm or how is it to be classified or handled?

MR. EIDS: That is a very good question.

In response to that, if you look at Annex 3 of the new version, so it may be - you do not have the benefit of looking into detail into this, so I apologize for that.

However, they did consider this, and they gave this as an example in Annex 3, and they showed this exact figure as shown in Annex 3. And in accordance with IAEA, the annex is not part of the document.

I will read for you their standard. They say: the appendix is an integral part of the main text and has the same regulatory status under the agency

status in the main text.

However, the annex is not an integral part of the text. So therefore since it is an annex, it is not an integral part of DS-390. It is given as an example, and it's left up to the states to deal with the norm, depending on the current regulations.

VICE CHAIR CROFF: I think that is too much for an engineer to figure out. (Laughter.) Leave that to the lawyers.

MR. CAMPER: This is Larry Camper. But as a practical matter what happened during the last committee meeting was, the graphic depiction of the norm, the concern the committee raised, it wasn't easy to capture norm on that graphic depiction because of the half-life involved.

It's a bit misleading as depicted there. Now it's a crude representation, that is true. But a lot of the discussion evolved around that, and I suspect that's why they removed it as an example.

MR. EIDS: Sorry, the other comment I would like to make when talking about risk is, the devil in the details.

So I think then it comes to the issue of the performance period. It makes a big difference for a performance period of 30 years, versus a performance

period of 1,000 years or 10,000 years. You will have different values for risk because of the contaminant transport.

So the issue of risk should be linked also to the issue of hte performance assessment as well. So in this regard we may end with some kind of size-specific analysis. And example of DU for example disposal in terms of the volume of radioactivity it could be different. It is a class A waste by default. However when you do consider you know the risk and the volume it may be easier to have some kind of size-specific analysis.

VICE CHAIR CROFF: You remind of something I'd forgotten just a little bit before concerning waste classification.

When you stand back from all of it and you sort of recognize how few waste disposal facilities we have and are likely to have for quite awhile to come, you have to ask yourself just how helpful is waste classification as opposed to just saying, here is my site. Here is a dose limit. Let's go in and see whether it meets it or not, and forget whether the waste is blue or purple or yellow.

And I think that is what Richard is sort of suggesting there, and you maybe have to start

asking yourself, I mean waste classification is useful if you got a lot of facilities; you want consistency. But maybe one depository, you know, struggling with low level waste sites. I don't know.

CHAIR RYAN: Those are great insights. And Bobby, thank you again for bringing us up to the minute with IAEA; we really appreciate that. It's within 48 hours of it being out in the press. That's great information. Thank you.

I think you also raised an interesting question that I think we'll begin to address with our next presenter after the break, Dr. Esh, that will talk about risk-informed analysis. Because I think that's where, Fred, you and Anne were discussing, kind of come together. What is your risk assessment? How do you do performance assessment to address all the variables that we have heard about so far this afternoon.

So thanks for being with us as always. And again with that we will take a 15-minute break and reconvene at 3:00 o'oclock for the next two presentations.

Thank you.

(Whereupon at 2:43 p.m. the proceeding in the above-entitled matter went off the

record to return on the record at 3:00 p.m.)

CHAIR RYAN: I would like to ask everybody to please take their seats.

Thank you. Just one administrative note. Several folks have expressed interest in obtaining copies of slides.

What we will do is, Mike Lee is the staff person helping with this meeting. If you would give him your business card. When we assemble the packet for this meeting, which is the slide sets, the transcript and so forth, we will sure to make distribution based on your turning in your business card to Mike Lee.

So if you would do that, we would be happy to provide them. And we can't provide them kind of as we go. That's just not a real efficient or effective way to do it.

So we will be happy to distribute it when we make that packet available. So thank you for your interest.

Without further ado, David Esh, Dr. Esh, is going to speak about risk informed analytical approaches to waste classification in the NRC staff review.

Welcome, David, nice to see you.

RISK-INFORMED ANALYTICAL APPROACHES TO WASTE CLASSIFICATION: NRC STAFF REVIEW OF U.S. DEPARTMENT OF ENERGY (DOE) WASTE INCIDENTAL TO REPROCESSING (WIR) DETERMINATION

MR. ESH: Nice to see you.

Do I need a microphone here?

CHAIR RYAN: I think you are okay. The microphone is on the table.

MR. ESH: I'm happy to be here and talk to you about what we've done in risk-informed analytical approaches to waste classification.

This is in the context of incidental waste, so we haven't applied it to any other waste management area or scheme. It's only for incidental waste.

But I guess the committee, we've talked to them in the past, felt that there may be some applications to other problems. So I'm here talking to you today not trying to give my ideas about how it may apply to your waste management areas but just to describe what we have done, and hopefully there will be some translations done by the committee and the stakeholders as to the applicability to hteir systems.

I'd like to acknowledge Karen Pinkston

here who was one of my co-contributors on this problem.

I'm going to give you some background. We'll talk about waste classification. And then just the approach I'm going to show you is for concentration averaging for incidental waste.

We have developed three categories. Categories don't mean anything more than that's a descriptive term within our reviews for incidental waste that tells what approach is being used.

We developed some averaging discussions for the staff to use. I'll talk about how we went about that, and give you some conclusions.

Some background for those of you who might not be familiar, waste incidental to reprocessing, or WIR, is waste originating from the reprocessing of spent nuclear fuel that does not need to be sent to a geologic repository in order to safely manage the risk that it poses.

So it's basically the residual material that you cannot get out of a tank, for instance, high level waste tank, or material that you separate out from the reprocessing or the management of high level waste, the low activity portion.

Those sorts of materials are falling in

this gray area that Allen Croff talked about. It's not the same as the high level waste, but it's certainly not meeting the language definition of low level waste. So exactly what is it and what do you do with it?

In this process NRC has worked with DOE in the past on a case-by-case basis, but then more recently in October of 2004 we had this Defense Authorization Act of 2005, which we refer to as the NDAA, which required DOE to consult with NRC on waste determination. So we are essentially an independent technical reviewer of their waste determination.

And the waste determination includes the performance assessment of the material to demonstrate the safety of its management and disposal, and some other things, removal of key radionuclides, or highly radioactive radionuclides to the maximum extent practicable. And we basically do an independent review of DOE's work.

And then also in this act we were assigned the responsibility to monitor DOE's disposal actions, and that is a more independent look at what htey have done to see if htey are continuing to meet the performance objectives, where in this context the performance objectives at 10 CFR Part 61.

It's basically that we assess whether the waste can be managed safely as if it was low level waste. But it's only the performance objectives in Subpart C, it's not all of regulation.

The NDAA, where the waste classification comes in, is that hte NDAA requires additional consultation if hte waste does not meet the Part 61 Class B concentration limits.

So we got into some issues about, well, how do you define that? On one hand the Department of Energy who we are consulting for say those Part 61 classification limits, how they were derived, that doesn't really work for our problem. Our problem is different.

And then we also had other stakeholders say the same thing but they were coming at it from a different direction. They felt, whereas the DOE felt that some of the things in Part 61, the derivation fo the concentration limits, was overly conservative for their types of problems, the other stakeholders felt that some of those assumptions and things that were done were nonconservative.

And so we took a hard look at this and said, okay, can we do this better if we just use the numbers that are in 6155, that's an easy approach, but

is there a better approach that is more risk-informed than that.

And 61.55(a)(8) provides for the use of concentration averaging in waste classification. So the basis is all there to do this; it's a matter of interpretation and implementation.

So what we did is, we looked at our guidance. We have a concentration averaging branch technical position, and that's for commercial low-level waste disposal. Looked at what it was saying, and we looked at the regulation, and we decided well, what can we do to look at the real aspects of these incidental waste problems while still staying in line and honest with the main elements that are in that branch technical position in the regulation.

We came up with these three categories, categories one, two and three. One is based on physical homogeneity of the waste, so it's basically if your material that you are worried about, what the concentration is and therefore what the classification of it is can be well mixed in your system, and you are not mixing it to dilute the classification, but you are mixing it to manage the waste, or to stabilize it.

You can calculate the concentration based on the average of the waste, and the averaging - or

the material you put in to stabilize it.

That's category one, a straightforward, do you have physical mixing basically.

Category two, stabilization to satisfy 61.56, is basically that 61.56 says that the waste has to be in a stable physical form for disposal. And within 61.56 it says you can determine the stability. Stability is kind of defined with respect to the potential intruder exposures.

So category two, the averaging is defined based on your potential intruder scenario. So if you are talking about deeply buried waste where you are worried about somebody drilling into it, what is the average concentration that somebody is going to hit with a drill if they drill for water or some other resources and exhume some waste.

If the waste is more shallow and they put in a basement, what is the average concentration you get whenever they put a basement in? Those approaches, we think, are well within the branch technical position and the regulation.

But we felt like that didn't capture all of what we needed to capture, and we came up with the site-specific averaging. The other participants in your meeting here have talked about aspects of this,

and I think this hopefully in a few slides here I'll show you how it all fits together, how we think it could fit together.

Granted, this was for our specific application, but there may be applicability to some of your other problems.

