UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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PUBLIC WORKSHOP

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U.S. Nuclear Regulatory Commission
Two White Flint, North Auditorium
11545 Rockville Pike
Rockville, MD

Tuesday, December 1, 1998

The above-entitled workshop commenced, pursuant to notice, at 8:00 a.m.

P R O C E E D I N G S

[8:00 a.m.]

DR. GREEVES: Good morning. Welcome. Move closer. First, let me introduce myself. I'm John Greeves, director of the Division of Waste Management here at the Nuclear Regulatory Commission. I see a bunch of familiar faces here that sit across the table from us frequently. So we've met a number of times, at least many of you, I have.

And it's just a little bit difference format and one I actually enjoy a lot better than many of the meetings that we have. This is, as I think most of you are aware, the first in a series of meetings on decommissioning activities. The Commission was able to get the decommissioning rule, the license termination rule in place last year. It unfortunately took us a decade to get all that done. But with a lot of the comments that you people provided, we were able to get that decommissioning rule in place. And I think it gave all of us the tools that we need to make progress on decommissioning.

Anybody sitting in this room understands the cost of decommissioning. It's hugh costs in terms of dollars. There's huge costs in terms of time and resources -- regulatory resources. Just the amount of effort that I put into it. And we've got to find ways to streamline that and make it more efficient.

So this series of meetings and other interactions we are involved in and you're involved in, I think, go a long way towards addressing that need. As I said, this is a first of a series of meetings. We're going to have workshops in our development of the standard review plan. Again, I recognize many of you. We've worked in other arenas, and the standard process is for the regulator to put together a standard review plan.

And, of course, that's for the staff to review your projects

if you happen to be a licensee. But we all know that the licensees pick up the standard review plan. It's a good tool for all of us to use.

So that's the journey that we're on is to come up with a standard review plan that serves us and the community for the license termination process.

Our goal in having these workshops is to create opportunities where industry, other stakeholders, agreement states, others interested in this process -- and I recognize a number of the different stakeholders, including the agreement states are with us today, and I think that that's quite appropriate -- that we get a chance to show you what we're doing, and you get a chance for early input on this process of developing the standard review plan as opposed to commenting on a very well-developed standard review plan that we've got a lot invested in already and some stakeholder just isn't happy with.

So we want that feedback early. We've put up a lot of this information on our website which we think is a useful tool. Can I ask how many of you visited our website on decommissioning? Great. Love it. Okay, well, we're going to continue to do that.

Dave Fauver, I think most of you know sitting up there in the front, is sort of the point man here at the Nuclear Regulatory Commission on these activities, and I chew on Dave regularly, and I've encouraged him to have conference calls, meetings like this, et cetera. So during these two days, find a way to talk to Dave. What's working? Is the concept of a monthly conference call -- does that work? Let Dave know the answer. I at least want to encourage him to try and have those, and we've had some.

These workshops -- we've set up a whole series. We got comments that people need to know in advance. Well, when are these workshops? Our travel budget, our schedule, et cetera is such that we've got to know in advance.

So we put out the Federal Register notice. I believe it's out front, right?

MR. ORLANDO: Right.

DR. GREEVES: With all the workshops set up so there's plenty of notice. And whatever your feedback is on this program, make sure that you express it during the meeting, find some time to talk to Dave so that we can be efficient and give you a chance to provide meaningful comments.

We encourage your suggestions and comments on this program. We want your ideas, and we're resolving some of these complex issues. We started out looking at screening levels. We recently put out the DandD Code that's on the web. Maybe some of you have exercised it.

We also recently put out a Federal Register notice on screening levels for surface activity. It's only the beta gamma activity. We had problems with the alphas, and that's part of what this workshop is about. And some of the discussions I have with my staff is, some of the bigger problems are not the simple problems. I think the people who have one nucleide surface contamination, they're going to be able to solve their problem. They're going to use that screening table. They're going to go to the region, and they're going to say NRC published this screening table back in November. I meet it. I want to get out of the pool. And the region can deal with that, and you can clean your site up and be out of the process quickly.

A lot of the discussions I'm having with my staff are the more complicated site. And, again, I recognize the faces in the audience. You've got these complicate sites. Many of you have uranium and thorium contaminated sites.

And one of the questions we have is how do we go from a simple case to a more complex case, and that's part of what this particular meeting is about is to address those issues. We've got some

ideas, and I know you have some ideas. You've got a lot of talent working in your organizations. We want to leverage that process and make sure we get the standard review plan developed so it takes advantage of all that collective talent.

One of the things we talked about early on and the Commission encouraged us to do was identify some test cases. We've identified some test cases from within from our vantage point looking out at the regulated community, and I understand there are a couple of you who have volunteered. You're going to come forward and share some of your activities and developed test cases.

We've worked with NEI. I've met with them in a number of public meetings talking about how we can make this process efficient. They've put together a group of their reactor stakeholders, and we're sending people off to a meeting -- I think it's next week -- to address some of the specific issues that the reactor community has.

So we would really appreciate some feedback from you in this meeting. And just from the attendance, I see that it's well attended, and we're looking forward to some discussions on this.

This meeting primarily is going to be focused on dose modeling. This is the toughest piece of the standard review plan. There are three other major pieces that we seem to have a better handle on. But the dose modeling issue is one of the most difficult to address. And, as I mentioned, the uranium and thorium series are the ones that we were unable to come up with meaningful screening criteria for. And we understand that some of you have some actual case histories addressing the resuspension issue associated with these particular nucleides.

I've visited a number of your fuel cycle facilities, and I know that you have this type of contamination. And we really do invite you to join us in addressing this particular difficult area.

In future workshops we'll be focusing on other items including the power reactor issues and other issues that affect other types of licensees. So this is kind of the kick off of this series of workshops. And actually I'd encourage those that are going to make presentations later in the day, there's space at the table. Would you please come up here and occupy that space. You've invested. You're going to make a presentation. I'd invite you to the table. Dave, I think it would be appropriate to go over the agenda. You want to do that?

First, let me -- do you have any questions for me? I won't be able to be here all day. I did want to make some opening remarks. The office director, Dr. Carl Paperiello, is very interested in this topic, and he will be down here during part of the meeting. So I just wanted to make these opening remarks. Thank you for coming. I encourage your participation.

Any questions? This is an informal format. We can take questions during the meeting at any time. Okay. I want to hear from Dave on the agenda. And, please, come up to the front of the meeting, the room. Take up some of these spaces.

MR. FAUVER: Thanks, John. What we're hoping to have today, regardless of these imposing microphones all over the place, is an informal meeting.

DR. GREEVES: They'll warm up after about an hour.

MR. FAUVER: With a little bit of coffee. Yeah, we'd like to promote as much discussion as possible on these things, and really get your ideas. We take a real careful look at the transcripts. Well, I should note this is being transcripted. So when you come up to comment, please identify yourself and your affiliation.

We do take a very careful look at it. So when you're speaking and you have some comments to make, even though you may think

it got lost in some of the conversations that were going on around you, if it is of interest and a significant comment, we'll be taking a close look at it. So you can be assured in that. The agenda today is focused primarily on dose modeling. We have some comments from NEI and the fuel cycle folks and a couple of minutes here to start the day off from the industry side.

NEI and the fuel cycle people have been involved to a significant extent so far in this process, and it seems like they're going to continue that involvement. We're looking forward to that.

But we're really looking for some industry participation outside of that realm as well to the extent that you all are out there and willing to get involved. The first few sessions this morning are really going to be NRC overview. I don't think we'll go over this kind of detail in all the workshops. This is the first one. You're lucky to be here if you're not familiar with some of these things. We're going to go over some of the details that have already been posted on the website and may have already been discussed in some of the workshops for the license termination rule guidance. But we're going to touch on that again as context, and we're going to get into some of the details, some of the issues we've been facing for screening and alpha meters.

And this afternoon starts probably some of the nitty gritty work that we hope to continue through this whole series of workshops we're going to be presenting, and we're going to talk about resuspension factor. We have Dave Spangler from BMW Lynchburg that collected some data at his site, and he's going to be presenting the results of that data. This is resuspension factor for indoor dose modeling.

Then we're going to talk a little bit about some comparison work with RESRAD that we've been doing. We're very interested in seeing utility of RESRAD as compared to DandD and where one can be used versus the other, and what the advantages and disadvantages are. So we're going

to be pursuing that. Chris Daily will talk about that.

On Wednesday morning, the whole morning will be devoted to industry test cases, burial, and I'm not exactly sure what the NSF case. But Earl Saito from Combustion Engineering and Greg Chapman from NSF will be presenting some work that they've been doing on some of their actual licensee cases using our guidance, our draft guidance DG-4006 and NUREG 1549.

Mark Thaggard's going to talk about test cases that NRC's working on tomorrow afternoon. And then we have plenty of time for discussion. I want to say that we do have a lot of time in this agenda, I think, for discussion today, probably not as much for tomorrow. But if there are some thoughts that you have that you don't have time to get to today, hold them til tomorrow because we have a good hour and a half or more to talk about these things tomorrow. And anything that strikes you that you want to talk about, come on up to the microphones and feel free to participate.

With that, I think we'll go ahead and start with the NEI comments. The handouts -- oh, excuse me. Chris wanted me to mention that if we're out of some of the handouts, we will be making some more copies. So please go ahead and check at the break, and there will be some handouts that you may have missed.

Okay, Felix Killar from the Nuclear Energy Institute is going to talk.

MR. KILLAR: Thank you, Dave, and thank you, John Greeves, for putting this workshop together. It is, as you say, is a first in a series of these. We look very forward to participating in these. Our biggest concern with all the workshops is how the outcome or what the outcome of this material and work is.

We think that we certainly have a good basis, as you'll see in the next couple of days, work with the fuel cycle facility form. We

have a number of issues and test cases which we think will provide some real enlightenment of the issues. But what we want to see is how that is handled and how that is addressed in the reg guide. So that's a key issue from our perspective is how this material is going to be addressed, and how we can continue to provide input so that it is captured and addressed correctly.

I think that, as Dr. Greeves pointed out, the uranium and thorium certainly are the big issues. The alpha meters and taking the measurements and what have you is a big issue. The dose to coming to some type of concentration particularly in soils so that it's a measurable factor out in the field is a major issue. And I think we'll touch on that in the next couple of days. I think it's certainly paramount in trying to go forward with the decommissioning.

And with that, I'll turn it over to the expert who really knows what's going on, and that's Dave Culberson.

MR. CULBERSON: I'm going to be very brief also. Thanks again for involving us in this workshop. We tried to outnumber you today, but I don't think we succeeded. We've got a lot of people here, but I don't think we actually have you outnumbered on it yet. We're working on it.

I am Dave Culberson and chairman of the Fuel Cycle Facilities Forum. And I would like to express my appreciation for our role in this workshop today. I'm very pleased at the way this workshop was conceived and planned. Industry was involved in helping to shape the agenda, and it does appear that we have some very good topics to talk about and lots of opportunity to get down to some real nuts-and-bolts issues relative to the implementation of some of these guidance documents.

And I think the sites that we have represented here, the fuel cycle sites are those test sites that John referred to earlier that

really are going to have difficulty implementing the rule in some of the guidance documents.

As you know, the Fuel Cycle Forum has had as one of its goals throughout its lifetime to provide opportunities for dialogue between the industry members as well as with the NRC. We've been focused the whole time on decomissioning issues. So we've lived with this for the last ten years.

But we've also had as an underlying goal trying to actually find solutions to problems. It's not easy, particularly for the sites that are represented in the Fuel Cycle Forum. But that's still an underlying goal, and we feel like this workshop today certainly will achieve that goal and is very much in line with that thinking.

From the agenda, you will notice we're going to be talking about some very focused, very specific issues. And that's really where a lot of the good dialogue is going to come about. I think that's where we're going to see a lot of the issues start to crop up. Many of the problems, issues, concerns that will be expressed, we're finding, are only encountered once you start to implement the process. You really can't -- no one can really anticipate a lot of those. Even we did not anticipate a lot of these until it comes time to implement and get along with the decommissioning process. And so what that tends to emphasize to us is that we need an iterative process throughout the whole development of the guidance and the rule and implementation, a process that enables us to get together, sit down and talk and raise these issues and work them out jointly.

And I think you're definitely on track with that. This workshop is just a good example. I'm real encouraged about what we're going to accomplish today and tomorrow. From our discussions with Dave, we've had the conference calls that John was talking about. We've had the interaction to prepare for today.

And I think we're going to hit on some real key issues. We do recognize that the NRC has been listening and hearing some of the comments. We've seen the changes in guidance, and we appreciate that. We're going to continue to be involved. We're going to continue to participate in workshops. We're going to continue to generate comments, provide written comments as well as oral comments whenever we have the opportunity, and continue to participate in all stages of the process where those opportunities allow us.

And I'm excited also about the website. I've been on that a number of times. I'm looking forward to using that to provide specific feedback and get solutions to very specific issues. And I would encourage industry as well to utilize that process because I think that can work in a very positive way.

I'm really looking forward to today's discussion and tomorrow's discussion. We once again want to thank you for the opportunity to be here and for involving us in the planning and preparation for this workshop. I think it's going to be a very, very good one.

DR. GREEVES: They're taking a little time warming up here. But I really would like to invite the speakers from industry to sit at the table during NRC's discussions. They've invested in this process enough that I think that they should join us at the table and get involved in the give and take.

MR. FAUVER: There you go. You've got a couple of them lined up.

DR. GREEVES: If you're on the agenda, please sit at the front table. Okay, a couple of acceptances here.

MR. FAUVER: Yeah, I don't think Earl's shy, from what I can tell. Okay, first of all, we're going to try a new technology here.

DR. GREEVES: Let me add that --

MR. FAUVER: Go ahead.

DR. GREEVES: If there's any representatives from the agreement states, I'd invite them to the table also. You share this regulatory problem with us. So I would invite you to come sit at the table and ask your questions. This is I think a real opportunity for the agreement states to participate in the process. So please join us.

MR. FAUVER: And as we proceed, of course, anybody else will come up and provide comments and insights as we go along.

I'm going to start out with a very brief run through of what everybody probably already knows apparently which is this process that we've put in place. So I'm going to get through this fairly quickly.

As you know, we announced this in the Federal Register, this process, and a copy is on the desk out front. It consists of workshops, website, technical meetings and e-mail lists, and that's new. So there is something new in this presentation I get to at the end that should help the communication process.

There's a list of workshops. This is the first one. We don't have the agenda set for the other workshops. We're working on that. In fact, we're working on one as far out as June 16th. It looks like it might be on groundwater modeling. So we might have that one posted fairly quickly.

What we'd like to do is post these agendas as a draft, get comments and feedback, if possible, before we finalize. Otherwise, we'll just move forward and finalize the agendas and post them in the final section of the website for final agendas. Here's the address. And in the website, we have six topics. As you can see, the first four are simply the major headings in draft Reg Guide 4006 implementing the license termination rule, dose modeling, final survey, law of restricted use.

The idea is if you have any thoughts, comments or

observations about the Reg Guide in any one of these areas, you would go into that section and start a message spread and identify yourself, et cetera, which hopefully would encourage conversation on that particular subject.

The same on proposed workshop topics. If something emerges from your work or review and you think it's important enough that you'd like to see it become a workshop topic, you can go ahead and post it and say I'd like to talk about this more. So that's the idea there. Also, we will put the draft agendas out on that part of the website. And then all of the final agendas will be posted as well.

The technical meetings -- when you look at proposed workshops topics, we'll also be posting these intermittent periodic technical meetings that we're going to be having on various topics for more of an indepth discussion.

So when people talk about using the website, what it means is to make entries into the website, not just to read it and observe what's on it hopefully. We are having technical meetings as they come up. They're detailed working level meetings.

Now this is fairly working level, we hope, but we're looking at a smaller group where you can really get into as great a detail with experts on a given topic -- as great a detail as is needed.

Out of those technical meetings, there may come resolutions, or there may come the need for additional workshop topics. So we'll see how that goes. NRC could call a meeting, or industry could call a meeting as they see fit, and then we would try to see if we could accommodate the meeting, where it would be, whether it's worth the participation or not. We'd make that judgment, then post and go.

We publicly announce the meetings. We would host and post it on the website. We also would participate in meetings that are invites from industry, and we don't necessarily post those. We're not

obligated to do that. But we would then try to put it on the website to the extent that we can and let everyone know what's going on.

An example of one of these meetings is that EPRI came in. They wanted to talk about some work that they had ongoing on a RESRAD/DandD comparison project that they were doing. They asked us to have a meeting. We posted it, held the meeting. It was basically an all-day technical discussion, very fruitful discussions. And we hope to have more as this thing proceeds.

Video conferencing upon request. Now that's for the meetings and these workshops actually. But we do need to get the request. We can't just put it out for people to call into. There is a linkage involved there.

We do have the capability both at the workshop and these technical meetings. So if you are interested, either contact one of us or contact me, and we'll set it up. We can use the video conferencing capability.

All the meetings will have teleconference access, although be there. We encourage your participation. We realize that it's hard to really become involved and participate through teleconferencing. But listening probably could be better than nothing, but we'll see how that goes. It will be available.

So we don't have any of these set up at the current time. But we would hope that we'll have several of these during this process.

E-mail lists -- what we want to do is to try to facilitate this process a little bit. So I'd like to try to offer up two e-mail lists, and I'll put sign-up sheets outside on the front desk out there. The first list, what we'd like to do is to notify you of draft and final agendas for the workshop and meetings, especially the meetings. They come up sort of on a ad hoc basis as things emerge. And if you're not checking the website every day or every week, you might miss an

opportunity. A lot of these things are very fast paced. We could identify the need for a meeting and hold it within three weeks.

So what we'd like to do is as soon as we set the meeting and start drafting the agenda for the meeting to put it on the website. The first e-mail list would be a notification of those meetings. So we would send it out to folks automatically with that first e-mail list.

The second e-mail list, Chris Daily assures me we can do. We haven't set it up yet, but it's a function of these websites where as there's a new posting or subset of these postings -- I'm not sure how it would work out exactly, that you would then be e-mailed the posting. So dependent on the involvement in the website, that may entail a lot of e-mails.

I don't know if any of you are on RADSAFE, but it can get annoying. I mean, you're getting these things all the time. But that should be useful, and I would encourage your participation if you want to get involved. I mean, you could just delete it if you're not interested in that topic. Is this something that we're going to be able to do, Chris? I might talk to you about it.

Okay, so I'll have these two sign-up sheets out there. You can sign up for one or both of these e-mail lists. I suppose we'll also post it on the website to give people that aren't at today's meeting an opportunity to sign for these lists as well. That's it. Any questions on the process?

MR. WILLIAMS: Dave I have a question. On the dates for the future meetings, how firm are those dates?

MR. FAUVER: Firm, unless something really unusual happens, those will be the dates for the meetings.

MR. WILLIAMS: Okay. Typically, what we like to do is when we have something like that, we'll schedule meetings around it because people will be in town. But we want to make sure that those are firm

dates.

MR. FAUVER: Yes. Right. Nick, did you have a question?

MR. ORLANDO: Yes, Felix, I just wanted to let you know those are real firm. We are going to have all of them here in the auditorium, and we had to book that out about a year in advance to make sure we had two consecutive days. We tried to do the best job we could do on scheduling, and unless something really drastic happened, those are the dates.

MR. SPANGLER: Dave, do all the six dates correspond with the six topics that you had listed?

MR. FAUVER: No. No. What we're trying to do right now is since dose modeling is probably the most significant detail topic, we'll probably have each of the subsequent workshops will likely have one day of dose modeling with one day of one of the other topics, ALARA dose modeling, ALARA final survey or restricted use. So there'll be some combination of those. But each workshop should have one day of dose modeling depending on the interest. We may find that ALARA is something that everybody has this compelling need to discuss. In that case, we would displace one of the other topics as needed or have a technical meeting on ALARA. So it's an interactive thing. We're hoping to hear from you.

MR. CULBERSON: Let me just add a comment to that. I think I said something earlier about this particular workshop. And I would encourage all the industry people as well. This agenda came together real well through an interactive process. And what we -- we talked. We got some -- started off in kind of a generic, you know, here's dose modeling, but we focused that down onto some very specific issues that some of the licensees have actually encountered and are trying to wrestle with right now.

And it was a really good way to get some specific issues on

the table. And at the time we were planning for this workshop, we were also looking at another table top exercise that the fuel cycle industry was trying to coordinate. And this is going to accomplish many of the same goals. So we deferred that for a while because of the way this was structured.

