United States of America Centers for Disease Control

National Institute for Occupational Safety and Health

Advisory Board on Radiation and Worker Health

Wednesday, April 11, 2018

122nd Meeting

The meeting convened at 9:00 a.m. Eastern Time, in the DoubleTree by Hilton Hotel Oak Ridge-Knoxville, 215 S. Illinois Avenue, Oak Ridge, Tennessee, Ted Katz, Designated Federal Official, presiding.

Present:

Henry Anderson, Member*
Josie Beach, Member
Bradley P. Clawson, Member
R. William Field, Member*
David Kotelchuck, Member
Richard Lemen, Member*
James E. Lockey, Member
Wanda I. Munn, Member
David B. Richardson, Member
Genevieve S. Roessler, Member
Phillip Schofield, Member
Loretta R. Valerio, Member
Paul L. Ziemer, Member
Ted Katz, Designated Federal Official

Registered and/or Public Comment Participants:

Adams, Nancy, NIOSH Contractor
Barrie, Terrie
Behling, Kathy, SC&A*
Buchanan, Ron, SC&A*
Burgos, Zaida, NIOSH
Calhoun, Grady, DCAS
Carroll, Stephanie*
Colley, Vina*
Crawfrod, Chris, DOL*
Domina, Kirk
Fitzgerald, Joe, SC&A
Giron, Eloi*
Griffon, Mark
Hand, Donna*
Hinnefeld, Stu, DCAS
Hughes, Lara, DCAS
Kocher, David, ORCRA
Lewis, Greg, DOE
Lin, Jenny, HHS*
Neton, Jim, DCAS
Presley, Louise
Rutherford, Lavon, DCAS
Stiver, John, SC&A
Taulbee, Tim, DCAS*

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(9:03 a.m.)

Welcome and Roll Call

Mr. Katz: Okay, welcome everyone. This is the Advisory Board on Radiation Worker Health. This is our 122nd meeting. I'm Ted Katz, I'm the Designated Federal Officer for the Advisory Board, I'm also acting as the Chair for the time being and I'll explain a little bit more about that later.

So, let me say few things before I get into administrative matters. The Board Members came in yesterday and we had a tour of the Oak Ridge facilities, this is not our first tour, it was a marvelous tour.

So the first thing I would just like to say is thank you so much to the community, to the facility, to DOE, Greg and his staff. It really a terrific tour and we learned a lot from it, it was very useful. And maybe Jen wants to say something too. She's the Chair of the Work Group that deals with this facility.

Member Roessler: Yes, thank you Ted and thank you Greg and your people for helping arrange, I was a really good tour. We realize it took a lot of effort and time to put it together and much appreciated. The information and everything we saw was very pertinent to what the Board and the Work Group will have to deal with.

Mr. Katz: Thanks, Jen. And it's great to be here at Oak Ridge. It's a real touchstone for us. First of all, it's beautiful here this time of year, but one of our original Board Members, longstanding, Bob Presley, this is his home.

In fact, yesterday after the tour we went to the museum, the Oak Ridge Museum, which is an incredible museum and we had the privilege to go through Bob Presley's childhood home, which is

actually a part of the museum now. And that was very meaningful for all of us.

It even has a picture in him, or couple pictures of him, of Bob Presley as a little boy, I think the only time he was little. And so, thank you very much for all that too.

Let me just talk about some administrative matters. The materials for this meeting are on the NIOSH website. They're also on the back table for people here in the room, but they're on the NIOSH website for people on the line. All the presentations that will be given today should be there as well as the background reading materials.

So you can go there, go to the NIOSH website to this programs portion of the website and look under schedule of meetings, today's date and you'll have access to all of those including the agenda.

And on the agenda, you'll see also a code for a Skype for those of you who are internet savvy you can join on the internet. All that will allow you to do, you'll keep this audio, this telephone line for listening, but that will allow you to actually see the slides progress as they are presented by the different presenters.

But otherwise you can just follow along those same presentations on your own at your own pace off of the website. Let me also note, there's a public comment session today, that begins at 5:00 p.m.

And if you wish to speak and you're here at Oak Ridge, then you would sign in in the book outside the room at some point today, you'll have plenty of time for that. For people who are on the line on the phone, we will take phone commenters after we have dealt with everyone in the room. So that's to come.

Okay. I think that takes care of logistic things, other thing for people on the phone is, please to keep your phones muted. Some Board Members are on the phone too, of course they don't need to do that, but

for everyone else, please mute your phones.

If you don't have a mute button on your phone press *6, that'll mute your phone for this conference line. And, for example, at public comments session to take your phone off of mute you can just press *6 again.

But please do that and please, no one on the phone put this call on hold at any point because then we will hear whatever kind of hold music or whatever you have on the line and it'll prevent everyone on the line from hearing what goes on here.

Okay, just one note before -- well actually, I think what we'll do is if -- are you ready Paul?

Member Ziemer: Yes. I just wanted to get some, I'm looking for the water.

Mr. Katz: Oh, we'll get you a water. There's water in the back.Member Ziemer: Oh, I see it in the back.

Mr. Katz: We'll get it. So we're going to go first -- yes, sure. We're going to go to our -- well, let me actually, one thing I haven't done, which I should do before we get started, Paul, is roll call.

We do not have any conflicts of interest for any Members for any sessions. So I don't need to address that and most of the Board Members are here in the room. But I'll formally run down the list in any event, even though I know they're here, for the record. So I'll do this alphabetically.

(Roll call.)

Mr. Katz: And we have a quorum, we have all but one. So that's good for our meeting to proceed. Okay, Paul.

