THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL AND PREVENTION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

convenes the

WORKING GROUP MEETING

ADVISORY BOARD ON

RADIATION AND WORKER HEALTH

250 DAYS ISSUE
AND
8314 SEC PETITION

The verbatim transcript of the Working Group Meeting of the Advisory Board on Radiation and Worker Health held in Cincinnati, Ohio, on Nov. 29, 2007.

STEVEN RAY GREEN AND ASSOCIATES
NATIONALLY CERTIFIED COURT REPORTING
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C O N T E N T S

Nov. 29, 2007

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P R O C E E D I N G S

(10:00 a.m.)

WELCOME AND OPENING COMMENTS

DR. CHRISTINE BRANCHE, DFO

DR. BRANCHE: This is a workgroup meeting of the SEC issues group including 250-day issue and preliminary review of 8314-SEC petition. I'm Christine Branche, and I'm going to go through the roll for the Board members who are on the work group.

Dr. Melius.

DR. MELIUS: I'm here.

DR. BRANCHE: Dr. Ziemer.

DR. ZIEMER: Yes, on the line.

DR. BRANCHE: Josie Beach.

MS. BEACH: I'm here.

DR. BRANCHE: Mark Griffon.

MR. GRIFFON: Here.

DR. BRANCHE: Gen Roessler.

DR. ROESSLER: Here.

DR. BRANCHE: The work group members are on the line. Are there any other Board members who are participating?

(no response)

DR. BRANCHE: Okay, we do not have a quorum of the Board so we can proceed.

Are there any other, who are the federal officials, please, starting in the room?

MR. ELLIOTT: I'm Larry Elliott, NIOSH.

MS. HOWELL: Emily Howell, HHS.

DR. NETON: Jim Neton, NIOSH.

DR. BRANCHE: Are there any other federal government agency participants on the line?

DR. WADE: This is Lew Wade on the line.

MS. HOMOKI-TITUS: This is Liz Homoki-Titus with HHS.

DR. BRANCHE: Are there any other members of other federal agencies who are on the line?

(no response)

DR. BRANCHE: Okay, SC&A or ORAU?

DR. MAURO: John Mauro, SC&A.

DR. MAKHIJANI: Arjun Makhijani, SC&A.

DR. BEHLING: Hans Behling, SC&A.

DR. BRANCHE: Okay, anyone else?

MS. BROCK: Denise Brock.

DR. BRANCHE: Thank you.

Is there anyone from the federal --

I'm sorry. Are there any petitioners or their representatives on the line; workers or their representatives on the line who would like to identify themselves?

(no response)

DR. BRANCHE: Are there any members of Congress or their representatives on the line?

MS. ROSNER*: Kathleen Rosner from Senator Harry Reid's office.

DR. BRANCHE: Thank you.

Are there others on the line who would like to mention their names?

(no response)

DR. BRANCHE: Okay, just one more item before I give it to Dr. Melius. For those of you who are participating by phone, if you could please conduct yourselves according to telephone etiquette. That means if when you're speaking you can certainly keep your line open, but if you could please mute your phone if you are not speaking that will allow all of us to hear all of the discussion that's going on.

And so, Dr. Melius.

INTRODUCTION BY CHAIR

DR. MELIUS: Thank you.

This is a meeting of the 250-day work group or whatever we're calling ourselves, the SEC Review Work Group also. And we have two reports that we're going to be discussing today. One is a report dated October 2007 called "Working Paper on Nevada Test Site Incidents Relating to Consideration of Employees with Less than 250 Days". And the second one is a report dated June 2007, again another SC&A report called "The Relevance of the 250-Workday Requirement to Potential Exposures Associated with a Single Blowout". It relates to the Ames Lab issue, working draft, I'm sorry. Larry was pointing out this is a working draft so it's --

MR. ELLIOTT: The work's in progress, and I know that there's interest perhaps our participants on the phone to know what these documents are, given that they're not on our website. They're not accessible. They're not publicly distributed at this time.

They contain Privacy Act-related information. They have not been reviewed or redacted for release at this point in time.

They're pre-decisional documents used in this working group study. Just wanted to make sure people understood the constraints we're all operating under.

DR. MELIUS: It's particularly important I think especially with an NTS document because the way --

DR. ZIEMER: Dr. Melius, this is Ziemer. I have a question as we discuss the first document dealing with the NTS cases. I notice there's a number of claimant numbers listed in the table of contents. Are those Privacy-protected numbers? I'm worried about as we discuss things today what we, how we can identify things.

MR. ELLIOTT: Yes, Dr. Ziemer, those are Privacy Act protected information. So you cannot use those, you cannot reference those in your speech.

MS. HOWELL: Dr. Ziemer, if I could make a recommendation -- this is Emily. If you'll look at the table of contents there, identified in numeric order is 3.1.1.

DR. ZIEMER: Right, that's what I was getting at. As long as we use that reference

we're okay, right?

MS. HOWELL: Yes.

MR. ELLIOTT: Yes.

DR. ZIEMER: I just wanted to double check on what we can say and what we can't. Thank you.

DR. MELIUS: Yeah, I was actually going to suggest page numbers, but then at least my copy doesn't have page numbers.

DR. ZIEMER: Well, mine has the same problem. There are page numbers referenced but the pages don't actually contain them.

DR. MELIUS: I think that's the original, the way the document was, not the way we printed it, Paul.

MR. ELLIOTT: I apologize for that. It was my fault.

DR. MELIUS: I don't actually remember the timing on this, but I believe the last meeting we had of this work group was last spring sometime, and I don't think anybody remembers, but where we mostly talked about sort of a general concept of how we would try to approach this 250-day issue; what were some of the problems doing so, and then I think

actually briefly talked about an earlier draft of the Ames report to that.

At that meeting we decided that our procedure to be able to address the NTS site issues which was by looking at, necessitated looking at individual claimant records, and then Arjun and Jim Neton, I think, have been working since that time to, I think at that time at that meeting, as I recall, we identified on a preliminary basis sort of the types of claims that would be useful to review. And then Arjun and Jim worked together on that, and Jim pulled these claims. I think I got the sequence right. And then that was the basis for Ajun's and the SC&A review of those.

DR. MAKHIJANI: Actually, Bob Barton did it.

DR. MELIUS: And what I had planned for the meeting today is to start with the NTS report because that's the one that in some ways is newer, we would do that and talk about that. My plan is that we will take a break around 11:30 or so. We will then decide do we work through lunch and then or do we break for lunch; how we're going to do that.

My plan is to try to wrap up before two o'clock if feasible, frankly, because I don't think we'll, I'm not sure how well we'll all think after two o'clock after talking about this stuff. But let's see where we are in terms of making progress and so forth.

So everybody agree with that approach on that?

(no response)

"Working Paper on Nevada Test Site Incidents Relating to Consideration of Employees with Less than 250 Days"

DR. MELIUS: Maybe we can start by Arjun, if you want to talk a little bit about what your, about the report. Sort of what you did in general. Then I think we're going to have to probably just start talking about individual cases in order to be able to wrestle with this. But go ahead.

DR. MAKHIJANI: Well --

DR. BRANCHE: Arjun, before you start -- this is Christine Branche again. If you could please mute your phone if you're not speaking. We're hearing some jingle bells in the back. Thank you.

Arjun.

DR. MAKHIJANI: Thank you, Dr. Branche.

At the last meeting we decided that there were four categories of potential situations that might involve less than 250-day SEC coverage so we would look at those workers who were involved in planned re-entry operations such as instrument retrieval. Workers were directly exposed to atmospheric fallout such as cloud sampling emissions, aerial photography, ground-based fallout measurements.

Workers who were frontline witnesses to atmospheric test shots and workers who were involved in post-shot operations and experienced unplanned exposures due to some form of logistical problem. And those were the types of claims that Jim looked for, and he identified --

DR. NETON: Twenty-one or 22.

DR. MAKHIJANI: -- yeah, 20-odd claims. And we looked at all those claims and we have the records from those claims and collected the information. We had 11 cases identified for planned re-entry, five exposures to atmospheric fallout, two frontline witnesses

to shots and four involved logistical mix-up. We had 22 cases.

DR. MAURO: For those of you following this, it's basically, rather than taking notes this is written up right in the introduction.

DR. MAKHIJANI: Yeah, and I was reading from Table 1 on page five.

And we collected their dose records, and their dose records are summarized in the same table. So there are some external exposure records. And then we summarized the incidents and then have a detail on each case. So that's what we did in preparation.

What we did not do is try to make any analysis of how these types of situations would fit into a 250-day criteria which we presume would be the subject of a working group discussion.

DR. NETON: I might just add to that that when we pulled these cases, we looked with people who had exposure during the SEC period, and we made no attempt to triage these into the ones that might be relevant to the 250-day criteria. These were just examples of people who would fall into those categories and may

have some unique exposure scenarios that could be discussed today or the relevance and the ability to have a large amount of exposure in a short period of time.

DR. MELIUS: And the issues, the focus is the scenario not the, you know --

DR. NETON: None of these cases may or may not be relevant to the 250-day requirement.

DR. MAKHIJANI: We took it as such and we pulled the records. And this is essentially a data summarization exercise without analysis. We tried the analysis route and interpretation route for us and it didn't work too well.

DR. NETON: You almost have to do a dose reconstruction to get there.

DR. MAKHIJANI: So we didn't go there again.

DR. NETON: I think these are 22 cases out of something on the order of six-to 700 total cases that were in that timeframe.

DR. MAKHIJANI: So I don't know exactly how you want to proceed in a case-by-case examination. Do you want me to go over the -- you have the report.

DR. MELIUS: Why don't you go through what you think is a good case to discuss.

DR. ZIEMER: Could I ask a question first?

DR. MELIUS: Sure.

DR. ZIEMER: This is Ziemer. I just want to clarify the dose values in here, in the report. These are the doses of record versus any reconstructed doses. Is that correct?

DR. MAKHIJANI: Yes, these are the --

Bob, are you on the phone?

(no response)

DR. MAKHIJANI: Yes, as I said I didn't do the data compilation, but these are the doses of record.

DR. NETON: I've got a couple questions, I guess, maybe before we start. I think if I could I'd maybe just focus a little bit on Table 1 first because that's about the only place where we have some summary information.

DR. MAKHIJANI: Well, Table 2 also.

DR. NETON: Well, Table 2. But the idea was to start looking at these case as to maximum exposures that were similar in criticality or something in that effect. I think there's a pretty good summary of what was in the cases. I guess, I have a question as to what represents the 95th percentile. What is that

value?

DR. MAKHIJANI: You know, I was looking at that, and I thought I'd talk to Bob about it before this meeting. If I might call him at the break and get back to you about that. I'm sorry.

DR. NETON: I don't know if this is the 95th percentile of a coworker model that we could use or --

DR. MAKHIJANI: It must be something like that. It's obviously not the dose of record.

DR. NETON: I don't know because maybe you constructed a 95th percentile. I'm reading --

DR. ZIEMER: Well, that was the follow-up question. Did they take the dose of record and just assume, for example, a lognormal distribution to give an idea of what a 95th percentile might look like?

DR. NETON: Yeah, it appears that way, Dr. Ziemer, because I'm reading a sentence here in the first paragraph. "Only the employment years before '63 which had non-zero dose were used in calculating the 95th percentile." So somehow all the doses that were available were, yeah, fit into a lognormal distribution

and summarized that way.

DR. ZIEMER: And then the maximum versus the 95th then would be what? Like the 99th?

DR. NETON: Well, this maximum, whatever that is, I think whatever the highest dose that was --

DR. ZIEMER: That is the maximum record.

DR. MAKHIJANI: It's the maximum among the 11.

DR. ZIEMER: I got it. I got it.

DR. NETON: Say for the first one, and obviously 18,500 is the highest for the --

DR. MAKHIJANI: Yes, this is the 95th percentile of the group, but I don't know how he did 95th percentile of two.

DR. NETON: As long as I understand it. This is based on the data that were available in the case files. I kind of have a feel for what was done then.

DR. MAKHIJANI: Yes. I'm pretty sure that data on the case files.

DR. ROESSLER: So that doesn't refer to the six- or 700.

DR. NETON: No, no.

DR. ROESSLER: It's the smaller groups,

specific groups.

DR. NETON: This is the, apparently some lognormal distribution was constructed out of the 22 cases that had external dosimetry --

DR. MAKHIJANI: In each of these categories.

DR. NETON: For each category, yeah, which is interesting to these categories, two categories.

DR. MAKHIJANI: I actually didn't catch that when I was compiling.

DR. NETON: I guess one thing that did strike me though is the doses, although they're quite large, are not huge, you know, at the level that we were expecting maybe to see for some of these cases.

DR. ZIEMER: Well, yes, they don't begin to approach the kind of doses you see in criticality accidents.

DR. MAKHIJANI: Well, except maybe for the ^ mix up.

DR. NETON: And that's at the low end, and that's the one that I think that's attached the entire evaluation report, incident report attached to the back of this document that discusses what happened there. And that was

actually measured I think on his personal dosimeter.

I guess with the NTS if we're using this as an example, there's two things to consider. One is that we've believed that we can reconstruct external doses for these workers because we have a fair amount of monitoring data. And I think frankly this table sort of bears some of that out. And then secondly is that the internal exposures were the basis for adding the class, right? So then when you look at that in that context, I suppose, this 250-day requirement.

DR. MAKHIJANI: You know, one of the questions that arose sort of in an overview out of the compilation is these people were involved in some unusual situations and the external doses may have been all over the map from relatively low in relation to the criteria to somewhat significant anyway.

But in most cases there are no internal dose records. We don't know what the internal dose would be. So the question of, which relates to what we're going to discuss with Ames, the question of what other criteria

for internal dose for less than 250-day, I think becomes kind of acute.

DR. NETON: Well, right. I think that's what I was trying to flesh out here early going is that I'm not sure the external is really an issue here. Maybe it is, but in my mind external is somewhat bounded by the amount of monitoring data that we have. And I've seen nothing so far that would indicate that would approach a level of a criticality incident or something like that from an external perspective.

DR. MAKHIJANI: Does the less than 250-day inclusion include whether you were monitored or not? Or is it if you are in the class and somehow in a situation defined by the rule that it doesn't matter whether you were monitored or not?

DR. NETON: Well, I think it depends on what the class definition is. I think the class, I don't have the class definition for NTS in front of me, but I suspect that it's got that standard language were monitored or should have been monitored for exposure.

DR. ROESSLER: It's got it here. That's

what it says.

DR. NETON: So that anyone who was in the class, anyone who should have been monitored, and by definition the Department of Labor has accepted that to mean exposure greater than 100 millirem per year, would be a member of the class.

DR. MAKHIJANI: Internal exposure.

DR. NETON: Yeah, internal, because I think the basis of the SEC was for our inability to reconstruct the internal dose. As you observed in these individual case files, we have very little internal monitoring data. So we believe that we can reconstruct external dose. We sort of indicated that all along. And in some ways this is borne out by Table 1.

Then you get into the external, and if one looks through these incidents, I think that the issue is do any of these incidents, any descriptions in here, relate to internal exposures that would be exceptionally high, similar, whatever the words are in the rule, to a criticality incident. I think that's what needs to be, that's what to me is the relevant issue.

I looked through these cases. I didn't go back to the original case files, but I didn't see much in here that would give me that sense that there was internal exposures that were exceedingly high. There certainly were exposures by some of these folks who flew through the clouds and that sort of thing. They're primarily fission products that sort of thing, and their duration of exposure was pretty short.