So I would encourage everybody to utilize the e-mail, utilize the website, and get some topics in there and then participate with Dave and anybody else on putting these agendas together. I think that's really working well.

MR. FAUVER: Thanks, Dave. Did you have something, John?

Yeah, John had pointed out that most of you have put your e-mail lists. And so maybe we'll try to latch on to this list that you've already signed into. You could probably put -- I'll have box one and two or something on it so you don't have to rewrite it. But -- so we'll try to use the list you've already written down. Thanks. That's it.

The next speaker is going to be Nick Orlando. Nick is the project manager for the standard review plan development, and he's going to go through where we're at with that. How do you turn this thing off? Okay.

MR. ORLANDO: We go from real high tech to real low tech.

DR. GREEVES: Nick, let me interject. The recorder's asking us and it's good practice. If anybody stands up and makes a statement, would you please identify yourself so the recorder can get the spelling close anyhow. Thank you.

MR. ORLANDO: Well, as Dave said, my name's Nick Orlando. I'm the project manager for developing the SRP. And as soon as we get this hooked up here, we'll start. What I want to do is give you just a real brief overview of why we're doing this and what we're doing and touch maybe a little bit on some of the things that Dave already talked

about. Hopefully, it won't be too much repetition, but I know we do want to keep these sort of introductory things to a minimum so you guys can -- all right. It looks like we've lost a bulb.

Oh, well. I hope everybody's got a copy of this. Instead of holding anything up, we'll just go ahead and move forward.

Just a little bit of background -- I don't have to look back up that way any more. Just a little bit of background. Over the past couple of years, the past decade or so, NRC's come out with several regulations pertaining to decommissioning.

Back in 1988, we came out with the technical and financial requirements for decommissioning. Then in 1993, we came out with some additional recordkeeping requirements. In 1994, we came out with the timeliness rule. In 1995, we came out with some clarifying documents for financial assurance. And then finally in July of last year, we came out with the decommissioning -- the license termination rule which set up the different criteria that were to be used for decommissioning licensed facilities.

Go to the next handout, I have a list here of some recent decommissioning guidance. We put this in here so that anybody that may not be aware of these different documents can request them. We have in December of last year, we came out with MARSAM, the multi-agency radiation survey and site assessment manual. We also came out in the summer with NUREG 1505 and 1507 which talk about the non-parametric statistical methodologies for design analysis and of final surveys.

In July of 1998, we came out with NUREG 1549. And finally in August, we came out with Draft Reg Guide DG-4006 which was the method by which we would demonstrate compliance with the new rule.

The standard review plan that we're trying to develop is going to take the DG, move it one step forward to set out the different criteria for the staff to use to evaluate how you all send in your

decommissioning plans using the guidance in DG-4006.

If you move on to slide number four, in a staff requirements memorandum back in July, the Commission told the staff to do several things. The first was to publish the DG-4006 for a two-year comment period, which has been done, and I believe the comment period ends in August of next year.

We're also to maintain a dialogue with the public during the comment period. This is one of the reasons we're doing this and why we've set up the website. We're also supposed to review the potential conservatism in the DandD screen, and I think Chris is going to talk about that in a little bit, as well as develop a more user friendly format for the reg guide, and Steve McGuire is working on that. I saw him come in a little while ago. I don't see him now.

The fourth bullet on this page is where I get involved, and that's develop a standard review plan that incorporates the iterative risk based process that was started in 1549, and that's what we hope to be able to do with your help.

Finally, then we're also supposed to test the DandD Code on some complex sites, and we're going to have a presentation on that in a little bit. Use the probablistic approach to calculate TEDE to the average member of the critical group.

We've provided the Commission with a time line for the decomissioning or developing the SRP, and I've included the major milestones at the back of the package. And finally include the ACNW in the review of all of the different SRP modules.

Now to just go over very briefly what we envision for the SRP, the idea is to enable the NRC staff to efficiently and in a cost effective manner go through decommissioning plans and make sure that no only do the procedures laid out in the plans indicate that the licensee can decommission a site in a manner that's protective of the public

health and safety, but that they will also be able to release the site or we can terminate the license in accordance with our requirements, whether they be unrestricted use or restricted use.

The way we're -- if any of you are familiar with NUREG 1199 which is the standard review plan for the low level waste disposal facility, we're going to use that basic format where you'll have acceptance criteria, responsibilities under each of the different submodules in the SRP, and then you'll have acceptance criteria and evaluation and acceptance criteria and then references under each of the different submodules.

And, again, what we intend to use the SRP for is to review not only decommissioning plans, but other documentation that might be submitted by licensees or responsible parties to support their decommissioning. Now as far as public outreach, Dave already alluded to the workshops. I'd like to expand just a little bit on one of them.

For the workshop we're going to hold in January, Steve McGuire and I are working on the agenda for that one. At least the second day. As Dave said, right now we've got all of the workshops set up so that the first day will be on dose modeling because that seems to be the toughest nut to crack.

The second day we're going to be looking at other of the different sort of new areas we are addressing in the DG. The first thing we'd like to take a look at is restricted use and alternate criteria. So Steve McGuire and I are putting together an agenda for that. We've lined up a couple of speakers already, some folks that are going for or have indicated they're interested in discussing some of their experiences or thoughts about restricted use. I would encourage anybody here that would like to get involved in presenting something at that workshop to let either myself or Steve McGuire know. My e-mail address is on here, and Steve's got a presentation later on, and his

e-mail address is also on his slides, I believe.

As Dave said, we're also looking at possibly the workshop in June maybe devoting all of that to groundwater dose modeling with groundwater. Jack Parrot and Tom Nicholson have indicated that they want to have a workshop, and since that does influence some of the dose modeling information, we're thinking about letting them take the full two days for that.

Right now, we're also thinking about for other workshops having one on the law, maye one on final surveys. But we need your input. If you've gone through the DG and don't see any problems with cranking through the ALARA calculation or making that demonstration, that's fine. Then we won't do one.

But if you see some potential issues associated with that, please let us know. We've also established a website and the address is there again on the slides. So I wanted to say, yeah, one of the things we're going to do is each of the -- there are several different subheadings on the website if you go in there. If you identify any issues, please post them there on the websites that we can start looking at them, maybe try and start developing some resolutions that we can put out, get your opinion on, see if you think that's going to work.

In addition, we're going to post the SRP modules as they're developed on the website for everybody to review and comment and let us know what they think about how we're going. I think the first thing we'll probably put on the website under sort of that general category is going to be the outline or the table of contents for the standard review plan. We're working on that right now, and hopefully that will done here within a pretty short time.

Let's see. We've also, as far as soliciting input from other stakeholders, John mentioned that the agreement states are involved. We've contacted the Council of Radiation Control Program

Directors and spoken to their chairman and solicited their input. We did that back in September, and they indicated that they would be interested in participating in the development of the SRP.

Last slide or last piece of paper is just sort of the principal milestones. We have several internal ones we're working on. But we established our work groups back a couple of months ago. We've made the first milestone by coming up with the default table for at least the surface criteria. They replace Reg Guide 1.86.

And we're currently working on identifying as many issues as we can to start developing the resolutions. We hope to complete all of the draft SRP modules by June of next year. That's with the exception of the dose modeling group. They have some higher hurdles than the rest of us have to go over. So they're going to probably get done sometime in April of the following year.

I put the close of the comment period for the DG on here, DG-4006 on the list of milestones. That's not one of my milestones. But I just want to remind everybody that that's when you need to have your comments in. And please use the website to give comments to Steve on the draft guidance.

We hope to revise the standard review plan based on all of the comments on the draft guidance, the DG-4006 when that's done. And then we'll start submitting it up through the ranks here for their final review and then hopefully publish it in July of 2000.

So that's a very -- and I apologize. I checked with everything except for getting one extra bulb. So it's always that one little detail that you forget. What is it, for want of a nail, the battle was lost. I apologize. Hopefully, if anybody did not get any slides, please let me know and I'll go ahead and make up some extra copies.

Anybody have any questions just on the general process that

we're going to go through?

MR. SAITO: Yes. Earl Saito, Combustion Engineering. I have a question about your replacing Reg Guide 1.86 with DG-4006. It starts out and it says, "Decommissioning is exclusive of the equipment and other materials in the building, and Reg Guide 1.86 generally applies to that."

MR. ORLANDO: The replacement is for surfaces like walls and floors and things like that.

DR. GREEVES: Yeah, we have to be careful. Many of you who are licensees have 1.86 built right into your license. It's not -- Dave, help me out on this. It does not affect your license.

What this is is for termination. If you've got a building and you're trying to terminate that building, those screening criteria we just put out are for the building. It does not address the equipment issue. As I said, a number of you have built right into your license or at least the values in the decommissioning termination guidance. They're the same numbers. I think you understand what I'm saying.

MR. SAITO: So you're not really going to replace 1.86.

MR. ORLANDO: Well, replace it for surfaces, walls and floors. You're correct. It doesn't replace it for equipment. And if you read the Federal Register notice, I think it goes into what the interplay between 1.86 is for equipment and the table. But no, that's a good point. I was thinking in general.

MR. FAUVER: I want to add on it. The use of 1.86 is not dependent upon it being in your license. We've made in our couple of papers to the Commission and in our Federal Register notice use of 1.86 for the equipment and removal of material will continue to be used until the clearance rule is finalized. We have a rule underway for the clearance of material which presumably would be dose based. And then when that dose based rule and those numbers come out, they would replace

1.86. Until then, 1.86 would be used for equipment. Hal?

MR. PETERSON: Yeah, Hal Peterson, Department of Energy. A question. What is the scope of the standard review plan. Does it cover all of NRC licensed facilities, or is it primarily reactor directed?

MR. ORLANDO: Right now, if you look at the different documents that NRC requires in the materials side, you have to send in a decommissioning plan. From the reactor side of the house, you send in a PSDAR, post-shut down facilities decommissioning activities report, something like that -- PSDAR.

That takes care of the decommissioning pretty much up through -- I'm trying to think what point -- about two years after shutdown. Then you send in what's called a license termination plan. And if you look at the different requirements under each of those three documents and lay them out, and I made a slide up for a different presentation. Maybe I'll try and bring it down later.

If you look at that, you can see where there's an awful lot of overlap. For example, the license termination plan in reactors, you have to talk about what cost estimate update. You have to talk about what you're going to do for a final survey. You have to show how you're going to meet 10 C.F.R. 20(e), those kinds of things.

The information that we're generating for the SRP for decommissioning plans is going to be focused on decommissioning plans. In other words, the material side of the house. But I think it's going to be applicable to the reactor side, too.

We're working with the reactor folks. They're going to be reviewing the modules that are applicable to the information that they need to terminate their licenses. Also, as you may or may not know, there's an MOU between NMSS and NRR, the material side of the house and the reactor side of the house where after this spent fuel permanently leaves the pool, the responsibility for project management shifts over

to NMSS, and we start using the decommissioning or the SRP at that point.

And like I said, if you actually look at the line up of the information that's in an LTP and a decommissioning plan, they're pretty much the same. There's just a little bit more --

DR. GREEVES: Hal, just to summarize. John Greeves. Part 20 applies to all licensees, and that's where this license termination is. It's in Part 20. So it applies to all of them -- reactors, materials, every one of them. The focus of the standard review plan is mostly for the materials fuel cycle facilities, but the very same approaches are going to be addressed at the reactor sites. And we're talking to the NEI, stakeholder groups about their reactor groups.

In fact, we're meeting with them in a week. So the short answer is that it applies to everybody. And we certainly don't want to write two standard review plans. We'd like to capture as much of it as we can now. And I've looked at a number of the documents that you have that you use in DOE, and they're quite similar, I might point out.

MR. PETERSON: Thank you.

MR. ORLANDO: One further thing just to let you all know. Usually in the past, we've come out with a standard review plan and then a format and content guide. And this is where the standard review plan is for the NRC, and the format and content guide goes to the licensee.

What we're going try and do this time is combine them all into one document so everybody's got the same book. Everybody can open it up to the same page. And everybody's playing from the same sheet of music. Dave?

MR. CULBERSON: Dave Culberson again. Is that process -- do you anticipate that being an iterative open process like some of the guidance development where, for example, industry would have at some point in time, have an opportunity to participate and make contributions

to that?

MR. ORLANDO: Sure. In fact, the next workshop's going to be on restricted use. We need to do the same kind of thing we're doing with dose modeling for restricted use and possibly ALARA and possibly final surveys. And as I said, as we develop what we think are the appropriate modules, we're going to post those on the website and let people start commenting on.

As Dave as saying earlier, too, the workshop agendas and the topics are still kind of nebulous. We want to kind of -- before we set them in concrete, we want to see where this thing is going and leave some open so that if we have to devote a couple to a particular topic, we have that flexibility further on in 1999.

MR. FAUVER: Let me add -- can I just add something to that? Your question made me think there might be some confusion, and I want to add some clarification.

The finalization of the draft guidance and the development of the standard review plan are really rolled into one effort. It's the same group of people, and the acceptance criteria that we build into the SRP will feed back into finalization of the guidance. And feedback we get on guidance will feed back to the SRP.

So it's really the same process, and I think we fully intend on the SRP draft modules being posted early just as if it were NRC license guidance. Thank you.

MR. ORLANDO: Elaine in the back?

MS. ROMAN: Elaine Roman --

DR. GREEVES: You're going to have to go to a microphone, Elaine.

MS. ROMAN: Just mention that Subpart E exempts uranium recovery facilities from the requirements.

MR. FAUVER: We need to use the microphones for the

transcription.

DR. GREEVES: Do you have that hand mike? Where's that? Oh, I guess Nick's got it on, doesn't he.

MR. ORLANDO: I saw another hand -- this gentleman.

DR. GREEVES: Why don't you come up to the table and sit with us? We have an agreement state representative.

MR. WEAVER: Kevin Weaver, State of Colorado. But I've been involved with conference radiation control program rule development. And some of our folks, for instance, radioactive waste management committee, have used the Reg 1199, and a comment about the format of that.

Multiple authors of sections. Be real conscious of that if you're using it as a model to have one good technical editor/author help keep it consolidated and streamlined.

MR. ORLANDO: Good comment. Thank you.

MR. FAUVER: Okay, thanks, Nick. The next speaker is Chris Daily from Office of Research. She's been heading up for several years now our dose modeling project and development for compliance with the rule. So she's going to talk about the draft guidance on dose modeling

MS. DAILY: Can everybody hear me? I don't have a tie, so it's not going to sit quite right. We're going high tech again.

What I'd like to do is talk a little bit, just give a quick summary of what we have in terms of draft guidance on the dose modeling. But before I get into that, I wanted to say a little bit more about what we're doing with the website.

We're trying to reorganize a way that a library of documents is set up in the website. We know that right now it's a little difficult to negotiate. It's hard to get to. And I'll be going out to Lawrence Livermore National Lab next week which is where our server is physically located and work with them to get that library set up, and

also to work a little bit on setting up something that's similar to a list serve where you can -- what Dave was talking about. You can sign up to get automatic e-mails for different topic areas.

And if anybody has any other suggestions on how to set up the website on how to make it easier to navigate, send me an e-mail. My e-mail's on this. I haven't really gotten a lot of feedback yet on the website. But I have a feeling that people haven't really tried to use it and set up some of the message threads. So that will come with time probably.

Nick covered some of this. I wanted to provide a list of the different references that we have. The DG-4006 is available on the website now. So you can download it from there. We have had some difficulty with people being able to download some of the documents. If you have that problem, if you could give me a call.

Sometimes we've got a glitch on the server side. If you can read WordPerfect documents, that's what we're using right now. We've had some trouble getting some decent translations into Acrobate format or some of the other formats. We're looking at some new software that's supposed to do a little better job of that. Most of the problems are if we have documents that have a lot of equations or graphics. They don't seem to move between programs very politely. So we're still looking at that. And if you have ideas for stuff that you've done, please let us know. But now right, a lot of things are basically available in WordPerfect format.

These other documents that Nick was talking about mainly for the surveys are not available on the website. But you can get copies through the public document room. For the dose modeling guidance, we have the draft NUREG 1549. That's the decision methods for doing the dose modeling. We've had some pretty extensive discussions on that in some of the previous workshops, and I'll talk a little bit more about it

today.

NUREG/CR-5512 Volume 1 is the original NUREG that has the list of the scenarios we looked at, some of the basic philosophy behind the dose modeling approach. Volume 2, I have right now. I've posted it to the website. I don't think it's available yet. But it's loaded on the site. So we should be able to get it available for you to look at fairly soon. It's the user's manual for the software. It will be published in hard copy either this month or next.

Volume 3 is the parameter analysis. There's an early version of that talking about the actual methodology used posted on the website. We hope to have a final ready for publication either this month or next month. And the parameter descriptions, the descriptions of what the parameters actually mean and the distributions that were developed for them are available on the website as separate letter reports for the residential scenario and the building occupancy scenario.

Those are going to be combined into the final version of Volume 3.

Volume 4 is talking about the model comparison that we're in the process of doing between the DandD software and the RESRAD software. I'll talk a little bit more about that comparison this afternoon.

The decision methodology that we talk about in NUREG 1549 is basically an iterative process, as Dave was talking about -- Dave Culberson has talked about earlier. The dose modeling and the process of development is similar to the whole process of developing this guidance. As we go along through the testing of implementation and do some test cases, we learn more than you can only learn when you actually try to apply something, and we try to incorporate that in the whole method for doing the dose modeling follows that same kind of idea where you start simply and bring in information as you need it as opposed to

going out, spending a lot of money, gathering a whole bunch of information that may not turn out to be very useful in the end.

The idea here is that you do a lot of optimization before you spend a lot of money. And that it gives you an opportunity to interact with the regulators and other stakeholders in your area to develop the optimal solution for your site.

This is the infamous flow chart for the decision methodology. It's probably going to change over time as people give us more comments on this. But it gives you an overall idea. If you proceed down what for you is the righthand side straight down, that would be equivalent to screening. Basically, the scenario definitions, system conceptualization has all been done as part of the DandD software and methodology development. If you meet the screening criteria as some of the tables that Bobby's going to talk about a little bit later, you just drop down that side to a final ALARA demonstration and release your license.

The important part for those of you who have more complex situations is the iterative loop in the center there where you gradually bring in more information, you explore other options, other models, other scenarios as necessary to release your site.

The testing that we're doing includes model comparisons that I talked about earlier. If we have an opportunity, we'll expand some of those comparisons. Right now, we're concentrating on the most common codes that we expect to see as people start working on their actual decommissionings.

We need to understand the model assumptions well enough that we can make decisions about where the models are applicable or not applicable. And the initial process of the model comparison was intended to be simply laying out what the basic assumptions were and how calculations are actually performed. It's not to make decisions about

what's good or bad or better or best. It's just to lay out those assumptions.

And we go from there to taking that information and extending it to other certain situations where this type of a calculation is inappropriate or where this calculation is going to be more efficient. That kind of work is going to be embedded into the standard review plan after this comparison is completed.

The test cases that are being worked on are going to help us get a better idea of how to do estimation of source terms. There's a lot of work being done on that. It's been kind of ignored in the past. But there's a lot of uncertainty in the estimation of the source term that can have a big impact on your eventual dose calculation. And we'd like to be able to incorporate that uncertainty with other uncertainty we're looking at in the parameters themselves and the model scenarios.

We're also going to be testing the 1549 framework and seeing if it actually is practical in the field. What we need to do to make it a little more efficient. And then all of these things will be hopefully efficiently rolled together in the end and used to update the final guidance documents and the standard review plan.

Finally, the work that we're doing on some of our existing tools, we want to extend the DandD model so that it will provide a Monte Carlo analysis. One of the difficulties that we've looking at is when you go from the screening, the default parameters and bring in some site-specific information, you basically lose the level of confidence that you had when you did the original screening.

And by changing some of the parameters, you may shift what are important pathways the eventual result of the code. What we'd like to do is develop a version that you can use without having to understand a lot about the Monte Carlo analysis. It would kind of do those analyses in the background using the distributions that we've already

developed for the parameters.

If you want to get into the details of a Monte Carlo analysis and extend the methodology, you can do that also. And we'll put up as much documentation as we can to make it so that a whole range of licensees will find this approach useful.

We're working with DOE to develop distributions and defaults for the RESRAD and RESRAD-BUILD models. We're looking at developing criteria for selecting models that will grow out of the model comparisons and the test cases and developing guidance for applying alternative scenarios. It's been clear from early on in this work that the main scenarios we use are the residential farmer for soil contamination and the building occupant for commercial occupancy of a building.