So category three is a risk-informed approach we believe that allows for consideration of the factors listed below: depth to waste, quantity of waste, concentration of waste, and maybe in the presence or absence of an intruder barriers.

If you think about it, what are you trying to do with classification? You are trying to ensure that material is safely managed and disposed of in a configuration that is appropriate for the material.

So what you are implicitly saying is that if something is less than class A it can be disposed of with less controls and less stringency than something that is a higher classification.

In this case, the classification though, our opinion is, it's impacted by the quantity, the concentration and the accessibility, so where you put it and how you've managed it.

Concentration can be a measurement an influence to risk, but it's only one of the elements

to the influence of risk, and I think Dr. Ryan talked to this. It's concentration times quantity times some factor that is related to its accessibility that is influencing the risk in the case that we talk about.

So that's what our approach is, it's trying to factor in all of those for our specific problem.

Then I have to say that when I first came up with this, it was fairly complicated. I think it involved sacrifice of a chicken, and there was a chipmunk involved. Karen and Cynthia from our staff reviewed it, and I think we got it a lot more clean now. It should make sense to all of you, and if it doesn't I'm always happy to talk about it; feel free to contact me.

On this slide here we have on the left the part 61 intruder construction scenario. That scenario is one where it is assumed that sometime after site closure and the institutional control period ends that a potential excavation would be made at the site, exhuming some quantity of waste. And those calculations that were done were deterministic calculations using dosimetry consistent with ICRP-2 and generic parameter sets.

As it needed to be for commercial low-

level waste disposal, the waste classification that they were trying to develop had to apply to any site across the country that was going to be licensed. So that was the right approach at the time.

What you need to understand, though, is that the scenario - the excavation and quantity and even say concentration of material - was kind of constrained by the commercial low-level waste application.

So it had some vision of, what was the type of material that was going to go into these facilities? What was the quantity of it? What was the type of disposal technology that was likely to be used for those facilities?

Ranges were looked at on all those things, but it was still within a box of commercial low-level waste disposal.

For our problem, this incidental waste problem, as Allen Croff talked about, work more on the edge of, certainly we have in some cases higher concentration material; but then we also have material that may be smaller in quantity, and also, much more inaccessible than the commercial problem.

So the figure on the right shows our types of problems that we are concerned with. We can have

piping that might be fairly close to the surface that would still be impacted by this excavation-type scenario; or our well driller we consider.

But a lot of the material is pretty deeply buried, more than 10 meters for instance, that could be intersected by a well that somebody puts in to try to extract groundwater or other natural resources.

So in our approach we looked at these different scenarios. We looked at probabilistic and deterministic calculations. We used more updated, or more recent dosimetry, and we tried to consider site-specific parameter values or distributions.

So the translation between what was done for Part 61, and then our problem, is what's shown on these figures, and we needed a way to convert between one and the other. So that's what I'm going to show you here.

Our approach was - sorry, let me step back a second. In this process we developed a guidance document to use to perform our reviews. So the Department of Energy would know what we were looking for, the types of information we were looking for, what our expectations were.

That guidance document is NUREG- 1854. So in this work is part of that guidance document.

Everything I'm talking about today is found in that guidance document. There is more documentation about the approach in the context and everything. If you want further information, please take a look at that; and then if you need more beyond that feel free to contact me.

What we needed, though, because that was a guidance document, was some way for our staff to look at DOE's arguments about waste classification and concentration averaging without needing to do a full blown analysis necessarily at the first stab, but to see, okay, is this in the ballpark where I think is reasonable, or is this some extreme case where the limits are being pushed, as how much averaging you can assume.

So we developed these concentration averaging expressions, of which - we constrained it to certain scenarios. And the reason why we did that is because in NRC space and in low-level waste space these were the types of scenarios that were considered for commercial low level waste.

So if we are talking about incidental waste, and we are saying, can this material be managed as if it were low level waste, then we should look at similar scenarios to commercial low level waste

disposal.

You can expand this and look at a broader range of scenarios. What we find is that between the NRC and other regulatory agencies there can be some difference as to how people look at disposal. NRC looks at disposal as that; it is disposal, it's not de facto long term storage where you are continuing - you can assume that somebody is going to be there in perpetuity, maintaining your systems, monitoring, et cetera.

But our approach is one where you dispose of the material; at some time it becomes a disposal facility where you don't have that continual control and maintenance; and then you could potentially have some scenarios where people contact the material.

And so these scenarios are what are addressed here.

What we looked at, what we wanted to consider, is that some of the material may be shallow or deep. Those are generic terms, but it's related to the processes that you may contact them.

They may be protected by an intruder barrier, or not be protected by an intruder barrier.

And therefore, based on these constraints, what would be the potential disruption process that

you could have that would expose material?

Because if you are using a dose-based approach to say what's appropriate for concentration averaging and therefore classification, it's related to how much material you are exhuming or exposing, and how long it's protected, and how it has been managed.

So this construct of these scenarios are what we use to develop our averaging expressions, and basically the staff is directed, if the waste is shallow and there is no intruder barrier then you use a certain approach. If it's deep and there is an intruder barrier then you use a different approach.

But it's a way to recognize this accessibility of the material in addition to what was done in the past with this quantity, or concentration really.

The example averaging expressions are just for the staff to use on this type of problem. And the way we set it up is, that is kind of a red flag to say, when do I need to have additional effort, when do I need additional review effort.

It doesn't necessarily mean that if it didn't pass our averaging expressions we would say it's a certain class.

It's up to the - in this case - the

Department of Energy to make the classification argument. This is just a review tool for our staff to make the review process work more efficiently.

We used some conservative assumptions, or what I would say are conservative assumptions, in development of these expressions. That's one of the reasons why we wouldn't think it would be appropriate for somebody just to take them and use them in a classification calculation. You wouldn't be doing yourself justice from a risk perspective.

These equations, like I said, are not to be used as a basis for waste classification.

So our goal was to develop some equations that compare this new analysis for incidental waste to the Part 61 analysis that was done in the past.

And what you see here, the equation to its very basic term is one of concentration for a scenario and a radionuclide times the volume of material that you may exhume or be exposed to times a transfer factor, this X(i,j), where it gives you a dose for a certain scenario and a certain radionuclide.

This transfer factor, X(i,j), is really what comes out of the performance assessment. That's - the performance assessment is converting some concentration and volume of material into a dose.

So what we did is, we, without wanting - not wanting to duplicate the Part 61 calculations, we made some assumptions that, given the concentration of material in the tables in Part 61, and knowing the volume of material that was assumed in the scenarios for Part 61, those concentrations were set with some other assumptions and a performance assessment calculation, to give you an intruder dose of 500 millirem basically.

Knowing all that, then we can define these things in the lower part of the equation. We will have new ones that would apply for our particular incidental waste problem. And we are basically doing a normalization to calculate what hte concentration is for an appropriate - for these incidental waste problems that takes into account the differences in concentration quantity and accessiblity of the material.

So we developed these averaging expressions. So the way we did that is, we made a probabilistic Goldsim model to calculate the intruder dose for each scenario for unit concentrations. Then we calculated the mean dose used to determine the value of the constant for each radionuclide.

Then we assume, like I said, the class D

concentrations correspond to 500 milliirem for a low level waste facility.

And you basically rearrange those equations, and you get a constant equals the ratio down here, the expression at the bottom.

Let's see. After we get that constant, then, the averaging equations were created for each scenario using the constant from the limiting radionuclide. So that is a conservatism.

So say we had a source or a mixture of something that had cesium and strontium and neptunium, and we do this approach. Maybe neptunium is the limiting value for our scenario that we are calculating in terms of this RC(j) factor, this constant in the expression, or sorry, the constant in the expression here is written out as constant.

We used the neptunium value for all radionuclides instead of, what you could have is, this constant is defined as a vector, and you multiply that, the right element from that vector in this expression to calculate a particular RC(j).

We felt that was too much complexity, as I said. It started out even a lot more complex than this, and that was too much complexity for somebody to implement easily. Because we wanted something that

can be implemented cleanly, and it's not fraught with errors or mistakes for people to do.

What's done in the bottom line is, we do the sum of fractions for all these RC(j)s and if it's greater than one, then that means more review effort is needed; if it's less than one, then that means the review effort is probably appropriate, or less review effort is needed.

The concentration averaging approach for incidental waste we believe is risk informed. Like I said this approach takes into account quantity, concentration and accessibility of the material. It's flexible, and you can probably apply it to many different scenarios. It's not just applicable to this problem, although we haven't applied it to any other problems yet. We only developed this for our internal use for this incidental waste problem, which we have talked to the committee in the past, and they thought maybe it had some applicability to this broader issue here.

And I think it really does. I think one of the issues, I know Dr. Croff talked about this in his presentation, where we said, well, let's just - maybe there is some validity to going to a site-specific analysis for each facility, and you just look

at the material you are putting in there and see what the result is.

In general I agree with that. But my one caution is, these performance assessments are not simple. In particular, if you start mixing a lot of different materials, you are worried about how things are mobilized out of the problem into the groundwater, transported in the groundwater.