DR. MAKHIJANI: Yeah, I think the question that does emerge is what are the internal exposure criteria because the records aren't there. And they were clearly involved in unusual situations of the types that we've identified. And since we don't have a way to characterize internal exposure potential according to SEC definition, and by the nature of the work they were involved in incidents that had significant internal -- at least some of them were involved in incidents that had significant internal exposure potential -- that factor a question of what are the criteria for --

DR. MELIUS: And if you remember from our

other meeting was that when we looked at criticality -- I forget the exact wording -- it was not a very informative criteria. And so, I mean, we're going, how do we struggle with coming up with a criteria. I mean that's what it comes down to. Remember from the other meeting we talked a little bit, well, maybe it's on the endangerment side, the criteria, but that doesn't, we don't have a very --

DR. NETON: You can't get there --

DR. MELIUS: -- there's not enough criteria on the endangerment side either.

DR. MAURO: I remember there are two strategies when you encounter a problem like that. One is you try to front-end it and say, well, what criteria would you use? And we've made a run at that, and it caused a certain degree of frustration in trying to do that.

Then the other approach is, well, let's not try to come up with a front-end criteria. Let's create a compendium of information. What do we know? What are the scenarios? What are the kind of exposures people might have gotten? And I think that,

and then you maybe iterate back and forth.

So in effect this report is like making a run at the compendium idea. This is a good way to start. But, of course, now we know that the compendium approach served us to a limited extent because really we only know something about the external, and we're struggling with, well, how do we get a handle on internal.

Now we did discuss at one time a strategy which may be worth discussing again in terms of the compendium strategy. That is, internal exposures, though we all recognize it, the NIOSH's position is you really can't do it, and that's why we have the SEC. But at the same time, internal exposures have been developed using methods that perhaps are not entirely acceptable to -- bear with me for a minute -- to NIOSH but have been used by DTRA for military personnel. So bear with me for a minute. I'm putting this on the table to keep the pot stirring.

In theory one could say, okay, what type of internal exposures have been reconstructed under the DTRA program for

people who were involved in these kinds of programs. Granted that these are military people as opposed to civilians, but what it does it says, okay, we recognize there are certain limitations to the DTRA strategy for doing internal exposures. And we all understand what they are.

But nevertheless, could they serve us in a different capacity in terms of saying starting to put, create some sensibility of the magnitude of the exposures that we're talking about? Not that we represent them as reliable or accurate, but at least it's one handle to say, okay, here's what DTRA is reporting to be the kinds of exposures people may have experienced internally that were involved in these different categories of activities.

I only put this on the table because we're looking for a handle, and I don't think we, right now I don't see a handle.

DR. NETON: I think that's an interesting perspective, but I think where you're going to end up is you'll end up with some doses, and then what do you do with them? Now, well,

let's say you come up with a compendium of doses for people, and they are in the ten, 20, 50 rem, I don't know what they are. I'm guessing, probably not that high, but let's say they were. What did that mean?

The way the SEC is structured you have no way of bouncing those against IREP. You can't really go to IREP because you don't know what the upper limit dose is to do the litmus test, and that's frankly why the rule is written the way it is because you can't do that. I mean, if you could do that, then you can reconstruct the dose.

DR. MAURO: In other words the fact that, let's say we walk away with a sense that, hmm, let's talk about doses, ever get about ten, dose, dose commitment, whatever you want to use. And I know that when we looked into the criticality question, we know there was a range of numbers.

They did, it seemed that there was a general sense, if I recall, that when you're getting above ten and moving into 100, we're starting to get into the range that people said now you're talking about numbers that all

would generally agree starting to move into the realm where people are thinking in terms of a criticality if I remember that's where -- I know five rem came up because that's when you start to see blood changes. Twenty-five rem came up as a number you see blood changes. Certainly, a hundred rem came up, and then you start to see --

DR. NETON: Deterministic effects.

DR. MAURO: -- we're talking deterministic effects. So I'm not saying that we found the Holy Grail by any means, but I'm saying that there was certainly a general consensus that when you're moving above ten and moving to a hundred, that's the world where -- now whether or not, and another issue that came up, whether or not it's external that we're really talking about delivered acutely or dose commitment delivered over 50 years, I believe we still have not engaged that issue.

DR. NETON: Well, see, that's a separate issue, and that kind of gets into, I looked at Hans' analysis. I didn't want to jump into that, but I think internal is going to be the sticky wicket here. And in my opinion

internal doses are not, to a specific organ are not comparable to an external whole body acute radiation exposure.

It's well established that different organs have different radio-sensitivities. So, for example, if one calculates a 200 rem dose to bone delivered over 50 years, that sounds like a very high dose equivalent to a criticality. If one would apply the current ICRP weighting factor for bone surfaces of 0.01, you have the equivalent whole body dose as a direct exposure of two rem. All of a sudden that brings it down into this range which is not even exceeding the regulatory guidelines for exposures today.

So you can't make these very large calculations, say, see, it's 200 rem to bone. It's 60 rem to lung. It's not comparable to an external whole body acute shot of gamma radiation. So we've got to be careful. That's all I'm saying.

DR. MAURO: I agree.

DR. MAKHIJANI: Part of the issues that came out here is a lot of the information that there were incidents is based on the

interviews alone. There are no incident records. It's what the workers said happened when we look at 3.1.2 for example. The internal dose, we can agree, is quite low and not part of the criteria so we have a very easy case.

And so the focus would be exclusively on -- this is on page nine and ten of the report. There are no investigation reports, and the claimant said he was exposed to radioactive iodine. Monitors went off in a certain area, and he was told to evacuate. And he said that he had enough contamination to be told to get off his clothes at a certain point, and that he was burned out a few times, but that doesn't appear to be related to external dose because his external doses --

DR. NETON: Well, burned out --

DR. MAKHIJANI: -- don't correspond to that definition of what would have been regarded as burned out.

DR. NETON: Very rarely would they be restricted from an internal exposure for iodine or something like that.

DR. MAKHIJANI: Right, so all I'm saying is

I'm just giving you information of what is not an atypical compilation in this list. Generally, there are no investigation reports. A lot of the information goes to internal exposure type of situations, heavily contaminated clothes, being subjected to fallout, contaminated with radioactive iodine. And the question arises how did he know that it was radioactive iodine. I don't know that.

Or you can take the next claimant, 3.1.3, where the external doses is somewhat higher. One year --

DR. ZIEMER: Which one is this, Arjun?

DR. MAKHIJANI: 3.1.3, Dr. Ziemer. The next one down.

DR. ZIEMER: Okay.

DR. MAKHIJANI: One year external dose are missing. Again there are no investigation reports that we identified. Remembers giving urine and blood specimens and received a high dose from balloon shot. His clothes and truck were confiscated. Had to take several showers.

I'm not arguing the case for inclusion or exclusion. I'm just telling you what's in

the record, that what we have typically in these cases in the record is no investigation report and a description by a claimant of what they went through which we've then identified as belonging in one of the criteria that we set.

DR. NETON: Hand selected out of 600 cases.

DR. MAKHIJANI: Right.

DR. NETON: But these are the ones that we could find.

DR. MAKHIJANI: That's right. Only the ones that we could find. We all agree what we have here.

DR. ZIEMER: This is Ziemer if I could add a comment. Sometimes the terminology -- and I don't know how common it is, but certainly at Oak Ridge if someone exceeded the 300 millirem for the week, which was a, you know, in the 15 rem per year -- they called it Roentgens in those days -- per year people would say they were burned out at 300 millirem. That really meant that they were at their limit. And that was really an administrative limit. The term burned out, which a worker might hear and be very alarmed, was simply an administrative

limit, which from sort of a biological point of view, is fairly low.

The other point I would make is confiscating of clothes typically occurred when things were contaminated at even a couple millirem per hour level or even less. I mean, you didn't let people take their clothing home. So the fact that clothes were confiscated doesn't necessarily imply extremely high dose rates as far as exposing the person.

You know, from a contamination point of view, usually you're talking about counts per minute that you just don't want people taking that home. And obviously to a worker that's very alarming, but from a biological point of view it could be very low. So all I'm pointing out is that we have to be cautious in assuming that because clothes were confiscated that there was a really sort of a catastrophic level of something.

DR. MAKHIJANI: I was just reading from what's there.

DR. ZIEMER: Yeah, I agree. I just wanted to point that out as a sort of a --

DR. MAKHIJANI: It could be low or high.

DR. ZIEMER: -- caution when you interpret those things.

DR. MAKHIJANI: And the problem is that we don't know.

DR. ZIEMER: I agree.

DR. MAKHIJANI: And that is a typical situation here. And in the case of 3.1.2 where he said he was burned out a few times, in fact, his annual dose of record does not exceed 300 milligram in any of the years recorded. So let alone weekly exposure, the annual dose didn't add up to that, but he did say he was told he was burned out.

And in the next claimant he doesn't claim that, but it could have been --

DR. ZIEMER: Sort of makes you wonder if the external was even accurate then I suppose.

DR. MAKHIJANI: Yes.

DR. NETON: I think John had a good suggestion on the potential relevance of the DTRA approach to bounding things anyways because if you can, under some worst-case scenarios come up with some pretty small internal doses, then maybe the job that we

find on a site-specific basis is not. I think we would all probably agree if these internal doses were potentially less than ten rem or something of that magnitude, then you could at least say for one case, site case, site that it's --

DR. MAURO: It's out there for the, just pick them right off the database.

DR. NETON: The DTRA database. Given all the uncertainties and everything, still, you would have somewhat of a sense that the internal exposures don't reach some level of magnitude.

DR. MAURO: Along those lines let's say, we'll try to grab that thread.

DR. ROESSLER: Before we follow that thread, as I recall, the DTRA approach was to use the external measured doses and estimate some internal exposures. Could you just summarize very briefly how that's done?

DR. MAURO: Well, it was complicated. No, I can give you conceptually though. In some cases it was fairly straightforward. That is, if you know what's on the ground, you know the time after the test, and you actually have an

external reading in MR per hour, there's ways to back out from that what's on the ground.

DR. ROESSLER: So this is rather situation-specific. That's really all I needed to know.

DR. MAURO: It's situation-specific. Now, a simpler situation is someone goes in after the shot. You know at a certain time period after a shot. I guess this is one of your scenarios. And you do know from survey readings what the MR per hour is at that location at that time after the shot. On that basis there are ways to back out, called the Hicks' Tables, what's on the ground in Becquerels per meter squared for 126 radionuclides.

Then they apply a resuspension factor, and they have a range. They have the very high end ones depending on the activities, and low end ones depending on what they were doing. And they come up with a way to approximate what might have been the airborne dust loading that this person may have experienced for the time period it was there. That's the simplest.

We can go up to much more complex ones

than that. So all I'm saying is that, and there are lots of limitations with that for the very reasons you expressed concern. But it's a way to say, you know, we wouldn't have to do those calculations. We may want to understand it, but they're out there. Here are the results.

Now the degree to which we believe those records of reconstructed doses have relevance here, you know, we'd have to make that judgment. I'm not saying this is what we, but it's a handle. I'm always looking for a handle. But right now what I'm seeing is that from this report that we issued as a compendium where we were hoping that it would help to inform us of what magnitude internal exposures, it's not informing us of that. I mean, that's the reality of it. We do know --

DR. NETON: If these occurred or --

DR. MAURO: -- they've occurred --

DR. NETON: -- incidents --

DR. MAURO: It's hard to say what the magnitude of, you know, you really can't do much with it.

DR. ZIEMER: Well, John, were some of those

also based on an infinite cloud where if you know the external dose rate in the infinite cloud, you also know the concentration of materials that are breathed during that period?

DR. MAURO: That's part of it, too, yeah. So there are many layers of how you come at the internal exposure. They even have ones related to flying through clouds. They have ones where individuals were doing certain activities, for example, cleaning off these planes that landed, and you had to clean them off because they were contaminated.

I mean, there are many, many, many scenarios that the military personnel experienced. The degree to which that experience has applicability to civilians is certainly another question. But if we could put that in the parking lot for one second.

To go back to the concern you raised, a very legitimate concern. Even if we get some numbers what are we going to do with them? In a funny sort of way, if we go to the Ames report, there's the table on page ten, there's Table 1. Now I only draw your

attention to that because here we have a case where we do have some estimates of what the dose commitment to various organs might have been from the scenarios that Hans modeled.

And he did the best he could to reconstruct it. The whole story is told there. But in the end for a very serious scenario, we're talking about these explosions of thorium and uranium where the dust loading in theory could have been pretty high --

DR. NETON: I'm not sure I buy it. We can talk about the technical aspect of --

DR. MAURO: Yeah, that's up there, absolutely. But for some short period of time there are circumstances where a few grams per cubic meter occur, but you can't stay there very long.

DR. NETON: Not for five minutes.

DR. MAURO: I'm not, disagree with you.

DR. NETON: Well, let's say these numbers are correct.

DR. MAURO: That's where I'm headed.

DR. NETON: I'm not saying they are, but let's --

DR. MAURO: Let's say I'm headed. Right now

you look at Table 1, and just for the moment let's postulate that it was possible that an individual experienced the bone surface dose of 12.7 rem dose commitment over one year. I'm looking at Table 1 right now as being, okay, because this person was involved in a thorium blowout, we're saying here it's not out of the question that he could have experienced an internal dose commitment from inhaling thorium as high as 12.7 rem in the one year period following that acute exposure. Now here's the tough question. What about it?

DR. NETON: Again, I brought this up. This is an equivalent dose to bone surfaces. It cannot be directly compared to an acute whole body exposure to gamma radiation such as in a criticality because these organs, you have different risk factors depending on which organs are irradiated.

And as you well know, the internal dosimetry models allow for effective dose equivalent calculations. Then you can compare an internal dose to an external dose as far as its risk. I'm not saying relative risk. I don't want to get into risk numbers.

The weighting factor for bone regulatorily today is 0.03. The current ICRP model is 0.01. So all of a sudden that dose becomes 1.2 or three or something like that. Or not --

DR. MAURO: Is it possible that that exposure could have resulted in, let's say this exposure was not delivered over a short period of time or was delivered over 250 days instead. Is it possible if you were to run IREP, you would come up with a positive compensation?

DR. NETON: For that one year?

DR. MAURO: In other words if a person experienced 12.7 rem over a 250 day period --

DR. NETON: No, probably not, and that's in a one year period. But I think we should avoid trying to do IREP runs because the whole point is you can't estimate the upper limit, and now you're bracketing upper limits using risk models. The reason that the 250 day was there and then we allowed for the criticality is because in a criticality incident, at least the thinking at the time -- and Ted's not on the phone but he can correct me later if I'm

wrong -- was that that, in our mind at that time, be an unambiguous event that would unambiguously cause health endangerment if you got into sort of deterministic effects from that type of exposure. And that's what we had in mind.

Otherwise, in between you have these gradations that you can just never come to some definitive conclusion one way or the other. There are just too many gray areas here. Again, you get into this I want to run IREP. Well, could bone surfaces of 12.7 rem cause, you know, a PC of greater than 50 percent?

DR. MELIUS: I think what John's trying to get at is is there some way that we can use some of these estimates in a way to decide is it appropriate to consider. I mean, to me the DTRA data would be more if it's all very low, but then it would tell us, you know, let's not pursue now. Again, the devil's in the details.

DR. NETON: The problem you run into is there are an infinite number of combinations that one can run in IREP. You could never

cover all of them. So let's take a scenario where you have the exact latency period that's required, the exact age, early age at onset. I mean, you could postulate in some instance that, yes, maybe this could have endangered just one example scenario's health because you can get an IREP number over 90, over 50 percent.