We need to develop some scenarios if you have both building and soil contamination, if you have a situation where a resident farmer just is not a viable possibility, and how you switch from one scenario to the next, what kind of demonstration you need to do.

And then we'll be developing specific guidance for site-specific modeling. That's all I have right now. If there's any questions or comments. I've finally become perfectly clear.

MR. FAUVER: Thanks, Chris. Well, we're running a little bit early here which. Let's see, I think we should just probably go on and then maybe take a early lunch if need be.

Let's go. Bob, are you ready to go now? All right. The next speaker's Bob Eid, and he's going to talk about our building surface contamination screening table that we have recently issued in a Federal Register notice, I think about two or three weeks ago. As he gets ready.

About those website lists, here's what I'll do. I'll put the attendance sheet back out on the table. And next to your name, just

put one and/or two next to it, and I'll know which of those two lists you want. Remember that first list number one is simply the announcement of the technical meetings and workshops and early announcements so that you can participate if you want to. And list number two will be the e-mail of all of the new website postings. So I'll just put it out, and you just put a one or two next to your name or next to your e-mail list.

MR. EID: Good morning. My name is Bobby Eid. I'm with the Division of Waste Management. The title of my presentation this morning is about building surface contamination screening tables.

I would like to mention again that the building surface contamination screening table was published about two weeks ago on the 18th of November in the Federal Register notice which we explained the screening values of beta and gamma parameters for building surface contamination. I would recommend looking into the Federal Register notice and try to use those tables. They are quite useful.

My presentation outline will be about the Federal Register notice. I apologize for this one is too long, so we can move here. Anyway, you have hard copies of the handout. If you do not have it, I have also extras if you'd like to have more of these handouts.

The first item I will be talking about is supplemental information on implementation of the final rule on radiological criteria for license termination, and this is about the FRN 63/FR 64132, again, which was published on November 18th this year. Then I'll be talking about the screening default table for common beta and gamma emitters for building surface contamination. Then the DandD Code screening values for the alpha emitters. Someone did not run the code. I would like to give you some ideas about what you get for the alpha emitters so you will have -- you decide early in the process whether to go for the screening or not to go for the screening when you are talking about the

alpha emitters.

And then I'll be talking about the assumptions for generation of the default value of the building surface contamination, what are the assumptions, the scenarios, how the calculation is done very, very briefly so I'll give you an idea if you would like to change the parameters or to change the scenarios or to go to site specific.

Then the comparison with action plan, how these values compare with the interim criteria. Then some conclusions. In the Federal Register notice published on the 18th of November this year, the first information we provided about the end of the grandfathering period.

As all of you know that the grandfathering period is the period from the effective date of the license termination rule which was August 20, 1997 to August 20, 1998. So that period has ended, and this means the licensees, they have to follow the new rules.

Then also we provided information in the FRN about the two year interim use of the draft Reg Guide DG-4006. Thank you. For a demonstration of compliance with the radiological criteria for license termination. Then also we discuss availability of the NRC DandD screen code, and we provided information on the website that you can access directly.

Then the screening values for building surface contamination. Also, we mentioned again the dates for the future public workshops in the Federal Register notice. And also we provided an outline of that we are providing or we are developing a SRP for decommissioning.

Also we provided a table about the status of the decommissioning guidance documents. If you are bored, you may be interested in some numbers. So these are the numbers for building surface contamination. Many of you will like to see what kind of

screening levels that you will be establishing for your sites, and those are the numbers for beta and gamma emitters. Again, for building surface contamination.

And also in the -- these values, they are listed in the third column. Those are in dpms per 100 centimeter square, and I tried to provide comparison with the action plan values so you can judge your previous criteria with the current criteria that you will be complying with.

As you can see, these numbers they have increased substantially for most of the nucleides. Some of them, they are comparable still with the action plan values. For example you have Sodium 22. There are somehow there are some similarities. Cobalt 60 and Strontium 90, there are some similarities with the action plan values.

However, for the others, some of them they increased very highly, and some of them are increased by a factor of ten or could be more. So I would say in general as screening values, they could be very useful to use for the beta and gamma emitters.

Those are the DandD code screening values for the common alpha emitters. They were generated based on the DandD code version one. They are not listed in the Federal Register notice. However, I tried to give you an idea when you run the code what kind of numbers you will get. So those are for the alpha emitters. As you can see, the screening values for unrestricted release for the alpha emitters we have being decreased substantially from the action plan values in most cases.

For example, Actinium 227 is 1.8 dpm/100 centimeter square. Thorium 228 is 41. Thorium 232 is 7.3. For Actinium is 8.6 and so on. So as you can see, those numbers are at or below the detection limits. We recognize that and we are working on a different kind of options for either to improve the screening. But currently, if you feel that you cannot meet those values and most likely you will not, just to go

immediately to site-specific analysis rather than to spend time for the screening analysis.

Meanwhile, we are thinking about ways how we can develop the screening default table for the alpha emitters.

MR. SAITO: Excuse me, is this total activity?

MR. FAUVER: Earl, could you identify yourself?

MR. SAITO: Earl Saito, Combustion Engineering. Is that total activity you're talking about in dmp/100 centimeters removable activity, or what's the --

MR. EID: Okay, that's a good point. I forget to mention that the activity levels that we are talking about are based on 10 percent removal -- 10 percent removable. This means the material or the contamination on the walls or on the surfaces they are the fraction of the materials 10 percent of that material is removable from the walls. And this is total alpha activity for each nucleide.

MR. SAITO: Okay, so in this table, it's 100 dpm/100 centimeter total activity for uranium 238.

MR. EID: Right. This is equivalent to 25 milligrams.

MR. SAITO: Which is 10 dmp smearable?

MR. EID: That's correct.

MS. DAILY: No, that's not quite right. We developed a distribution for this parameter. It's based on assuming that 100 percent of the material was removable. And then when we developed the default itself, we assumed that only 10 percent would actually be removable.

So that's -- that number up there is for total activity.

MR. SAITO: Okay. What is the measurement I would take out in the field to measure this?

MS. DAILY: That's total activity.

MR. FAUVER: Well, let me add on. This is Dave Fauver, NRC.

We've had some discussions on that. And you're onto something.

It's not as easy as in the Reg Guide 1.86, the so-called action plan values. The Reg Guide 1.86 numbers. In that table, it was a measurement table. It was 5000 dmp/alpha. And so really it was irregardless of the ingrowth and where you were, whether you depleted uranium, at risk uranium, natural uranium. Five thousand dpm/alpha for uranium, for example.

In this case, I believe the way these numbers are broken out are the parent in the chain. So, for example, in this case, I think you've got Thorium 232, and that is the Thorium 232 itself. So when you get -- no, that's the entire chain?

MS. DAILY: Remember, the way that we're modeling it if you put in Thorium 232, then the code goes ahead and dictates single radionucleides that there is in growth over one time period. So that end point is total activity of whatever you input plus ingrowth of any daughters that you had during that one year period.

MR. SAITO: So Thorium would be the entire chain over a 1000-year period, whereas uranium would probably not be the entire chain?

MS. DAILY: Right. But remember, for building occupancy scenarios, it's only one year from the time -- basically from the time of basic license termination. That first year following license termination is that assumption. So there's one year of decay from when you put into your source term that fits the number of living occupancy only runs one year. And that number represents total activity at the end of that one year. And what you have to do is check against that total activity number and verify that it is less than 10 percent or less. If you meet that criteria, then yeah.

MR. CHAPMAN: Christine -- Greg Chapman. Some of our building contamination have been there for several years, and there's

already an ingrowth of daughters. So to apply this table, I would have to measure that portion of the activity just from the parent as well as every daughter and then do a sum for actions to determine whether or not?

MS. DAILY: I don't think this table is going to be of much use to you. It's based on single radionucleides, and hardly anybody has a single radionucleides. This is for very simple situations. For a situation like what you have, you're going to input your actual source term. And the easiest way to do that is to use the software and let it go ahead and handle that initial source term for your value.

MR. FAUVER: To clarify something. Chris, the value up there, Thorium 232, that's the value that they would enter into the DandD Code. 7.3 dpm curies, or whatever, dpm per 100 square centimeters would deliver 25 milligram, is that correct?

MS. DAILY: Right. It would --

MR. FAUVER: So Thorium 232 --

MS. DAILY: That's based on unit concentration at the beginning of the year. So if they put in 1 dpm per 100 centimeters squared, that's the number they would get equivalent to 25 milligram.

MR. FAUVER: So it would ingrow to 7.3 in one year?

MS. DAILY: That says that you have 7.3. It's not saying it would ingrow to 7.3. It says if you had 7.3, that would be equivalent to 25 milligram.

MR. FAUVER: Right, Thorium 232?

MS. DAILY: Right.

MR. FAUVER: But that includes ingrowth. It's going to account for ingrowth in the dose. So getting back to Earl's question, there's more activity. When you put a meter to the wall, you're going to see more activity than this.

MR. SAITO: No, you'll see less.

MS. DAILY: You will see less. If you're only looking for Thorium, you have to account for daughters.

MR. FAUVER: So this is total activity. All right. So you're going to see less.

MR. SAITO: But isn't that somewhat nonconservative? I mean, five years from now, Thorium would be a higher level, and the dose to the occupant five years from now would be higher.

MS. DAILY: The beginning assumption many years ago was that we would look at the first year following license termination. We did some early on tests and decided that the amount of increase in dose over a longer time period wasn't significant compared to the uncertainty in the building lifetime.

MR. SAITO: Because of the cleaning of the area and the area would be clean, and that would remove the substantial fraction. That's the kind of logic behind that?

MS. DAILY: Yeah. Well, that's an additional assumption is that basically the area is cleaned up when you go to do this survey, and there's less than 10 percent removable.

MR. SAITO: You're kind of back to my original question, then. It's trying to tie this to MARSAM's. If we take a -- I'm going to go out there with the gas proportional counter, and I'm going to measure for Thorium since we're on that, and I'm looking for 7.3 dpm per 100 square centimeters. And then I'll have to smear it and look for .73 dpm per 100 square centimeters. And I will in addition have to take in some new factors that we never took into account for, namely, the source efficiency factor. Is that correct?

MR. FAUVER: That's basically correct, yeah.

MR. SAITO: So compared to our current way of doing this, we're really looking -- if I was out there with the meter doing it the way I do it today, I'd probably be looking for something on the order of

2 dpm per 100 square centimeters?

MS. DAILY: Which is why this information was not included in the main table, and why we're looking more closely at it.

MR. EID: That's the point I'm trying to make. Actually, I'm not saying that this is the table you need to abide for. But this is the table that gives you trouble and problems. And what I am saying is that it's most likely you will not be even thinking about using those values. You go directly to more site specific analyses for the alpha emitters.

MR. SAITO: Well, the source -

MR. EID: That's the point I'm trying to make. I'm not trying to say that this is the table that you'll be using. Understand that I said that these numbers are at or below the detection limits. So if you are trying to detect that something and to look for something you cannot detect, the question is how you will be applying it.

MR. FAUVER: Dave Fauver, NRC. I think there's another point you're bringing up that is germane regardless of whether the number is high or low. What's going to come out of these codes, you're going to have to very carefully look at and ascertain is this ingrowth or not ingrowth, what number is this, what component is beta, what component is alpha in order to figure out what type of instrumentation you are going to use.

If this is total dpm from ingrowth of Thorium, some of it's from beta and some of it's from alpha. So that's another split. So what you're bringing up is a very important point that in fact would be an excellent thing to consider in future workshops as how one would put all this together in a reasonable way to implement it what the numbers come out of these codes.

MR. SAITO: And self shield then from the source is going to be enormous if we're expected to do that.

MR. FAUVER: The numbers in NUREG 1507, I don't think, are that horrible. The defaults are --

MR. SAITO: Cement surface. Your self-absorption is going to probably be at least a factor of 10.

MR. FAUVER: Is that's what's in the default?

MS. DAILY: But remember two things. First of all, these are screening numbers. So they are just a starting point. And second of all, the rule specifically says it has to be distinguishable from background. If you can't distinguish it, you don't have to go and find it.

MR. FAUVER: Well, in fairness --

MR. WILLIAMS: Let me stick in a nickel here. My name is Alexander Williams. I'm with the Department of Energy. I'd like to go a little bit farther with the gentleman's example of Thorium at a site, Thorium 232.

As I understand it, and I hope you'll straighten me out if I misunderstood this. If you had a facility that was contaminated with Thorium 232, you'd not only have to measure the Thorium but also each of the decay products because unless you know at the time which there was contamination, you wouldn't know the extent of ingrowth.

So using your example, sir, as I see, you would not only have to measure the Thorium, but you'd also have to measure all the long lived K products like Radium 228 and Thorium 228. And then somehow come up with a survey method to inexpensively determine the presence of each of the alpha emitters and beta emitters or at least the long lived ones. And from a radiological survey point of view, I believe that this is totally impractical. I don't know of anyone who has an inexpensive way of measuring alpha emitters by any kind of scanning. You can do it with the beta emitters, but for the alphas it's very difficult because there's so much self-absorption.

And so I'm sort of left with a question here of how can you use this table for anything that's practical because, as you pointed out, these levels are below the detection levels. You have numbers for the parents of the long lived K chains which may be in some degree of equilibrium. I think I would agree with your basic premises that this needs more work.

MR. EID: Exactly.

MR. WILLIAMS: Because, you know for doing surveys for uranium, to take a different approach, Uranium 238 is the easiest of the uranium nucleides to measure because you can measure the biscanning, the beta particles from Proactinium 234. However, for enriched uranium, you may have an uncertain degree of enrichment, and the U-234 concentrations are going to be much higher, and measuring U-234 is a rather expensive proposition.

And, of course, when you get into highly enriched uranium, you get into a problem with the U-235 beginning to be a significant proponent of dose as well. I guess the conclusion I have is that, you know, these are, I'm sure, very good calculations using the DandD Code. But at the same time, it would appear that they're somewhat divorced from any reality in terms of actual operations and any practical method of detection.

MR. FAUVER: Thanks, Alexander. We need to clarify again for probably the third or fourth time, these are the first outputs from the DandD screening code. We recognize in our documents, the Federal Register notices and many different forums that these numbers are not going to be useful in routine measurement systems.

We do have a sort of a default position of indistinguishable from background. And for some reason, you ended up with a number regardless of all the site specific modeling you could do. There is this default position of indistinguishable from background. And our

guidance document does provide a technique in the 1505 and in DG-4006 on how to measure indistinguishable from background.

But that's an aside. The main point is we do not expect these values to be useful in the field. And so that's why we're pursuing all these different avenues of increasing these numbers on a site specific basis. In fact, even today the next presentation after the break is going to go through in some detail all the different ways that you can modify the DandD Code and other codes to make these values go up. That's what Chris McKenney's going to talk about.

One of the most sensitive parameters in the DandD Code for surface contamination is the resuspension factor. We're actively exploring that. This afternoon we're going to start out with the presentation by Steve McGuire to talk about the components of that factor, and then Dave Spangler's going to go through in some detail data he's collected at his site that hopefully will serve to provide a more realistic value of that resuspension factor for buildings coupled with any other data that we can collect over the next several months or year as a part of this process.

So we recognize that this value needs to be adjusted, and that's one of, I think, the key issues for fuel cycle folks doing decommissioning. Anybody with uranium and thorium is going to be participating in this process so we can figure out how to get a dose modeling scenario assumptions, parameters, mathematical formulations that give us more reasonable results. And we're starting that process today.

MR. ROBERTS: Rick Roberts, Rocky Mountain Remediation Services. My question is in order to choose a screening level, you have to choose a percentile on your distribution, 50th, 75th, 90th, 95th, something to say, okay, this is my screening level.

What percentile on the distribution did you choose to

publish these numbers.

MR. EID: That's a good question, actually. I have the next slide as saying about the percentile and the basis for selection of those numbers and the default values so you could contribute and make comments about how can we improve the situation. That's the whole idea behind the presentation.

If you allow me to talk about the assumptions, can I answer your question after I show the slides? Then I could go back to your question?

MR. ROBERTS: Sure, no problem.

MR. EID: I guess most of you now, you are prepared to try to see the assumptions or to understand the assumptions behind the revision of those numbers, how those numbers became.

The assumptions, they are for the derivation of those numbers, they are based on the building occupancy scenario. And the building occupancy scenario is like industrial occupant. This means somebody will go to work for eight hours a day in that building, and there will be some mechanical disturbance on the floors for that building to cause a resuspension factor. And then the person will breathe that contaminated particulates in the atmosphere. Then I will put his fingers on the walls, ingest that material, and, of course, the direct exposure from surface contamination to that individual.

So the external exposure will be calculated based on the exposure duration, how much is that person stays in that building during working hours, and the dose rate factor multiplied by the average surface activity per unit area. For the inhalation dose, it is a simple static model largely dependent on the suspension factor. That's why we have a session about the suspension factor. And the dose is equivalent to the exposure duration, again, times the volumetric breathing rate times the suspension factor or surface contamination times the

inhalation dose factor times the average surface activity per unit area.

The addition pathway dose, it is exposure duration again times the dose factor times the effective transfer rate which is the meter square per hour, how much is the person would be transferred to from the wall to the hands, from the hands to the mouth.

And then the average surface activity per unit area. So it's a very simple model the way the calculation.

MR. FAUVER: We've got about ten minutes.

MR. EID: Now you may ask the question about the default input parameters that are used. Again, I showed you the numbers. They are very simple. There are few numbers that you input to the code. The time in building which is assumed that 97.4 for .46 days per year. This means the person working eight hours is equivalent as the 8.4 hours is 97.46 days.

The occupancy period for the building through the whole period, the volumetric breathing rate for that individual is assumed to be 1.4 cubic meter per hour. The resuspension factor for surface contamination is assumed to be 1.42 to the exponent -05 meter to the minus 1. Again this is assuming the fraction of releasable contamination or removable contamination is 10 percent, or that fraction is .1 of the total activity.

Then the transfer rate for addition is 1.11 to the exponent -05. The fraction of loose surface contamination again that's the answer to the question about the loose contamination on the surface. We assume it is 10 percent. It is not 100 percent. So the depletion of the source is assumed there is no depletion of the source. The source continuously is there, and the lung clearance class is the most restrictive or conservative lung clearance class for the calculation of the dose factors. The answer to the percentile of the output dose distribution for isolation of the default parameters, it is the 90th

percentile. That's the answer to that question. And the dose factors used I see RP 30 and Federal Guidance Report No. 11.

And, of course, the assumed particulate size is one micron.

MR. ROBERTS: On that last slide -- Rick Roberts, again, you've chosen the 90th percentile for your output distribution.

MR. EID: Yes.

MR. ROBERTS: Published numbers. Is there a discrepancy between using the 90th percentile and stating that you're going to use the average member of your critical group?

Because when you say average member of critical group, that implies a 50th percentile. And in all your exposure scenario literature, it says you use the average member. Should that really be a 50th percentile there that you use more than a 90th.

MR. EID: Well, you are talking about a very important issue we were discussing among the staff. For the critical group, we say the 90th percentile for the physical parameters, for the physical parameters across the United States for all NRC sites across the United States. How these parameters, they change. The critical group will define based on occupancy, how many hours.

We did take actually the average of the behavior parameters, as we call it, like the average for the occupancy for that critical group. And we took the average for the breathing rate for that critical group. So for the -- I call it the behavior parameters and the metabolic parameters, we did take the average or the mean values. However, for the parameters -- the physical parameters, we took the values for the 90th percentile values. Christine would like to add more on that.

MS. DAILY: Yes, this is actually the issue that causes a lot of -- we set up the critical group very carefully and specified very carefully who that group was in this particular scenario. It's workers

in light industry.

And then for, as Bobby was saying, behavioral parameters, things that directly affect the critical group and would change if the critical group changed. We developed a distribution for those parameters, and then we took the mean of that distribution. And when we did our analysis for the Monte Carlo analysis, those values were actually held as constant at the mean of underlying distribution.

The only parameters that actually varied were the physical parameters. The main difference between physical and behavioral or metabolic parameters is the fact that behavioral and metabolic parameters will change with the critical group. Physical parameters will change with the site.

Like your breathing rate isn't likely to change if you move a block away. But a physical parameter, a resuspension actually could change if you have a totally different physical conditions at your facility even if it's right next door and you have the same kind of people being exposed there. That's the idea.