That can be a very technical complicated problem, so if you went to a site-specific approach, it puts more burden on us if we were the regulator, or on the state regulators, to really look at that with a fine-tooth comb and make sure there isn't something being done that is funny.

The classification approach, if you do that in a risk-informed way, it should allow you flexibility but still put some constraints on the problem. Like in this case we are putting some constraints on the problem from the scenario perspective. We say, if we are talking about disposal from an NRC perspective, then that means we use certain scenarios to look at disposal. We don't look at scenarios of, well, we have a recreational exposure that walks on the site five hours a year, and nobody ever digs up anything and nobody uses groundwater.

Well, of course if you are looking at that sort of scenario, that can buy you a lot more concentration and quantity that will be appropriate for disposal than if you are looking at one of these scenarios where people disturb the material.

So that's kind of where we are. I'm happy to take any questions.

CHAIR RYAN: David, thank you.

That's, again, it's exciting to hear about this work, because I think you've really captured what our thinking is in the last slide that your work for WIR seemed very appropriate, and it's flexible and applicable to different scenarios.

For example, if you think about it, you've got everything from a dry yard environment to wet eastern environments. You've got different streams for the water. So that's the vector.

You've got different waste packaging and waste form issues. You can certainly address those. You've got arrangements of intruder technology and other kinds of things. All those you dealt with in at least some extent in some form or fashion in here, so that is what sort of got us excited, the basic pieces are the same, although they may look a little different in one application or another, but we can

sure handle it.

That's one I think great advantage of this technique.

The second is, it's probabilistic, which means you can take two analysts with the GoldSim tool and make the same kinds of analyses in two different rooms and they will come back with similar answers. It's not interpretative; it's the analytical calculations relating to the analysis, rather than the analysts experience being the driver which is often the case. So that makes it extremely powerful.

And I think there is a lot more transparency at the end of the day with these kind of results, and the more arcane, very complex transport kinds of models that people tend to look at to do these calculations.

So with that - and again, I fully recognize the caveat, you haven't applied it yet, so you are not going to declare victory in anything other than what you've done, which is appropriate too.

But it really integrates to me that the key things you have to look at in any performance assessment for disposal, whether it's very low activity dilute stuff, right on up to irradiated hardware.

I posed the question earlier about, well, you know, we have a factor of 10 rule know for hardware. Why couldn't we have a factor of 30? Well, this is a really simple straightforward way to say, okay, is that within reason based on all the other forms and features of that problem?

And if you get at those kind of questions, I think, in a real risk-informed way pretty clear.

That's more of a comment than a question.

MR. ESH: People like - I have a comment that people like concentrations, because they feel they are easy to evaluate against, whether it's in groundwater, in the material you are putting in, somebody can quantify the material and say, how does it compare to the concentration.

But the concentration, to be frank, it's very unfair to some people in some scenarios or some systems, and it might be unfair in the other direction to others, if you are not careful about how that analysis is done, et cetera. Yet whenever say regulators try to set those concentrations, we try to be conservative.

But if you tried to p ick the most conservative scenario, and most conservative parameter, for everything that went into the

calculation, you would be setting an extremely low limit that would be very expensive financially and otherwise for people to be trying to meet that criteria, and in our - in this approach and in our opinion that is not risk. That, if you can do something like this you can be more fair to everyone. You can be more fair to the people that may have a situation that their material is less accessible, and has been stabilized more than somebody where their material is more accessible and has not been stabilized. And that has to be recognized in the classification system, because ultimately you are trying to protect health and safety, and that is the bottom line.

CHAIR RYAN: One last comment, and then I'll ask other members if htey have questions or comments.

We are on record with the commission as saying, recognizing this in our WIR letter that this is very very creative and powerful work that has in our view a lot of capability, and I'm sure we will continue to encourage that they recognize the fact that this is a tool that might unlock a lot of the doors that we are talking about today that are very complicated circumstances.

So congratulations to you and your colleagues, and Karen and Anna and the others that have worked on it. It's really very, very excellent work.

MR. ESH: Thank you.

CHAIR RYAN: We are happy to move that forward.

MEMBER CLARKE: Yes, I think it worked out really well, that Allen's talk and David's talk came when they did, back to back. And this is more of a comment. You answered my question already, so I don't need to ask it.

But it seems we have traditionally not only for radioactive waste but for chemical waste started with deciding what classification it is and then asking the question, what can we do with it.

This approach, if you turn it around, and we have a particular menu fo engineering designs for certain site-specific environments, okay, let's look at that and see what we can put in. I think that - you know, there is a lot of value to turning the scenario around and thinking about it that way.

MR. ESH: Yes, I agree. And especially because the types of systems that are in play, or what people do to manage their waste is very - has a lot of

variability. And the performance that you can get out of a system, as you are well aware and have commented on, is very dependent on the service environment in particular.

So something that works well in a human environment might not work well in an arid environment and vice versa. So if you aren't acknowledging that in your approach, and you say, everybody use this facility and everybody do this, it can work, but it also - it can be overly burdensome to some and maybe not burdensome enough to others.

So you are ultimately trying to strike a balance there. But if you take an approach like you said, coming at it in the other direction, then it allows people the flexibility to make hte decisions to meet the safety criteria, and they can come at that in a number of different directions, managing their quantities, their concentrations, or how htey are disposing of the material.

MEMBER CLARKE: The other thing I'd like to see, the probability, after the use, of being risk-informed strikes me as more available if you come at it from this angle than if you come at it from the other.

MR. ESH: Yes, we like to use risk-

informed, because it's a buzzword, but when you get down to it sometimes things aren't very risk informed. But that's where it's applied.

MEMBER CLARKE: We have put descriptive designs in the wrong environment, so we can do as well - would have if we did something else.

The question I was going to ask is, given all the caveats you gave us about not wanting to use this for waste classification, and I totally understand that, but it does seem that this approach would have merit for looking at low activity waste in the kinds of facilities that would be suitable for those kinds of decisions.

Do you agree with that?

MEMBER CLARKE: I agree with that. My main reservation in particular with the low activity material is that I think you could do this especially if you have a dedicated facility for a certain type of material. You could do that well.

When you start mixing these materials, and you put say some radioactive materials where in the assessment maybe somebody is assuming that the material has very low solubility, and it sorbs pretty strongly to the natural materials, and it doesn't go anywhere basically, and you calculate a low dose

impact, you put that in a facility that has a bunch of organic solvents an chelating agents and everything else, and all of a sudden that analysis goes out the door.

That I think is the challenge if you make it open to taking these types of materials and trying to do a dose assessment where you can just put them in any type of material of a certain quality, a certain quality in terms of its performance to isolate that material.

But the uncertainty in how well that facility can perform I think is impacted by the types of materials that you put together.

MEMBER CLARKE: I would just add that the good news is that we don't put solvents in landfills anymore.

CHAIR RYAN: On the other hand, though, that's the advantage, that you can take care of those actual site characteristics, where there are solvents or not solvents, and that kind of thing, as opposed to have a fixed assessment that now drives you to a very conservative answer.

So on the one hand it's a challenge. There's lots of things to take care of. But once you take care of them, you get kind of more into the

realism sort of picture than a fixed arbitrary picture.

So it's kind of a two-edged sword, isn't it?

MR. ESH: I have to say that I was stunned by the complexity of the waste classification system, especially on the low end of the spectrum.

CHAIR RYAN: That's why we are here.

MEMBER CLARKE: Thank you for an excellent presentation.

CHAIR RYAN: Ruth?

MEMBER WEINER: I want to commend you, too, for a really excellent presentation.

And if you could put slide six up again for a moment. There, yes.

What you are proposing with the site specific, as I understand what you are proposing with the site specific disposal facility is, based on the WIR considerations, and with WIR you are already there. The facility exists, and you are talking about how to best stabilize it or dispose of it or what to do with it.

Can you see any problem with your category three where you are creating a site, or using an existing site which meets your category three

standards to bring in the waste from others?

And the reason I ask this question is, having lived in the West with a number of sites that were sited there because of the environmental characteristics of the place - I mean Hanford really is a pretty good place if you get away from the river a little bit - can you see any problems with that?

MR. ESH: It's a good question. I see that for - where you have the ability to select a site, or to choose a site, the site selection criteria and the robustness of the site characteristics would certainly play a role in this.

And the way that we've handled it as you commented, most of these sites are - the sites and facilities for potential disposition of material that is removed, because we do have that situation too. It isn't just material, residual material that may be remaining in a storage tank, but there are waste streams that are removed and purposefully disposed of in another facility. So you would have some options as to where you put that material in theory. In practice we don't really have many options.

But the site selection part of it I think would have to be factored in, too, and it's not here.

MEMBER WEINER: Well, carrying that one

step further, what you get into in site selection is somewhat related to what Hanford faced, oh, 20 - 25 years ago. Everybody said, you are bringing all the world's low level waste to Hanford. And as a matter of fact, that probably is an okay idea, given the characteristics of the site.

But it becomes sociologically difficult to handle.

MR. ESH: It does, yes. And this, on slide 10 here, this X(i,j), this factor, the transfer factor from your quantity and concentration, due to the result. By implementing site selection, hopefully you are making a better X(i,j), for a site that you have done a good job selecting than one that you have done a poor job selecting.