I don't know if you could run all those scenarios, if it would be possible to do that. It wouldn't be defensible. Someone could always come up with another scenario. You couldn't run them all. All the central organs, I mean, leukemia comes to mind for bone doses. I don't know what the bone marrow dose would be here, but that would be relevant for leukemia. That happens to be one of the lowest cancers, the lowest dose rate cancer here.

DR. MAURO: I hear the challenges. What I do is I put myself, if I were a worker at Ames. I was involved in the explosion and ten, 20 years later I do develop whether it's a bone cancer or a lung cancer. And I would say right now, me, as a health physicist, what

I know I say is it realistic to think that it's possible that the exposure could have caused that cancer.

And I would sit down, and I do dose reconstruction for myself. And I'd try to answer the question is this a plausible scenario. And right now I haven't done the calculation. In other words I think that the fact that a person was there for less than 250 days, it's troubling to me that if he was there for a longer period of time and got the same dose that we just calculated right here, he might have been compensated. But because he was there for less, he's not.

DR. NETON: Well, I don't think this particular number, the 12.7 number, would get the person compensated.

DR. MAURO: Okay, well, that's important to know. Because I know the assumptions Hans made here. What he did is he made some --

DR. NETON: Three and a half grams of uranium and thorium per cubic meter, by our Bethlehem Steel analysis is not appropriate.

DR. MAURO: Remember the explosion scenario he went through.

DR. NETON: The explosion --

DR. MAURO: He went back to the numbers from Fernald.

DR. MELIUS: Well, let's do Ames as a separate report.

DR. NETON: No, what I'm saying is we did an entire analysis at Bethlehem Steel, and by Wes Van Pelt's analysis, 300 milligrams per cubic meter is as high as you could get a sustainable cloud for a short duration, and that's five or ten minutes. And I don't think you could see through 300 grams per cubic -- you wouldn't see. My opinion is that they would allow at least the stuff to settle before they run them back in there.

DR. MAURO: In effect there would be an explosion --

DR. NETON: If there would be an explosion, and say, okay --

DR. MAURO: And you're going to have that --

DR. NETON: -- for the record.

DR. MAURO: -- for some short period of time, and then it's going to settle in this mess.

DR. NETON: But they're not going to rush

right in when it's three and a half grams per cubic meter if they can't even see their nose or hand in front of their face.

DR. MAURO: So you're basically taking issue with it being more than five minutes. Maybe it was 30 seconds.

DR. NETON: No, I think that these exposures are probably ten times too high. I think they wouldn't be working in scenarios, maybe three, 500 milligrams per cubic meter, maybe, for five minutes. And so you're 10 times too high for half of the dose. I think it may be different equipment, but it doesn't happen this way.

DR. MAURO: So what we're saying around the table right now is that there may be a way for us to agree on a scenario, dust loading, associated with transients such as in explosions, that we could all agree, yeah, that seems to be a reasonable number.

DR. NETON: I mean, you've done a great job here of suggesting that we can do dose reconstructions, right? I mean, this is a bounding dose reconstruction that you've got. And I would suggest that if a person came into

our shop with a less than 250-day exposure and said, hey, I've been involved with ^, we'd probably reconstruct it. If there was convincing evidence --

DR. MAURO: It's a paradox.

DR. NETON: I mean, if a guy comes in and says I was exposed to an incident, we say you're right. We can't reconstruct chronic doses. We've already admitted that, but you're right. There is this unique situation. You were there for ten days, and we have the data. Hans has done an excellent job demonstrating that you can put some kind of upper bound on this person's dose which is the criteria for SEC.

DR. MAURO: Does that mean by definition unless there's a criticality accident, these people can't be compensated for that if --

DR. NETON: No, I think in the internal world it's going to be pretty hard to show that you can't do something with it.

MR. ELLIOTT: Well, we bound it. We have the data from Y-12. We could bound that dose.

DR. MAKHIJANI: Hans has bounded the dose. Hans has done a hypothetical calculation --

DR. NETON: That's what I'm saying. It could be bounded given these -- I mean, it's possible. It's possible to reconstruct a dose from an incident like that.

DR. MAURO: Let me counter that. What Hans said, listen, we don't know how often these occurred so he picked one of them per month.

DR. MAKHIJANI: He found a lot.

DR. MAURO: And then he said, okay, and on that basis we're going to assume a certain percentage of them becomes air -- , but in other words it's very, very hypothetical.

DR. NETON: The problem with that analysis is that it's not consistent with the urinalysis data that was collected by the ^. I mean, we've got data on a bunch of workers, and if this one-a-month scenario did occur --

DR. MAURO: Some of the would have the --

DR. NETON: -- the intakes are massive. I mean, you're talking -- I don't know what it was, gram quantities, 12 grams per year or something like that, huge amounts. It's not consistent with what you would observe in the urine samples. That's a different issue. I think we need to decide not whether this

happened at Ames, but if you had data like this, what does it mean. And again I'm suggesting that internal exposures to a specific organ are not comparable to an external whole body dose.

DR. MAKHIJANI: How about lung dose?

DR. NETON: A lung dose weighting factor is 0.12. So it's bigger, but the doses are small, say, 69 rem to the lung over 30 years in this particular scenario.

DR. MAKHIJANI: It's irrelevant in this concept. I mean I --

DR. NETON: Because that was, well, as I mentioned, the intent of having a criticality incident as sort of the poster child for this was that it would be unambiguous in almost anyone's mind that health was endangered because there would be more than likely deterministic effects that would show up. So the dose exceeds some thresholds.

In an acute shot you've got deterministic effects. We don't know how high that criticality could have occurred, but you start to see deterministic effects. So it's sort of an unambiguous end point, a litmus

test, if you will. When you get into internal doses, these doses are delivered over a 30-to-50 year period. It's an individual organ not an external whole body, so the risk of developing a health endangered situation is much lower if you only irradiate only one or two organs versus the entire body.

And that's the whole fundamental basis of the ICRP-30 internal dose limitation system. If an individual organ when it's irradiated chronically over 50 years has a much different level of health endangerment than an acute shot of gamma to every organ in the body.

DR. BEHLING: Can I interrupt for a second here since we're already talking about doses that I expressed in my report? And I do want to make a comment. I was going to wait until we came to the Ames report, but since we are discussing I'd like to make some comments here.

DR. MELIUS: Okay, Hans. You're on, Hans.

DR. BEHLING: Jim Neton's trying to obviously establish parity. And no one is saying that a criticality accident that

delivers an instantaneous dose, external, that more or less uniformly irradiates all tissues is the same as an internal dose that selectively targets specific tissues.

On the other hand the common denominator in an instantaneous exposure from a criticality accident is that ultimately you would end up having a potential risk of a cancer. And on the basis of dose to that tissue, you would say the criticality accident would have contributed a 50 percent or greater probability of causation.

In my case where I did develop certain estimates of exposure dose from thorium or uranium blowouts, I calculated a dose that was contributed in the first five minutes as opposed to the next 30 days from residual activity -- and you can look at the numbers -- and for a five-year period of time-integrated exposure to select tissues -- and I selected bone surface and lung -- and you end up with significant doses to those tissues.

Now if a person, a claimant, were to come to you and say I was exposed for five minutes during a blowout, and my lung dose

was, let's say, 60 rem. And you do a POC calculation, it turns out to be greater than 50 percent. What are you going to tell him? That you don't qualify? I mean, you can now establish that in five minutes of exposure time to the lung that particular dose contributed to a probability causation that is compensable.

And that is the area of parity. I don't care. I don't want to necessarily assign similarity or parity between a criticality accident and an internal exposure during which the dose is a long-term issue. But what I want to show is parity between the end point when a cancer does occur to either a lung from an internal exposure or to an external criticality accident that dose was, in fact, a contributing factor greater than 50 percent, and thereby, establishes compensability. That's the whole issue of concern here.

DR. NETON: But I think you're missing the point in the regulation that talks about examples of what would constitute a class, what would constitute granting a class of less

than 250 days, and the criticality example is the one that's out there.

DR. BEHLING: Well, it's an example, but it shouldn't be the only one. And I don't think the regulations -- and I'm going to be stepping on somebody's toe here by interpreting regulations, but I will express my opinion on that issue. I don't believe that that example is necessarily one that says anything else other than a criticality accident will not be considered.

DR. MAKHIJANI: I'll agree. I mean, it doesn't say that, the regulation itself doesn't say that exposure has to be acute. It says exceptionally high level --

DR. NETON: We agree with that.

DR. MAKHIJANI: -- such as nuclear criticality accidents or other events involving similarly high levels of exposure. And if the whole program is about cancer risk to organs, and that's how the whole program was constructed. It's not constructed on the regulatory idea that you've got to limit total dose to five rem by making organ equivalents. It's a different scheme of thinking.

DR. NETON: Well, not necessarily, Arjun. But I still think you need to look at the, at what you've done. You've done a calculation for an incident here which I think is way too high to begin with. But let's assume that these numbers are valid for some scenario --

DR. BEHLING: Can we postpone that discussion until we get to the Ames issue? I just really intervened here in behalf of this particular issue that tries to establish parity between a criticality accident and internal exposure. But I think let's try to postpone the discussion for the Ames issue until we get past the NTS issue.

DR. NETON: Okay, that's fine. But what you're saying though is these high doses, you've done a calculation that gives you a high dose, and now you're suggesting that we need to do an IREP run to say if it's greater than 50 percent or not to establish a class which by definition it says we can do the dose reconstruction.

DR. BEHLING: Well, you can or you can't because we don't really have full documentation for these events. And as I

said, I think we're stepping, we're going beyond the issue here because I think that'll be part of my presentation when the Ames issue becomes the topic. Right now I believe we're still talking NTS. So if we could, I would prefer to postponing this discussion.

DR. MAURO: Maybe we could craft the question in a different way. What we're really, to go back to where we began with NTS was really do we believe, sitting around the table, from looking at the compendium of information that is before us that there could have been some scenarios that took place at NTS where, and we've identified four or five different scenarios where we felt as health physicists that those scenarios could have been associated with relatively high internal exposures.

And then we ask ourselves the question, well, how do we get a handle on what the scale of exposure that was. Was that a rem? Was that ten rem? Was that a hundred rem? And unfortunately, the answer is we don't know from what we've done so far. And I guess the question then becomes let's say we

were able to get a handle on that.

The fact that we could somehow get a handle on the order of magnitude, a sensibility -- let's call it a sensibility -- on the scale of the exposures to various organs that could have occurred from internal exposure for NTS, does that mean by definition that we can reconstruct the doses? I would argue no. I would say that all we could do with that is to get a sense of the scale of exposures.

And then I would say once we understand this plausible scale that we would all agree to it. Yeah, this is a plausible range that some individuals might have experienced, realistic scenarios, and given that we agree that that was the scale of the exposure, do we feel -- again collectively, the Board feels -- that that type of exposure is of such a, a potential exposure might have occurred from those scenarios, is of such a magnitude that it would only be fair to compensate those people even though that exposure may have only occurred under a one day --

DR. NETON: How do you make that determination?

DR. MAURO: Well, that's where we're trying to get to.

DR. MELIUS: But when you said we -- first meeting or we decided we couldn't come up with criteria. You know, we started thinking this sort of hypothetically. So let's look at some examples. And I think what John's proposing is let's, you know, here's another way of estimating these exposures, what we're going to do. Call that and would it be useful to do that? To me it would be useful to do.

DR. NETON: I still say you need to come up with a dose. What you're saying is you want to come up with a dose at which health was endangered, and I don't know that you can do that.

DR. MAURO: Let's say right now that I -- a hypothetical -- let's say I come up with a hypothetical that says, you know, I could postulate a scenario where the dose to some organ is on the order of 20, 30 rem, a dose commitment, 50-year dose commitment, on that order, from plausible scenarios that we went

over. That is a plausible scenario.

At that point from the work we did on criticality, we're starting to fall in the range that from looking at the experience with criticality, if you remember, there was a distribution that went to a fraction of a rem to hundreds of rem. But there was also a general sensibility that once you start to move above ten rem and moving to a hundred rem, we're getting into the realm where I think there's general consensus, yeah, that's the scale of exposures that one would start thinking about as being within the realm of what a criticality would be notwithstanding whether it's internal or external. That's another debate.

But those kinds of doses, so I'm saying that we did make some progress on coming up with a general sense of where we are when things start to get serious. So I think with regard to criteria, I think there's been a general sense. I get that feeling.

DR. ZIEMER: John, when you're using those numbers for criticality, you're also talking about acute exposure. A 25 rem, you know, the

blood changes or something like that, the deterministic effects, very hard to compare that with a 25 rem exposure or committed dose to internal for any organ.

DR. MAURO: I agree. I agree.

DR. ZIEMER: So I'm not sure how you make that comparison. Even if we agree on a number like what's a biologically effective number that we could use. If you're comparing acute doses associated with criticalities, it is very difficult.

DR. MAURO: Let me say what I thought I just had. If a person's exposed acutely to external radiation to, let's say, ten rem from a criticality event, or let's say 50 rem, to a criticality event, and the exposure is whole body. But the cancer that you're about to compensate him for is the cancer to his liver. So in effect you're reconstructing the dose to the liver and then predicting the probability of causation. How does that change anything?

DR. NETON: One is an a priori. One is an a posteriori calculation.

DR. MAURO: Given that the cancer existed.

DR. NETON: What the chance, even if the

cancer exists, what's his chance versus what the chance the cancer would develop given this exposure.

DR. MAURO: Let's say we have a person that has the liver cancer, and he applies, he claims that my liver cancer's due to the exposure I experienced while working at this facility. Now we see this very same person. Now in one scenario that person was exposed chronically to external uniform exposure for ten years, and you do his dose reconstruction.

Then I say, but wait a minute, that's from external exposure but is the dose delivered to the liver over that time period? And you do the calculation and you compensate. I'm just using that hypothetical.

Now the very same person but his scenario's different. His dose to the liver that was delivered to him over that same time period was not from a chronic uniform whole body exposure. It was from a one shot intake that deposited a certain amount of radioactivity in his liver that delivered a dose to the liver internally from that radionuclide over a ten year period. To me --

DR. NETON: The risk is going to be different.

DR. MAURO: Oh, I agree the risk will be different, but --

DR. NETON: The risk is proportional to where it occurred --

DR. MAURO: Right, where --

DR. NETON: -- period and the age and everything.

DR. MAURO: And now it may turn out that that, the way in which the dose was delivered in the case of the acute exposure given the latency may actually be worse for the acute short term because of the latency.

DR. NETON: The longer the latency the better.

DR. MAURO: No, no, remember, there's a period where there's dead time. In other words here's the diagnosis. There's a certain number of years before that where that dose doesn't contribute to that.

DR. NETON: So for an acute exposure you get the maximum effect because you've got a ten year latency.

DR. MAURO: You've got it.

DR. NETON: For the chronic exposure half of the dose isn't even going to count because of that minimum five year window.

DR. MAURO: You see what I'm getting at is that, the point I was trying to make with regard to what Paul has just said was that we're still dealing with ultimately the dose to an organ. So it's --

DR. NETON: But the instantaneous delivery of the dose is going to be your maximum risk because let's say the cancer occurred ten years, the maximum risk is conferred in ten years.

DR. MAURO: I agree with that.

DR. NETON: If you've got a dose, let's say, uniformly delivered over ten years, almost 50 percent of the dose is going to be assigned a risk of almost zero. It's not a zero, but it approaches zero. It approaches zero.

DR. MAURO: So there's a window of time before the diagnosis that the --

DR. NETON: The count essentially.

DR. MAURO: -- it's really not going to contribute. So I agree with that.