So it's actually -- the rule says the dose to the average member of the critical group. So we specifically calculate for the average member of the critical group. And then for screening, we say these are conditions that could occur across sites anywhere in the United States. And to be protective, we take the 90th percentile of physical parameter or the average member of the critical group. Does that help?

MR. ROBERTS: I understand what you're saying. But will there be something that explains that logic because it's going to be very important when we start getting into site specific modeling more where the different -- where you're looking at using an average versus an upper percentile for use in the model. So that's going to be real important to write that down and understand where you're coming from.

MR. EID: You are raising a very important issue. Currently, we're discussing among the staff and we are discussing at the end, you know, what percent tied to adult at the end of the two year period, the 90th percentile or the mean values. So we are discussing this, and that's a recommendation from your side that we will take, we will look into.

MR. FAUVER: I'd like add a little bit to that in that Bobby's right, we are looking very carefully at this. What we've started down the path of this probablistic type of an approach to parameter selection, and it's kind of new to everyone in dealing with uncertainty in this way in this dose modeling.

And so within the staff, we're looking very carefully at how to use the output of this kind of process and how to pick the percentile, the mean, the 90th percent has gone forward here. And it's a very important change that we're trying to put into this dose modeling approach, and we don't want it to be something that's much more complicated than the value of what comes out of it. But we do think that there is some promise in this, and this is definitely an area where we'd like as much feedback as possible over the next months during this process to see how people feel about this value of the output, the pros and cons as well as the percentage selection, mean versus upper percentiles.

MS. DAILY: One other thing that I should mention. For those of you who aren't used to thinking in terms of probablistic which are probably the most normal people, remember that the average is different from a percentile, and you can have an average value that actually is above the 90th percentile.

So we're dealing with distributions that aren't necessarily normal distributions, and you need to keep that in mind. There's a big difference between saying average or mean and a percentile distribution.

MR. ROBERTS: Thank you.

MR. EID: Thank you.

MR. KILLAR: Bob, before you take off, I have a question on the occupancy time.

MR. FAUVER: Would you identify yourself?

MR. KILLAR: Felix Killar with NEI. You have the 97.46 days per year. After you figure a typical 40-hour work week and you figure that this guy has no holidays, no vacation time. He comes to work every day. He's never sick. You end up with only 80-some days per year versus 97.46 days per year. How did you get the extra days in there? He is working overtime, too?

MR. EID: I believe this is based on some kind of data that is coming that we look at the probable distribution functions for the average worker. You know, how many hours per week, and I believe the number of hours were about 60 hours. Christine?

MS. DAILY: No, we looked at the census data itself. We used actual census data for light industry workers, and it's actually equivalent to about 45 hours a week. For light industry, if you go into the census data itself, you can build distribution directly from that data or work in those kinds of industries. Then we took the mean of that distribution, and the mean was about 45 hours a week.

MR. KILLAR: Yeah, I can agree with the 45 hours per week. But once you stretch that over a year time period, you don't have the 45 hours per week because of things like holidays and vacation times and what have you. I agree, you need to be conservative. But I think here's a case where you're being ultra conservative.

MS. DAILY: And if you look at the letter report that's posted on the website, it talks about exactly how that distribution was developed. And your comment is exactly the kind of information that we'd like in terms of feedback. For people to look at those

distribution descriptions and how we got to where we got. And if you have other information sources or you think that we should have evaluated them differently, or we should have taken other information into account, then we can go back and modify those distributions.

MR. FAUVER: Also, this is Dave Fauver. This is a perfect kind of an entry for the website. I mean, this is your thought -- you look at it, do your review and just make an entry in dose model and say that you think this is too conservative. It should be 35 or 40 or whatever, based on information that you have.

MR. EID: Also, the other possibility. You could change these numbers based on the actual occupants of the building. Maybe it's not light industry. It could be used as office work.

For office work, the scenario would be different. So the resuspension factor would be far less than what we have here because we assume mechanical disturbance on the floors. So if you would say that building is going to be occupied for something else, not light industry, it is more room, it is used for storage, or it is used for something else, this is a way actually to move from that building occupancy scenario to go the site-specific analysis.

MS. DAILY: And what he's talking about is changing the critical group.

MR. EID: Right.

MS. DAILY: That's where we've tried to lay these parameter descriptions out in as much detail as possible so you can go in and say my critical group is not what you described here. It's over here. Therefore, the behavior parameters that you've associated with light industry aren't appropriate for my group.

MR. FAUVER: And some of this really folds into the definition of critical group. If you're going to try to explore this a little more in your review of the document, it would be worth your time

to pay attention to the definition of critical group, how we're using it, and then how that definition feeds into some of these parameter selection and distribution functions.

MR. EID: This is just to compare with the action plan values, we, as I said, the default values of beta and gamma emitters are less restrictive or comparable to the action plan values. So I would recommend trying to think about using those values.

Whereas, the DandD screening values of alpha emitters as most of you commented, they are more restrictive and most likely you will find that they are not amenable for screening, using the current tool.

In conclusion, the default table DandD screening values for beta and gamma emitters are appropriate, and you may establish them as screening values. DCJL screening values for your sites.

The alpha emitters are more restrictive. I would recommend not using them or for scaling analysis and to think about site-specific analysis directly. And also the conclusion that the staff options for dealing with the alpha emitters screening values that either we revise the DandD screening default parameters. An example is the resuspension factor which we will be talking about. That's an area we could modify those numbers.

Other option to compare and assist the inhalation static model in the DandD Code because the building occupancy, the alpha emitters are based most -- the major pathways for the alpha emitters is the inhalation pathway. Therefore, if we try to compare and assist the current inhalation static model and to see if other models could be more appropriate.

Also, we may acknowledge at the end that the alpha emitters are not amenable for screening and actually would recommend for you directly to go to screening. Just don't think about using those values

for screening. And that's the conclusion of my presentation.

MR. WILLIAMS: Alexander Williams with the Department of Energy. Did you mention that the inhalation pathway was a significant pathway for all of the alphas?

MR. EID: That's correct.

MR. WILLIAMS: This includes Thorium 232 and equilibrium with most of the K products?

MR. EID: That's correct.

MR. WILLIAMS: Thank you.

MR. NELSON: Dennis Nelson, SERV. Could you go back to your slide four? That's the beta gamma emitters. I'm trying to understand why the acceptable screen levels for unrestricted release are so much higher than the action plan values on your beta gamma chart.

Here, you've got Tridium with 120 million disintegrations per minute per 100 square centimeters, and it's only 5,000 for the action plan. I don't understand that.

MR. EID: Again, the action plan values, they are not dose-based values. Those are just generic screening values. They were used for the action plan values, and they are not based on specific critical group. So the critical group is different because we do not have a critical group for establishing the previous values, and they are not dose based. This is based on conservative assumptions for the scenario and for the critical group, and those are the numbers we have derived.

MR. NELSON: So you're saying that 120 million disintegrations per minute per 100 square centimeters with a potential for resuspension in the sense that Tridium can easily exchange with water and the atmosphere, that's not a problem?

MR. EID: Well, that's the assumption in the model. I mean, again, if you have any concern about these numbers they are high, and

you have reason that you think the model is not appropriate for Tridium or for Cobalt 14 or some other radionucleide, you may make these comments, and we'll look into it.

But so far, using the current, this is again an interim use for the next two years. For the current model using the same -- the critical group that we are talking about, those are the numbers we have generated. And we are looking into it.

If there is -- if comment that they are quite high and they're not conservative, please let us know.

MR. MCKENNEY: This is Chris McKenney. Also remember that even if you meet the screening limits, you still have to look at the ALARA calculation.

MR. EID: That's correct.

MR. MCKENNEY: And the fact that some of these are much higher than the action plan values have been used and have been successfully used in the past. A lot of these can be if the ALARA determination may require you to go further down.

MR. FAUVER: Okay. If there aren't any more questions.

MR. SAITO: Earl Saito, Combustion Engineering. I have a question as to when you have a building with multiple rooms, we don't just model the room. We would also be expected to change occupancy scenario in them, or we may change occupancy scenario in them.

For instance, an office that overlooks the production floor would have a different occupancy scenario than -- the office has a different scenario than the floor. So --

MR. FAUVER: If you thought that that was something that were useful to you and you wanted to change the critical group for some reason, you could then submit your justification for why that would never be an industrial wide area, it's always going to be an office or whatever, and you could modify it.

The critical group was chosen for building occupancy that meant to be, well, for the definition of critical group including an upper end exposure and all these definitions built into it which means that we're willing to use it as sort of a default conservative scenario.

So it would be -- if the number is satisfactory to you in an area that you think would only used for an office, then fine. That would be okay. If you had an area where you thought that for some reason you needed a higher number and that that scenario were not appropriate, then you would come in with a site-specific scenario for the occupancy in that area.

MR. MCKENNEY: Yes, the other part of your question is you could have different scenarios throughout the same building. And that could be a possible justification for that situation.

MR. FAUVER: Okay, I think everybody's warmed up now, probably ready for a cup of coffee. I guess we'll reconvene in 20 minutes at 10:35.

[Recess.]

MR. FAUVER: We are about ready to get restarted if everybody could settle in. Okay, we are about ready to restart, I guess. The next speaker is Chris McKenney. He's going to continue the rather lively discussion about some of the issues with dose modeling for building surface contamination for the alpha emitters.

We've developed some ideas, and Chris has some ideas on ways to go from the screening to more site-specific that can make that value more realistic. Chris?

MR. MCKENNEY: Yes, I'm going to discuss some possible methods -- I'm not going to go into a conclusive, like Bobby said earlier and say in every method that you can do to get out of what the assumptions are in the DandD Code.

Mainly, I'm going to discuss how you may be able to change

some of the parameters in the current scenario. Of course, there a lot of other methods that could be done in changing the scenario and the critical group itself that are beyond the scope of what I'm talking about today.

My name is Christopher McKenney. I'm an assistant performance analyst with the Division of Waste Management. If you know what that is, tell me. And there's my e-mail address.

Okay, the basic assumptions in the data for the occupancy scenario is that your radionucleides are the worse chemical form they could be in terms of dose conversion factors regarding inhalation and ingestion.

The particles are one micron activity median air dynamic diameter which just means that to model how much material gets into a person's lung, the assumption is the average diameter is one micron. There are particles bigger, and there are particles smaller. And the size of the particle determines where it goes in the lung.

But that's tons of equations lower than nearly anybody goes. One of the other assumptions is that we have a resuspension factor that's based on mechanical disturbances and on a few data studies. And Steve's going to talk about that after lunch and go into more detail. So I'm not going to go into much detail in the resuspension factor.

One of the other assumptions that we talked about earlier is the 10 percent removal fraction. And one of the other important things is where is the actual contamination. The modeling currently assumes the contamination is on the floor. That's why that resuspension factors are so high. Okay, for chemical form, we have -- we're really worried about the long term chemical form, long term in this sense being only a few years. This is also applicable to outside, too, though.

The default is the worse, as I said. And each element has

up to what are considered three different classes of inhalation, and they're based on the chemistry how does your body absorb the material, how fast, how slow. Uranium has three different types. Cesium only has one. The three classes are Class D which is that it stays in your lungs for days, W which is weeks, and Y is years.

There is already discussions in Part 20 that says that licensees can take information they know and use (1) the appropriate class they have instead of the default we have in the system, and (2) they can actually do some modifications based on studies of their own that if they have a chemical form that is generally considered to be a certain class, if they have data that shows that theirs could be actually classified as a different thing like if it was UF-4 which is Class W Uranium, and it didn't -- it had some other trace materials in it. So it tended to behave as a Class D material. Those sort of studies which can be involved can be done to modify your data.

In determining your class chemical form you're going to use for the decommissioning modeling, you're going to have to worry about the reactivity species. For most radionucleides, this isn't really too much of a deal. But for uranium is the biggest one that has an effect. Class D materials for uranium are hexavalent and tend to be highly reactive and form into Class W.

Similarly, Class Y is actually go to Class W over long periods of time. Federal Guide Report No. 11 has a list in the back for each radionucleide what is the inhalation class and what chemical forms are assumed in that inhalation class. More data can be derived by going into the actual ICRP documents that Volume 30 that are the basis for Guidance Report No. 11.

Okay. There is a couple bases here for how do you determine the solubility class. As I said, the historical information can be used. For example, Class Y forms of Uranium are high-fired oxides. UO2

and some U3O8. Class W are low-fired oxides. Usually, I think it's something below 400 degrees. A lot of the uranium mills in the U.S. actually do low-fired oxides.

Greensalt, UCL4 and stuff. Class D are hexavalent forms of uranium. Generally not a radiological problem, they're actually a chemical problem that either they have a bad reactor species like UF-6 or that they have heavy metal poisoning in large ingestions before they have any radiation dose of anything of any importance. The other one is if you don't really have historical operational information that really nails down a good classification, or you have a mixture of radionucleides. And since you have a process that modifies your source throughout your process, you're not sure where in the process something is.

There is methods and companies out there that do in vitro testing using simulated lung fluid which is the basis for the classification in the first place by ICRP. Okay. For particle size -- oops, actually I want to go back to slide four. I want to talk about the other side.

The other side of slide four actually shows some numbers instead of just this general discussion of yeah, you can change everything, and you may get something, you may not. The graph is one of a ratio to the default or to the worse chemical form. What is the dose conversion factor for the same amount of inhalation? What is the dose delivered.

So for uranium which is on the screen, the little red triangles with gray background that's all the way in the back of the 3D diagram, it's Class Y as default. But Class W actually doesn't show up good on this, but Class W is about 2 percent of the Class Y value.

So for the same inhalation amount, you'd only get 2 percent of the dose that would be calculated for Class Y. In other words, if

just using a Class Y dose conversion factor with the current DandD model, you'd go from about 100 dpms up by a factor of 50 up to 5,000.

But it isn't always roses. For Thorium which is the red one and Plutonium 238, the yellowish one, is the Class W in default. And there are some Class Y forms, and the reduction is only 70 percent. The Class Y is only 70 percent of Class W.

Okay, particle size. You've got a question, sorry.

MR. ROBERTS: Rick Roberts, Rocky Mountain Remediation Services. On the dose conversion factors, those factors are based on ICRP 30 or ICRP 60 methodology and are based on a number of equations that have uncertainty and variability with them.

Are there any plans by the NRC to go back and look at the uncertainty or the variability within the dose conversion factors for each radionucleide?

MR. MCKENNEY: No. For ICRP 30, for one thing, it would be -- if we wanted to do that, that would have to be fully financed by some part of the U.S. government because nobody else in the world would do it, and it's a big job.

There currently is patterns on the international stage to do that for ICRP 60 Plus which is the most recent dose models for humans. There is work that ICRP coming out with that and supposedly it keeps on being said that it's just about to be published. But currently the federal regulations are that we calculate effective dose equivalent. ICRP 60 Plus models calculate effective dose which is a different number. It's like Canadian money and U.S. dollars. So they're not comparable.

MR. ROBERTS: If the NRC has that position, could they please write that down and give the reasons for why they're not going to go forward and do that uncertainty and variability analysis.

MR. MCKENNEY: Okay.

MR. WILLIAMS: Alexander Williams, DOE. For the dose conversion factors as a follow up to the previous question, do you have any feel or any estimate for what the uncertainty might be in the dose conversion factors in Federal Guidance Report 11 and, for that matter, 12 because everyone is relying on these published tables which I realize are published by EPA, not by DOE or NRC. We're seeing some very elaborate analysis being done using those, and I don't have a feel for the uncertainty. Are we talking about 10 percent, 20 percent, 50 percent? Any idea at all.

MR. MCKENNEY: Well, first of all, dose conversion factors don't calculate dose to a specific person. Almost nobody fits the description used in the models because they're a conglomeration of a population. The average -- the body size of the human used to make those conversion factors is considered to be 70 kilograms. There's a lot of -- everybody has all of their organs which a lot of people don't any more. They have apendices. They also have certain locations that all those organs were in which is also dependent on your size.

The risk factors themselves for the radium factors are both male and female generated. The breast which is the highest weighted organ right now in the ICRP 30 method is based on female data, not male. There's only one or two cases of cancer from the atomic bomb survivors in males which is all you'd expect for a population of about 100,000 or so. So it's really hard to say whether -- what that is comparably to whatever you're trying to hold as real.

The other thing is you've got 25 millirem limit. To be honest, as UNSCER says, the risk factors that derive all the radium factors in the first place that are based on -- you need to have a population dose of 1,000 person room before they're even valid.

Below that, they're most likely the result of cancer risk is zero.

MR. WILLIAMS: Okay, well, let me follow up on your example where you say the dose is 20 millirem. Well, let's suppose that someone cleans up a site to exactly 25 millirem, and let's forget about the ALARA requirements. If the uncertainty in the dose conversion factors for a given radionucleide is 50 percent, that might mean that someone has done an inadequate job, or, alternatively, it might mean that they've done a gold plated job and has spent money they didn't need to spend.

And it seems to me that if you're going to do an elaborate analyses and look at distributions of parameters, including Monte Carlo analysis, that the uncertainty related to the dose conversion factors now becomes something that merits some consideration. Thank you.

MR. MCKENNEY: But on the other side, so does the dose limit because the dose limit uses the same model for derivation, it has the same uncertainties inherent in it. So it's not 25 millirem if you go with that logic. It's between one and 200.

The dose modeling system that NRC uses should be viewed more as a measuring stick that we've used. We said with this model, we say that an answer of 25 is what we want for a limit using this measuring stick. The actual risks are much more involved and not really valid.

It just -- the NRC is not about to go into calculating uncertainty in the dose conversion factors themselves because you think decommissioning is tough, you want to do occupational doses for everybody you want with complete uncertainties because that's what you're asking for.

MR. FAUVER: Let me add something to that. Dave Fauver. I think the way the number of us are viewing this probablistic approach is as a tool. And I think one of the things we have to ask ourselves is does this tool provide us a better foundation to move forward into dose assessments over the next several years or ten years or whatever the

case may be.

The very fact that that question can be asked, I think, speaks to utility -- one possible utility of this tool in that it gives us an opportunity to explore the various sources of uncertainty and make some rational risk informed type decisions about where we want to go with it and what we want to do.

If we just close the book and treat everything deterministically, I really think that one possibility is that in the end we're not going to have as flexible a tool for everyone to use, regulators, industry as well.

MR. MCKENNEY: Also, one thing that I didn't put on slides is that this is the current guidance. There actually is an effort underway within the bowels of NRC and some other agencies to try to actually switch over to the newest dose conversion factors. Which ones, we don't know since there's three or four volumes of near dose conversion factors.

But that would be done in a longer time period than a year. It would be much longer, and it's not being driven by decommissioning. In that case, there's some tremendous changes just from that.

MR. FAUVER: I want to add one more thing to that. These considerations of these untreated uncertainties I think you need to carefully evaluate it in terms of the level of effort we put into some of these other uncertainties that we feel like we can characterize, and it's a very valid point to talk about the untreated uncertainty in this process as we go forward in these workshops and talk about dose assessment because there's modeling uncertainty, scenario uncertainty, parameter -- in addition to parameter uncertainty and some of those dose factor uncertainties that aren't being considered. So you have to look at the whole picture when we evaluate the effort. And also the interpretation of the output of just the parameter uncertainty

evaluation.

MR. MCKENNEY: Yes, back to particle size. The default is one AMAD particle size, one micron -- AMAD, sorry. In the ICRP 30 document, they have a simple equation that says how to create new inhalation dose conversion factors based on different particle size.

NUREG 1400 also goes into how you can do that. More on ALIs and occupational, but it does give you methods on how to measure your particles so that you can derive the data. On the lefthand side of the table on the screen, I did some -- these are with the equation what the effect of particle size is on a few of the radionucleides. Again, this is ratioing between the 1 AMAD in this case and what the other particle sizes are of the same chemical form.

Uranium and Thorium, actually, drop when you get up to about-- when you get to 5 microns, they drop to about 35 percent of their initial. And at 10 microns, they get down just a little bit further. Actually, Thorium and Thorium 232 -- Thorium in Y Class actually stays fairly constant. But I've said in NUREG 1400 in Section 4.1 does go into the methods. You could measure these.

Also, Reg Guide 8.25, Section 4.1 which is how to -- it's setting up measurements and calculations for occupational workers. But it goes through on how to measure particle size at your facility. It says exactly what to do, how many measurements, at least for occupational. Of course, they're assuming a higher level of contamination than that. So you can use that as a guide.