So that is where, in this construct right now, site selection will come in under this generic guy that is going to do a performance assessment.

But you could certainly take it separately that, by choosing sites that have certain characteristics for certain types of material, that you are improving the ability of that facility to retain that material.

MEMBER WEINER: Finally, I know that right now the Department of Energy is wrestling with this

question of greater than Class C waste, and I realize this - we wanted to focus on the low end, but if we can consider that for a minute, would you see this as an approach to the disposition of greater than Class C waste?

MR. ESH: I think determining what to do with greater than Class C waste should certainly factor in the characteristics of the material, the potential places you could put it, how you could isolate it, yes. I think you could certainly factor it in. But in that case you are always saying what the material is. You are saying it's greater than Class C and it's more of a technical problem of how do I isolate it.

Whereas in these cases you are trying to use something like this to say, what class am I? And therefore, how should it be managed.

And I think the classification system, as I said before, has value, because it gives people an idea of how much effort you need to put into trying to isolate it in general.

I mean if it worked right, Class A waste, you would know, I need - me as a regulator, I can give less attention to the technical aspects of what I'm doing with Class A waste than Class C waste. It

should work that way. Whether it does work that way or not is a different question - so.

CHAIR RYAN: There's some element of a fallacy with greater than Class C from my perspective in that the very small sources which calculate to be greater than Class C can in fact, be trivial in terms of risk. So again, I'm kind of bringing it back to that point that the centerline, the middle of the range of concentrations, it works great.

MR. ESH: I mean, if you put a Cobalt 60 source or a Cesium 137 source in an engineered facility deep in the ground and you had high confidence that you keep it there for 200 years or 300 years you're not talking about a high-risk source any more. So, I mean, that's the -- the idea behind this is you can try to represent those sorts of things.

CHAIR RYAN: Whereas, maybe some small percentage of that activity, you know, in a chemical or a physical form that gave it mobility, creates a much different higher risk situation. So again, I like -- I mean, the thing that's fabulous about this is it's concentration and quantity and all those elements of the system in which you put it that gets evaluated, you know, all on an equal footing.

So if you change one you see the result.

If you change three you see the collective or the integrated result of those three changes. That, to me, is the real benefit here. Allen?

VICE CHAIR CROFF: You know, one question; the Category 3 approach has been on the street now for some number of months. In your dialogue with DOE have you come up with any unintended consequences or problems or, you know, does it seem to be going well or what?

MR. ESH: We have not had any further waste determinations that we've reviewed where they've applied it yet. We did have a generic technical issue meeting it's called, with a series of meetings with them on various topics to try to talk about some differences or similarities and they asked a number of questions about specific applications. So if I had a layer of high activity on the wall of a tank, how would I consider that in this approach, in particular because in our averaging expressions that are in our NUREG-1854, there's things in there like the user specifies the depth of the well that somebody is trying to get resources for or there are some things that are specified in the equation and so they wanted to know for that specific circumstance, how would you apply that in the averaging -- in the averaging

approach. And we described that to them. I mean, you basically -- you sum up the quantity of the material in the wall that you could intersect and the bore hole and shrink that down and that gives you an equivalent thickness of a layer that you'd hit. So the wall circumstance can be converted into the layer circumstance, which is the main one that we were looking at.

So there is some -- there were some questions like that regarding the application of it but we haven't had any further waste determinations yet to really iron it out. And that's where you find whether you've done well with your guidance development or not is when it gets applied, the law of unintended consequences occur.

VICE CHAIR CROFF: Yes, agreed, thanks.

CHAIR RYAN: Okay, well, David, again, thanks very much. We really appreciate your presentation. It was interesting and informative.

Next, we have Ralph Andersen, from the Nuclear Energy Institute who's going to talk about enabling informed analytical approaches to waste classification.

MR. ANDERSEN: Thank you for the chance to come up and talk with you on the topic of

radioactivity waste management. The title is a little bit of a misnomer. Probably enabling alternate approaches to management of low activity waste would be a little more correct. The idea is it is reliant on what we at least call was conformed approaches.

What I'd like to focus on and it was fortuitous that Commissioner Jaczko kicked off this portion of the ACNW meeting, is one particular alternative to perhaps serve as a model for how we might make other alternative approaches enabled on a more generic basis and that is the use of RCRA facilities for disposal of low activity waste. You know, obviously, we had the ANPR, Advanced Notice of Proposed Rulemaking issued by EPA in 2004 and in fact, one of the things that I'll provide the Committee were comments that we provided on that in 2004. I look forward to hearing EPA's presentation tomorrow to hear once again what the status of that effort is.

But I suggest that the important thing that I heard from Commissioner Jaczko today, and I agree, is that we have the visibility and thus, the importance of an issue like this without the urgency and that's rare in our business. If we, for instance, are gearing this at major facility decommissioning, primarily nuclear power plants, we have the luxury of

15 or 20 years to work our way through what probably would be a complex process certainly from a political point of view.

But his simple concept that was actually illustrated in his comments that I call your attention to dated June 26th, 2007 on this topic and you can find it on the NRC website under Commissioner's speeches, was just isn't it possible to do a comparative evaluation between what is required by NRC for Part 61 disposal facilities and what is required by EPA for RCRA Subtitle C and Subtitle D facilities and draw some conclusions about equivalency and protection of public health and safety. And his primary focus was ways in which to be transparent, open and to carry along public confidence and credibility about the technical conclusions that we draw.

The premises, therefore, that are in this kind of approach is that you can make such a comparison in the first place. There are differences. The simple one that I always like to point to is the basic subject of the millirem that we're talking about the Part 61 millirem which dates from the time of dinosaurs or are we talking about contemporary millirems which, in fact, are used in EPA risk assessment space. And secondly, like all good things,

is it worth doing from a sense of could we implement the results of it if we reached the conclusion that new alternatives could be pursued.

And finally, you know, there would need to be some impetus across the board for stakeholders to both participate and support the effort. The principles that we've put forward over and over again in any of these alternative approaches is, first of all, I shouldn't represent deregulation and I know that's usually the number one argument that is made against doing anything but, oh, gee, you want to deregulate it. In this particular case, not true. We have a very stringent regulatory system within the NRC. You have a very stringent regulatory system within the EPA.

Secondly, there's always the additional issue of increasing risk somehow which I always find intriguing but the key here is, is that we certainly think as a principle that we should be maintaining comparable levels of protection of public health and safety. I'll touch on some of these issues a little more as we go on.

And finally, with processes like this, assuming that you clear the technical obstacles, all too often we find that that after the technical work

is done, that we can never really get going on the -- in the true public policy-making process. A great example is the very, very large volume of work that was done to support the idea of criteria for the disposition of low activity material and I believe it was generally describing clearance criteria but after all that fine technical work of the NRC staff, nothing really has come of it.

Our suggestion then and our suggestion now is to actually begin by determining what you want to accomplish, begin with thinking about the endpoint, you know, what is the level of dose that you want to assure protection below and what might that imply in terms of criteria for the type of waste you're talking about. I believe it's important to set the goal first rather than to go backwards and determine what can I do and then decide whether what can I do is good enough. That always kind of sounds like deriving safety standards based on economics and capability rather than some other basis.

A second step would be to actually characterize what waste we would be talking about. As I'll mention in a minute, we're actually hard at work doing that. And then thirdly, is using that information, then is to actually go through

performance assessments in the context of both NRC requirements, namely Part 61 and also EPA requirements and see how those match up. It may be possible to do that generically and have discussions with EPA and potentially one could do it from the generic criteria that exist in regulations and guidance.

However, it would probably be beneficial to do a few case studies also with real sites. I mentioned that we've been doing some of our own evaluations. Among others we actually took the criteria that IAEA has on the basic safety standards for clearance which are attended by their calculation to imply one millirem per year maximum exposure and I'll mention that's a contemporary millirem and so what we did is an analysis of the waste that we generate both in operation and during decommissioning and try to determine waste streams that on a practical basis could be redirected. So we didn't just take all the waste and then overlay these concentration values.

Rather we looked at where would it actually be practical to apply them. What we came up with is really the -- during operation, the practical waste stream is the dry active waste, namely plastic and paper trash, used protective clothing and the like, so our garden variety trash type waste. For the

entire industry, it looks to us like you would be talking about 400,000 cubic feet of dry waste generated, which actually equates to somewhere on the order of about 20 to 40,000 cubic feet once it's been compacted, put into containers and all that.

It's really not a very large volume and among 100 plants, you divide those numbers by 100, it's not particularly remarkable. So I would make the comment that if that's all we were looking at, it really wouldn't be worth the effort. That would be a simple answer to the operating regime. And again since power reactors represent the most significant portion of low level waste as well as low activity waste being generated that could go into this. I just suggested the cost of effective equation for application of NRC resources wouldn't yield a very interesting result. But when we looked at decommissioning, we did a couple of case studies. What we actually came up with there on a per reactor unit basis is in round numbers, probably talking about 100 million pounds of decommissioning debris and soil.