DR. BEHLING: John, can I interrupt here? I

mean, this is again a discussion that leads nowhere. And I don't want to say that a time-integrated dose is equal to an acute single dose, but what if the time-integrated dose is three, four times the acute dose but in the end based on IREP calculations, ends up with a same probability of causation that exceeds 50 percent?

DR. NETON: You're right, Hans, but where, the question I've been raising is where do you draw that line? What is that dose?

DR. BEHLING: You let IREP do that calculation for you. That's what we use when we do IREP calculation, and it involves an internal exposure. I mean, that's currently part of our scheme for doing dose reconstruction. We integrate internal exposure along with acute external exposure --

DR. NETON: Hans, wait. From what scenario though? See, you've got a calculation here where you've done this. But now let's take another scenario where, I could tell you what the smallest amount of dose is going to be. It's going to be a likely leukemia that occurred like two-to-three years after

exposure. You can get down into the sub-rem range. People have been compensated in this program for 750 millirem exposure for leukemia that occurred just at the right time.

So now you're in a situation where you say, well, gee, there's a scenario. So then by definition almost everybody is in for presence. I would suggest that 750 millirem which is -- I know we're not supposed to talk regulatorily though -- which is a very small fraction of the current regulatory limit, is not the appropriate metric. And you can do that.

You can come up -- so you're always going to be challenged. You can come up with these scenarios and say, yes, this is good, but then every other scenario, if you have to evaluate it on the same, through the same lens, is going to be challenged because you can always come up with a lower dose scenario that should, say, be based on presence.

DR. MAKHIJANI: Well, part of the problem I think is with, we have to decide, the Board has to decide in considering this is whether health endangerment has something to do with

cancer risk.

DR. BEHLING: Can I also add, give you one more tidbit to think about, and let's just get away from the notion of criticality versus internal exposure that has a chronic integrated dose associated with it. Let me go give you one example. Let's assume, let's go back, and I really didn't want to discuss it, but we're on this discussion and so let me give you an example to think about.

You have two people at Ames working there. One person who ends up being exposed to a blowout for which we can document the exposure, and he worked there for 251 days. And on the basis of that one single blowout exposure we calculated dose to his lung or the bone that ultimately translates to a dose that is compensable.

The second person was there for one day, same dose, same exposure, but he was there for one day only. Are you going to tell that guy who was there during the blowout for one day that he has no business filing a claim, and the other guy does get compensated because he happens to spend 250 additional

days with no additional exposure? Is that what we're talking about?

DR. NETON: You acknowledge that we can't estimate the dose for the guy that worked there 251 days. That was the whole point of the SEC.

DR. BEHLING: Well, that's exactly right, but we also realize that a single exposure can translate to a dose that would otherwise be compensable had we monitored these individuals. And the truth is at Ames we know blowouts occurred routinely, and we also know that they were not documented, and there was no monitoring data.

And that's the whole concept here for discussing these doses. They're hypothetical, but they are obviously in a situation where we have no documentation when they occurred and who was there. And it's clear that a single exposure to one of these events would, over a very short period of time of exposure, the first five minutes, translate to a dose that if that particular tissue was the cancer of concern, the bone or the lung, would translate into compensable dose and a claim.

DR. NETON: If you believe you can get 3.5 grams of uranium and thorium in the air.

DR. MAKHIJANI: Apart from that.

DR. NETON: Well, that's what you're saying, that these doses are not --

DR. MELIUS: Let's go back because we're going around in this, and I don't think we're moving forward here at all. And I think we've already decided, my premise is we've already decided that we're not going to be able to just develop a criteria and then go back. We need to work through some examples and determine, in some actual situations to determine if this is something, you know, that's appropriate to address in some way and then how to do that.

And then admittedly we then have to come up with some criteria at some point. But I think we decided last time that those criteria would be easy to develop if we had particular situations that we needed to address with this. And I'd like to go back to the NTS report because I think that's where we need to decide how to move forward and because we're going to be in Nevada in about six

weeks. So we're going to be asked about this issue.

And I guess I was intrigued by John's suggestion of DTRA. And I realize that we're also in this funny situation because we sort of rejected the DTRA approach as a basis for going forward originally with the SEC because it wasn't ready to review at the time. I'm not even sure what the status is of their methodology.

Is that correct? Is my recollection --

MR. ELLIOTT: It hasn't been validated yet. We haven't seen a report of validation.

DR. NETON: I'm not sure the resuspension stuff is done.

DR. MELIUS: Okay, okay, I'm just saying it's another issue. But to me to move forward what John was suggesting would be useful in the sense of if it comes out low then will we be in a position then for some reasonable number of scenarios or whatever to dismiss the internal as a significant issue we have to worry about for the less than 250 days?

DR. MAURO: The benefit of that is we're not

forced to come up with criteria. Or we can agree this dose is relatively low, and we're not saying what the criteria is. All we know is to say this is low. Otherwise because try to find a bright line.

DR. NETON: What's low?

DR. MAKHIJANI: Well, that's the problem I think. You know I think if you take, Jim, description at his word that people that have been compensated for leukemia, then I think the basic question, Jim, is are we discussing a criterion that's related to cancer risk or not? Is health endangerment to be linked to cancer risk? Because otherwise you can compile a lot of examples, and you won't be able to draw a conclusion from it given Jim's description of what has to be compensated in this program.

DR. MELIUS: I mean, I think we can make some judgment that it's not near --

DR. NETON: Criticality.

DR. MELIUS: -- criticality. It's a lower level that we're considering, and we'd have some more ^. Now if it turns out that it's higher, then I think we then have to wrestle

with the issue of where's the line, but that's it. The problem is that the way we've constructed this law, the program, the regulations this doesn't give us that bright line and it makes it difficult. And I think the question that we're trying to get at is there are going to be situations where we're going to have to go forward and address that line in some way and come up with a criteria. And so far I think for the most part we're saying no, but let's satisfy ourselves to that. To me on Nevada Test Site there's a sort of two issues. One, is there any significant internal dose in these situations? And to me the DTRA model would provide us with some information that would be useful. I think the second issue that we really haven't discussed here, maybe we have in the past, is are we confident that the external doses for these people can be reconstructed. And I think, Jim, you've made some statements that -- - in fact, I don't have any basis for doubting you or not doubting you about -- but I think that's the second --

MR. ELLIOTT: The class was added because we

couldn't do internal.

DR. MELIUS: Right.

DR. NETON: We made statements that we could reconstruct external.

DR. MELIUS: So I guess my question to people, do we need to re-examine that issue at all for any of these cases or any scenarios.

MR. ELLIOTT: Well, it goes to why the class was established. If there's an instance where we say we can't reconstruct external dose for the class and 250 days comes to play, then it's the external dose that's at issue.

DR. NETON: Or we could always add additional classes because I think that's what this effort tried to flesh out. Are there classes out there that should be added based on presence that we can identify and say, yes, there are these pockets of workers that, you know, let's take Hans' example at Ames. I'm not saying it should be done, but blowout, for people of all the blowouts at Ames. I mean, I don't know.

If that were to be added that would have to be evaluated as a separate class for instantaneous presence, not part of the class

for these chronic 250-day exposures that we all agree we can't reconstruct. Now we've got another pocket of workers that we're looking at, and we're saying, well, maybe there are these isolated pockets. And unfortunately, I think those do have to be evaluated one by one.

DR. MELIUS: Then the question is how do we evaluate them one by one? I mean, it's as difficult as if there were thousands of them in that situation --

DR. NETON: It's essentially another SEC evaluation for each site. If someone wants to suggest and file a petition and say I think blowout workers or NIOSH could self identify through the 8314 process. But I'm saying some class of workers who were involved in these high exposures, it would be another SEC evaluation, evaluation reports and be evaluated in that light.

DR. MAURO: Isn't that what we've been doing?

DR. NETON: Well, no, not formally. I mean, this is what we're trying to do is establish what the mechanism is --

DR. MAURO: The science we've been doing though is going toward that question.

DR. NETON: True, true, that's true.

DR. MAKHIJANI: Yeah, initially we tried to establish a general bright line criterion, and the working group decided that that was not going to go places which is what we found out in these examples. I mean, I understood that the idea of these examples was along the lines that Jim was just talking about which was you have to establish some class of people who were exposed to discrete incidents.

But when you strip everything else aside, what we're talking about is a discrete incidence piece of the regulation, forgetting the high, the low, the risk. Were there things that you can identify as discrete incidents that people were exposed to? And then you'll be, maybe the simplest way to think about it might be were there situations in which people were exposed to discrete incidents and just identify that.

DR. NETON: Through the SEC process can you bound that dose, yes or no, and if you can't, was health endangered? See there's two tests

to be applied here then. And so now that you've identified the discrete incident population then the SEC evaluation would have to say can I do a dose reconstruction for these incidents, yes or no. Can I bound this? And if you can't, then you end up at this test of, well, was it a degree of exceptionally high exposure. That seems to me the way to process this.

DR. MAURO: I think we're going that road, but it's been difficult. On NTS we did identify what we believe to be conceptually discrete incidents. These early entry people are a perfect example. But then we run into this brick wall. What kind of exposures? Can we reconstruct it? And the answer is, well, not really.

We really are not in a position to be able to do a good job in reconstructing those people that might have been exposed to the early entry internal exposure. But then we have to ask ourselves, well, okay, so can we say something about whether or not health was endangered.

And we're agreed that, well, we don't

really know. We don't know the magnitude of the exposures. And even if we did have some sense of the magnitude of exposure, not that we can reconstruct it for that person, but add some sense to the magnitude of the exposure by some handle.

Then we're at the dilemma, well, okay, now we know the magnitude that might be plausible. Is that compensable under these criteria or comparable to criticality? So I mean, we've got all these hurdles in front of us.

DR. NETON: But see, unfortunately, that last piece, you almost have to do a dose reconstruction to know that.

DR. MAURO: But see, that's where I disagree. I mean, what I'm saying is I'm not saying we're doing a dose reconstruction. I'm just saying that what are the scenarios where people could have been exposed for short periods of time to relatively high internal exposures. And I think the answer is perhaps, yeah, because we understand the helicopter taking off or a truck driving a couple, few hours after a fallout incident at Nevada Test

Site. Yeah, you know, we can visualize this.

But then what we really don't know is what kind of magnitude of exposure. Now for any individual I would argue that you really can't predict a dose to any individual because you don't know exactly what puff he was exposed to. But for that kind of scenario I would say that, well, we probably could start a place, get a sense of what that exposure might have been. Does that serve us well to have an appreciation of what that might be? Does that mean we could place an upper bound? I would say I'm not quite sure.

I think if we can get a sense, and if it comes out to be ten rem, 20 rem, 30 rem to some organ, it's very similar to what Hans did. What in effect happens here if you think about is Hans went ahead and did such a scenario. He said, yes, there were scenarios. We did do reconstruction, and this is what he came up with.

Now we're really discussing right now could we do something similar to that only at the Nevada Test Site by somehow taking advantage of DTRA work. Not that we're

reconstructing the dose to an individual just like Hans would be the first to admit he's not doing a dose to an individual. He's just saying what kind of doses could have occurred.

DR. NETON: See, I think that's where we could use the DTRA stuff. I do agree with that. And we said we couldn't use the DTRA stuff to do, an accurate dose reconstruction to a person with sufficient accuracy.

DR. MAURO: I will agree.

DR. NETON: It doesn't mean it couldn't be used to establish some -- I don't want to say bounding -- some --

DR. MAURO: Sensibility.

DR. NETON: -- order of magnitude level --

DR. MAURO: Just millirem or rem?

DR. NETON: I think that has some merit. I'm still not sure where you go once you come to the ^.

DR. MELIUS: I think we may be back in the same thing, but I don't see any other way --

MR. ELLIOTT: Actually, I think you will be. What dose triggers health endangerment?

DR. MELIUS: Well, it may be able to either say --

DR. ZIEMER: Jim, could I add a comment here?

DR. MELIUS: Sure, go ahead, Paul.

DR. ZIEMER: This is Ziemer. In part I think we have to return to the 250 day itself. I think everyone would agree that it's entirely possible even once you establish an SEC class that there could have been someone there 249 days, just like someone who was there 250 days, who in a sense could have been endangered.

And if you say, okay, 249 days, that's probably true. What about 248, 247? I think what we're, we end up living with a somewhat arbitrary division line which got established through the original process and had some basis in congressional intent I would think. That although it appears arbitrary, it sort of speaks to the probability that the longer the person worked there, the more probable it is that there was health endangerment.

And somewhere along the line someone had to say, well, okay, does that occur after a month, after a year, after five years. We're living with one working year essentially

I think is what the 250 days is. And I think you can always think of a scenario where someone could have had a combination of exposures and the right cancer and so on where they were endangered, and it's not going to be covered.

But the probability of that occurring is not so high as long as you select that line. The 250 days is one of those lines. It's just a criteria. It's not going to take care of every person, but perhaps the majority of them.

DR. MELIUS: Yeah, but, Paul, that's not --

DR. ZIEMER: That's sort of a framework that I'm saying that I don't think we can ever think of a situation where we're going to cover all of these. Any criteria we come up with someone can think of some event that will give you a condition where perhaps someone should have been compensated, but they won't be.

DR. MELIUS: We understand, Paul, but I think our focus has never been should 250 days be changed to --

DR. ZIEMER: Oh, no, no, I'm not suggesting

that at all. I'm simply stating that I don't think it's beneficial to try to think of particular events where someone, in fact, you know, they were there the one day when something could have occurred. It does help I think to inform us. You know, for example, if the external really is minute compared to the, or the internal compared to the external at NTS that's helpful, but at some point you still have to say what are you going to do with this all.

DR. MELIUS: Yeah, but our focus is on acute incidents.

DR. ZIEMER: Right.

DR. MELIUS: And so the one day, I would say if you were there the day of the incident -- I know there's a sort of a factual issue there -- but that's I think the focus, and that's something that was, quote, remember evolved from the original legislation, the Amchitka, so forth. And it also I think evolved from the regulations that were put in place that, yeah, have some vagueness and arbitrariness to them also.

But the problem is they didn't say you

got to be there for 60 minutes or whatever because that wouldn't have worked. So the focus is on the acute incident, and criticality as we discussed is sort of a broad range of exposures and so forth. So we've got to try to figure out is it appropriate to compensate some of these people. And Hans related these acute incidents.

And to me I think the best way forward I can see on the Nevada Test Site issue is looking at the DTRA thing. And I don't see any downside to that other than that we don't have a line to measure it against, but we're never going to have that. At least we haven't been able to come up with it so far.

So it makes sense as a way of moving forward and understanding this and say that, look, anybody in these incidents we can reconstruct external exposures based on the information we have and that we have good evidence and a range of incidents that we've looked at that the risk for their internal exposures would be very, very low or whatever you want to say. Then I think we have a way of moving forward at least on that example

that won't deal with the other situations, to that. And it may not be what we'll find or maybe it narrows down the types of incidents or situations we look at in some way.

So since I promised to break at 11:30, should we take a ten-minute break? And then we'll come back and we'll focus on the Ames report.

DR. ZIEMER: Well, have we got everything we need out of this one?

DR. MELIUS: Well, I'm going to give ourselves ten minutes to think about that, and then --

DR. MAKHIJANI: I might suggest that -- I've been kind of flipping through these claims to see if there's another one that would be useful to consider. The case of the worker that has a very high external gamma dose, 18.5 rem actually, from a single year and then there were doses in other years. And there's quite a description of the activities at the test site as a coworker --

DR. MELIUS: Can you give us the number?

DR. MAKHIJANI: It's section number 3.4.3. It's on page 31 of the report.