In general, they use some sort of cascade impactor device that will sort and collect your particle sizes in an instantaneous manner. I've seen the ones that are hand held. I'm not sure that they go all the way down to one micron. I saw these in slides from one meg. But there's also -- but we realize that direct measurements of this may be difficult for low concentrations. Also, while this may be -- this is

valid for a short term exposure like we are considering in buildings, it may not be that useful or that appropriate in soil-related situations because there's lots of data on the fact that as with the rule of entropy, in time everything's going to get smaller. I mean, it's just going to degrade.

There's lots of data for Montenegro from the volcanic ash that they started out -- most particle sizes were about 140 to 200 microns, and within a couple months they were down to ten or five microns from mechanical disturbances, wind and rain.

Rule for action -- okay, we've said it's 10 percent. There -- truly, you could actually -- we've included in the DandD model, it's included in the default resuspension factor in a manner. Basically, the default resuspension factor that Bobby showed you is the results of the parameter analysis multiplied by 10 percent. So the actual resuspension factor is something like 4 x 10 to the fourth.

And then if you have better data on your actual removal fraction, you could scale that with the fraction that's actually there. So if you had 5 percent, you'd get a double end of your -- or alphas, you'd nearly get a doubling of your allowable concentration.

There's the possibility -- this is really early, early discussions of how much NRC can take credit for various fixation, you know, changes. A lot of our conservative assumptions assume no -- that even if you paint the walls, put up something that there's some removable.

Certain strategies may be what the proper justification. This is why I'm saying it may be done as this is early in a two-year process. This will be discussed. That there be fixation methods that you can take account of also to even -- not even have to worry about removal, or fairly effectively not worry about removable or the creation

of it in the short term.

Okay, and what are other important assumptions is that contamination is assumed to be on the floor. The mechanical disturbances are people walking, cleaning the rugs, doing whatever. If it was on the walls, on the ceiling, the mechanisms of disturbance wouldn't be as available. There still would be mechanisms of disturbance. They just wouldn't be to the same degree.

Some of the data that we used and we reviewed in the report that Chris discussed earlier do talk about -- have data on lower activity situations. And they may -- and that may be a method because some of those can result in a couple of order of magnitude reduction in the resuspension factor if you don't have contamination on the floor and it's mainly on the walls or some other surface which is actually probably one of the easiest methods of changing because you're going to be measuring it anyways. So they should pretty well show you where everything is.

But these are just a few of data related ones, as all these alternatives were alphas. There are alternative models. There are also alternative scenarios and critical groups, and those, of course, will have to be justified by the licensees, the applicant.

And that's about it. Any questions?

MR. CHAPMAN: Chris, Greg Chapman with the NSF. Will DandD let you play with the models such that you can avoid looking at resuspension off of other surfaces other than just the floor?

MS. DAILY: There's one input for a resuspension factor. So it's not like you can select a surface and change every resuspension factor for the surface. We tried doing individual calculations but with resuspensions, like if you thought that you had most of your contamination on the walls, for example, the things that would cause resuspension would be less than you thought you could support by a

different resuspension factor. We could put that in and see what the impact of that calculation would be, and it would give you an idea of if it would be worthwhile pursuing that.

I mean, you can always run more than -- go through the model more than once and add up different impacts and come up with a percentage impact.

MR. CHAPMAN: But DandD itself assumes that you get resuspension off of all surfaces equally.

MS. DAILY: Yeah, it basically doesn't have an assumption about that. So that's the impact.

MR. FAUVER: But then again as you're going to find this afternoon, this resuspension factor data that has been used so far has essentially involved primarily floor contamination. So the counter argument could be, I mean, just in all fairness is that the wall contamination wasn't even built into, perhaps, some of the data sets that we've seen. So we'll have to weigh all of that when we consider changing the resuspension factor.

MR. CHAPMAN: But that's for the factor itself. But then when you apply it to the total surface area in a room, the total levels in there would go up.

MR. FAUVER: There is no total surface area change in DandD, I don't believe, and DandD doesn't allow you to do that. So it's a simple model in that respect. There may be some changes and/or using other models could improve the sort of site-specific nature of your assessment.

MR. MURRAY: Scott Murray with GE. Could you explain the removable fraction assumption of 10 percent? Is there data to support that, or is that just an arbitrary 10 percent number?

MR. FAUVER: Let me try that one. We talked about that in some detail in our work group meetings. And basically it came from the

survey data that we've seen over the years, Scott. You know, 20 percent was the limit under Reg Guide 1.86, and we found that in every case they're well below the 20 percent, and in most cases removable activity in decommission facilities was down to essentially zero, 1 percent, 2 percent or something. So we thought 10 percent was a good shot at it.

From an implementation perspective, what it means is you have to make some demonstration about whether you're above or below 10 percent. If you feel that it's too expensive to get to 10 percent and you want to use 30 percent for some reason, then you would go and run the DandD Code using 30 percent removable. You'd actually have to change the resuspension factor. Understand the origin of the resuspension factor instead of multiplying by 10 percent, you'd multiply by 30 percent.

And when you do an ALARA analysis or whatever for your facility, you may find that it's to your advantage to have more removable because of the cost of remediation versus the lower end of the limit, for example. So it's just a starting point. It's in no way analogous to the Reg Guide 1.86 removable number of 20 percent of fixed. It was what we put in as a baseline assumption, as a starting point, rather than starting from what we thought was a very unrealistic assumption that it was all 100 percent removable which would have driven us to a ten times higher default resuspension factor.

Thanks, Chris. I think that's it. I guess we're ready for lunch a little bit early. We're going to reconvene at one o'clock at which point Steve McGuire, NRC and Dave Spangler of BMW are going to talk more about resuspension factor and where we can go with that in terms of screening for alphas. See you at one.

Don't forget, you've got the lists out there of your original sign in sheets. You can put the e-mail list preference to the right of your e-mail entry. Thank you.

[Whereupon, the workshop was recessed, to reconvene later, this same day.]

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

[1:03 p.m.]

MR. FAUVER: I guess we are about ready to get started if you folks could come on in. There's a handout. Steven, did you have some copies of your handout? Okay, al right. Okay.

If you haven't gotten a handout, Steve McGuire's going to talk, and he had a copy of his slides. But I got some slides for Dave Spangler's talk. And so there is -- if you don't have the talk with Dave Spangler's name on it, it's out there -- copies of the slides.

Okay, I'll wait for these folks to get back in -- give them a couple minutes.

Well, this afternoon, we're going to get into discussing resuspension factor and hopefully spend a couple hours talking about that. This is really a carryover from this morning's conversation about the alpha emitters and calculation of surface contamination limits for alpha emitters using DandD and other codes as appropriate.

And as we mentioned, the resuspension factor is a key parameter in terms of sensitivity for the DandD code. So we're going to talk about that. The first speaker is Steve McGuire. He's going to go over the basis of how we selected the resuspension factor, and how it's used in DandD. Steve?

MR. MCGUIRE: Good afternoon. I hope you had a good lunch, but not too good a lunch so that you don't feel you need a nap. It's always tough being the speaker right after lunchtime.

But I'm going to talk today about the indoor resuspension factor, tell you a little bit about what it is, how it's used to calculate dose, and then also give you sort of a critical review of some of the literature that I have started on but not completed.

So first of all, maybe this one is too simple. But we might as well make sure we know what the indoor resuspension factor is. When

we're modeling the dose from building surfaces, the indoor suspension factor determines the concentration of residual radioactivity in the air relative to its concentration on the building surfaces. So what it will be is concentration on the surface times the resuspension factor equals the air borne concentration.

And we're going to use it to calculate the dose from the inhalation pathway. Now why is it important? Okay, these are a few runs of DandD to illustrate the point. Just running certain nucleides with all default values, just the basic case, what we see is that for Strontium 90, we have, for example, 93 percent of the dose is coming from the inhalation pathway. And for Thorium 232 and Uranium 238, we have 99.9 percent coming from inhalation pathway. That means essentially all the dose is coming from the inhalation pathway, and everything else is negligible, the other two pathways being direct radiation, gamma from the floor and ingestion -- the inadvertent getting some off the surface somehow into your mouth.

So when we look at the results, we can draw certain conclusions, and that is for many of the most important radionucleides, the inhalation pathway is the predominant pathway. And for alpha emitters, the inhalation pathway's effectively the only important pathway.

And a third conclusion is that the indoor resuspension factor has the largest potential effect on the calculated dose because its value is the least well known. So to calculate inhalation dose, I'm going to multiply several factors including the inhalation factor while I'll multiply that by breathing rate, for example.

Well, if you tell me somebody is alive and awake, I can give you a very -- not very precise, but I can give you a pretty good idea of just exactly what their breathing rate is going to be. There's not much variation. Maybe one person will be 20 percent, 30 percent off compared

to somebody else conducting another activity.

But with the indoor resuspension factor, we have to look at an order of magnitude or more uncertainty in just exactly what is the correct value for this. So it's not -- it's the parameter that can have the practical effect of most influencing our inhalation dose.

Now how do I calculate the dose from the inhalation pathway? Starting with these terms on the left, the resuspension factor times the surface concentration is going to equal the air borne concentration. I take that, and I multiply it by the occupancy time in the room times a breathing rate, and basically what I get is an intake. And I multiply the intake by a dose conversion factor, and what I get is an inhalation dose.

So that's the basic equation that we're calculating. This is in particular and specifically in the DandD model. Now does the resuspension factor apply to the removable surface concentration or the total? Okay, normally when most people use the term, they're applying it to the total surface concentration, and this is the way the Code is using it.

When the value that you have as a default there is a value which is applied to the total concentration. But the way they got that default was they looked at some experiments involving loose contamination, assumed that it was all removable, and then they assumed that in a facility what they would have would be 10 percent removable because most of the removable stuff would be taken away.

So that there would be a factor of 10 difference in the discussion that they have in the parameter report where they're talking about the resuspension factor for removable activity as opposed to the default in the Code which is the resuspension factor for the total activity. Is that clear? Yes? Okay.

Some confusion on that issue. Okay. Now we've talked about DandD, but one could look at other codes, and one could say would the use of a different code like RESRAD-BUILD get us away from this uncertainty in the resuspension and, therefore, the inhalation pathway.

And no, it doesn't. And the reason is the RESRAD-BUILD uses a resuspension rate. Now if I -- this actually I didn't get from their handbook, but from another reference, Shapiro, which is mentioned later on. But if we kind of consider that in most cases the removal of air, the ventilation will be the primary removable mechanism for particles from the air, and that's generally the case if we don't have stagnant air and we don't have very, very large particles that settle out, then I'll get a resuspension factor equal to a resuspension rate divided by the air exchange rate, and then changes per hour, and the height of the room.

So there's a simple relationship there. Now what happens -- that particular equation, as I say, was from Shapiro and Health Physics. The value for the resuspension rate must be determined from the same experiments that we would use to determine the resuspension factor. So what I'll do to determine this is I basically take a measurement of a concentration of the air, and I measure a concentration on the surface, and I relate the two with using some appropriate parameters or equations.

They're the same experiments. They have the same uncertainty. I have to use the same data to get either parameter. So whatever my uncertainty is, it's going to be the same in each case. So going to a different code like RESRAD-BUILD doesn't help us, doesn't get us anywhere, doesn't solve the problem.

So what's the objective of this analysis now is really to take a second look at the technical literature relevant to the indoor resuspension factor for the purpose of deriving a probability

distribution function which is what the probablistic approach in DandD would do. And also if, in case you wanted default value, perhaps a prudently conservative value of the parameter which, for example, might be in a case, you might take that as the 90th percentile on the distribution or whatever you decide is the appropriate value.

Now looking first at the default values that have been used in some cases, we have RESRAD-BUILD, they basically provided in the handbook on the thing. They didn't tell where they got their default value from, and I was going to have to do a little bit of arithmetic to get it, and frankly I just couldn't drive myself to do it. I figured, well, if they don't give me any justification for why the number of default that's in the Code, I really should do it, but I just couldn't get motivated. So I didn't bother.

NUREG 5512, Volume 1, which is the original report that describes the building occupancy model selected a value of 10 to the minus 6 per meter. But they provided little justification. They provided a table of data and various aspects of resuspension that said some people had certain ranges. But they never really told how they got their 10 to the minus 6. It just sort of appeared, and they said it was their judgment.

The default right now is in DandD is 1.42 times to 10 to the minus 5th per meter, and this was based -- there's a description in the letter report that describes this. It's basically based on two references. One was Fish, and the other one was Jones, I guess. It's described in there. And these were experiments that used particulates that had been generated and aerosol had been freshly deposited in a room in an experimental room and then performing certain activities in the room to generate airborne activity.

Now before we look more closely at this, what are the

physical factors that affect the indoor resuspension factor? And there really are three -- we could put them in really three categories. One is high tightly are the particles bound to the surface? Are they very loosely bound, or are they very much embedded and attached and firmly bound to the surface. So the relationship of the particles to the surface is one of the important characteristics that we have to look at.

A second is the driving force that causes the particles to be ejected into the air. They don't just jump up. It takes something to do it like a foot scraping on there, perhaps a mechanical force, for example, like that. A very strong air current potentially, for example.

And the third thing that affects the resuspension factor is how long the particles will remain in the air. Now that may be not quite intuitive because you think in terms -- if you think of the words resuspension factor, you think in terms of how many will be ejected into the air. But in fact there's another part because it's airborne concentration, it's also how long they stay there. If they're removed very quickly, then the concentration will be relatively low. So that's the third item.

Now what are the factors that influence how tightly the particles are bound to the surface? One is the type of deposition, whether it was a wet deposition or a dry deposition. A wet deposition will tend to bind surfaces tighter because there'll be some solubility of material. It would be from the particle or even from the surface itself, and when the material dries, there's a chemical bond that's been created.

Have the surfaces been cleaned to remove loose particles? A lot of cleaning things will remove the more easily removed or less firmly attached particles. The age of the particles on the surface is another factor. Particles, if we put them on a deposit, the mono surface freshly deposited, as they age, just aging alone causes certain

chemical bonds to form and causes them to adhere more tightly to the surface with just the passage of time.

And there are some other processes to make particles adhere just like there can be mechanical processes, just sort of grinding them into the surface from motion over them, things like that. Now what are the driving forces that remove the particles from the surface? Okay, the main one is really mechanical disturbances just as walking on a surface, sweeping it, a car riding over it or any vehicle or wheel. Just a mechanical abrasion of the surface.

A second way but really almost always less important is strong air movements. Now when you walk, if we look at the micro air movement right under our footstep, some of that movement can be quite violent, and it will propel the surfaces, propel the particles off the surface. But a third one, then, is air flow -- air flow from normal ventilation one might think would be a mechanism. But in fact normal air flow has so little force that it rarely will remove particles from surface. There has to be some particular or very forceful movement right close to the surface.

Now what are the mechanisms that remove particles from the air? And ventilation is by far in most ordinary rooms that have ordinary room ventilation is the primary removal mechanism. A second way that particles can be removed from air but is turbulent impaction. And what this is, is as air flows, the currents will bang against objects in the room, be it walls, ceilings, floor, people, and some of the particles will basically impact the surface and stick to it.

And a third removal mechanism is gravitational settling for large particles. And this is basically just falling under gravity. This tends not to be a major factor unless we have extremely large particles over ten microns, for example, or unless we have extremely stagnant air where there’s basically no air flow out, then this can be

significant. A Brownian diffusion is kind of the opposite end. That's for extremely small particles that are hit by molecules of air, and this causes them to bounce around. And eventually if they bounce around enough, they will hit a surface and a certain proportion will stick to it. So these are the removal mechanisms.

But primarily, it's ventilation. That's what's reducing our airborne concentration in a normal work place. If I had a sealed room that was truly stagnant air, of course, the ventilation then becomes -- that factor becomes zero. But that shouldn't be the real case in the scenario we're envisioning.

Now you might think perhaps we can find out something about the indoor resuspension factor by looking at outdoor resuspension factors. And the answer to that is not really. The source is very different. Surfaces in a room are just much more regular than surfaces outdoor for the most part where we have plants and rocks and variations and soil. Soil just isn't as smooth usually as a building surface.

The driving forces -- outdoors, wind tends to be a more important driving force and things like automobile traffic and that type of stuff. And the removal processes, well, the removal process is sort of ventilation, but it's really just the wind blowing and carrying the stuff away from the source that reduces the concentration. So that there's so much difference in these factors that looking at the outdoor resuspension factor is not useful in determining the indoor resuspension factor.

Now looking at how to go about just considering the probability distribution function and determine whether it could be improved, or whether it's suitable or not, the approach I took was really to try to find additional references and data to try to give more weight to the measurements that are more representative of the residual radioactivity at the decommissioned sites and more representative of the

building scenario and also looking for ones that have the appropriate amount of ventilation.

And I decided to try to look at resuspension factors separately for aged or fixed material from those of freshly deposited material because it's really a different situation, and perhaps looking at both could give us some insight into what's happening and what's going on.

The first attempt I did which I don't think was successful was to try to produce really two separate probability distributions, one for removable material and the other for total material on a surface. And I found that the data did not lend itself to this kind of analysis, and I'll show you what I mean there.

The loose versus fixed model assumes an airborne concentration is calculated in this manner where I'll have over here a surface concentration. I'll have a certain fraction of that that is loose and a certain fraction that is fixed, and each of those will have perhaps a characteristic resuspension factor. And combining the resuspension of the loose with the resuspension of the fixed will give us an airborne concentration.

So for interpreting measurements using freshly deposited material, basically we're assuming -- usually the assumption that we tend to use is that it's all loose. So that's the fraction there. And that I guess we're not necessarily saying anything about the resuspension factor for fixed. But for fraction, it's fixed. So that term goes to zero. So we interpret what we're measuring to be the airborne concentration to be proportional to the resuspension factor for loose material.

Now if I try to apply this to decommissioned facilities, and this, by the way, these particular sets of view graphs are not in your handout because I derived the equations last night, and I typed them in

this morning, and the thing had already gone to publication. So it's there.

We're kind of assuming that we've got a resuspension factor to get our airborne concentration. We're taking our resuspension factor for loose material times a fraction that is loose and assuming that the resuspension factor for fixed material is zero. That's what we're doing. So we're assuming in this case for decommissioned facilities that we have these factors -- this fraction of the loose.

Why I had trouble with this approach -- People have looked at what the smear samples mean, what is this fixed and removable material. And what they found is that if I did, for example, a smear on freshly deposited material, basically most of it stays. I don't get most of it up on my smear.

If I take material that has been very well washed, I will get and I suspect it all to be fixed, I still get material on smears. And if I do it -- smear it again and again, I'll still get material off. At what -- the kind of a good theoretical discussion of this was from Thomas 79 -- that's a DOE report. That actually is not supposed to be a question mark in there. It's a slash.

But what they're saying is that particles are not loose or fixed. Every particle basically has some degree of attachment to the surface, and it's more a spectrum. Some are more heavily attached than others. It just is hard to distinguish.

A second article discussed the problems with interpreting smear measurements and basically concluded that you can't really interpret them as being a measure of loose or fixed. In fact, I also noticed that Eric Ablequist put something in the Health Physics newsletter within the last week or two -- last month or two, and he basically said the same thing.

And for clean surfaces, resuspension is basically the

mechanical removal of particles that are fixed to some degree. So this is supposed to have a knot in it that we cannot assume that the resuspension factor for fixed material is equal to zero. Now I'm not -- so what I concluded would be the best approach, and, as I say, this is work that I'm in the process of doing and I don't really know how well it work out, and I don't know to what use it can be put, and I don't know whether at the end it will really be useful.

But what I concluded that the best approach to do would be really to try to collect data for resuspension from surfaces that have predominantly fixed residual radioactivity that is aged on the surfaces for long periods of time and use that as the basis.

I'm looking at weighting sources, weighting factors for source terms. Giving more weight to studies that would be more representative, less weight to ones that were less representative and basically not using data that was not at all representative of a facility.

And similar with driving forces, and I'm not sure to what extent these will be useful. But just trying to give some kind of a qualitative weight to the data. Now in the preliminary results -- and, again, this is all preliminary and don't take this with too much faith because it may not be really in the end prove to be that good. But I think there is some good data that is available, not a lot, but some. The best reference I found was Al Breslin work from Health & Safety Laboratory. These are the values that he got from studying three areas for the resuspension factor.

And if this is true, then the current PDF that's the default there might in DandD might be a little high. But we can't make that conclusion at this point. We really have to look more closely at this data, and, most important, it needs critical review to see whether it is of any validity at all.