That's a lot of pounds. I did try to do some back-of-the-envelope conversions as to what that might mean in volumes and things that I came up with were probably on the order of maybe 200,000 cubic feet

but in this analysis, it's kind of a meaningless quantity because, in fact, the RCRA sites dispose of things by weight, generally, not by volume. That always has fascinated me the difference between NRC disposal, regulated disposal sites and RCRA disposal sites and that's primary because they're bringing things in, in truckloads and not necessarily neatly done one way or another.

To throw some dollars on that and these are rough numbers and it's why I didn't specifically put them on the slide, but one can never resist doing the economic analysis. What we sort of came up with is that probably the net impact for operating units if we were able to go to say RCRA Class C facilities with low activity waste, it's probably on the order of about a $50,000.00 a year savings per reactor. And again, that's pretty rough numbers.

On the other hand, if you assume that decommissioning degree in soil connote decommissioning at that magnitude would go to RCRA Class C, Subtitle C facilities, you're actually talking about something on the order of 10 to $20 million. If you assume that it went to a Subtitle D type facility, it's about five times per unit and that's how we get up into these numbers that you saw in the NAS report and others that

are on the order of several billions of dollars difference. The perspective that we've gained from our initial review is that it can be done and it can be done safely and cost-effectively and then it does have some very tangible benefits that we think might be of value to a wide range of stakeholders.

For one, if you really look at the available disposal capacity today for Class A, B, C waste, there's not enough there to accommodate decommissioning of the existing fleet much less new plants and that's a fact. Now, it's the job of the vendors to tell you that, of course, approvals will be made and expansions will be made and politics will remain constant and all things would be good and so that actually that capacity would be forthcoming when it's needed and that might be the case, but I will tell you that when you go by current capacities, "Sorry folks, we can't dispose of all this waste and the existing available capacity." So there is a great value in applying risk informed principles to send waste to the right place. I will tell you that when you look at the capacities available to even a limited number of the RCRA sites it dwarfs what's needed. You might imagine when you step away from radioactive waste into hazardous waste, the volumes and magnitudes

increase substantially. So our infrastructure in this country actually has quite a lot of room in those areas.

The other huge benefit is the one that was exemplified at the Big Rock Point site for the outcome of being able to dispose of material cost effectively in the municipal landfills which are EPA regulated sites through state regulations. They are not holes in the ground in somebody's back 40. It actually allowed them to take the site to a Greenfield type status such that the site can be used as a public park. Had the economics not prevailed that way and had they dutifully disposed of everything in low level waste disposal sites, it would have greatly effected the ALARA equation under 25 millirem total effective dose equivalent which is the limit for decommissioning and license termination, such that much of that material would have been left on the site in a realm titled "Acceptable Risk" but the bottom line is it would be a public park that would produce predictably a certain amount of radiation dose from playing at the park.

So it was -- that's by the way, why it was so well supported by the local community. So it opens up options like that, that are much more attractive

than just saving a dollar here and there.

Come closing thoughts, I guess I would like to leave with this is that -- and I've talked with Commissioner Jaczko about this before, and we don't actually differ. Although he emphasizes that we ought to get the technical work moving and get it done and at least reach the technical solution. I think what we've seen and particularly at some of the DOE facilities that have had to regroup for their cleanup and kind of start over again. There's a tremendous value in getting the stakeholders involved at the very front end of the technical analysis so that they understand the assumptions that are going into it, that they have some ability to offer input into those assumptions and can follow the process through so that when the results come out at the end of the trail, instead of them suddenly being produced, you know, here's NUREG 1,000,552 and it's got all the answers in it and if you turn to the back page, there's a number there and believe me, the number is correct, and everybody looks at the 500-page NUREG and says, "I'm not going to be able to read this and go through and see if I believe it's correct, so I either trust you or I don't", that's our current process.

And typically speaking, one community

tends to say, "Okay, I believe it", and another community that weighs in equally tends to say, "I automatically don't believe it". So I think what DOE among others have learned through that process, when you bring stakeholders through that, at the end of the day you've got to resolve it's both acceptable and credible.

So you know, I would comment that identifying the stakeholder issues up front and responding to them, is important. And even if there are issues that are non-technical, sometimes you see things you can do in technical space that will help address those at a future time.

Secondly, I think a great recognition that came out from some of Ruth's comments and some of the -- in the NAS report as well. The burden of implementing this regulation isn't going to rest with the NRC. The NRC isn't going to be out implementing anything. They just, at best, would be creating a regulatory framework to enable this, nor would EPA here in Washington DC or ever in the regional offices be out implementing anything. We just sit there, for a state to say, "Gee, if I want to dump a lot of resources into this that I've not been budgeted for, I could probably implement a state framework and

actually allow the local vendor to do this if they wanted to do it". That's not provided for.

In fact, in our original comments, we even suggested if EPA was going to go forward, then part and parcel really needs to be thinking about the appropriations that would be necessary to provide grants or other types of opportunities for the states to take this, once developed, and actually carry it out into practice. Otherwise, I can guarantee you after all the fine work is done, it will go nowhere.

And then finally, we need to recognize that both the compacts and the site operators have gate-keeping roles. Compacts actually have an authority about import and export of waste. So it's all nice and good if you enable all this, but the compact either could say, "Frankly, I don't want you shipping your waste there, or alternatively, I don't want you shipping it into my geographical boundaries", and additionally, they could simply say, "Well, since you're going to save x amount of money it would be awful nice if we got that".

So they could certainly wipe out any economic benefit for doing that if they chose. Having them involved in the front end is the point. Likewise, site operators it might be useful to involve

them on the front end to see if they're even interested in the notion of having radioactive material come their way.

My final comment that I wanted to conclude with on the risk issue because like I said, it always does come up, when we looked at the types of waste we're talking about, looked at the concentration values that are in the IAEA Basic Safety Standards, what we always like to do as an exercise is compare those values to common soil and compare those values to foods we eat and they're typically much below that. And unless we've changed the laws of physics, it's not impossible for a matter to occupy the same space, whether it be waste or soil or fruit that went to the dump or anything else, or at least when it tries usually have a very interesting event that occurs. So the fact is, is I would argue that by introducing materials that are essentially less radioactive than either the existing geological terrain in which the site is located or less in many cases than the quantities of radioactivity that are going there as just part of the normal garbage disposal process, that you are not reducing risk.

You're probably diluting it in a very technical sense, but again, that's why it's useful to

get stakeholders involved up front and go through the technical exercises. Those are the comments that I wanted to make. Appreciate the opportunity and be happy to entertain any questions.

CHAIR RYAN: Thank you, Ralph. I'm pleased that we have representatives from all the constituencies you listed who should be at that table. Hopefully, this is an early and opening discussion on this issue.

MR. ANDERSEN: I hope I got all of them to get engaged.

CHAIR RYAN: Yeah, Jim?

MEMBER CLARKE: Just a quick question, Ralph. I'm sure you do this but I just wanted to ask anyway. It seems to be the appeal of being able to use these sites is two-fold. One is the capacity that you mentioned and the other is their geographical distribution. RCRA sites tend to be near industrial areas which tend to be where the reactors are. So did your cost savings factor that in, in some way?

MR. ANDERSEN: Yeah, actually, distance does play a role. If you assume that there might only be one or two -- we really started by focusing on the Subtitle C hazardous waste facilities because we knew there would probably be a wide margin of

protectiveness provided by that. So again, if you made some assumptions about which ones might be likely to go forward with something even if it became possible, the transportation is an aspect in terms of both cost and also the hypothetical risk assessment associated with doing that kind of transport.

So the more limited you are without that distribution referred to, the larger impact that has. It doesn't cancel out the benefits but it does cut into them significantly if, for instance, you're going all the way from Florida to Idaho, just by way of example.

MEMBER CLARKE: Assuming all things being equal that all of these facilities would be available, it strikes me as a real advantage.

MR. ANDERSEN: I would argue a two-tier system that enables disposal at municipal landfills which, obviously, would be much more restrictive criteria than others that enabled disposal specifically of hazardous waste facilities.

MEMBER CLARKE: RCRA has a good precedent.

MR. ANDERSEN: Yeah, and you know, there the PCV drove them to have to select an additional site. Absent the PCV actually everything would have simply gone to the initial municipal authority.

MEMBER CLARKE: It sounds like fortunately they had a PCV site not that far away, too.

MR. ANDERSEN: That was fortuitous, yeah.

MEMBER CLARKE: Thank you.

CHAIR RYAN: Right?

MEMBER WEINER: Could you put up your last slide, please, Ralph?

MR. ANDERSEN: Sure. Let's see.

MEMBER WEINER: It was such a nice summary and I have to ask a question. There. Your first bullet, I would say this depends very much -- since stakeholders are frequently self-identified, this depends very much on who is identifying himself or herself and to implement this plan, I would encourage you to look at some of the DOE experiences that you might not readily look at and I'm thinking of the Sandia Mixed Waste Landfill. That is located -- there's nobody around, there's no groundwater leak, site-wise, it's very good and even radiologically, it's a very good site because relatively short half-life material that is stored there and in 40 years the activity will be pretty much gone.

That has been a bone of contention now for close to 10 years and the major contenders don't even live anywhere downstream or in the same watershed.