DR. MELIUS: We don't have page numbers, Arjun.

DR. MAKHIJANI: I'm sorry. I will change all that.

DR. MAURO: About two-thirds of the way through the report.

DR. MAKHIJANI: If you look at the dose table it seems that he had a quite a few significant exposures until 1956 at least. And then he describes being involved in working in a number of bomb tests in each operation. So he worked in five different operations. He worked in several bomb tests in each operation. And he had a coworker who received quite a high dose, a higher dose than what he says he received. And his coworker died three weeks after this incident. I'm not clear on which, this incident in 1956.

DR. NETON: There's a whole report on that at the very end here. The attachment details the entire incident ^ tables.

DR. MAKHIJANI: And I agree. This is one of the cases where we actually have an incident report. So it's worthwhile considering whether this would be -- the only reason I'm

calling attention to this is it's worthwhile considering whether this might fit the definition of a discrete incident for a person just on the basis of external exposure and whether there might be internal exposures associated with it that might complicate it. I just wanted the group to consider it because it's the extreme case in this site.

DR. MAURO: But no handle on internal dose?

DR. MAKHIJANI: No.

DR. NETON: I don't recall if that incident really involved much internal dose at all. It had to do with pulling a cable and retrieving some instrument package. I mean, there might have been some, but --

DR. ROESSLER: You have urinalysis. If I'm on the right page which is under 3.4.3 and there's some urinalysis results.

DR. NETON: Of course, we don't know what. DPM of what?

DR. MAKHIJANI: Yeah, actually I noticed that.

DR. NETON: We probably can figure that out.

DR. MAURO: No, it actually says in the text claimant had four plutonium urinalyses.

DR. NETON: Four plutonium. Those are not trivial numbers for plutonium.

DR. MAKHIJANI: And then here we actually have a quantitative example to deal with as to whether he would qualify or not. Presumably if we calculated a lung dose for that person it would be quite high.

DR. NETON: I guess this is an example of an incident where we know, we have the information. Then I guess the question is are there other incidents like this that we don't have --

DR. MAKHIJANI: Right, there are a number of cases, this is interesting because we have a report, and there are a number of cases where people, where there are no reports and people have said there are incidents. And so there is the additional complication other than the bright lines and where you draw the line of what you do when you don't have information other than the statements.

DR. MELIUS: But what I was going to propose for going forward we do this DTRA exercise. The DTRA exercise ought to consider a number of these types of incidents. That would be

one, or scenarios. I guess we call them scenarios. And what I was going to suggest is that SC&A propose some, propose how you would approach that. What would be the scope and types of incidents that you would look at with the DTRA thing. Or it may be that you'll have to look at what's available from DTRA also. But we circulate that and come to some agreement that we think it will be useful to do.

DR. ROESSLER: We still come down to, once we have that, what are the criteria for health endangerment. And I think we still get back into how do we evaluate it. Is that health endangerment determined by what we know scientifically, epidemiologically, or in equity is it compared to the people who are actually being compensated? And that's what's tossed around in my mind is how do we determine the health endangerment?

DR. MAKHIJANI: That might be a useful criteria though.

DR. ROESSLER: Which one though?

DR. MAKHIJANI: How do these kind of situations, maybe it's a situational analysis

that you want compared to people who would be compensated. I don't know.

DR. MAURO: In other SECs that question is answered all the time. In other words whenever a judgment is made, one of the criteria, two big ones, can you do it and the answer is no, if it's no. Second, is there reason to believe there was health endangerment and then the answer is yes. And so some place along the line someone is making that judgment.

DR. NETON: That judgment is made because you can't bound the dose. But in fact that's just a criteria right there.

DR. MAURO: Isn't that the first one? I guess I felt as if the first one was --

DR. NETON: There really is just one.

DR. MELIUS: There really is just one, and it's for the class, and it's a distribution. And I think we recognize that if we could, if we try to look at it in the same way we're talking about now that there'd be some that may be on the lower part of the curve and some people on the upper part. But we're recognizing that there's no way we can tell

where people go on that curve. And that's the interpretive informational aspects of it.

So it's hard. I mean, I don't think we're trying sort of avoid the issue. It's just a hard issue to get at, and we're trying to be fair to people exposed in these acute incidents. I don't have any, maybe not smart enough to think of another way of doing it other than let's look at the way, may make it easier, we hope it makes it easier to figure out where a line is or what's appropriate, but it may not. We don't know, but I think at least it gives us some harder information, some better information to think about.

DR. MAURO: We do have this one case, and I'd have to say I'm very glad you pointed this one out where you have some bioassay data which can readily be converted into what kind of dose --

DR. NETON: I was going to say we probably have a dose reconstruction but then I realized he's in the SEC.

DR. MAKHIJANI: Most of these people are in the SEC because they didn't work less than 250 days. They're just describing their incidents

just from the theoretical point of view of doing a situational analysis of why --

DR. NETON: Right.

DR. MAURO: It's a scale question.

DR. NETON: Yeah, you get a feel.

DR. MAURO: We'll get a feel. This is the dose his lungs could have experienced.

DR. NETON: I predict there'd be some pretty significant doses here. But were those doses accrued over an, if those were accrued over a four-year period so was that an incident or not? Those would probably be models of a chronic exposure scenario. I mean, that's what we would do. If he got four years, actually, this is two years' worth of doses.

The other issue, and I know it's probably not relevant because Arjun always says it isn't, but the probable implications of this, I think -- I've forgotten this number exactly -- but there's something like maybe 60 people out of the eligible population are in the SEC to have less than 250 days. And then, I don't know what that means --

DR. ZIEMER: At NTS?

DR. NETON: Yeah, I think it's, there was

something around 60. That's my recollection.

DR. MAKHIJANI: Well, you could define it also as a discrete incident and add them.

DR. MELIUS: But also even that's sort of a biased number in the sense that people, I think everyone knows it's 250 days the way DOL counsels people when they apply and so forth, we tell them it's more likely if you work there longer. And I think our selection of NTS wasn't based on the fact that it was 60, but it seemed to be the kind of incident we needed, the kind of scenarios that we needed to look at.

DR. NETON: But would it not be more informative maybe to look at the types of exposures for people who were involved at the plant less than 250 days? If they were truly involved in these type of, because most of these people are not in the SEC as Arjun just pointed out. These are long-term workers who were doing some --

DR. MAURO: That's a good point.

DR. NETON: -- pretty routine work with many opportunities to get involved in incidents. Now you take these 60 people that were

probably short-term contractors doing specific things, and I recall looking at them building structures and doing things, coming in and off the site, are those people really likely to be, or are we biasing our results by looking at --

DR. MAURO: It was my understanding though that the short-term people were very often were the people that came in for particular tests. They may have actually come from other sites to come in to support a particular test for --

DR. NETON: But were they not the workers who were doing the actual chain pullings and, you know, I don't know.

DR. MELIUS: I don't have any objection to doing that, but remember again, we just looked at these because we wanted the scenarios.

DR. NETON: Right, and clearly this has demonstrated the potential here.

DR. MELIUS: Would it hurt to do that, those 60? I don't think so, but I'm not sure.

DR. NETON: I'm just concerned that if we came up, you know, this particular person was a long-term worker, are the people there less

than 250 days really involved in these type of activities? That's the question.

DR. MELIUS: Then let's do it in parallel. Let's do the DTRA effort and then do that at the same time because that may help us in saying, well, practically, we don't have to --

DR. NETON: (Unintelligible)?

DR. MELIUS: Yeah.

DR. MAKHIJANI: Well, maybe NIOSH should pull those.

DR. NETON: I already have. We had them on the O drive a long time ago.

DR. MAURO: And you have this person's story so we get a sense of whether --

DR. NETON: We could look at the, I mean, I don't know if it's exactly 60 -– don't quote me on that number, but look at the population of workers with less than 250 days just to see if there's some that stand out.

MR. ELLIOTT: Are you applying this based on if they lived there though?

DR. NETON: Actually, you're right. It's 83 days, isn't it? If they had lived, had, not permanent residence but continuous residence during their --

MR. ELLIOTT: They would only have to spend 83 days by definition.

DR. NETON: But I think it would behoove us to look at those cases a little bit.

DR. MAKHIJANI: So NIOSH is going to do that?

DR. NETON: Yeah, I mean we'll pull them out. I think I've already got them summarized at one point. In fact, I'm very sure I presented this at some point, but I'll dust those off and see --

MR. ELLIOTT: In this scenario you're still trying to answer the 250 day issue but only looking at 83 days. They kept those folks out.

DR. MELIUS: We really are looking at the one day. Back to Paul's point, we only really care about the one day. I mean, Jim's point is that let's look at the people 250 days and see how many of them have these one day --

DR. NETON: Yeah, are there stories like this permeating throughout these 60, and there may or may not be. I don't really recall.

DR. MAURO: And that would solve the NTS question. In other words it wouldn't solve --

DR. NETON: As we said our case is going to come in the door. We do have to solve it universally, but I still think the form is to look at what we have in our hands and say...

DR. MELIUS: Now we will take the ten-minute break.

DR. ZIEMER: How long is the break?

DR. MELIUS: Ten minutes. We'll reconvene I think about five of.

DR. NETON: We won't break the connection. We'll just put this on mute so we won't be able to talk to each other.

DR. MELIUS: We'll try to remember to take the mute off.

(Whereupon, a ten-minute break was taken.)

AMES REPORT

DR. MELIUS: So, Hans, do you want to give a brief overview of the Ames Report?

DR. BEHLING: Yes, I can, and let me first start out by saying is there anyone out there who doesn't have access to the report. This was sent out back in June of this year.

DR. ZIEMER: Let's see, the electronic copy was called what on that one? Is this the Ames Blowout Analysis?

DR. BEHLING: Well, Paul, Kathy just sent out to all of the working group members the report in case, just in case you don't have it.

DR. ZIEMER: What's the title of it?

DR. NETON: It starts out, "The relevance of the 250-day workday requirement..."

DR. ZIEMER: The title of the report?

DR. NETON: Yeah, the relevance, there's big, it says WORKING DRAFT in caps and underneath it says, "The relevance of the 250-day workday requirement to potential exposures associated with a single blowout."

DR. ZIEMER: Oh, okay.

DR. MAURO: June 2007.

DR. BEHLING: And by the way, that report was PA reviewed so you can basically discuss it as it exists.

MS. HOMOKI-TITUS: Actually, we're not sure who did that Privacy Act review, and we want to go through it again before any names are mentioned. I think that was done before OGC was assisting with Privacy Act reviews.

DR. NETON: Because it's also stamped all over the front, "Do Not Distribute".

MS. HOMOKI-TITUS: Yeah, I'm a little bit concerned until we receive that document and ensure that it was actually cleared, but you all probably shouldn't use names.

DR. BEHLING: Okay, if no one else has any questions, and if everyone has access to the report, I will make reference to it. But obviously (telephone failure) go into detail. But let me just talk in very brief terms.

The Ames Laboratory operated for about a ten-year period, '43 to '53, thereabouts. And their principal function started out to be one of research involving the reduction of uranium to pure metal as well as thorium to pure metal. And as it turned out their success was such where they turned a laboratory into a production facility.

And over the period of time the Ames Laboratory processed about two million pounds of uranium and 130 pounds of thorium. And the process that they developed was the reduction of uranium tetrafluoride and thorium tetrafluoride by various means that included the use of metallic calcium, zinc chloride and other means of reducing the fluorinated

version to pure metal.

And most of these reduction processes occurred under different conditions and sizes, but I identified a standard value where a uranium biscuit of about 42 pounds was reduced, and a thorium biscuit of about 39 pounds was the standard bomb dimensions that would define what potentially might have become an airborne issue.

And as part of the reduction process when you reduce uranium or thorium tetrafluoride to pure metal, the reduction process is a highly exothermic reaction that raises the temperature into the thousands of degrees. And in the presence of moisture which frequently happened, you would get an explosion called a blowout.

And so we know that these events occurred because even though there are no formal documentation to these events in terms of when they occurred, anecdotal accounts, as I cited in our report that reviewed the SEC for Ames, were a common occurrence. In fact, in one of the accounts that was mentioned there was six blowouts in a single day. And

we know that these occurred on a routine basis pretty much throughout that time period.

Having said that, the blowout would create an airborne environment, but in the absence of any documentation that would assess the airborne concentrations or the actual monitoring of workers, we're kind of left up in the air as to what the exposures might have been as a result of even a single blowout. And looking at the data we were basically looking at a model that was totally hypothetical until I came to review the Fernald site profile and realized that we had, in effect, a documented blowout at Fernald.

And not surprisingly, the reduction of thorium metal was similar in terms of the methodology that was used at Ames. And so I looked at the particular situation that occurred in April 1954 at Fernald in which 100 pounds of thorium tetrafluoride, ten pounds of zinc chloride and 35.9 pounds of calcium metal were being blended and resulted in a blowout.

And as a result of that accident and the investigation that ensued, it was established that approximately 50 percent of

the thorium was unaccounted for, and therefore can be assumed to have been volatilized in the immediate area of the area where this took place. And using that particular data I went back and said, okay, let's apply this to the bombs that were being reduced at Ames and assume 50 percent potentially of the material was volatilized.

And on that basis I established a scenario that incorporated site-specific data including the facilities at Ames, which is known as Little Incani*. And looking at pictures and drawings I concluded certain aspects to the surface area and the interior volume during which this blowout might have distributed airborne concentrations of either uranium or thorium.

And these were described in Section 6 of the report that's entitled "Section 6 Assumptions Used for Modeling an Acute Intake Dose from a Blowout". And you'll see a number of assumptions that are lists of one through ten. I won't go through all of them, but you can briefly scan through it and understand what assumptions were used.

And then I established an intake model that says, “Perhaps in the aftermath of such a blowout a person might have been exposed to a very high level of airborne concentration for a period of five minutes,” and stopped at that point, five minutes. Although the anecdotal accounts as given in some of the documents that are reviewed earlier, cited that oftentimes even after such a blowout, people would continue to work there so my stopping it at five minutes was rather arbitrary.

But I sort of capped it and said, okay, let’s just look at the airborne concentration in the first five minutes, exposure in the first five minutes, and stop and then pick up again for the next 30 days involving once the dust settles and it’s now a surface contamination. It’s subject to being re-suspended and potentially being a source of internal exposure for a 30-day period, a one-month period, for workers who might have continued in that environment.

So the model incorporates a very, very short, five-minute acute exposure to the immediate aftermath of a blowout, and then 30

days of exposure involving working there with resuspension of this material. And for that I actually used empirical data as was available from the Ames Laboratory in ^ what might have been the airborne concentrations for that working period.

And in the process I calculated doses that you'll see as part of Table 1 and Table 2 for thorium as well as for uranium. And our model is based on the assumption that Thorium-232 and -228 were in equilibrium and our model is for two solubility classes. And I integrated the doses in behalf of the first year time-integrated dose of five year, ten year and 30 year for bone surfaces and lung.

And you can obviously see from the table that even as little as five years following such an incident the doses to the bone surface would have been substantial and somewhere around 60-to-70 rem to the bone as well as to the lung. And similar exposures, well, reduced exposures would have occurred for the result of a uranium blowout.

But for the thorium blowout obviously it's clear that a single blowout involving the

model parameters that I defined would have resulted in a substantial dose both to the bone surface and the lung. If I look at the SEC criteria as defined in 40-65-83*, the issue is one of protecting all workers for all cancers. So these would obviously be the highest doses associated with an intake.

And I did not go and proceed to establish any calculations for a POC, but obviously you can look at these numbers and come to the conclusion that for a single exposure the doses would be very high to the bone surface or lung from a thorium blowout. And on that basis I believe that a 250-day criteria may or may not be appropriate.