And what I'm offering to do is to send a copy of all the relevant references that I've collected, and this corresponds to about several hundred pages and copies of the associated work sheets that analyze it basically to anyone who agrees to look at the material. And if you're interested in looking at it and would like to receive a copy, just give me your mailing address at this meeting or afterwards. This won't be ready for -- I'm still collecting information. I have references that I haven't obtained yet, that I haven't read. And so this wouldn't be ready for several weeks.

So just to summarize, this was essentially a look at a default parameter, but the default parameter which is perhaps the most sensitive in the building scenario or for many important nucleides. What I'd like to do is there's another talk on resuspension factor coming up. So if there are a couple of short questions, I would take those, especially any clarifications. But for kind of long discussions, I'd prefer to wait until after the second one. Go ahead.

MR. ROBERTS: Rick Roberts, Rocky Mountain Remediation Services. Most of the surfaces in our facility at least are painted, and we'd be going in doing dose assessments on painted surfaces. And how do painted surfaces fit into your resuspension factor research that is going on? Are you looking at painted versus bare versus different -- concrete, wood or metal? What are the different surfaces you're actually addressing?

MR. MCGUIRE: There's -- I haven't seen anything -- any reference that applied to painted surfaces, where a material has been painted. If we think of a mechanism, though, as a mechanical abrasion of material, then the fact that it's covered with a thin layer of paint might decrease the resuspension factor but doesn't totally change it.

So in view of the lack of better data and perhaps as a first approximation, you could just ignore the paint. On the other hand, you

might try to come up with some approach that would use it. But I'm not aware of any data that would help me with that.

MR. ROBERTS: Could you explain a little bit ignore the paint? I don't --

MR. MCGUIRE: Just pretend that it's not there. In other words, use a resuspension factor derived for aged material that is well fixed to the surface. The idea is that when we have the aged material, it is material that is tightly bound to the surface. When people walk on a painted floor, basically they're abrating it. Some of it is becoming airborne.

MR. ROBERTS: This is just a -- could it be that painting a surface could actually become a remediation or loose contamination in a building, then, if you're looking at it that way? Because if you've got loose contamination and you paint it, I mean, isn't that kind of -- you're fixing it right there. So I guess I see if it will be addressed or somehow later on if there could be some look at painted versus non-painted surfaces because there's a lot of contamination that could be left in paint at some facilities if we just look at it straight --

MR. MCGUIRE: We haven't -- I don't know that we've looked at that, and I don't know that I can give you an answer.

MR. FAUVER: Rick, are you offering to take that up and provide some data?

MR. ROBERTS: Actually, we have a lot painted-on contamination, and that's why I asked the question is because there's-- to have a resuspension factor for painted surfaces is a lot different than a bare concrete surface. If you're looking at having to scabble off paint before you do your dose assessment, then that has a large cost impact as well.

And it's just something I think we need to keep in mind because if surfaces are painted and there is fixed contamination in

there, we need to really take a close look at it. Are we requiring ourselves to scabble off that paint before we actually apply our dose assessment, or can we apply it with the paint on. Thank you.

MR. MCGUIRE: Sure.

MR. FAUVER: Our next speaker is Dave Spangler from BMW who's going to talk about some measurements that they made pertaining to resuspension factor.

MR. SPANGLER: As he said, I'm Dave Spangler. I'm a radiation protection manager at Naval Nuclear Fuel Division. I was asked at a recent fuel cycle facility forum meeting if we could come up with some real licensee data to apply to resuspension factor since it's so important in the decommissioning.

Most of the facilities scratched their heads. We couldn't think of any rooms right off. I went back and looked at some of our past historical data, and it turns out we did have a room that had a fair amount of data at least as much as some of these other studies that have been published. So I agreed that I would do a little study, present the work here, and also then provide it to anyone to scrutinize later. And hopefully, it would be some help to establish a resuspension factor with a real world licensee versus just sprinkling in of talcom powder type substance and stirring it up and counting it.

There's another fellow I need to mention. Shawn Chesney is a health physicist that works with me there at BMW to help me with this. We decided to take a simplistic approach. First of all, we needed to find an area that both approximated the building occupancy scenario and also had a lot of smear and air sample data over a long period of time. There turned out currently there was only one area in our particular plant. I called several other licensees, and they didn't have that was not influenced also by the processes that were going on in the facility in the line operations or recovery operations or dissolutions or

anything.

I had two other quick slides here, but they want me going into the definitions of -- wasn't privy to the information that the other people would be presenting. But that's the same information, the same definitions out of 5512 for the resuspension factor and also the building occupancy from that NUREG 5512.

The key thing, I think, to get from the building occupancy that wasn't pointed out earlier that the assumptions are for not deliberately disturbing the surfaces in a passive manner. The scenarios represent a long term chronic exposure versus, say, the building renovation which would be an acute exposure.

These scenarios here come right out of the NUREG 5512 as well, and they demonstrate the things we've been talking about as meeting a light industry or passive use of a building. This would be considered what we're doing now as passive use of a facility as well as some of these others. We're not deliberately disturbing the surface.

That's important when you look at some of the other resuspension studies. You see a wide range, four or five orders of magnitude of resuspensions listed in their studies, but they start with passive, and they end up quite often with some very aggressive agitation of the surfaces. And they get quite large resuspension factors.

Those should not be considered in the building occupancy scenario establishing that parameter. To give you a little background on the area core, it's a uranium handling area. We have shelves. We store containers in there. We inventory containers. We pick up the containers and carry the containers out.

The containers on average are about twice the contamination of the floor, and I'll throw up a table with the data in a minute. But there is about 1,000 fixed air samples pulled in this room over the year, and about 4,000 smears pulled. So 5,000 pieces of data on a

one-year study. I think that served pretty well for a chronic. It's at least as much or more data that was pulled in some of the previous studies that are mentioned here. So it gives it some strength.

The room area is not filtered. It is recirced, though. It's air conditioned treated cool. It's recirced. So we don't have removal by hepa filter like in many areas in the plant. That's because there's not the level of activity. There's no opening containers, no handling of unencapsulated uranium in that room. So that air is recirced. It's about six to seven room air changes an hour, and the room's about 100 feet by 50 feet by about 12 feet tall.

On this table, I think if some of you all strain, you can see the data. But you'll notice I put up BZ and can container smear sample. I just did that for a comparison. That represents to me more of a building occupancy, I mean, a building renovation scenario. Those were acute individuals that went in and actually handled containers and inventoried them and worked with the containers which were about twice the floor. Half of them were a magnitude higher. The fixed air -- I want you to see the locations here. The fixed airs and the smears were more representative of continuous work throughout that area.

What was interesting to me was that after a year's worth of data -- this is 1995 data, we reduced the data and came up with 1.6E to the minus 6. The similar number that's listed in 5512, Volume 1, and in a couple of his references in there. I think also Brodsky uses it. They talk about it as being a magical number without a lot of support.

Lo and behold, we came up with some data that actually does support it, and think that should be considered. I apologize on this. I had made a little white paper, and I've taken these slides out of that white paper. So my reference is here at the bottom reference the DandD runs that I did that were attached to that, and this reference of 4.4 is the draft letter that I reviewed from Sandia that was looking at, I

think, the parameter analysis for the upcoming Volume 3, I believe, is what the purpose of that was for.

Again, I used this, the BZ. I just threw this in here for a comparison for a building renovation scenario, 1.6E to the minus 6 comes to a TEDE of .024 when I run that in the DandD model. I put in 1.42E to the minus 4 because I got that from the table. I talked with Steve McGuire about the relationship that current default in there is minus 5. But that being 10 percent, representing a 10 percent of the smearable, he and I believed that this was the correct correlation with the data that I had taken and was trying to represent.

The other difference here from the default -- I used 83 for the days, the 83.3 days, and I also used the 1.2 meters. But I did do another run with the defaults just as they were, and there's about a 20 percent difference there by leaving in the other ones.

MS. DAILY: Just as a clarification, are you saying that your removable material was more than 10 percent of the total left here?

MR. SPANGLER: No. I'm saying I just took these smears without regard to removable, took my fixed air and came up with this as a resuspension factor.

MS. DAILY: What I'm asking is for the default or the DandD, if using that 10 to the minus 4 value, you're basically saying that a 100 percent removable activity in your facility. And if you had said 10 to the minus 5 number, you're saying that 10 percent or less of your material is removable.

So I'm asking for a little bit of clarification about why you decided to use a 10 to the minus 4 instead of the 10 to the minus 5.

MR. FAUVER: Well, Dave, isn't it -- we've talked to you about it, and I thought that your number 1E to the minus 6 was a ratio smear data to air data.

MR. SPANGLER: That's right.

MR. FAUVER: So it wasn't fixed measurements. It was actually the smear measurements presumably would represent 100 percent removable, the way he's done his resuspension factor because he did only smears, not direct. So it would -- in this case, that would 100 percent removable the way he did his ratio to get 1E to the minus 6. That's the way the data was collected in which case it would be correct to compare the 1E to the minus 4. It's just a ratio effect. A quizzical look.

MR. SPANGLER: And that may bear some further scrutiny. But I did discuss that with several people when I noticed that the default was different than it was listed in Table 4.4, I believe, and I wanted to make sure I used the correct one when I compared those two. But I also ran this with the other defaults that are in there. It was interesting that the other defaults were all just slightly higher. That just added just a little more conservatism to choose the 97 over the 83 and to choose the 1.4 over the 1.2. You add about another 20 percent of conservatism to that.

Summary -- The data quality, I believe, is good for this. We have -- we're NRC licensed. Our instruments are calibrated, calibrated semiannually in accordance with procedures. The RADCON techs are trained on taking an 18S smear. You have about as much control on the atmosphere and the conditions surrounding the collection of the data as could be warranted for that.

The resuspension factor, 1.6E minus 6 is in good agreement with the other references there. The 5512, they reference two things in there, two studies, Sehmel and the IAEA of 1970. One was a 1E minus 6, and the other was 5E minus 5.

It would make good sense to use these in this upper range because we are going to be decommissioning, cleaning up, as Steve McGuire had said, down to where there's very little loose left after a wash of the walls or what not. You'll have a fairly clean facility with

the majority would probably remain in the fixed factor or something closer about and not in an aerosol fashion that's been allowed to lightly resettle on the surface and then be kicked up or resuspended. This data, I think, is really good data. I was fortunate to be able to find this. Hopefully, we'll be able to cast this out there and be able to use it some more, interrogate it a little more, and it will be of some value to the NRC as they look at establishing these resuspension factors.

In closing, these things have already been said there by the other speakers. The resuspension factor -- if you compare two orders of magnitude for a licensee, that would mean millions of dollars for each licensee, probably for each order of magnitude.

If there's other licensees, DOE facilities that have similar data that they could dredge out that could support or refute this, it's of the utmost importance for the uranium/thorium licensees to help establish this factor. This is going to be the single -- for building occupancy, not for solo occupancy. But for building occupancy, this will be the single most cost factor in this whole DandD code or any similar code you do that is involved with this resuspension factor. Thank you.

MR. SAITO: Earl Saito, Combustion Engineering. Can you put the slide back up again? It's this one. I'm still very confused here. Now the 1.42E to the minus 4 leads to a 2.2 dose conversion factor millirem per dpm per 100 square centimeters which would roughly end up to be 12 dpm per 100 square centimeters as your release limit. Am I interpreting that correctly if at 25 millirem a year.

MR. SPANGLER: That's right. And if you put in the other default values, the 97 instead of the 83, 97 days and the 1.4, you'd get about 9.7, I think, is what Bobby got there.

MR. SAITO: Okay. And then the 10 percent is there because

that's loose instead of fixed which we saw earlier in the day was the 100 number.

MR. SPANGLER: That's right.

MR. FAUVER: So that's compatible. It's the same number accounting for the 10 percent.

MR. SPANGLER: That's right.

MR. SAITO: Do you have any idea what your ratio fixed to loose in that area?

MR. SPANGLER: No. Like most licensees, we were just required to do periodic smears and not a direct reading.

MR. SAITO: Was it a painted floor? Was it sealed at all? It's straight cement?

MR. SPANGLER: Just straight concrete cement floor.

MR. SAITO: So it's probably substantially higher because it's probably ingrained pretty deeply in the cement, I'd imagine, over the years.

MR. SPANGLER: Through years of use, there's probably a fairly good fixed component. But it's never been very high activity room. The room's been maintained at this activity.

MR. SAITO: But unsealed cements can have the contamination --

MR. SPANGLER: Oh, yeah, over time, it's been taking in a little and depositing a little. But this is the activity that room's been maintained at for many years.

MR. SAITO: Okay.

MR. BURKLIN: Rich Burklin with Siemens. There's a notable difference between the lapels and the fixed air samples. Is that because these people were perhaps moving around with drums, and they would be getting a higher air concentration from carrying those coming off the ground?

MR. SPANGLER: That's correct. That was -- what I was hoping to demonstrate by including that was there's an acute function of the individuals working with, setting a container down on it, picking it up, turning it around, inventorying it, and leaving versus the fixed airs that are then over here located throughout that room if you remember the map over a longer period of time.

MR. BURKLIN: It would seem to me, you know, highly possible that most of the airborne that you measure was actually due to the moving drums or containers. Were they drums or -- you said containers?

MR. SPANGLER: Containers.

MR. BURKLIN: Moving containers in and out of the room. And so that these factors you found would appear to be conservative.

MR. SPANGLER: Well, that's what --

MR. BURKLIN: That's higher than what you might possibly -- much higher than what you'd get had you not been moving contaminated material in and out of the room.

MR. SPANGLER: That's correct. I would call these conservative by having this work go on in there. There was no way to actually separate out the hours that they worked with the container and the hours that they may have walked around and didn't work with containers. And the BZ would be with the people working with the containers.

That localized contribution does go into the air mix and get collected on the fixed air and get accounted for.

MR. EID: This is Bobby Eid with NRC. Are you planning to publish this data because it is crucial to publish the data so we can rely on it.

MR. SPANGLER: I had planned to talk with NRC here and see what it would take to make a paper sufficient for something that they could use. This was -- keep in mind, I put this together in just about

two months and on the side of doing my regular work, and it was interesting what I found, and I would like to shore it up if it is of some use there. It is a good paper.

And I'd also appeal to anyone else if they can think of a non-process room that they have smear and fixed air data on, I'd encourage you to go back and pull that information. It might take you just a little bit. It's a side line for most licensees. But if you pull out it out the currency data and see what you come up with, see if it comes up with anything in these ranges that we've used. And if it is, it's useful. Write it up and send it in.

DR. CHEN: Shih-Yew Chen of Argonnne. I don't have any data to either support or refute your claim. But I have a similar thing. Since your data only runs through one single year, can you continue to measure it beyond the first year?

MR. SPANGLER: We changed the process in that room at the end of 1996, maybe towards the end. And so we're not doing that particular monitoring.

DR. CHEN: That's too bad because it's indeed these suspension factor are time dependent. These should not be steady state to begin with. And plus, the whole concept of using a steady state because, you know, it doesn't have mass balance there. It assumes that you have an infinite supply of radionucleide on the surface.

And I think that's a problem here because when you try to determine which is reasonable, which is not, you lose that mass balance idea. So you don't have that need to check. My only estimate of using mass balance into minus 6 roughly correspond to 100 year complete depletion. And 110 to the minus 4 is first year. Within one year, you deplete everything. That's automatic. So that's my observation her that (1) if you can continue to measure it for more longer period of time, that would more validate your measurement to begin with; (2) time

dependence seems to be important because the wall may deteriorate over time. So when you assume it's a perfect wall today, it may not be tomorrow, and that's my only observation.

MR. SPANGLER: That's a good point. And I did look to see if, boy, if one's good, three or four would be better. And so I went back to the source there and --

DR. CHEN: And I agree with you. Ten to the minus 4 seems to be pretty conservative because we had to assume everything depleted within the first year based on mass balance estimate.

MR. SPANGLER: Right. As well as we have so much conservativism in all of our models that if we're not careful in the most key parameters in the models, if we apply excessive conservatism, we're really going to -

DR. CHEN: Then I would encourage to, if you have another chance to measure beyond the first year, one for maybe five years or even longer, that would validate a lot of things you're doing.

MR. SAITO: But that would be difficult because his is an active facility. So you are continually adding material to the situation.

MR. SPANGLER: Right. That's a good point.

DR. CHEN: And if that has been the situation, then that would cause problem to your experiment because you don't even know which one is which.

MR. SAITO: The steady state is much more applicable to the BMW data than it would be if we had a site that had stopped work, say, a site that is in decommissioning and is in essence stopped work, but they're still driving fork trucks around. People are still moving in and out. You're no longer adding source to the material.

DR. CHEN: I understand that. But I see in the application of the DandD rule here, if you're going to do the building occupancy,

you are assuming people are going to be staying up to 30, 40 even 70 years.

MR. SAITO: Yes.

DR. CHEN: But with that, I'm just questioning the validity of that first year measurement.

MR. FAUVER: Well, hold on. Let me ask you a question about that. I think I agree with Earl. Looking at this data, it seems to be a steady state kind of situation. They have sort of a constant inflow of material, constant sort of clean up and sort of steady surface activity of this removable surface activity in this room. With that -- and they also have a steady ventilation rate.

So with those two factors sort of being constant, it seems like the data would be useful for estimating resuspension rate or resuspension factor, however you want to consider the information. But it seems like if you thought of this data as steady state, once you stopped bringing in more source term, then, of course, you may have depletion assuming the same rate. And you have depletion. But if you looked at the data as maintaining a steady source term because of the influx of these new cans into this room, then wouldn't that be then valid for sort of a steady resuspension rate once you hold --

DR. CHEN: I don't dispute what he has done. I'm just saying there are conditions beyond the first year that you didn't anticipate. So the whole thing is that (1) there's a time dependence consideration considering the wall may deteriorate after 30 years or 50 or whatever. That's one.

Number two, mass balance needs to be considered.

MS. DAILY: If I could make a couple of comments. I think what you're talking about using the data like that is an excellent approach, and it's really what we're encouraging people to do in terms of site-specific analysis. There's a difference between doing a

site-specific analysis and just doing a screening approach where you're not doing all of that data gathering or evaluating old data. If you've got that data, that's great and you should be using it. If you don't have that data, then you have to fall back on other values.

You may be able to take the data that you've generated and use it to update the distributions that we came up with. I would encourage everybody to go and look at the letter report and look at the way that the distribution was developed for resuspension and evaluate whether or not that was an overly conservative approach or there is other information to be added into that.

When Steve said that we used mainly two studies to develop that distribution, we actually looked at more than two studies and threw out quite a few of them as being not applicable to this situation.

MR. SPANGLER: Correct. If they're sweeping into a fan, that's not passive --

MS. DAILY: Right. That's not applicable. We threw that one out. So we did do some stupid checks type things. We did some adjustments for data from studies where there was going to be actual source depletion occurring because of air exchange rates or other effects.

So we did try to adjust data to look at an annual average and to adjust it to be not bounding, not unusual, not something that wouldn't occur over an annual type time period.

In terms of the one year, remember the rule is talking about the peak dose. So --

MR. SPANGLER: Maximum exposure.

MS. DAILY: That's what we're supposed to be looking at. And when you talk about changing the hours of exposure and what not, what you're doing is adjusting the critical group. And if you think that that 83 is a better number than the 97, then you need to defend

that in terms of the definition of a critical group.

MR. SPANGLER: That's why I pointed that out. I didn't come prepared to argue the difference in the two. There's just when I had run the DandD code, I had loaded in those -- I'd had actually run both, and I had hoped to have a little more time to discuss going away from a previous 5512, using the 83, and now using 97 just to show that we had already through whatever analysis updated it, and we'd added a little more conservatism -- not much, about 20 percent. But the biggest factor would be to change from using the 1E minus 6 to this 1E minus 4. That's a big departure from the old 5512, and the most important one for the uranium users.

MS. DAILY: Right. But I still think most people are going to use the 10 to the minus 5 value as being more appropriate for their site. If you do some smear measurements and demonstrate that you have 10 percent or less removable, that's a relatively straightforward calculation. And we think that's more realistic than assuming that 100 percent of your contamination is --

MR. SPANGLER: Yeah, but I think you're missing the point there. My smears were regardless of efficiency. I just took the activity that we were measuring at a power plant. This is exactly what you do is you go out and you smear and you took this activity, and you related it to your activity that you count on your patch. And that's the resuspension. We then go back to try to say, then, how much was on that surface.