MR. ANDERSEN: Right.

MEMBER WEINER: So you really -- the stakeholder issue problem is one that is very difficult and while I appreciate the optimism of your first bullet, our experience has been that it doesn't always work.

MR. ANDERSEN: Yeah, it doesn't always work and I'm sure it's how you configure it. I remember some years ago working with the International versions of Green Peace and Friends of the Earth. We were in a context in which we recognized that we needed to solve a problem and that the problem was independent of our religious beliefs about nuclear energy and in my mind setting up context really has a lot to do with it. The political arguments -- what I liked about Commissioner Jaczko's approach is you start with a focus on the technical analysis.

My simple comment is, engage the stakeholders at that point. I mean, if somebody -- if a particular stakeholder is in a just say no mode and you're simply able to communicate to them, well, then you're not really going to add much value to this process. We'll see you when we get to the decision making process then. But you're welcome to participate and observe if you want. Meanwhile we are

going to do a technical analysis.

So optimism, yeah, that's a new spirit that's kind of sweeping across the country, I hope but what I do recognize is the failure to do that, is to guarantee failure at the end of the process.

MEMBER WEINER: Yeah, and I would agree with that. What has happened with the mixed waste landfill, of course, is that it has provided -- in a sort of perverse way, it's provided employment for a large number of people for many years and that's only because people keep raising these objections. But I think the point of using a RCRA site really is a very good one. I don't mean to detract from that.

But your second bullet is also very well-taken. The states must be -- in any decision involving this, the states must be a major stakeholder right from the beginning, right to participate in the technical aspects. That's all.

MR. ANDERSEN: I think the reciprocal opportunities are that the -- you know, the monies that you're talking about solving -- saving, particularly when you're talking about decommissioning space, is money paid by electricity consumers to create decommissioning funds. And depending on whether you're regulated or unregulated environment,

you know, it's either directly regulated by the state or indirectly. But the key there is -- and that's why I think it's important to really lay out on the front end, why would you even go to do this, lay the benefits out, the states have a much broader role than just the regulatory aspect. It has to do with economic development. It has to do with, you know, availability of less expensive electricity, and it also has to do on the receiving end with, "So what's in it for me if the stuff is coming in to my state".

So, you know, if you look out to the decommissioning era and I've made this comment to you all previously, that it's a night and day difference between looking at low level waste in an operating context, you recall the graph that I always show that's got the huge bulge when you go to decommissioning, and when you look at it in a decommissioning context, you know, from a lot of points of view. But the states really need to have -- I agree with you, it's not just a regulatory point of view. They're also stakeholders in their own right.

MEMBER WEINER: Thank you.

CHAIR RYAN: Allen?

VICE CHAIR CROFF: One question, at a couple of places in your presentation and I think

verbally you noted that there hadn't been a comparison or a valuation of Part 61 disposal and you know, RCRA disposal and --

MR. ANDERSEN: What I suggested was, is that there's not been a comparison of performance assessments done within each context.

VICE CHAIR CROFF: I accept your word, I guess. I'm surprised or puzzled but I mean, this idea has been around for a long time as been evidenced by the EPA rulemaking and nobody has gotten that far yet.

MR. ANDERSEN: Yeah.

VICE CHAIR CROFF: It would seem fundamental.

MR. ANDERSEN: Yeah, I would suggest to you that -- sorry Dan, but Dan Schultheisz from EPA will be up tomorrow morning, so, you know, please ask him that question but when I've asked them that question, the answer has been no. When I've asked NRC, the answer has been on.

VICE CHAIR CROFF: Okay, well, maybe some of the site specific people, the experiences out there, maybe they can share what they learned. They must have done some kind of assessment, as they go through tomorrow. Thanks.

CHAIR RYAN: And again, Ralph, thank you

very much for your insights and being with us today and hopefully tomorrow and we will move to our final presentation of the day. Are you both speaking or is one speaking? John Greeves is speaking, all right, for a risk informed approach to low activity waste disposal. Welcome, John.

MR. GREEVES: Thank you. It's good to be here. Thank you, it's good to be here. And I'd really like to thank whoever put me last.

(Laughter)

CHAIR RYAN: You don't get to critique everybody else, John. You just get to do your presentation.

MR. GREEVES: No, not critique, it's a roll-up.

CHAIR RYAN: Just kidding.

MR. GREEVES: I've spent a lot of time in this room and I've really found this afternoon to be rewarding. I think most of us are saying the same thing. So what I hope you get out of this presentation is a concrete proposal. Jim Lieberman, my colleague in the back, who most of you know, and I have been toying with this idea for three years. We've put together some concepts I want to share with you and as I said, it feels good to be at this point

in the presentation.

We've had a lot of talk about getting the technical work going, moving. We're at that juncture were we see the need but not the urgency. There is this hump coming on the current reactors going into decommissioning and now is the time to take action on that. I was requested to identify if we were representing anybody today and the answer to that is, no, we're representing ourselves. Talisman has afforded me the opportunity to travel internationally, done work for the IAEA internationally, so these thoughts are a compilation of things that have occurred over a large number of years.

We speak internationally frequently and I usually like to start with, you know, what's the genesis of the thought process and safety in terms of what we do in the waste area. I borrowed these slides actually from an IAEA colleague and you normally start with the basic safety or the science, the UNSCEAR data that feeds into the ICRP recommendations. Principles, I always found that that was a good hook to hang your hat on in terms of explaining yourself to people and it flows down into setting up these standards. The IAEA, as people have discussed before me, and the European Union are in a position to set these

standards.

And then the States earn their own right to do that as they see fit for their particular state. All of this actually comes together in the Waste Convention. I had the opportunity to go to one of the meetings they had a few years ago and a lot of the things we're talking about actually get implemented there and that's why it's critically important to have a way to be able to communicate with each other internationally. So that's a bit of a theme in terms of what I wanted to present.

I see what I call progress internationally, establishing disposal facilities. I've seen a number of facilities that actually aren't here in the United States that do this low activity waste disposal approach; principally France, Spain, Sweden. I've seen evidence of it in Japan and UK. The IAEA, as other speakers have identified, has established standards for low level waste, high level waste and have decommissioning guidance and they've got a clearance piece of guidance that's used in part internationally.

Other speakers have identified that the fourth bullet, disposal capacity, remains a challenge worldwide, especially this high volume, low activity

waste and I think some of the international examples are ahead of us in that area and I'll give you some of those examples. The last item, Dr. Croff mentioned this, Draft Guide 390, I actually worked on this a number of years ago. I've kept close with it. It's -- I don't know, maybe I'm too close to it. It's not that complicated but maybe I've been too close to it.

I too would show this chart and my understanding what the IAEA is trying to do is get a set of language, a tool, a classification system that leads to a disposal route. And this is a chart with less content on it that you saw earlier and what I'm talking about today is this area right in here, the very low level waste disposal piece. That's the piece that I'd like to focus on in my comments and my summary. I think internationally people have done a good job with clearance. We now have a clearance standard in the United States. Other countries are using this very effectively. The IAEA put together a criteria with quantitative numbers that defines what this is.

Very short life material, this is also working very well internationally, this country, elsewhere. The rest of this isn't working as well as it should be and what the IAEA is looking for is a

comprehensive system to be able to communicate and what I would give you is the example of they like to do performance assessment, peer reviews. They like to go around from country to country and this supports the Waste Convention. In order to be able to do that, you've got to have a similar language. If you're talking about clearance or exempt waste and how you're handling it in your country, you do a peer review. It's very nice to be able to have an agreement on what that is and how you do that.

And this particular box in here, the very low level waste disposal facility, I'll give you a couple of examples of where that's done. It would be nice to have that terminology and use those types of things in those peer reviews. So I find it very rewarding in the travels that I have.

There are over 100 near-surface disposal facilities internationally in the world and I've visited many of them. The one on the right here actually is in France. This is the one where you can find a very good example of a typical low-level waste disposal facility with engineered barriers like we design addressed back in the `80s but never built, the French built those facilities. And also very nearby within a number of kilometers is this very low-level

waste disposal facility right here. I'll have some pictures of this also later, where they have implemented this approach that I'm describing today.

A couple of others are on this chart. The US program, we'll all familiar with the regulations over the past number of years are a patchwork. This is a term that the committee that Dr. Ryan worked on used. It truly is. It's a patchwork of regulations. Some of the wastes are currently over-regulated based on the risk involved. I think a number of us have seen examples of that and there is a demand for a simpler approach, more cost effective disposal of what I call very low level waste, consistent with these definitions that the IAEA is putting forward.

Whatever approach we use, as other speakers have mentioned, needs to be protective of the public health, safety and the environment. That's got to be built in. And part of the way you do that is through the rulemaking process. You get full ventilation, people have a chance to talk. So that's what I would point to as a way to look for public acceptance over time.

We agree collectively disposal in Part 61 facility is protective. However, it can be quite expensive for the high volume low activity waste.

This is what's in the room with us now and we just really don't have an effective way to deal with that issue that's going to be out there when the current list of reactors go towards decommissioning. We do have this 20.2002, used to be 20.302. You look at those 100 some examples in that SECY paper and they go back through time under various pieces of Part 20. They've led the use in landfills and there are some inconsistencies in how you do that type of work.