Moreover, if we look at the breakdown between the doses that served for the first five minutes exposure versus the 30 day, you realize it's really dominated by the first five minutes. So at that point I'll leave it open and allow Jim or anyone from NIOSH to respond to these calculations.

DR. MELIUS: You may want to reiterate --

DR. NETON: I can reiterate some of the points I've made. I see what you've done

here, Hans, and I think you've done a nice job at it, but I do have some reservations about some of the assumptions made. And one is that the dust loading could be as high as 3.5 grams per cubic meter and have these people be breathing that over a five-minute period. I just don't know if that's a credible or plausible exposure scenario in my mind.

DR. BEHLING: Well, let me respond. I don't either, and I'm not sure anyone would ever the means to measure such an event because it is an acute event, and it is transient. But I have witnessed a certain thing that I will share with you that just in visual terms may make some sense.

I remember a couple years ago dragging up a ladder an 80-pound bag of Portland cement that at the ten-foot level dropped down to the ground and basically exploded. And I can tell you there was a huge, huge cloud of airborne cement dust that took a few minutes to settle out. And without having empirical data to measure what that airborne concentration was, it is certainly possible for a brief period of time to have such high airborne

concentrations.

And I will also tell you that in the case of Fernald when I looked at some of the actual airborne concentrations that were measured at discrete locations, for extended periods of times they measured airborne concentrations of uranium that, I believe from one of the memoranda I even cited, was somewhere around 600 milligrams. And so --

DR. NETON: I can understand 600 maybe but not five times that.

DR. BEHLING: Again --

DR. NETON: That's a critical distinction in my mind though, Hans, because that brackets your doses here in directly proportional, and if you reduce your doses by five or ten, you're down into some ranges that we were talking about earlier that --

DR. MAURO: Hold on though, remember --

DR. BEHLING: Let me respond to that. First of all I don't know if it's possible to have 3.36 grams per cubic meter for any period of time. But also realize that I cut it off in five minutes. How do I know that it wasn't half of that and the exposure was for ten

minutes? These are arbitrary decisions that you can --

DR. NETON: I know. These are theoretical calculations. I understand that, but I think that's kind of high. Secondly, it makes the assumption that 100 percent of these particles are respirable which I don't believe they are. And when you have an explosion, you've got a lot of large chunks going out. And you can't convince me that it's all 100 percent less than ten micron particulate.

DR. BEHLING: Well, again --

DR. NETON: Again, that's why I think this calculation is sort of borders on the implausible. I don't deny that there were large exposures there, but I think these doses are inflated by quite a bit.

DR. BEHLING: One thing is for certain when you talk about the exothermic reaction that took place that may have involved temperatures in the thousands of Fahrenheit may have certainly volatilized the metal into a state where at least a brief period of time before it condenses again onto particles.

DR. NETON: Yeah, we're getting into physics

of what happens here, but I still think the way it settles out, especially when I talk to people at Fernald that have witnessed these type of things, it just doesn't go that way. But we're not going to answer that here or there, but I'm just pointing out my reservations for some of these calculations.

The other thing is I'm not sure that these multiple scenarios that you postulate, these ten times, that sort of becomes a chronic exposure scenario then over a long period of time which is what we've covered.

DR. BEHLING: Wait a minute. I'm not sure I follow what --

DR. NETON: Well, you're talking about ten blowouts, one blowout a month for ten -- I don't know. What was it?

DR. BEHLING: No, no, no. This is just to show you that there is a certain degree of periodicity that can be reasonably expected so that one could say any person who worked there for even one month period may have, within that ten-year timeframe, been exposed to at least one blowout. That's all it was. I'm not saying that I want people to be exposed

for ten months for ten individual, discrete events.

DR. NETON: Well, I thought that's where you were going to head when I was saying these exposures are much smaller, I believe, than you've calculated. Then you would have to start speculating as to more blowouts to get it up to the point where you might have a higher dose.

DR. BEHLING: No, no, what I intended to say here is that any worker who worked there for even, let's say, a one-month period of time between '43 and '53, may have been subject to such a blowout. That's all the point was here. The calculations that I intended to use here are strictly confined to a single blowout and nothing more.

In other words if the issue was one of, oh, there was one kind of blowout at Ames. The next question is, well, who was there during that time who would have been affected by that. And the question is we don't know that.

But in this case we're talking about the routine event so that any person, and I've

looked at some of, in fact, some of the documents that I looked at actually had the names of individuals. And during that period of time there were awards given to people who were there for one year, two year, five years or more, et cetera.

And I remember seeing a list of names whose employment was less than one year. And again, this is relevant here to the discussion of the 250-day criteria because there was a substantial number of workers whose total employment was less than one year.

DR. MAKHIJANI: Just as a point of information about maximum dust loading that has been measured in a nuclear weapons complex. I've often mentioned a Fernald measurement of 97 ^ MAC. That comes out to four and a half grams per cubic meter.

DR. NETON: Right, that was the sample, Arjun, we talked about that was taken inside a dust collector. I mean, you always --

DR. MAKHIJANI: I don't believe that, that you haven't read the document. That's not correct.

DR. NETON: You brought this up in a past

meeting.

DR. MAKHIJANI: This is not correct. I have the document, and I can read it into the record.

DR. ZIEMER: Can I ask you a question on that, Arjun or maybe Hans? At those dust loading levels, is that in terms of, for example, visibility and so on, how is the sort of atmosphere characterized around the person? Because typically people do, their avoidance mechanism, if the dust loading gets to a certain point, people try to get out of there regardless of what it is if they're having trouble seeing or breathing. Do you know in this case physically what the sort of characteristics of that kind of dust loading are?

DR. BEHLING: Let me point, Paul, to page five of the report.

DR. ZIEMER: Okay. I know there's some pressure on the people to sort of stay there and get certain things done, but there are also the avoidance mechanisms.

DR. BEHLING: I cannot read to you the citation that I want you to read because --

DR. ZIEMER: Okay, on page five, is it the first paragraph?

DR. BEHLING: Yes.

DR. ZIEMER: "Corridor filled with dust." The person was, let's see --

DR. BEHLING: Let me read it to you.

DR. ZIEMER: No, I see what you, he was pacing up and down in the corridor that was filled with dust is what you're saying, right?

DR. BEHLING: I will quote that section which does not contain any names. And I quote, "Suddenly there was a terrific explosion which blew out several of the windows in the front of the chemistry building. When I came out of my office to see what happened, the corridor was filled with dust about six feet above the floor to the ceiling. I was relieved that the individual had not been injured, but he looked very dazed and was pacing up and down the corridor. As I passed him I heard him muttering," and, of course, this anecdotal stuff.

DR. NETON: I think the --

DR. ZIEMER: I was trying to relate though at the maximum loading used in the

calculations what would visibility be?

DR. NETON: It depends on particle size, Paul.

DR. ZIEMER: Yeah, of course.

DR. NETON: This was done for the Bethlehem Steel analysis. Mike Thorne did a fairly in-depth analysis of that. And it depends on how big the particles are. It could be a low as a couple tenths of a meter at those levels I think, and it could be a little further, but it would certainly, visibility would be impaired.

DR. MAURO: As a ballpark I've been using from the work that Hans did, and others, when you're at hundreds of milligrams per cubic meter of airborne dust, and generally in the respirable range because we were looking at that, visibility's impaired and respiratory distress. You can't stay in that type of setting very long.

DR. ZIEMER: Well, yeah, because my concern is the five-minute issue is one that I was going to ask about. How realistic is it that someone would stay at that loading for five minutes just in terms of their own avoidance

mechanism? Now this guy was dazed so perhaps that is another factor. Well, you can consider it sort of a rhetorical question.

DR. MELIUS: Yeah, and I think as Hans pointed out we have to sort of balance that with the limitation of five minutes. But to me that would argue for an additional calculation, maybe a, be more realistic about what, how long a person would be at this very high end or what the high end would be. But also be more realistic, assuming there was pressure for them to stay in the room, what would the exposure be for over that period of time? And it --

DR. NETON: As we talk a little bit more, that calculation aside, even if we have a number we can agree on, what's the dose that constitutes health endangerment then? Because unless we have that value, we can do all the calculations we want and come to the conclusion and say, well, it's not 200, it's 100 or 50 or ten, whatever. Unless we can, one has a number to fix on --

DR. MAURO: Well, I think it does bring us where we want to be right now. In other words

in Table 1 Hans puts forth the scale of exposure we're talking about. And from what I heard, yeah, maybe three grams for five minutes, maybe 600 milligrams for three minutes or one minute.

I mean, it's really the integrated intake. How many picocuries did this person inhale over let's say the week following that explosion, you know, after the explosion and continued to work there? I mean, what I would argue is that this is a pretty good starting point to say this is the scale we're talking about within a factor of two, three, whatever.

DR. NETON: Four, five.

DR. MAURO: Okay, five. I'll go with five. And we're also talking about committed dose. You'll notice we're looking at one particular number, bone surface, 30-year committed dose, 214 rem. Now, maybe it's not 214. Maybe it's closer to 50. The question becomes now we're in the realm of committed dose to a particular organ that is not unlike the acute dose to a particular organ experienced in criticality accidents.

Okay, that's where we are right now.

So I think there's a general conclusion that there are plausible scenarios associated with the explosions that occurred at Ames where the committed dose to particular organs are in the range of exposures that people have experienced from acute exposures from criticalities.

DR. NETON: I don't disagree, but I don't know that you can compare a single exposure to the organ to a multi-organ exposure --

DR. MAURO: We're talking about cancers to the organ -- remember, we're talking about a --

DR. NETON: Hear me out. The intent of citing a criticality was that there would be an unambiguous agreement among health physicists that health could have been endangered. That that would have, the evidence of some deterministic effect would be so high that a reasonable health physicist would conclude that health could have been endangered, and that would be cancer risk because it's most likely that cancer could have been caused by that high exposure related to a criticality.

That implies though that all the organs were irradiated, and then what is the chance that one of those organs might develop cancer down the line? This is different now in an after-the-fact test that we're saying, okay, we've calculated this organ, this bone surfaces could have developed, let's say, 50 rem of exposure over 30 years. It's not acute. And the fact is that that risk is not equivalent to that criticality exposure. And not in any way, shape or form is the risk of developing a cancer equivalent.

DR. MAURO: But the exposure is.

DR. ZIEMER: Well, there you don't use, you probably don't use all of the dose in the risk determination because of the latent period.

DR. NETON: That's true.

DR. MAKHIJANI: You're setting this up as an a priori versus a posteriori case, but I think the whole program is a posteriori. You're dealing with only with -- no, wait a minute. You're not asking whether the population of people who worked less than 250 days should be included in a less than 250-day category, you're asking among the population those who

are known to have cancer should they be included. So I think the analogy that, you know, you have whole body and could they get cancer as an a priori analogy is not correct.

DR. NETON: But remember -- let's follow the line where Dr. Ziemer was going though. You've got a 250-day criteria that's already in place. And it was our opinion, I believe, that to change that there would have to be some very credible, unambiguous exposure scenario to move it down to less than that. And it would not be based on doing an IREP run and looking at the percentiles because you can't. You just don't know what the doses exposures were.

MR. ELLIOTT: Because we have admitted we can't reconstruct this dose.

DR. BEHLING: But let me make a point here on that issue. I fully agree with the 250-day criteria for a select circumstance that, for instance, is one where we have workers in on a routine basis exposed to a controlled environment -- and I underline controlled -- where we can reasonably conclude even if there was no monitoring, that exposures were less

than 300 millirem external a week and airborne concentrations were less than the maximum permissible air concentrations as defined in those days.

And on the blanket assumption, the blind assumption, that these controlled environments exposed people for a period of 250 days, that would amount to certain exposures where one could reasonably say, well, we don't have any monitoring data. But on the assumption they complied with existing regulations for external and internal, the doses would have been too small for people exposed to less than 250 days or one work year.

We're not talking about a controlled environment here. And as Dr. Melius pointed out earlier, we're talking about acute events, single events, a moment in time, and all I wanted to say here is that these exposures amount to significant, integrated, time-integrated dose for an acute exposure internally.

DR. NETON: And I agree with that, but and also as we've discussed before, these doses

are delivered over a protracted period of time. And so the risk of developing cancer is not equivalent even given the same unit dose.

DR. BEHLING: Nobody said they are, and I hope you don't think I'm arguing with the issue of parity between a time-integrated internal dose and a single moment in time external acute exposure. They're not equal. You'd have to be something of an idiot not to understand that there are obviously differences.

DR. NETON: Okay, Hans, let me ask you this simple question then. How would you conclude then that this 214 rem, 30-year bone dose endangered health? What would be your test?

DR. BEHLING: How would one calculation say, let's just --

DR. NETON: With what?

DR. BEHLING: -- a guy was working there somewhere around 1945, and he came down with a cancer that was documented to the lung or the bone, let's say 20, 30 years thereafter. Do an IREP and come to your own conclusion. If the POC was greater than 50 percent, you'd have to come to the some understanding as to

whether or not this person needs to be compensated even though the exposure was a moment in time exposure --

DR. NETON: But this is not a person. This is a class that you're establishing so what you're using is your criteria to establish the class.

DR. BEHLING: Well, you know, we obviously have an understanding that there were people at Ames, and as I said I have documents in my box here that says there were a substantial number whose employment was less than a one-year timeframe which means that we would exclude them from consideration based on employment period without regard to their internal exposures and without regard to the dose that they may have experienced to an organ that is their cancer. And I would have to say if I were one of those people, I would want to contest that 250-day criteria.

DR. ZIEMER: If those people could establish that they were there during incidents, they could go through the very construction that you're talking about --

DR. NETON: Exactly.

DR. ZIEMER: -- and establish, for example, that they got the 214 rem or whatever bounding assumption. Because this is kind of a bounding assumption here.

DR. BEHLING: Well, Paul, that's what I started out to say. There is no documentation that says on November 29th, 2007, there was an explosion here or blowout. There is not data, so the ability of a claimant to prove that he was there during even one event is basically difficult because of the lack of documentation.

DR. MAKHIJANI: Can we settle a factual point about dust concentrations?

DR. NETON: Yeah, sure.

DR. MAKHIJANI: Okay, I'm reading from a December 7th, 1960, memo, subject: Cleaning Under Burned Out Oxide Conveyors. It's in the Fernald SEC petition, Volume One, page 294, PDF, page 295. The number of air samples from the bottom of page one, the individual, quote, "The individual air dust samples and their respective air pump locations are on the attached table."

There's a table on the next page which

reads, “Breathing zone sample results were, operator cleaning under burned out conveyor averaged 1.3 million disintegrations per minute per cubic meter or 18,000 times MAC.” And then it says, “Up to about one year ago an operator had to position himself,” anyway, the prior year’s results are cited, and it says, “Breathing zone samples of this operation were found to be in the prior year 97,000 times MAC.” It is not inside a stack.

DR. NETON: I remember using the same air samples that you raised, I don’t know which meeting it was, a long time ago, and we went back and looked at it. The operational key there is the guy was underneath the duct, and I think he was cleaning underneath it. And this was coming down from his cleaning operations, not being suspended into the air from a mechanical --

DR. MAKHIJANI: All I’m saying --

DR. NETON: -- very different, Arjun.

DR. MAKHIJANI: There was a person who was working there who was exposed --

DR. NETON: No, but your implication was that you can generate sustainable 3.5 grams of

air from a mechanical operation --

DR. MAKHIJANI: -- than to say the documented air concentrations that are on the same order of magnitude as what Hans has in his report for more than five minutes.