MS. DAILY: But I think what you're doing is not using the value in the way that it was derived -- the way the model intends that it be used. Probably we need to talk some more about that and clarify it. I can tell there's a lot of confusion here about what was intended with the model and how the calculations are done versus how it's being interpreted and used. I think we need some more discussion of that.

MR. FAUVER: Well, I think it's pretty clear, though, that the 1E to the minus 4 resuspension factor comes from an evaluation of the two references that Steve mentioned that were based on all the activity being removable, and that was our baseline resuspension factor. And then the 10 percent number reduced that from 10 to the minus 4 to 10 to the minus 5.

What Dave is presenting is material that is analogous to the 100 percent removable assumption in that it's based on swipe samples on the surface. You can argue about what the percent recovery of the swipe is. But assuming that that represents the removable fraction, then that ratio of the air samples to the smears is identical to the 1E to the minus 4 number.

Now we have to look at the data to see applicability in either case. But from that perspective, they're the same data set -- 100 percent removable versus airborne contamination concentration.

MR. BURKLIN: Rich Burklin, Siemens. I really don't have a question, but just a comment. If you want to assume that he was only -- since he's only taking the smearable portion of it, you want to multiply that by a factor of 10 in here to get the fix like you were doing here, and that would make that factor change by a factor of ten. So it certainly appears to be a conservative number.

My question is that it really is very difficult for a facility to take a room that's no longer in use and sample it for a year in order to get some type of data so that you can be site specific. Is the NRC open to borrowing data from other facilities that are very similar?

MR. FAUVER: Yes, you know. What did you say -- following data?

MR. BURKLIN: Borrowing data.

MR. FAUVER: Borrowing data. Well, I don't know why we

would borrow data. If there's valid data that's presented to us as a representative and argued as representative of a given facility, that's the whole objective of site-specific modeling that we're discussing here is to use that information to the greatest extent that you can.

And I think it's incumbent upon NRC to take these various submittals and evaluate their generic application and, perhaps over time, we would then modify the default resuspension factor as our database gets larger so that maybe less people would have to do a site-specific review.

MR. SPANGLER: What Christine had said there is true. I could take this data and shore it up a little bit and be able to use it for a site-specific model. But that wouldn't be my intent because I know there's 30 other licensees and a bunch of DOE sites that don't have the time that you couldn't apply timeliness in decommissioning and spend a year studying and get it done in two years and develop site-specific for each one of these. So it's important we try to get it as accurate as possible so that majority of people can go in and use the factors that we have in there.

MR. EID: That's why I'm proposing -- sorry, just very minor comment -- to publish the data so hopefully we would consider using it and revising the resuspension factor. So if we revise it, it will be applicable to most licensees instead of one licensee. So that's my proposal. And I believe this is an area we need to take a look at and possibly revise our resuspension factor.

MR. FAUVER: Yeah, I wouldn't say that the data has to be published for us to be able to use it. I would say that the data has to be of sufficient quality for us to use it however that demonstration is made.

MR. MORTON: Henry Morton. It seems this conversation about in this case smearable versus total and how it works in the program and

so on. Isn't it easily resolved to say since Dave uses smearable data in the denominator in the determination of the resuspension factor, then he simply use smearable data comparable as the source term. The product of those two will give him the right airborne concentration.

MR. FAUVER: That's a good point.

MR. SPANGLER: I think that's what Dave was saying.

MR. FAUVER: One question. Are these air concentration samples -- how were they used in your licensing, in your radiation protection program?

MR. SPANGLER: These particular ones were used for posting, for occupancy. We used this particular area was less than 10 percent. So we didn't have to post it airborne. Everyone at the time did not have to wear BZs. The reason we've changed in that area now, we've decided because we have so many other people that work in the area that were BZs routinely, they're on an airborne monitoring program that requires them to wear it routinely that we've removed the fixed air samples. It was just additional work that we were having to do when we had BZs on everyone that went in there 100 percent of the time.

MR. FAUVER: So you have a different population of personnel with BZs at this point.

MR. SPANGLER: Yes.

MR. FAUVER: You've got the ones that are actually handling the cans and the ones that are sort of doing some other activity in the room.

MR. SPANGLER: Right.

MR. FAUVER: Well, that would be another interesting supporting data set to see.

MR. SPANGLER: All right.

MR. FAUVER: It may go down. It may end up somewhere --

MR. SPANGLER: Right in between the two or something.

MR. FAUVER: Yeah, but --

MR. SPANGLER: Depending upon the hours of each worker that's been in there as well.

MR. FAUVER: Arguably, that could potentially be more defensible in terms of representing the true concentration if someone had questions about the placement of the air samples in the first place being representative.

MR. SPANGLER: Good.

MR. FAUVER: But I think I would encourage you to crunch some of that data, and let's see what a year looked like. We could even assume perhaps -- assuming the same -- are you still doing smears in the room?

MR. SPANGLER: Yeah, we still continue to smear it.

MR. FAUVER: I think that would be good data. Maybe we can talk about the trouble of getting that together.

MR. SPANGLER: What BZ --

MR. FAUVER: Yeah.

DR. YU: Charlie Yu, Argonne National Laboratory. One comment on the scabbled slice showing the RESRAD-BUILD code does not use resuspension factor. That is correct. That is why we don't have a default variable risk resuspension factor. But we do use resuspension rate and the near removal rate, air exchange rate, particle deposition, velocity and so on. Other parameters to calculate indoor air concentration.

And this parameters are discussed in RESRAD-BUILD Data Compilation Handbook. Some of the people in this room may have already got a copy of that. Anyone interested, we can send a copy to them.

Second comment. On the resuspension factor, measuring the resuspension factor for your facility, can that resuspension factor used as other facilities, other buildings, different size? Can you use that

given for the same building, same room. You have localized contamination, surface contamination. How do you adjust resuspension factor. In DandD code, I think there's no way to adjust that assuming one room, this room. How would DandD handle this case?

MS. DAILY: Do you mean how does DandD handle if you've got more than one room, Charlie?

DR. YU: Not necessarily one room. You have different size room, one smaller room, one larger room. Do you same resuspension factor, or even you have same room, or you have localized contamination on this spot. What resuspension factor to be used? Do you use the same resuspension factor?

MS. DAILY: That's when we get into area factor.

DR. YU: So you agree it's area factor.

MR. SAITO: Earl Saito again, Combustion Engineering. I have one comment and then a question that I'd like to have answered.

The first comment is I think that this kind of shows that at a future meeting it would be very good to take this from Chris where she has her model, and she knows what she meant when she did it, and Dr. Yu, he knows what he meant when he did it, and kind of pull that forward to what we're measuring in the field. And how does that fit together so that we're measuring the right thing in the field that you thought we were measuring, so that we're all -- so that it works all together rather than me being out there measuring something and the modelers think that's useless information or spurious information.

So I think that would be a very good topic in the future to go into a lot more depth on. My question, though, is kind of going back to the scabbling of the floors and the painting of the floors question.

If I had a building that I had scabbled to remove some contamination, do I do my dose model on the scabbled floor or on the floor as it would be finished for the occupancy?

MR. FAUVER: I'll take a shot at it. We have situations where the condition of the contaminated material or the condition of the facility is going to be changed as a known part of the remediation or maybe even post-remediation work that's done.

In those kind of conditions, situations, it's analogous but different situations where the activity was not intended to cover up the contamination, for example. The activity wasn't intended to blend the contamination, but it was an activity that was going to be conducted for economic reasons or some other reason, then there could potentially be an argument made that we know that's going to be a condition of the facility, and we're going to do this for some reason other than simply covering the contamination. Then that argument could possibly be made from that context.

In general, you know, your safe bet would be to do it prior to covering it and resurfacing it is what I kind of hear you saying.

MR. SAITO: Yeah.

MR. FAUVER: But I don't think that's beyond the realm of acceptability if it's for some economic reason of refurbishing the building or remodeling the building.

MR. SAITO: Well, after you scabble the floor, you're going to do something with it. You're not going to leave it in the scabbled condition when you go to use it. That would be very difficult to do anything in that room. I mean, you'd reface it somehow. You'd either skim coat cement on it, or you'd put some sort of other top dressing on it.

MR. FAUVER: I've seen buildings in warehouses with scabbled floors, and they have no intention of resurfacing them. But that's probably a different type of situation maybe than one where they're doing a sophisticated process in a warehouse or something. Any more questions? Okay, I think -- well, one more.

MR. BURKLIN: Rich Burklin. That leads to an interesting question, then. Do you do your final survey on the scabbled surface?

MR. FAUVER: We're really getting into speculation at this point, I think. This is speculative. However, I would think you would want to assess your source term that you were leaving.

MR. WEAVER: Ken Weaver, Colorado. We're entering a whole new realm for data quality objectives.

MR. FAUVER: I do believe. After no more questions, I would like to thank Dave and Steve for that. I think it was a nice presentation.

MR. SPANGLER: I appreciate the opportunity.

MR. FAUVER: I think we're ready for a break. Why don't we -- I guess it's about 2:30. Okay, why don't we reconvene at three o'clock.

[Recess.]

MR. FAUVER: Okay. I guess we're about ready to start up again. We're going to have a little break in the agenda. What's next on the agenda is the DandD RESRAD Comparison Report, the Office of Research.

But first, we've got another individual, Henry Morton, who wants to present some data that he's been generating relating to resuspension factor and, I think, modeling for resuspension. So, Henry.

MR. MORTON: What I had tried to do was to think through the process of what are the important factors in as simplified a model as we can think through. And I think I will basically explain a look at this process.

And in that regard, the outcome is, I think, fairly compatible with what Steve and Dave had said just previously. Basically, that in looking at derivation of resuspension factors and what kind of values they were getting, this look from my perspective is

not particularly different from that.

But what I did do was to think through the models from the conservation of mass or mass balance approach, and I don't claim originality for that. Steve and Charlie have already have that programmed.

But what I did try to do was take the rate equations and reduce them to as simple a perspective as I could so that I could see what some of the significant factors seemed to be. And so while this is not "the resuspension model" that's been discussed, the outcome over long term is, I think, compatible with what data that Dave has presented.

I'll put up the dose equation first only for one reason. One of the factors that would seem to be significant if we don't account for it otherwise potentially is the fraction of airborne dust that's respirable. So in the remainder of what I'll mention, I just used that as the overall airborne concentration, not the respirable fraction.

To try to go through things as rapidly as I can, I'll basically give you the bottom line first. The long term airborne radionucleide concentration from suspension of a braided material seems to me to be able to be reduced to basically these factors. And in this case, I went along with the idea that the first item is the total aerial density on the floor or the floor surfaces, and that over a year's time or some period of time, some fraction of that will be removed by abrasion.

That becomes in effect the original source of introduction of the radioactive material into the room, and I use the one compartment or one room model, so that the fraction of the source that's removed by abrasion would be represented by the Fs here. The As, I would term as the radioactively contaminated area that's subject to abrasion. That basically acknowledges that you might in many rooms have residual

contamination after you've decommissioned and cleaned the room over the total surface. But as an occupancy factor, oftentimes a good portion of that surface would be covered up by something. The corners we don't often occupy. You might have equipment and other things during the course of a year long term that we perhaps don't usually traffic.

So you could account for that in the As. Then there is some fraction of what is removed by abrasion that becomes airborne dust. And then there is some time span over which this averaging is done, and then finally the room air exchange rate. And then a time conversion.

Now I think what is perhaps significant about this as a bottom line relative to some of the other resuspension factors that have been published is that it would say there is a sensitivity to height of the room. That is, if As is 1, then B is the volume of the room. Then airborne concentration may be sensitive to the height of the room.

It is also sensitive to the room air exchange rate and so on. Essentially, when I take that equation and put some estimates of data into it and work an example problem through using one air change per hour, 6 percent is the fraction that could become airborne. That is, I figured perhaps somewhere between 2 percent and 20 percent and 6 is roughly a factor of 3 plus or minus between those -- a factor of 3 and uncertain.

In working the sample problem through, yet an equivalent to the resuspension factor of 3 times 10 to the minus 6. So without using the precise definition of resuspension, it basically comes into agreement. And if I use a respirable fraction of three-tenths, then for a nucleide, example nucleide U-34, for example, over a long term this would estimate that 2200 dpm per 100 square centimeters total would produce 25 millirem. So it's at least within the range and I think consistent with what Dave and Steve were looking at as factors.

And I think it's consistent with what Dave is looking at

because in his measurements, doing a lumped measure, that is, what you got off the floor, what you got in the air, over a long time accounts in his case for height of room, it accounts for ventilation rate, it accounts for all these factors. They're all lumped right in.

Basically, why does this give this kind of an answer? Well, looking at mass balance, the ways that material can get into this space or this system or room could come in in incoming air. To simplify the model, I'm assuming fresh air. So the incoming is I'm assuming zeroed in. If we have cleaned the surface so that you don't originally have loose dust at the end of decommissioning or decontamination, then material can enter the system by being abrated and then suspended.

Once it's suspended in the air, it can settle out. And to be, I guess, precise about the definition, I would term resuspension as the resuspension of what deposited, not what was original source. And when I went back and looked at one of the main sources, Birney Fish's information, in my at least interpretation, that's exactly how he did the experiments and defined it. Injected less than 10 micron material into the air, let it deposit, measure what's on the surface, stirred it up, measured what's in the air. It's a true deposition resuspension.

And in this case, another way to remove radioactive material would be cleaning the building, basically vacuum it up and carry it out. Another way that airborne material can leave would be in exhaust ventilation. Essentially, when you take that rate equation, write the rate equation for that, the inventory in the room, of course, is just the volume of the room times the airborne concentration, Chi.

The rate equation then would be the rate at which radioactive material enters the room in ventilation air, the rate at which it exits in ventilation air, the rate at which it's suspended originally from the braided source, the rate of settling and the rate of resuspension.

Essentially, if I'm simplifying the problem to look at it, at equilibrium, that is, over a very long term average, if we don't deplete the source, basically just say a certain fraction of what is on the floor is going to be abrated so that it's suspendable over some long term, say one year, then in the very long term, the rate equation would say the rate of change of Chi would be zero in effect if you deplete it, if you don't decay it and some other things.

This is not to say that it won't be perturbed in the short term by other means. But if we have a long term rate equation changing Chi to zero, if we assume fresh air coming in to the room is zero and if in the very long term -- the long term average, the deposition is basically a deposition from concentration at air, that's the source of resuspension in this definition.

And one of the things that Steve pointed out was that the removal of material from the system is mainly by ventilation, that relative to that, the settling -- the basic settling rate small relative to that.

When that's the case, it would look like that the dominant terms in setting the airborne concentration are Qa Bs, that is the abrasion and suspension minus the removal by air outflow. And in the long term, although there may be many abrations in the short term, the rate of deposition and rate of resuspenion in pure terms would need to be equal. Otherwise, you get material piled up somewhere.

When that's the case, then the two controlling terms become those at equilibrium. They reduce to that -- the last two terms. At equilibrium, you can solve for Chi, and that's what falls out of it. So when you do solve for that, basically the first equation comes back out of it. And those would appear under these conditions, that is, long term average beginning with a floor that at least has been cleaned of dust, fresh air coming in, one-room model. These would seem to be the

factors that are significant.

And, again, basically when you plug that into the data, it looks like that the outcome is consistent with Steve's observation, and they're consistent with basically the measurements that Dave found. Anyway, any questions?

MR. WILLIAMS: Alexander Williams, DOE. I don't have a question, but I would like to vehemently agree with one of the statements you made which is that vacuuming of facilities as part of clean up is done in almost all cases. The assumptions that there's a large amount of removable material being left after decommissioning is something, at least in my experience at DOE, is simply not the case because it's very cost efficient and very easy for someone to take a hepa vaccum around a building or facility and vaccum at floor level. It's more difficult to get dust to removal contamination out of roof support structures. But nonetheless picking up contamination from areas at floor level is certainly -- I would say it is probably universally done. And if it isn't universally done within DOE, we basically ought to be making some changes because this is something that is done.

You know, the casual assertions or inferences that there'll be removal of contamination in significant amounts after clean up of a facility are, I think, probably wrong. And your statements that there wouldn't be much removable at all after clean up, and that it would be produced by abrasion or other mechanisms, I think, is certainly in agreement with my understanding of how we've been doing business. Thank you.

MR. FAUVER: All right, thanks, Henry. The next present, Chris Daily, is going to talk about some work that was done through one of our contractors to start the comparison of DandD and RESRAD.

We're trying to undertake this effort over the next year or so to get a better handle on the pros and cons and the positive

attributes of the various codes and how they can be applied.

MS. DAILY: Thank you, Dave. I'm going to give a brief overview of the model comparison here at the high tech part. First of all, I'd like to emphasize again that the purpose of this model comparison is a first step in a longer process.

We're looking for differences and similarities in the actual structure and assumptions of the model themselves. The purpose of this particular model of comparison is not to determine which model is better. That's a later stage, and it's going to be based on site conditions.

What we would ideally like to be able to do is tell licensees that if they want to do screening, for example, here's the sort of information they need to provide to demonstrate that our screening model is appropriate for their use, and specific conditions where a screening model is not going to be appropriate.

We'd like to be able to say that if you have contamination in a specific media and in a specific configuration, there's a model that will be better or worse for your use, and here are the specific criteria that you need to meet to demonstrate that it's appropriate for you.

In order to do that, we have to have information about how the model is constructed and what the underlying assumptions are. So the results of this initial comparison are going to be used, are going to be rolled into development of further guidance for the license termination rule and for the SRP. And we're looking for ways of -- the most useful ways of consolidating this information and making it available to our license reviewers and to you so that license reviewers can look at a submission from licensees and in a fairly straightforward manner make a decision about if the analysis has been done correctly.

We set this model comparison up as a series of tasks. The

first one was to identify the intent, why that particular code or model was constructed. What they were trying to address, identify the basic assumptions, have a whole list here of assumptions that are built into a lot of these models. And sometimes they're relatively explicit. Sometimes they aren't.

We've tried to make our documentation as clear as possible. It's not perfectly clear, and we keep going back and updating it just like the parameter distributions will be updated over time. I think especially this meeting has pointed out that there are certain assumptions in the model that have not been clarified enough for the people that are going to be using these models.

Next task was to look at differences in the assumptions and begin to look at what some of the implications are for having different assumptions or different approaches for the various models. Analyze those differences with sensitivity analyses based on what was looked at in the previous task.

So we're gradually gathering more information that will be more directly applicable to people using these models. We want to be able in one place summarize the capabilities, the data requirements, the limitations of the different models, and then document all of these results in the model letter report.

We put the first draft of that report on our website in the hopes that people would have a chance to look at that and provide comments -- things like if there's things that we should be analyzing or should include in the model comparison that would be of use. Those are helpful comments.

Charlie Yu has been nice enough to provide us with a fairly detailed comment on that model comparison from the point of view of did we evaluate the RESRAD software appropriately; are we mischaracterizing something; did we miss an important point.

We're going to try and get together -- get Sandia and Argonne together and resolve some of the questions that have come up as part of this model comparison so that the final version will clearly represent correctly what the different models are doing.

So as I said, it's on our website. This is a slightly different address than the one that was provided earlier. The one that was provided earlier takes you into the top level where we have our discussion topics listed. You can get to this same area by clicking on the library place in any one of those topic areas.

It's probably best to use the other address. I'm trying to restructure the library so it's a little easier to use, and this address may change when we get that restructuring completed.

The other documents that we have available there that will help in looking at the model comparison and understanding better what we're doing with updating the guidance and the SRP, the Draft 1549, the initial draft Volume 3 discussing the methodology.

When Volume 3 is finally published in the next couple of months, it will consolidate the letter report information on the parameter distributions with the methodology discussion. Methodology has changed a little bit since this was first put out, but it will give you an idea of what the original process was that we were trying to use for selecting parameters.

And there's an example application that I think is the same as what we included in 1549. We compared the DandD model residential scenario against the RESRAD model, and then we compared the DanD building occupancy model against RESRAD-BUILD model. These are preliminary findings. They may change as we go through the discussions, as I mentioned, between Argonne and Sandia. And Argonne has pointed out that we used an older version of the RESRAD model, and what we may need to do is update that based on the information that Argonne has available

on their website and/or rerun some of the calculations with a more updated version of RESRAD.

But with the version 5.61, we found that there was reasonable agreement in agricultural doses for most isotopes if the DandD default plant mass loading factor was reset to 1 percent from 10 percent. When we first did our parameter analysis, we did not re-evaluate that particular parameter in DandD. We had time and resource constraints, of course, and we had prioritized the parameters that we could look at in detail.