I do a lot of consulting in that area and there's more questions than answers. It takes a fair amount of time to run these to ground. It would be useful to have something that would help level the playing field in terms of how you dispose of this particular low activity waste. The proposal that Jim and I have worked on would be to put together a risk informed approach to dispose of this low activity waste under the IAEA regulatory format. We take on the same terminology as the IAEA does, very low level waste. It would be the low end of Class A waste and you would not need all the requirements of Part 61. There are some pretty expensive requirements in Part 61. There's control by the state or the Federal Government. There's some monitoring requirements that I'm sure the speakers tomorrow will tell you more

about and so we would see using a licensing program subject to oversight by the agreement states.

A number of the speakers today identified that the rubber meets the road with the states. And what we would do would model a regulation on the CRCPD Subpart M. For those of you who are not familiar with that, Subpart M is one of those suggested state regulations that addressed a Part 61 facility. You could attach a 25 millirem standard to that for this type of waste. You could pick another number. As I said, waste would be a subset of Class A and you could consider unrestricted released after a post-closure period.

The performance objective, call it 25 millirem following post-closure period, so you could have 100 years of control but effectively it would end up looking like a site that's released under the license termination plan. It's no worse than that. During the post-closure period, a dose could be limited to 100 millirem. If you've got fences up, et cetera, but somebody gets on site as an intruder, you could have that type of a criteria. It would simplify design requirements different from Part 61 and you would essentially come up with a waste acceptance criteria set to comply with that particular

performance objective.

It's -- it really looks a lot like what Dave Esh was talking about earlier. Decide what your performance objective is. That's what the WIR criteria does, it tells the staff, "Look at the performance objectives and then see whether this circumstance, the DOE site meets that".

CHAIR RYAN: While you're on that slide, you don't meet 25 mr, you mean 25 millirem per year.

MR. GREEVES: Correct.

CHAIR RYAN: Thank you.

MR. GREEVES: Twenty-five millirem per year.

CHAIR RYAN: Per year, yeah.

MR. GREEVES: Right, correct.

CHAIR RYAN: Yeah, thanks.

MR. GREEVES: Segregation isn't needed. Packaging wouldn't be prescriptive. Government ownership might not be required in this case. That is an expensive operation, to require government ownership for a disposal facility. Long-term control issues could be used. The State of Ohio is taking a long-term control approach at one of the decommissioning sites. NRC has approaches for long-term control. There's concepts that could be build

into this.

Conditions could be build in, in terms of financial assurance, maintenance, monitoring for radiation, et cetera. They just wouldn't be an onerous or as costly as they are for a Part 61 site. Could consider an independent party to take long term custody. These are concepts that we've talked about for other reasons that could be built into a regulation.

The benefits of going in this direction is it addresses what essentially are limited disposal options. At this time, these options exist internationally. It would maintain public protection at a lower cost. It could accelerate cleanup of some contaminated sites. I've seen this happen internationally and it seems to work well there. It would avoid worker exposure at unlicensed sites in monitored facilities that you would require some amount of radiation protection for the workers and radiation monitoring. It's consistent with the Amendments Act of `85 and it would be regulated by the states who have extensive low level waste disposal experience.

It also provides a flexible approach that should reduce the cost of disposal of low-level waste

considerable. Consistent with the plans of the international community on waste, it would be part of the process that this country could explain in its presentation to the convention on waste management. It avoid inconsistencies in the exemption approach. We've talked about a number of those today. I think this would help level that out.

Standardized or regulatory approach for low activity waste provides a consistent regulation for all states. This could be done anywhere. It's just -- at this point it doesn't exist in terms of a regulation, so a developer can't step up and say, "I would build that type of facility". I think it would diffuse some public concerns about unregulated radioactive disposal activities. I'm sure EPA tomorrow is going to tell you about the concerns that they're getting about going to RCRA facilities and depending on how you put it together, it could generate public acceptance over time.

Here's just a little bit more detail of the facility in France, the Morvielle site, which I'm not good at French, but this is the site they use for very low-level waste disposal activities. Here's a disposal site. I'm not going to go through all these. Here's an up close shot. It is a landfill and

obviously, bringing in bulk weights. It's more control than I think RCRA facilities is. It has a radiation overlay on it in terms of the controls.

Fast forward, I started with I wanted to make a concrete proposal. I think all the speakers, including the Commissioner, we're looking for how do we move this forward. It is a state responsibility under the Amendments Act. The states have the experience to implement low-level waste disposal and the bottom line is what about developing a suggested state regulation proposed for this category of very low-level waste disposal. It's consistent with what's done internationally. There are examples you can go visit that are up and running and very effectively dealing with waste disposal issues, large volume, low activity, internationally.

So I am thankful to be able to summarize these points. I really have made many of the same points that the other speakers have and I'd be pleased to address any questions today or tomorrow.

CHAIR RYAN: Great, thank you, John. I guess I'd just offer you a friendly amendment to our middle bullet on this slide. Seven states have experience but the others don't.

MR. GREEVES: Well --

CHAIR RYAN: A lot have tried by only seven have done it.

MR. GREEVES: We can debate that. The states have a lot of low-level waste experience, more than the seven, but this is a concept.

CHAIR RYAN: I'm with you. And again, I appreciate your --

MR. GREEVES: If I have to keep slides on the slides, I'll take ownership of those.

CHAIR RYAN: I just don't think you want to say states have -- all states do, some do and some have been observers but --

MR. GREEVES: I'll stand by the bullet, "States have experience with low-level waste".

CHAIR RYAN: Jim.

MEMBER CLARKE: Just one question. You mentioned the French facility that I believe you said employed the design that we looked at in the `80s but didn't use. Could you tell us a little more about that?

MR. GREEVES: Well, I've been there, I've looked at it. It's an engineered facility. They do a lot of concrete. The package the waste. ANDRA runs the whole show over there. It's very consistent. Everybody knows what they owe ANDRA. It comes

together. I can't ever get an answer what it costs. I can't every do the conversion. Maybe somebody else in the room has done this. But it's basically an engineered facility.

MEMBER CLARKE: They have features that ours do not? Is that --

MR. GREEVES: Well, we don't have an engineered facility that I know of where you would bring in concrete vaults and put them together. You've got roofs over the top of them and they've got under-drain systems. This is not Clive and this is not -- see, Barnwell has evolved over the years and Bill's back in the room, maybe he can tell us later, but you know, having been to Barnwell like even longer than I, it's evolved over the years from a trench to concrete right circular containers and now my understanding is everything goes in concrete but it's fundamentally different from that.

MEMBER CLARKE: The confusion was, you're used to the term engineered facility. Just want to know a little more about what you meant by that.

MR. GREEVES: These were engineered from the get-go. This thing was built after -- through effort that we did with the Corps of Engineers in the middle `80s and it looks like earth-mounded concrete

bunkers.

MEMBER CLARKE: So similar to Japan, I think it was.

MR. GREEVES: Japan has a similar concept, too.

CHAIR RYAN: I've visited as well as John has. It's a vault system with under-drainment, not only drainment but inspection capability so you can look at the bottom of the concrete and all those kinds of things. So there's quite a lot of detailed features.

MR. GREEVES: It's a world class facility.

CHAIR RYAN: It is -- it has some differences in how it's, you know, been developed and run of course. It's a national site for the entire national system. So it's got the authority of the entire power company of France behind it.

MR. GREEVES: What I appreciated was being able to see both of these facilities side by side. This country, which is a major nuclear country, has invested in both of these facilities as being needed and they're a workhorse.

CHAIR RYAN: One of things that it does take advantage of that I think is important tying back to David Esh's presentation is they both considered

concentration in quantity in disposal and they actually have a quantity limit in the low-level waste site.

MEMBER CLARKE: Thank, John, that's helpful.

MR. GREEVES: Okay, thank you.

CHAIR RYAN: Ruth?

MEMBER WEINER: Picking up on Jim's question, how does the French facility just roughly compare with Clive, because there is some engineering at Clive?

MR. GREEVES: Well, I'm not an expert on Clive, but I --

CHAIR RYAN: Why don't we leave that question and we'll talk about the facilities tomorrow?

MR. GREEVES: Well, Clive is a Class A facility.

MEMBER WEINER: Yeah, Clive is a Class A facility.

MR. GREEVES: All you have to do is go to each of them and I think you --

CHAIR RYAN: We're going to have folks talking about their experiences at facilities tomorrow, so why don't we table it till them.

MEMBER WEINER: Okay, sure.

CHAIR RYAN: Good. Anything else?

MR. GREEVES: You could build that facility at Clive.

MEMBER WEINER: Sure, that was -- I was --

CHAIR RYAN: That's getting into the client interest, though, isn't it?

MEMBER WEINER: Yeah, I was kind of concerned. I have one other thing and that is what is the cost of this French facility? Is that something that --

MR. GREEVES: I have many times asked and I'm not good at converting the -- you know, the --

MEMBER WEINER: Converting francs to dollars or Euros to dollars.