DR. NETON: For material coming down from above, not being generated. Big difference, Arjun.

DR. MAKHIJANI: Well, was a worker exposed to multi-gram per cubit meter --

DR. NETON: Can a worker be exposed from mechanical generation of air up into the air and sustained it at 3.5 grams per meter? That's my point.

DR. MAURO: Well, I would say that ^ extreme is this falling. In other words we are dealing with a very extreme scenario --

DR. NETON: ^.

DR. MAURO: -- which I think Hans has made a very powerful case. Those scenarios are real, and they did occur, not --

DR. NETON: As long as it occurred we don't disagree --

DR. MAURO: -- and the fact that that scenario is real also, it's not an explosion,

but there are scenarios that can occur where perhaps as high as gram per cubic meter of dust loading occur for some short period of time. So I think that we have accomplished a certain amount here, and that we do know that gram per cubic meter levels are high, hundreds of milligram cubic meter --

DR. NETON: Hundreds of milligrams I'll agree with, five-, 600 milligrams.

DR. MAURO: -- but on that order because that's well within a factor of five. And to me we're in a factor of five. We're doing pretty well. It can occur for some relatively short period of time, maybe minutes. So I mean the scenarios are real. I think there's agreement that these kinds of exposures within a factor of five --

DR. NETON: Well, I think there's a difference.

DR. MAURO: Again now, remember, as Hans pointed out, it was, he just said this was a one-month thing. In other words this is the scenario. The event occurs, an exposure over a period of a month. So that's one-twelfth of the time period, but it's one of these

scenarios where these exposures apparently occurred multiple times. Does that mean that it's possible that there are scenarios where the exposures were greater than this?

So I would argue that within the realm of reasonability, someone could probably put a boundary on. It could be as low as this, but it could be as high as that.

DR. BEHLING: John, just for your sake there's reference to a single day where six blowouts occurred in a single day.

DR. MAURO: Yeah, that's the point I was making. I don't think we can parse this very well. I think we put a, maybe place it in a box, and we can actually come to an agreement, yeah, probably it could very well have been higher than this but not very much higher than that.

And I think that Hans' number may fall toward the higher end, but it's still within the box that I think reasonable people could say, yeah, that could have occurred. That intake, that intake could have occurred on this relatively short period of time, less than 250 workdays.

DR. NETON: I'm starting to look at this in terms of kidney effects and stuff. I mean, these things are ridiculously high.

DR. MAURO: Well, but that would be another, the case could be made that such scenarios could not have occurred.

DR. NETON: I have not looked at this in detail from the plausibility perspectives as far as kidney damage occurring and all that kind of stuff. But the point is even if we do decide what's your cut point, Hans' litmus test is to do an IREP run. And I would suggest that you can't, it's a difficult thing to do because you have to make up a hypothetical case.

DR. MAURO: In other words is it more likely than not this will occur? I mean, let's say you just picked an IREP run without even trying to --

DR. NETON: What's your latency? What's the age at exposure? What's the age at diagnosis? Those all come into play in determining whether or not this exceeds 50 percent.

DR. MAURO: Is it your sense that just about everyone, let's say it was a ten-year latency.

The guy was in his 20s and ten years later or 20 years later. Do you think in general you'll come up with a positive --

DR. NETON: Was it a 200 rem dose to the bone over 30 years? I don't know.

DR. MAURO: Now the other side is I would say that there's another test, and that has to go back to the criticality. I think there is an interpretation of the rule here that scientists really are not going to be able to help on, mainly we have agreed in general, I believe, that when you're talking about 50 rem, 100 rem. We're in the realm of declines of doses that are associated with -- and we could show that. We have the records -- that say that it's not unreasonable to say that's the kind of dose people would associate with a criticality.

DR. MAKHIJANI: The tables we didn't have are conclusive --

DR. MAURO: Well, I, when I looked at the data, I said, my goodness, it goes from a fraction of a millirem up to hundreds of rem. And --

DR. NETON: So ^ is exceptionally high I

think is the words --

DR. MAURO: -- and there are numbers that are off ^ , of course, but I've added --

DR. NETON: -- Exceptionally high would imply first of all above some of the regulatory limits by some multiple.

DR. MAURO: Okay, I'm taking a leap of faith right now. From looking at the data from the criticality I think back to -- I remember the number hit me right away, 100 rem. I said if anybody's going to, if I was going to pick a number. Someone else would say, well, I'd go down to 50. Some others may say ten. I think anyone who would pick a number in that range would not be being unreasonable. I'll try to argue that case now. That's me speaking right now.

Then we have the dilemma, okay, if somehow we could come to some agreement, even if it was a 100 rem, even if it was that high, that would be comparable to criticality. The question becomes the fact that it's a committed dose as opposed to an acute whole-body dose, does that change the whole story or have we met that threshold as defined by the

law. The answer is I can't answer that question.

DR. NETON: I can tell you they're not equivalent risk. Arjun may argue this, but if you say that you have 100 rem whole-body exposure, that's what, 20 times a regulatory limit of five rem, right? One hundred rem exposure, 20 times the regulatory limit. This exposure is 214 rem. If I apply ICRP new weighting factor to bone surfaces wouldn't exceed a five rem limit for exposure. So therefore they're not equivalent risk. They're not equivalent risk. If Arjun, if you insist the risk of developing cancer and the regulation has any bearing on the risk of exposure related to cancer which is they do, then you've got a factor of 20 difference between those two numbers.

DR. MAURO: Do you realize what you just did though? You just drove yourself into IREP. There's no escaping it then. If you're going to start to make a risk-based argument --

DR. NETON: And I'll saying you can't do that --

DR. MAURO: -- I mean, if once you start to

make the risk-based argument to try to say that, no, it has to be risk equivalent to a criticality, you have no choice but then to start to do risk, do probability of causation and start to ask yourself the question are we talking about doses to organs that it's not unreasonable to say, yeah, we could have a probability of causation greater than 50 percent.

Certainly, there are going to be, try to find the limiting. I'm not saying that. I'm saying that, listen, are we talking about doses that everyone would agree have the very real possibility of resulting in a POC of greater than 50 percent. And how you do that, but I think that's where you're headed.

DR. NETON: I don't know if that's practical. I'm not heading that way because I'm just, the regulation essentially doesn't address that issue because of that very reason. It had to be somewhat intuitively obvious to someone looking at this that this is a very high exposure.

DR. MELIUS: Jim, see, I think that's a very faulty interpretation. It's your personal

interpretation. It may be what you intended. It's not in the regulation, and I think when we went back and examined it, it's open to other interpretation. So I think we have to think what's fair to the claimants. How do we have equity in this program so that a person, so that invariably deals with some of the risk issues in terms of endangerment?

DR. BEHLING: Can I make a comment here?

DR. MELIUS: No, no, you can't because I'm still talking, Hans.

DR. BEHLING: Okay. Let me know when you're finished.

DR. MELIUS: And that so that we have this equity issue to deal with which invariably I think has considerations of risk with it and how are we treating people that have these acute exposures in this program? So where do these risk comparisons? Well, do we do it for someone exposed for 20 years or 250 days because that's the lower limit on the other end.

And I think we know there's a distribution of this, and it gets into a very complicated scenario, but I really have

concerns about going to this area, well, it's going to be the judgment of used of health physicists would just all agree unanimously that this must be endanger. I think we have to go back to what we've already decided in the program and base it on that and figure out how we approach it in that context. I'm not sure if it makes it easier or harder, but --

DR. NETON: I don't know if what you're suggesting is doable because we tried this four or five years ago. And what you're going to have to do is then, if you're going to run IREP, it's not just these organs, it's all potential organs because you can't presume a priori that the highest organ, you know, exposure to ones that are going to go over 50 percent. And then under what scenario, what latency -- there are a tremendous number, also an infinite number of combinations that one would have to do a test using IREP to make a conclusive determination that health was not endangered.

DR. MAKHIJANI: Well, I think it's the other way around. If you're looking at the cross, you have to do one calculation to show that

health was endangered and then it's over. I mean, you're talking about a class of people presumably.

DR. NETON: Yeah, right. But there are classes that you, if you, let's say, to be fair with equity across all the analyses and it intuitively didn't look like that's like anything, where do you stop your scenario analysis so you don't top over 50 percent. You can't envision doing that.

DR. MELIUS: There's an issue of how do you define equity. How do you calculate that equity? But I think that's, you know, another and important consideration. The other scenario approach I was thinking of that you actually mentioned was, well, if you do the calculation, you can bound. So therefore, dose reconstruction is feasible.

What if we made that assumption for this group of people. No reason to say that there isn't some that for people with short-term exposures that, or short durations of exposure who worked there, that we might be able to bound doses and not be able to do it for other groups. I mean, that's, you've

never done it, but if we did that, what if we then presumably we're convinced that this is...

But then based on the fact that we then come up with what we think are plausible scenarios for that and there's some effort doing that, but we probably have enough facts to figure out what would be the average incident or something like that or some --

DR. NETON: You know, some uncertain distribution.

DR. MELIUS: -- distributions or whatever. And then we find in this instance -- and I'm not, again this is an assumption -- that these incidents were so frequent for these people with certain kinds of jobs, they're working in certain parts of this civilian -- I've forgotten a lot about Ames.

But that chances are that if you worked there for a day or a week or a month, you were likely to have been exposed in an incident. Because we know the records are not, we're not going to have individual records. Is that an approach to think about?

DR. NETON: Well, I think if we can put a

plausible upper bound, we would reconstruct the dose. But the difference there is you're not doing a hypothetical dose reconstruction that you couldn't bracket because you don't know what the parameters are, you're doing real dose reconstructions on people based on their --

DR. ZIEMER: Isn't this already an option?

DR. MAURO: Yeah, it's in the matrices.

DR. ZIEMER: Even though the documentation of the blowouts is not apparently on the records, just the fact of establishing that they occurred is by witness, right?

DR. NETON: Right.

DR. ZIEMER: Or affidavits?

DR. MAKHIJANI: No, in the documents.

DR. ZIEMER: I mean if you were to go the direction of saying, okay, there were these blowouts; and therefore, if people worked there, say, less than a year, they are eligible, you still have to establish that the blowouts occurred by affidavit or somehow. Well, if you can use that --

MR. ELLIOTT: Establish presence at a blowout by affidavit.

DR. MAURO: They're presumed there.

MR. ELLIOTT: What if you presume --

DR. ZIEMER: That's what I'm getting at. Similar to what Jim is saying. If you can establish that the blowout occurred in 19-something, and the person worked there that year, and they don't know whether they were present at a blowout, could you not do a dose reconstruction and make that assumption?

DR. NETON: That is an option.

DR. ZIEMER: I'm saying isn't that option already there? I mean, all right, the person maybe hasn't established that they were at a blowout, but if they don't know, if we don't know when the blowouts occurred and the people are somewhat, maybe not everybody knows that they were there.

DR. MELIUS: It's not an option now, I think, because we've said it's not feasible, but that lack of feasibility for dose reconstruction was based on chronic and not just blowouts.

DR. NETON: I think you're right, Doctor. I don't think there's anything to prevent us from doing a, we always do partial dose

reconstructions for people who are not in the class. And then we do a dose reconstruction to the best extent possible given the information we have at hand. If there's an indication in the CATI or in the records somewhere that this guy was involved in blowouts, I don't think there would be anything legally preventing us from attempting to reconstruct the dose.

DR. ZIEMER: Just as was done in this example.

DR. NETON: Yeah, or something similar.

DR. ZIEMER: Yeah, yeah.

DR. NETON: So to that extent, that approach, yeah.

MR. ELLIOTT: But your starting point has to be there. You have to understand a source term.

DR. NETON: Well, I think we've got a pretty good idea. These are 40 pound charges and they were furnaces --

DR. MELIUS: We're worried about going, we're struggling with going the other way of saying that we can't and these are like a criticality or whatever you want. But what if

we go the opposite? Now I'm not saying that's, this may be unique or situation, but, and I would argue you would have to have an affidavit. I think you'd have to define who's in that class. Who you can do that with because I just don't, my recollection is the records are so poor or the incidents were so frequent that you could presume that people in certain years or types of work or whatever.

DR. NETON: On a practical basis I don't, Hans seems to know better than I do, but I don't know if there are that many people at Ames that had less than 250 days that were what I consider like chemical operator types or something to that effect.

DR. BEHLING: I don't know what their job complications were, but I do have a list. As I said it involves awards that were handed out by the director to people for periods of employment. And I remember seeing one page that says less than one year. And if there was something like in that particular document, 20-some people whose employment period was considered less than one year.

DR. MELIUS: Dr. Fuortes corresponded with

us recently and I can't remember the situation or the example exactly, but it was a two less than 250 days. And to me it was, my recollection is that it was plausible in terms of being exposed to incidents. Whether it was just his memory or what I don't recall, but --

DR. NETON: In my opinion if we can bound the exposure it's preferable to do this in this manner to apply the doses to the people who were receiving those exposures, and then also the doses to the cancers that were more likely to have developed as a result of those exposures.

DR. ZIEMER: What I'm thinking about is the possibility of saying, okay, we don't know exactly when these blowouts occurred, but based on affidavits we know that in this certain year there were multiple blowouts. And that therefore anyone who has a claim in that year we will assume that they may have been involved in the blowouts and whatever the bounding calculation is for that you give them credit for that. It would still be a dose reconstruction rather than an SEC, but it would take care of those kinds of situations

where there's some ambiguity.

DR. NETON: Personally I feel comfortable in looking at that although I don't want to speak for Larry and/or our OGC folks who might want to look at the legality of the SEC and how all that plays out. But I --

MS. HOWELL: Can I just ask a question? I mean, if you -- I'm just trying to understand what you're proposing here. It seems to me it would fall under the rubric of the dose constructions and not the SEC --

DR. MELIUS: Yeah.

MS. HOWELL: -- because you're having to look at a whole different set of parameters.

DR. MELIUS: Well, it --

MR. ELLIOTT: You established the class. What you're doing now is saying here's a unique exposure scenario. Can we reconstruct it for that class and for the non-presumptive claims for that class?

DR. MELIUS: Right now we go back, and we try to partly from dealing with the Department of Labor on some of these classes, we go back and we try to specify what we can, what NIOSH can construct --

DR. WADE: With sufficient accuracy.

DR. MELIUS: -- with sufficient accuracy, blah, blah, blah. You know, do that, I'm not sure. I know we don't try to be comprehensive about that because we don't know everything at the time but there's other stuff. But I think it helps in terms of when basically for DOL to recognize who's in and who's out and so forth.

MR. ELLIOTT: We currently don't reconstruct Ames' doses this way I don't think.

DR. MELIUS: Yeah.

MR. ELLIOTT: We don't look at this exposure, this specific exposure --

DR. NETON: We're not studying any internal exposure at all to anyone on a non-presumptive cancer at Ames for less than 250 days. But I don't know if there's anything that would prevent us from doing a partial dose reconstruction that --

MR. ELLIOTT: I don't think there is.

DR. NETON: -- for the people who it would make sense to do that.

MR. ELLIOTT: If you have a plausible bounding approach.

DR. MAKHIJANI: Well, for partially you

don’t even need bounding.

DR. NETON: Well, this would really be a, I guess it would be a partial, but --

DR. ZIEMER: It would be a kind of a bounding.

DR. NETON: A bounding because you don’t want to, you have to be able to bound it in order to do that particular --

MR. ELLIOTT: Yeah, you have to come in with the maximum plausible. With anything less you run the risk of not achieving what you’re trying to accomplish.