When we did a sensitivity analysis, originally that parameter did not come out as important. But that was mainly because of the way that the pathways had come out in priority. If you have a situation, for example, where the groundwater pathway is not the primary pathway, some of the other secondary parameters do become important, and this is one of them.

And we've gathered some information on this one, and it should be relatively simple to update the distribution and re-evaluate the impact of changing this factor. And I'm just pointing this out because this is part of the process that we're expecting to go through over the next two years. As we get more information about resuspension, we incorporate that in our distribution and update the analysis the same way with some of these other parameter values.

We also got good agreement for doses from direct radiation, inhalation, soil ingestion as long as we essentially made the two models compatible in terms of how the parameter values were set.

There's a significant difference in the groundwater models. So it's not too surprising that you can get a lot of differences not only from groundwater, but from the pathways that are affected by groundwater like irrigation pathways, drinking water pathways.

We found significant differences in the tridium and

carbon-14 results because those models also are different. And I think this is valuable in terms of looking at the way that the two models approach carbon-14 and tridium. We have separate models for those two radionucleides because of the way they act in the environment, and this will be useful for telling us whether or not we need to change those models. If they're useful for default and we can leave them that way, or if we need to just specific situations where these models would not be appropriate even though they're screening conditions. That's something that we need to look at further, and it's part of our ongoing analysis.

And that might answer the gentleman's question from this morning about the fact that the tridium numbers seem to be very high. This is part of our analysis to relook at that number and find out if it's an actual structural problem with the model itself.

And as I said, we compared the building occupancy scenario in DandD with RESRAD-BUILD. One of the biggest differences between the two models is that RESRAD-BUILD handles radon transport, and DandD does not. But we did get reasonably good agreement for inhalation and ingestion pathways, again, when we matched the input parameters.

The external dose results didn't match well. That's also not surprising when you look at how the models handle external dose. DandD assumes an infinite plain. It's a simple screening model. RESRAD-BUILD handles different geometries. So you would expect that you're going to have differences when you take that approach, and that's one of the underlying assumptions that you need to understand is there when you choose between the two models.

In some cases, it's not going to make a big difference. In cases where it will make a big difference, you may want to change to a different model to take into account the conditions of your specific site.

We had a lot of disagreement between the two models for deposition pathway. And as this report was brought into a draft condition, we didn't have time to track down exactly what was causing that difference. So that's kind of an open issue for right now.

The time dependence of the models is a little bit different. We've been talking a lot about resuspension factor. The way that RESRAD-BUILD handles transport air pathways is different than what DandD did. DandD's a very simplistic model. It basically has a resuspension factor, no time dependence. It doesn't account for air movement except as embedded in the resuspension factor definition itself.

So these factors that impact air pathway, of course, are going to be pretty different. You can get close when you try to match parameters. So we have confidence that it's not a major difference in something like dose factors. It's basically the structure of the model itself.

There's a difference in the dose rate reporting basis in that DandD calculates an annual average of dose, and RESRAD and RESRAD-BUILD are based on the concentration at the beginning of the year. The implication for that is probably not of great import for most of our licensees. But we need to look at it a little bit closely. It may affect things that have short half lives and/or that move quickly in the environment. But, again, this is just pointing out that there is that difference there -- not that it's good or bad or anything else. It's just a difference in the way that the doses are calculated.

That's a quick overview of the model comparison. As I said, we're continuing to work on it. And we hope to have something finalized in the next month or two. It kind of depends on our contractor budgeting people's time over the next couple of weeks. Questions?

MR. ROBERTS: Rich Roberts, Rocky Mountain Remediation Services. I have two questions.

The first one is DandD is a probablistic code, and you look at distributions as inputs to that code. And RESRAD is deterministic is that there's single points. By doing this type of comparison, is the NRC saying that it's okay to use a deterministic code to calculate your clean up criteria for soils or for building?

MS. DAILY: That's not quite a correct characterization of the codes. DandD is actually a deterministic code. The probablistic portion comes in at the moment we did some probablistic calculations in order to develop the default parameter set. The code itself does its calculations in a deterministic manner.

We will be developing a Monte Carlo version of DandD, but that's not available at the moment. The way that the calculations are done in RESRAD-BUILD are deterministic, but it also has the ability to do probablistic type calculations. So it's not quite that straightforward.

MR. ROBERTS: Well, I guess I'll rephrase my question, then. Is it can RESRAD-BUILD and RESRAD soils be used to calculate clean up levels for soils and buildings to satisfy the requirements of the license termination criteria?

MS. DAILY: I think that's a question NMSS needs to answer.

MR. THAGGARD: Yeah, this is Mark Thaggard. We've gotten into a lot of discussions about this. Right now, we're not precluding the use of other codes. I mean, that's a misconception out there, I think, in the industry that people can only use the DandD code, and that's not correct.

The problem with the use of other codes is that you need to be able to defend the parameters, you know, so certainly you can use other codes as long as you can defend the parameters.

And that may be a little bit difficult if you've got a lot

of parameters such as, you know, in the RESRAD code. And so you're going to need to use some kind of process to weed down the number of parameters that you need to defend because you obviously can't defend every parameter that's in the code.

MR. ROBERTS: So it would be okay, then, if you defended every single parameter within the RESRAD code to use that type of code rather than using a code that you need to input distributions?

MR. THAGGARD: Well, that's correct. But I'm not saying that you have to defend every parameter in the code. I'm saying that you need to be able to defend the parameters that affect the doses. And so you're probably going to have to do some kind of -- use some kind of process to identify which of those parameters affect the dose.

But I'm not saying that you have to defend every parameter in the code. Obviously, if you use DandD, you don't need to defend the parameters if you use the default parameters because we've gone through this process of selecting default parameters. We've got a confidence -- there's a certain confidence associated with those parameters. So there's a certain pedigree that's established.

That hasn't been done for the other codes, and we're struggling right now with how we're going to accept the use of the codes. But we will not rule out the use of other codes.

MR. ROBERTS: Okay. And my second question is RESRAD has a probablistic shell that can be put onto it. Are there plans in the future for comparing the use of RESRAD with the probablistic shell with the distributional analysis within DandD?

MS. DAILY: We are working on a project right now where we will be working with Argonne to develop input distributions for the parameters in RESRAD and RESRAD-BUILD. That's the first step to being able to do a more direct comparison.

MR. ROBERTS: Thank you.

MR. WILLIAMS: Alexander Williams, DOE. I'd like to take exception to a couple of comments about RESRAD. First of all, on your last slide, the business about RESRAD calculating instantaneous dose rates, this is true. It's somewhat misleading. If there are concerns about changes in concentrations of radionucleides, the graphics in RESRAD would clearly show this if people did an analysis correctly by choosing parameters. You can see very rapid changes in concentrations in media or in dose rates. And there are parameters within RESRAD that can be manipulated. Frequently, they're not but can be manipulated to show this.

Second of all, on the point that Mark just made with the gentleman from Rocky Mountain Remediation, Mr. Roberts, the comments about defending input parameters, most radionucleides only have one or at most two significant pathways of exposure. The input parameters that become very important are the input parameters that relate to that particular pathway.

For example, for contamination from Cobalt 60, the predominant source of exposure is direct gamma radiation. And for direct gamma radiation, the parameters that are important are occupancy at the site, and shielding if any is present, and that's about all. I guess the size of the contamination, but that's about all. And it doesn't really matter what the other parameters are or what the parameter distributions are.

So that on a per radionucleide basis, it's very difficult to say what parameters are important or what parameters aren't without looking at each specific radionucleide for any given assumption as to which pathways are important and, hence, which parameters are important.

So this is something that sounds very complicated, but it gets very simple when you look on a per radionucleide basis at what the important parameters are because you may have 150 input parameters in

RESRAD, but for an awful lot of radionucleides, it becomes very simple very quickly.

And some of your colleagues have telephoned me and asked how to look at RESRAD for the purpose of licensing. And my standard comment to them is to look at what pathways are important for any particular site because that's where you want to spend your time and your money. And I think that for a site that has cobalt where your risk is from direct gamma radiation, you're wasting a lot of time and money looking at groundwater or agricultural pathways when these are not important, even if you make some absurdly conservative assumptions.

So it sounds complicated. But for a lot of radionucleides, it gets very easy very quickly. So thank you.

MS. DAILY: Thank you.

MR. THAGGARD: Yeah, this is Mark Thaggard again. I just want to also mention that we're going to talk a little bit more about this tomorrow when I go through my presentation on the test cases. You know, we are looking at RESRAD and some of the test cases. So we'll probably get into a little bit more discussion about this tomorrow afternoon.

MR. WEAVER: Ken Weaver, Colorado. In your letter, did you run a uranium -- a natural uranium test case?

MS. DAILY: No, we didn't. We had to select a short set of radionucleides for the model comparison. We wanted to look at a range that would look at all of the specific pathways. So I believe we did radium and thorium to uranium. Cesium --

MR. WEAVER: Uranium is much more mobile. So it's more interesting. Are you going to compare uranium with RESRAD off site that's available.

MS. DAILY: DandD is basically an onsite code. So it wouldn't make sense to compare it to a code that looks at offsite tests.

MR. WEAVER: How about for some of the restricted use scenarios where you may have a little larger volume of material left in some shape? Have you thought about doing the kind of cyphering out what is and is not comparable? Sometimes RESRAD has advocated as possibly using layers with some work with those situations. Have you done the compare and contrast in that regard?

MS. DAILY: That's part of what is being developed for the SRP and what is going to be built from these model comparisons. There's a specific situation that you need to model that one approach does not include, then obviously you need to model that, and you need to use something that takes that situation into account.

What we're trying to do is to make it as clear as possible how these models can be used, and if there's fairly straightforward markers that a licensee or a license reviewer can use going in that says these are things that are going to be important, and this kind of an approach is going to be most useful.

MR. WEAVER: Is that going to end up in the standard review plan?

MS. DAILY: Yes.

MR. WEAVER: Those markers?

MS. DAILY: As many as we can get in there in an efficient manner. We're still in the stage of trying to figure out what some of those markers would be and what are reasonable acceptance criteria.

MR. EID: This is Bobby Eid. I would like to add more to what was said. The papers of the current comparison are just to see how the codes compare to each other assuming that somehow the source term because DandD screen assumes the contamination occurs in the 12-15 source.

I believe there were mistakes in both cases because you can have valid comparison between the two codes. Your question regarding

more complex cases. We are dealing in this RP of selection of the codes and a model appropriate for precise site-specific model. And then the SRP hopefully will be developing criteria for the codes to be selected that are appropriate for the site-specific model.

Whereas, on RESRAD is an onsite code for those assessment whereas the current RESRAD version is not suitable for offsite. And it is because of the contaminated transport model RESRAD. I hear from Charlie Yu that there is a newer version that's called RESRAD for Offsite, and it has other potential uses for offsite. Apparently, if the licensee comes with a code like RESRAD which is used for offsite. So there could be other codes more suitable than the current version of RESRAD.

In the future, there could be other codes that could be useful for offsite entities. There could be as RESRAD for off site entities which is apparently in the beta version. Beepers or other codes suitable for offsite.

MR. WILLIAMS: Alexander Williams with DOE. I have considerable experience at sites involving natural uranium. I'd be happy to talk with you afterwards if you're interested. Thank you.

MR. SAITO: Earl Saito, Combustion Engineering. Could you give a more specific, Chris, and when you say good agreement, are you saying is it the same order of magnitude, the same -- the one significant figure that's good? Is it 10 percent? Is it 20 percent? What is good agreement to you?

MS. DAILY: That's a sticky question. And, of course, a modeler's going to give you a totally different answer than somebody else. To me, agreement within an order of magnitude, it's pretty reasonable. Within a factor of 2 would be fantastic.

I think what I'm saying is it's less than the order of magnitude is pretty reasonable. And we're trying to make sure that all

the results are in there so that just because I say there's good agreement, you can go and verify yourself that you have the same definition of good agreement that I might have.

MR. SAITO: Thank you.

MR. FAUVER: Any more questions. I guess that wraps it up for the day. Tomorrow morning at 8:30, we'll start up with the industry folks telling us about some of their site specific groundwater modeling cases. Somebody? Well, one more. Dave.

MR. CULBERSON: I was just going -- and it may be too late in the day to ask this question. Maybe we can pick this up tomorrow.

But going back to the earlier afternoon session, talking about the resuspension factor, I guess I went on break kind of left hanging. I wasn't sure what was going to be done with where we were. We had some hanging questions about -- I know I talked to Felix during the break just a little bit. We've got some actual data now.

MR. FAUVER: Okay.

MR. CULBERSON: But what are we going to do with it? We've got some not necessarily disagreement, but difference between what the default values are in DandD. What do we do about that, and where do we go with that? I would hate to leave it here just leaving it hanging with some sort of a discussion about what we could do with that. Felix and I talked just a little bit during break about the possibility of maybe somehow getting into -- and I think you alluded to this earlier. Bob did certainly somehow getting that data or some industry experience documented. I'm not quite sure we do that in any perspective.

But then if that's done, will that be useful in making modification code, and is that an appropriate thing to do? I just wasn't sure we had reached a conclusion after the break.

MS. DAILY: If I could throw out a suggestion, what we would like to do is broaden this discussion beyond just the people here just

what we're trying to do with the website.

If you can put your ideas and thoughts into the discussion area, we can also look at if you could provide that information electronically, possibly posting it on our website so that everybody would have access to the data, and they would get an idea of what kind of data we're looking for, and we might get a little better response from other people providing data.

We're also working on trying to develop a standard methodology for updating distributions. And I think putting that up when we get something in writing would give people a better idea of what we're talking about in terms of incorporating new data into our existing distributions or possibly developing entirely new distributions if there's a major shift in the definition of the parameter itself.

MR. CULBERSON: Let me state it again. Is that format sufficient to hang your hat on as far as making basic assumptions and changing the code? Is the fact that it was put there, is that sufficient?

I know it's has referenced some published documentation, and it's substantiated more than just put it on to be usable.

MR. FAUVER: Well, I suspect that we would probably need some kind of additional quality information on the data perhaps. But from a broader perspective, I think from discussions during Dave's presentation and during the break afterwards, what I heard everybody talking about was all right, okay, so how does this data fit into the assumptions into the models.

And then I talked to the RESRAD folks who were saying, well, how does this fit into the -- it does or doesn't fit into our model assumptions, and it does or doesn't fit into some of the DandD model assumptions.

I think when you get a data set like this, somebody's going

to have to try to put those pieces together and say this is why it fits the model. This is why it fits the scenario. This is why it doesn't fit.

Now who that person is in the case of this data set, I'm not sure. If industry -- Fuel Cycle Forum, for example, were to take that as a task with the encouragement of this meeting to say, yeah, it looks favorable, I think there's a general favorable response about the data.

If you were to take a task to pursue it with our help and maybe some additional meetings, these technical meetings I talked about, teleconferences, whatever to try to piece together the second part of the argument -- why it fits the model assumptions, why it's a good data set, what additional information might be needed to justify it as a data set.

So just to say here's a data set floating out there, what do we do, that next step of linking it to the models has to be done a little more concretely and a more specific way. You know, if you tried to link it to RESRAD-BUILD, I think you would have a different thought process of linking it to perhaps linking it to DandD. Or maybe you should think about it from both perspectives.

But I think that's the next task. Chris was talking about the process of modifying the input distributions. Well, I guess that's sort of what we have to think about when we evaluate new data.

MS. DAILY: I think what we're calling that, it's a development of acceptance criteria. And we all need to be involved in deciding what we think would be reasonable criteria for accepting things like data sets that had been generated from a specific site or from a publicly available data set.

You know, when we talk about getting regional data off the web, do we generally say that there's a lot of U.S.G.S. data sets out there that are quite reasonable and well evaluated.

When we say that, what do we exactly mean. Do you have enough guidance that it helps you in deciding what data sets are going to work for you. Or if you need to do something to them to make them acceptable.

MR. CULBERSON: Right.

MR. FAUVER: Well, perhaps then one would consider this as a test exercise of going through this process in a very specific, very needed set of data to go through this while we might be working on a generically or with industry, Fuel Cycle Forum specifically for this data set, the lessons we learn going through one set would obviously be useful in working into other data or other parameters, et cetera.

So it seems to me that we could use this and move forward with it in some unified way to figure out how we would use it, what's positive, where additional information might be needed, that kind of thing.

MR. EID: I proposed earlier to speed the process of publishing the data because the basis for establishing -- my name is Bobbie Eid, and I would like reiterate again the basis for establishing resuspension factor -- the full value in the screen is based on two publications because it is published data.

So if that data is offered, I don't see any reason why it cannot be included at re-establishing the distribution function so we can have substantive justification because the data that we have is published data. We ought to go and examine how the quality of the data so if it is published, this is justification for it later. They will believe if it is published. I don't see any reason why we do not revisit the resuspension that we tried to codify the number, and it's not that complicated a process. And just acknowledge that number should be changed by certain factors.

MR. NELSON: My name is Dennis Nelson, and I just had a

couple of comments that I wanted to make. One, what is to pry people from doing active intervention on these sites that have been painted or coded or whatever? What if they decide to tear down the wall or take a jack hammer to it or strip the paint with a paint stripper? How are those people going to be protected. How will they even know that there's something there underneath all of this if it's not gamma emitter, if it's an alpha or beta emitter. They won't even know it's there. And the second question, I still have a lot of problems with the numbers. I don't know where these numbers came from. But these acceptable screening levels for surface binding contamination? You've got Cobalt-60 at 7,000 counts per minute.

Now I wouldn't want to be sitting in a room eight hours a day working if I've got the walls are radiating me at 7,000 counts a minute. You've got Cesium 137 at 23,000. Now to me, those are excessive radiation -- external radiation values.

So I think that however this thing was generated, it needs to be rethought because there's something wrong with these numbers.

MR. FAUVER: Do you want to try it?

MS. DAILY: I guess what I would say is the structure of the model itself, how the calculations are done, what the values are that were used in the calculations and how those were developed are all available for review, and we are open to any comments you want to make.

I encourage you to review exactly how those calculations were made. And --

MR. NELSON: I wouldn't want to sit in a room with radiation being 23,000 counts a minute.

MR. MCKENNEY: That's 12 micro rem. It's 25 millirem a year. The new changes -- it's not as clear on these forms -- is that the action plan was from a measurement standpoint, and a lot of people are lawyers, and those are human psychology, any change is always

difficult.

But there is new factors based all off a single dose value of 25 millirem. And, yes, there are model assumptions, but that's the way you've got to look at it.

MR. NELSON: Take 23,000 --

MS. DAILY: Could you use the microphone, please.

MR. NELSON: Take 23,000 disintegrations per minute, and assume that you're counting the efficiency of your counter is maybe 50 percent, if it's that, you're going to get 11,000. Well, most counters are calibrated as 1,000 counts per minute is one millirincolas per hour. So if you've got 1,000 counts per minute at 1 millirincolas per hour times 10, you've got 10 millirincolas per hour. That's 80 millirincolas in a day.

MS. DAILY: We could also have some requirements for how the surveys are performed. And your instrument is only 50 percent efficient, you have to take that into account so that you get an accurate evaluation of what's actually on the surface.

MR. NELSON: This is just a rule of thumb. I could be off by a factor of 10, but it's still excessive.

MR. FAUVER: I think that the point was made earlier that what we've been talking about is compliance with a rule of 25 millirem per year. The calculations we're performing are intended to in a prudently conservative way to estimate the dose that a person might receive, how they may receive 20 millirem per year.

We feel with the conservatism of the calculations that the actual dose that a person receives would be less than the regulation of 25 millirem.

MR. EID: This is Bobby Eid. I would like to add that the calculation for exposure is quite simple. As I said, the direct exposure dose is coming from the exposure duration which is the time as assumed

on the average that would be saying eight hours day for the light industrial scenario. And the surface which was taken from Federal Guidance No. 11 and those are agreed on the average service activity per unit. That's the way those numbers were derived. So direct exposure is very, very clear, it's not that complicated. And you know, we calculated what was equivalent to 25 millirem.

So we need to revise again those factors and look at them. And then I'm quite sure you will find these numbers are consistent with those converging factors for those calculations.

MR. FAUVER: Anything else? Any other questions? Dave, you done this time? Well, on that, we're going to adjourn. We'll see you tomorrow morning at 8:30.

[Whereupon at 3:54 p.m., the workshop was recessed, to reconvene at 8:30 a.m., Wednesday, December 2, 1998.]