MR. GREEVES: It's Euros now. All I can assure you is it's very expensive and, in part, that's why they built the other facility.

MALE PARTICIPANT: Okay, so they built the other -- so the other facility is --

MR. GREEVES: Well, the other facility is for decommissioning waste.

MEMBER WEINER: Yeah, and so segregate that because of the cost.

MR. GREEVES: That would be my assessment.

MEMBER WEINER: Okay, that's fine, thank

you.

CHAIR RYAN: Allen?

VICE CHAIR CROFF: No questions.

CHAIR RYAN: Okay, great. Well, with that, we will -- oh, excuse me. You may.

MR. CAMPER: Thank you, Dr. Ryan. John, in listening to your presentation and listening, frankly, to all the presentations, and being involved in the work on DS-390, I always come back to the question of what is the definition of low-activity waste? I mean, for example, if you look at the chart that was earlier, the upper range of very low-level waste is somewhere on the order of 400 bacquerels per gram alpha. It talks about it being approximately 100 times clearance level. You said the lower end of Class A. There is no definition for low activity waste internationally that I've been able to find and so given the preciseness that we have today at our classification scheme where if you go to the tables in Part 61, you see radionuclides and concentrations. As you know, it's a great degree of specificity.

I always come back to the point that if we're really going to try to pursue an alternate pathway for disposing of low-activity waste, we're going to have to come up with a rather precise

definition because that's what people in the United States have become accustomed to.

CHAIR RYAN: Larry, I'm going to take an alternate view --

MR. CAMPER: So what is it?

CHAIR RYAN: -- just for the sake of the discussion over today and tomorrow. I don't think you need a precise definition. I think what you need is precision in the tool used to make those assessments and clarity and transparency in the tool. That's why I think the committee is so supportive of the work of David Esh and his colleagues on a transparent clear tool to make that assessment for all the reasons Dr. Esh stated. Every site's a little different, there are different features, there are you know, different environments, different engineering features, all those kinds of things.

So trying to bin it and say very low-activity waste is up to this concentration doesn't measure the risk in a disposal setting. It gives you a metric that's somehow related to risk in one disposal setting. It's behind the assessment. So I would take the alternate view, just again, for the sake of the discussion. I don't think that's the best way to go. That's why we've gotten into trouble.

You know, then you end up with the least common denominator for that number. So think about that. What I think we need to do is not so much focus on what's the right concentration, I think we need to focus on what's the right tool to assess the given waste being disposed here and doesn't meet the objective.

Now, we've talked a couple of times today about folks that said dose objectives. Sounds good to me. But, you know, there may be other ways to think about a risk metric that's more broadly applicable in different settings for different technologies than simply a concentration. So just as an alternative, think about that.

MR. CAMPER: Well, I hear you and I agree with you.

CHAIR RYAN: I've got one other short point. The Commission is authorized under 6158 to develop alternate systems of waste classification. It doesn't say alternate classification tables or concentration tables. It says alternate systems of waste classifications, so as long as the principle protection criteria are met or words to that effect. So not only is the risk that are measured by that, the Commission has the authority to do that now. We don't

need to change any regulations.

MR. CAMPER: Yeah, well, I agree with you philosophically and you witness the work of John -- I agree with you philosophically. The point I come back to though, and it's a stakeholder issue that was raised earlier, stakeholders have become accustomed to a rather specific definition of waste.

CHAIR RYAN: And they don't like it much because it's not clear --

MR. CAMPER: Well, it's not --

CHAIR RYAN: -- in the cases I've had that experience.

MR. CAMPER: I agree but the level of preciseness that is there is something they've become accustomed to and when you move toward a system that is fuzzier, if you will, and relies upon site specific performance assessment, which I happen to think, by the way, is a very good idea, I am getting at the notion, though, that stakeholders will ask you specifically what is this material. And in terms of waste classification, the principal reasons why we have it is operational handling of the waste, how do we package it and so forth as you know.

CHAIR RYAN: Well, again, the operational health physics aspects and the transportation aspects

are two different risks analyzed for two different reasons. Once disposed is where the methodology that David presented today comes in and to me can be a whole lot more transparent than trying to explain a concentration table in some abstracted scenario. You can talk about this site and this location with these features that the stakeholders know are the right numbers for this area. So, you know, again, I'm just trying to shake the tree a little bit here and think about a different vision of how to go about it, you know, for the purpose of getting this conversation going.

MR. CAMPER: I understand that and I agree with you philosophically. I'm just pointing out that all the time when we get into discussions of low-activity waste whether it be here or abroad, there is not a clear definition.

CHAIR RYAN: And again, I'm not trying to pre-suppose any stakeholder's view, but I think that's where engaging on the Commissioner's point about let's get the stakeholders into the process and think this through, that's a good way to think about it. Bobby?

MR. GREEVES: Can I answer his question?

(Laughter)

CHAIR RYAN: Yes. Bobby, did you want to

make an additional point there or did you want to wait for John?

MR. EIDS: That's all right, I have just a question and comment to make.

CHAIR RYAN: Okay, go ahead, John, sorry.

MR. GREEVES: Larry asked me, you know, is really a question about the lack of specificity and Larry, you and I have traveled over there and worked in that environment and I would just point out, it's very well-defined what the international, at least the IAEA, defines as this exempt clearance, and this is quantitively defined. It's very well done and people still complain about it. So you're going to have people on both sides of this issue and the definition of this very low-level waste that you'll find in this document is 10 to 100 times this clearance number.

So that gives you something to work with. But my experience working with these people internationally is they don't want to be roped in. It's like Mike said, "Give me a little bit of room here. I want to be able to work on a performance based approach and if I come up, you know with a construct like the French and the Spanish have for this very low-level waste concept, I don't want anybody dictating to me, Spain, France, what

parameters to select. But generally, they follow, I think a very consistent approach. The French actually use 25 millirem in their calculation for that facility and I think that's good enough. They don't want to be fenced in over there either. So you're not going to find a lot more precision on what these lines are on in whatever the final piece of the --

CHAIR RYAN: In fact, this squiggly tells you a little something right here.

MR. GREEVES: On purpose, on purpose.

CHAIR RYAN: I know, I know, John.

MR. CAMPER: Yeah, I recognize the squiggly.

MR. GREEVES: Thank you for the question. Bobby?

MR. EIDS: Yes, I have just a comment regarding the category under the exempt waste and the question regarding the concept of BRC which the NRC dealt with for some time, so people mixed this with the concept of BRC and now we are talking about before as you remember it was 10 millirem and now we are talking about one millirem even. And the relationship between that concept which was descended for a certain time and the exempt category, that's the first question.

The other question regarding the proposal on slide number 7.

MR. GREEVES: there was a question in there?

MR. EIDS: Yeah, there's a question on that, on your proposal on Slide Number 7. This proposal does have --

CHAIR RYAN: Would you bring up your Slide 7, please?

MR. EIDS: Slide Number 7.

CHAIR RYAN: Thank you.

MR. GREEVES: Is that 7? I've got pictures in mine.

CHAIR RYAN: Yes.

MR. GREEVES: Okay.

MR. EIDS: Which says that all risk informed, I think, the numbering is different.

CHAIR RYAN: It might be 8.

MR. GREEVES: Yeah, see, I inserted pictures in mine. I couldn't send them through an e-mail, so is it 8?

MR. EIDS: It could be 8. Yeah, that's the one, the first bullet. Does this -- has something to do with EPA, they are doing regarding AMPR and who you perceive that this can be done concerning what EPA

is doing and that AMPR.

MR. GREEVES: Well, I'm currently not familiar with what EPA is doing. It's been a long time. I think that's part of our problem is we've had these rulemaking efforts going on for since 2000 whatever. I'm not familiar exactly. I look forward to what Dan has to say tomorrow. My memory is that they were going to pick some dose number and we had these discussions about 25 versus 15, so I think you'll get your answer from them tomorrow. I can't speak for the EPA.

Internationally, people are using numbers like 25 millirem for that French facility that I showed on the diagram as the objective to do the back-calculation to derive the concentrations which end up being basically a WAC, a Waste Acceptance Criteria for that facility.

MR. EIDS: So the proposal is under the Atomic Energy Act and the question what is the EPA role in this case concerning that doing the work under the AMPR.

MR. GREEVES: A good question. That's what this meeting is all about, throw things on the table and we'll know better what EPA's thinking is tomorrow.

CHAIR RYAN: Bobby, let's carry that question tomorrow, maybe we'll integrate the answer.

MR. EIDS: Okay, what about the exempt and the BRC issue?

MR. GREEVES: I don't want to talk about BRC. I'm very comfortable with the -- I worked on that exemption clearance standard. I believe in it.

CHAIR RYAN: If you don't want to talk about it, stop talking about it. Okay, good.

MR. GREEVES: I'm not going there.

CHAIR RYAN: Okay, good. With that, I think we are at a good place to stop our discussion. I want to again thank everybody who participated today. It's been a very informative and lively discussion and I look forward to everybody's participation tomorrow. Thank you all very much.

(Whereupon, at 4:42 p.m., the above-entitled matter recessed, to reconvene on February 14, 2008.)