DR. NETON: And, yeah, these people are not members of a class anyways, not members of an SEC class by definition.

MR. ELLIOTT: You’re trying to give them the best dose you can.

DR. NETON: Well, except I think we still wouldn’t be able to do the routine, we couldn’t assign them anything but the incident exposure.

DR. MAURO: That’s the only way you could do it. It’s interesting that, we’re claiming that we can do exposures from explosions but not from chronic exposures.

DR. NETON: Well --

DR. MAURO: I'm not used to thinking that way.

DR. NETON: I mean, it's a very discrete bounding event where you know how it happened initially, how much can you generate in the air, and you've done --

MR. ELLIOTT: Let's be honest here. NIOSH can come forward and say this is how we would treat that. We can reconstruct dose with sufficient accuracy because we can apply a plausible bound here, and so we're not going to add that component or that group to the class. And you also could say, well, let's think about that. We don't know that we can bound that dose, so we're back to square one. If we put forward a class, if a class comes out of this, and we have to evaluate it, we say we can reconstruct that dose scenario for that class.

DR. NETON: Well, if we can't --

MR. ELLIOTT: Then the question becomes is a bounding scenario appropriate.

DR. NETON: And then that's appropriate. Then it goes through the SEC process, and the

SEC litmus test would be mere presence. Can you bound it with sufficient accuracy, and the answer is no, and then --

MR. ELLIOTT: Isn't this the circular discussion we had about five years ago? Just around and around. It all brings us back to the same dilemma.

DR. MAURO: But we never talked about it with respect to explosions. We never asked ourselves the question can we -- see, Hans worked his calculations solely to show that, yeah, you get pretty high doses with these explosions. But now we're at the point where we say wait a minute --

MR. ELLIOTT: We talked about different scenarios and saying first of all, meeting the first prong of the test, hey, we can't reconstruct dose. Now how do we determine health endangerment? And how do, where is there an instance where a presence might lead us to say that's enough. And we never could come up with any -- because we kept wanting to go back and we're trying to reconstruct a dose so that we can understand the risk.

DR. MELIUS: Exactly, exactly. No, we did

go round, and so then we sort of threw out the criticality thing as sort of a --

MR. ELLIOTT: We had public comment on this all over the place, trying to identify a bright blue line here.

DR. MELIUS: Right, and we ended up with saying let's just keep the 250 days. Criticality was our way of dealing with that acute incident thing, but we didn't think it through because we didn't have an example and now we're dealing with it. But I would even, you know, we think this is --

MR. ELLIOTT: Well, we had examples. We were trying to wrestle with it.

DR. MELIUS: No, no, I --

MR. ELLIOTT: We didn't do that in the public forum, in the Board forum.

DR. MELIUS: But I'd also say that I think that this approach is worth exploring. I think it gets us the same thing with NTS, you know, what John was talking about now.

DR. MAURO: We're further along here. We're further along at Ames than we are at NTS.

DR. MELIUS: And that's the way I would suggest to go forward is let's try to make the

exposure part of this more plausible. I mean, is that something NIOSH should do? You want SC&A to do? We do it together? I mean, I don't know.

DR. NETON: They've got --

MR. ELLIOTT: They've brought it up to us to react to what we see Hans has delivered here. And if it makes sense to us to take it one step farther to show what Jim has been trying to explain that, you know, how you look at the risk from this leads you to a different place maybe than what Hans was thinking about.

DR. BEHLING: Can I make a comment at this point, Dr. Melius?

DR. MELIUS: We cut off your comment there. I apologize.

DR. BEHLING: Let me go back to the issue of the argument that Dr. Neton has thrown out on the table repeatedly. And that is the issue of parity between a criticality accident that instantaneously exposes all tissues of the body, and therefore, for SEC reasons and the 250-day issue, we'll use that as a reference point.

But the fact remains as the following:

We are giving currently SEC status to Ames Laboratory people for 22 cancers if they've worked there for 250 days as an aggregate. And so the question now is where's the parity between that and the criticality issue? Because I'm looking at the 22 types of cancers, and they include things such as obviously thyroid cancer, male or female breast, esophagus and so on and so on.

And clearly it's understood that the exposure at Ames was dominated by internal exposure to uranium and thorium. And there's probably no way in which you can come up with an understanding that things as breast cancer or thyroid cancer would have resulted from inhalation or ingestion of uranium and thorium. And so what separates the issue of those people who are excluded on the basis of 250 days has nothing to do with the issue of criticality.

It has simply to do with the likelihood that their exposure was less than what would have been an exposure for people who had at least 250 days. And that's really the only meaningful comparison that we have to

look at in coming to some kind of a conclusion as to whether or not a period of employment less than 250 days should be considered for compensation.

DR. NETON: Okay, Hans, this is Jim. I have two comments on that. One is I didn't write the act, and those cancers were not put in there by us, so you're not going to win any points by citing --

DR. BEHLING: Well, I'm just pointing out a few things that simply don't make sense on the technical --

MR. ELLIOTT: And that was our argument for, a scientific argument for cancer-specific classes which we lost.

DR. NETON: And in the second place I'd just point out that unfortunately or fortunately, however you want to look at it, the exceptionally high exposures similar to a criticality incident is in the regulation, and we can't ignore that.

DR. BEHLING: And I realize that, but the issue is also one again, you repeatedly bring out the issue of a certain dose and the deterministic effects associated, but this act

is not there to compensate people for suffering a deterministic effect. It's there for cancer and ^.

DR. NETON: I agree, but --

DR. ZIEMER: Deterministic effects are only clear indicators that the high doses occurred.

DR. BEHLING: Yes. And, of course, they weren't monitored. Going back also to an earlier discussion by Jim Neton, they were people who were assessed, who were employed at Ames who were assessed for kidney damage. And there are documentation for the fact that there was proteinuria and other effects that seem to indicate that these people suffered kidney, renal failure.

DR. NETON: Right. But not complete renal failure I suspect.

DR. BEHLING: Well, again, that's the question.

DR. NETON: I think the kidneys might shut down with some of these exposures that occurred ten times in a month, but --

DR. MELIUS: But just going back to the issue of the organ-specific SECs, the Board didn't like that because it was where to draw

the line issue.

MR. ELLIOTT: For better or worse, where's the line?

DR. MELIUS: It's the same issue. We've always been reluctant to do that because it's hard in a lot of ways.

MR. ELLIOTT: We would be, I guess, ready to take Hans' piece of work here and react to it.

DR. MELIUS: Yeah, because I think making this, let's call it plausible, look at alternative assumptions, sort of call it that way. It would be a way, I mean, it would really move us forward on both fronts. And one is can we think we can bound, can we do dose reconstructions on these. Or secondarily it gets us to furtherance of discussion on, you know, where's the line I guess. Where's the line relative to this, you know, where's A and B situations, people situations, relative to some line even though we can't define the line.

DR. NETON: I think what I'm hearing is we need to determine among ourselves at OCAS that we can, if we can or not bound Ames exposure scenarios to the NTS incidents. And if we

believe we can, put a straw man out there that either is similar or not to what SC&A has put together. If we determine that we can't, we're sort of back to square one. But that it's worth pursuing in my book.

DR. MELIUS: Well, we also would have been some of the issues of these scenarios for Ames.

DR. NETON: I don't want to predict that we say we can. I feel like we might be able to go back and scratch our heads and think about this as well.

DR. MELIUS: I don't think it's futile. I don't think you're just doing it for the exercise. I think it's --

DR. NETON: To the credit of SC&A they've gone a long way towards mapping out the parameters here and what needed to be included. Can we cover all the bases?

DR. MAKHIJANI: Jim, how would you determine the number of blowouts?

DR. NETON: Well, that was what was in the back of my mind..

DR. MAKHIJANI: I think what Hans has done is a good exercise for one blowout, but --

DR. NETON: But then, you know, you need to look at, I was thinking about going back and looking at some of the cases that also are in the SEC. Admittedly, that doesn't cover all sins because we still have to go, you know, there's other cases could come in the door. But, yeah, I think there's something constructive to be learned from looking at the cases we have. What their employment duration was. I think you come up with a credible number of blowouts I think based on production records, something to that effect. I mean, you should be able to bound that somehow.

DR. MAKHIJANI: I don't know. It's an issue. ^ issue than a blowout calculation itself.

DR. NETON: Yeah, I think that would be the toughest issue to overcome is the number of blowouts. I think we might be able to all agree at some point how high, you know, it can't be higher than X.

DR. MELIUS: But we normally do what we call claimant friendly, I mean, I agree that there's work to do to it, but I don't think that's insurmountable.

DR. MAURO: And if this could work here, it could work at NTS, too.

DR. NETON: Well, I don't know.

DR. MAKHIJANI: It's less defined.

DR. MAURO: What we've done here -- think about it -- we've defined a scenario for an explosion. Now the question is can we define scenarios or range of different classes of scenarios that occurred or might have occurred at NTS where we could similarly place a plausible upper bound. That's what we're asking ourselves.

DR. NETON: The problem at NTS is you're dealing with almost a periodic table. Here you've got two nuclides, uranium and thorium, and what are the doses? And that's pretty well defined. We started at NTS, and we read a guy had an iodine exposure. We got another guy who was grossly contaminated going through a cloud. My thought was well maybe come up with an upper bound on the total dose and then just throw it all into one organ, you know, the organ that developed cancer, and you might be able to bound it that way. And I thought the worst internal dose you can come up with

for a scenario is, say, ten rem. Well, it's bounded then if you just give the guy his liver dose -- I don't know. I'm not sure --

DR. MELIUS: This gets us around the point Paul brought up which worries me in Ames. We don't want to get in the thing, well, you had to be there 240 days or something like that or, you know, at least four months. I mean, that kind of calculations, and so by doing dose reconstruction we're just doing it based on the records, whatever you have. And there are some assumptions that are claimant friendly and bounding and so forth. You work off of that and then so forth. I mean, I think it has the added advantage to the extent it helps some of the people with non-SEC cancers.

MR. ELLIOTT: I mean, that's the biggest thing I'm taking away from today's discussions. Here's an opportunity maybe to look at helping those folks out.

DR. MELIUS: Yeah, yeah.

MR. ELLIOTT: We hadn't thought about can we reconstruct exposures.

DR. MELIUS: So, it's good, and I'm

intrigued with NTS, too, but let's see where it is different and more complicated, but it's, let's see where we go with it.

MR. ELLIOTT: The interesting piece here is that it wouldn't change the class definition as we see it right now. It would just help those non-presumptive.

DR. MAURO: That couldn't be helped before.

DR. MELIUS: And we don't undermine them. Anything else?

ACTION ITEMS

DR. MAURO: Does SC&A have an action item?

DR. MELIUS: You have an action item with DTRA. And I think the first step in that is to, I guess one would be to look at the -- I know nothing about what DTRA had.

DR. MAURO: Wanted the proposal, so maybe we can work out the details.

DR. MELIUS: Yeah, in the proposal let's do a three-way thing that moves us forward.

DR. NETON: I'm more concerned about SC&A would have to access the DTRA doses, right? And those are not public record.

DR. MAURO: Well, that could be a, yeah --

DR. NETON: You'd probably have to work

through us because --

DR. MAURO: We're not doing any of that.

DR. NETON: So we could work out something, the proposal first, I guess we're going to look at the cases less than 250 days. We'll profile them at NTS, and then we're also going to evaluate the plausibility of doing a bounding analysis for the blowouts and see what happens from there.

DR. ROESSLER: What's the timeline?

DR. NETON: That's always the last question.

DR. MELIUS: We'll have the reports next week.

DR. NETON: Some of us have use or lose government leave, but I don't know.

DR. ROESSLER: ^

DR. NETON: I don't have to be involved in this. These calculations can be done by others.

MR. ELLIOTT: I don't know that we're prepared to commit to a timeline because I'm not sure what, how many cases we're going to have to look at.

Do you have a sense of how long it's going to take to --

DR. MELIUS: Look it over and then come back. The DTRA thing I think is going to take --

DR. MAURO: Well, the proposal's easy.

DR. MELIUS: The proposal's easy.

DR. MAURO: Once we agree on the proposal, then we'll have to figure out how long it's going to take.

DR. MELIUS: Okay, and then do that. And I think we have progress to report for the January meeting.

DR. ZIEMER: We're showing some kind of progress.

DR. MELIUS: Yeah, and I think that's good. Paul or Mark or anybody, any other comments?

MR. ELLIOTT: I think if there's any paper that's generated on either OCAS source or SC&A here, we want to make sure that we get it distributed to everybody. I feel that this last round of your two documents only went to a select group of people. I ended up sharing it with the lawyers so I'd ask us to be diligent in the distribution of this that we use here.

DR. MAKHIJANI: I thought it was distributed to the working group.

DR. NETON: The last one came from Dr. Melius for some reason. I never got it except for Larry gave it to --

DR. MAKHIJANI: But we agreed that Dr. Melius would send you the --

DR. MELIUS: I thought I sent them to you, too, but I could --

DR. NETON: Yeah, it didn't come out from SC&A like it normally does which is to the entire working group.

MR. ELLIOTT: I'm not raising this to blame anybody. I'm just saying --

DR. MELIUS: No, I sent it to the working group. I sent it to the working group, and the reason I was trying to be very careful, because I actually sent it to the working group with a note saying be careful. This is Privacy Act, you know, this is individual records.

DR. NETON: You're right. I forgot about that.

DR. MELIUS: That was why I think it was --

MR. ELLIOTT: Well, that's okay.

DR. MELIUS: I also might have typed your address in wrong or it bounced back. It happens to me all the time.

MS. BEACH: Hey, Jim, this is Josie. I have a quick question for you. I wasn't involved in the discussions three-to-five years ago, but are there any other sites that are going to come up under this besides the two we've been discussing today?

DR. MELIUS: First of all, it didn't start three-to-five years ago. It was, we've probably been working on it almost a couple years.

MR. ELLIOTT: When NIOSH says three-to-five years ago that was internal discussions we were having in the development of the regulations.

MS. BEACH: Okay.

DR. MELIUS: Yeah, the only other site for, I understand, this has been mentioned, and I'm conflicted in the site so I don't know the specifics of it, is the Apollo.

DR. ZIEMER: The Pacific Proving Grounds.

DR. MELIUS: And Pacific, that was the other one, yeah.

MS. BEACH: Okay, so there may be a couple more.

DR. ZIEMER: It's not restricted.

DR. MELIUS: No, it's not restricted, and what we're trying to do --

DR. ZIEMER: The sites were just good examples.

DR. MELIUS: Yeah, exactly, yeah.

MR. ELLIOTT: Certainly we understand Fernald had these kind of explosions that Ames had. We understand that the gaseous diffusion plants had a different kind of release going on. We understand that in certain instances like Rocky Flats there were fires.

And we talked about fires maybe being one of those kind of events that just presence should be examined under. So it's not restricted, Josie, just to the two examples we're talked about here today. Hopefully, they will illuminate yet how we would handle some of the other examples we're not talking about.

MS. BEACH: Right, thank you.

DR. MELIUS: With that we'll close. Thank you all.

(Whereupon, the meeting was adjourned at 1:11 p.m.)

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I, Steven Ray Green, Certified Merit Court Reporter, do hereby certify that I reported the above and foregoing on the day of Nov. 29, 2007; I, Steven Ray Green, then transcribed the proceedings, and it is a true and accurate transcript of the testimony captioned herein.

I further certify that I am neither kin nor counsel to any of the parties herein, nor have any interest in the cause named herein.

WITNESS my hand and official seal this the 5th day of Nov., 2008.

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STEVEN RAY GREEN, CCR, CVR-CM, PNSC

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