Tribute to Dr. Melius

Member Ziemer: Before I present this memorial resolution, which is a tribute to our late Chairman, Dr. Jim Melius, just a couple of comments. I

recognize Louise Presley, who has just joined us. Louise, we're glad to see you here.

(Applause.)

Member Ziemer: Also I want to mention that this Memorial Resolution is based on contributions from these Board Members. I've simply put it together as sort of an editor.

But the places in the Resolution or the tribute that use the first person, first person pronouns, don't necessarily represent me but whoever it was that made that particular comment. So this is a tribute to Dr. James M. Melius from the Advisory Board on Radiation and Worker Health.

Dr. James, Jim Melius, an occupational physician and international leader in occupational medicine and epidemiology, died unexpectedly of cardiac arrest on January 1st, 2018.

Members of the Advisory Board on Radiation and Worker Health, of which he served as Chairman, mourn his death and wish to pay tribute to Jim for his significant contributions to worker health and safety.

The extensive impact that Dr. Melius has made on addressing the health and safety issues of workers throughout his career has been well summarized in his obituary. Thus, as colleagues of Jim, on the Advisory Board, we will share our personal thoughts about his impact on us and on our work as a Federal Advisory Board.

The Advisory Board on Radiation and Worker Health was established under the provisions of the Energy Employees Occupational Illness Compensation Act in 2000. Dr. Melius was one of the original members appointed by the White House and had served faithfully since then until his recent death. This included appointment as Chair of the Board in 2009.

The Advisory Board is charged with advising the

Secretary of Health and Human Services on matters related to the compensation of employees whose cancers were likely to have been caused by radiation exposures at Department of Energy facilities or at Atomic Weapons Employer facilities.

Dr. Melius was a prime advocate behind the enactment of EEOICPA or the Energy Employees Occupational Illness Compensation Program Act, and it is fitting that he then served on the Advisory Board that developed from the legislation.

It was also notable that he was also a principal advocate for the James Zadroga 9/11 Health and Compensation Act in 2010, which established a health care program for victims of the 9/11 terrorist attacks on the World Trade Center and the Pentagon.

For us on the Advisory Board on Radiation and Worker Health, Jim Melius was a consummate bridge builder between all three perspectives represented on this Board: scientific, medical and worker.

In this pursuit, he was patient, humorous, attentive and insightful in doing his part to bring us closely into consensus as possible for a given decision. Throughout our activities, he was caring of his fellow Board Members, of the program and the Board staff as well as the claimants, their families and advocates.

Our personal impressions about Jim Melius include the following, I appreciated him for the respect and no-nonsense way he treated me over the years. He always listened and gave me advice, mostly with a smile or a smirk, depending on his mood that day.

To sum it up, I'll miss Jim because he was an honorable and dedicated man that cared about people and fought for people who couldn't always speak for themselves.

I will always remember Jim Melius as a gentle, fair, intelligent and effective leader of our Advisory Board. He had selfless and deep sense of social justice. He

spent his life and his efforts helping those whom he felt were unjustly treated. He was kind and respectful to everyone.

Jim was a man of great intelligence and compassion and worked tirelessly to improve both the health and safety of others. He never shirked the battle to improve the lot of others who he never knew.

His legacy to mankind is the many laws and regulations he wrote or helped get implemented to protect the health and safety of others. He truly stands out as a man of great accomplishments and will be missed by all those who knew him.

Reliability of character is not often given much attention outside the halls of commerce, but it is a priceless commodity in our lives and the daily relationships that surround us.

When a reliable person is suddenly and unexpectedly gone from us, the ripples in the fabric of those lives extend much further than we can control and the results are significant. Jim Melius was a very reliable man.

Dr. Melius demonstrated fairness, compassion and respect for his fellow Board Members, the claimants and everyone else he interacted with in the scope of his responsibilities as Chair of the Advisory Board.

Two quotes by Maya Angelou remind me of Jim Melius.

Quote 1: "My mission in life is not merely to survive, but to thrive and to do so with some passion, some compassion, some humor and some style."

Quote 2: "A great soul serves everyone all the time. A great soul never dies. It brings us together again and again."

Dr. Melius' legacy will bring us together again and again as we continue to learn from his example.

I was always amazed at Jim's boundless enthusiasm and willingness to contribute his skill, expertise and time to thoughtfully distill solutions for everyone who asked.

Jim Melius always found time to assist and apply his intellectual ability and consensus building skills to achieve large and small impacts on real life concerns often behind the scenes.

He had a unique ability to create an impact across the spectrum of local, state, national and international occupational and environmental health discourse, always with an eye to benefitting the public's health. His calm leadership, intellectual curiosity and vast practical experience, all shared with humor, will be missed.

Although we focus on our work with Jim on the Advisory Board for Radiation and Worker Health, we must not overlook some of his activities that are not as widely reported. For example, Jim played a key role in helping establish the New York State Occupational Health Clinic network in the 1980's, the nation's only state-based Occupational Health Clinic network, and until his death, served on the State Oversight Committee for that network.

Whether it was serving on the Advisory Board for the New York/New Jersey NIOSH Education and Research Center, or helping the New York Committee on Occupational Safety and Health, secure a speaker or helping develop a training course for hazardous waste and emergency response workers, or simply providing advice to activists on dealing with the troublesome local health and safety issues, Jim was always there to turn to and help.

And Jim, despite his elevated rank, was not above attending to the quotidian tasks of Committee and Board Members and Administration which are the sinews of a viable health and safety movement.

Jim demonstrated the ability to provide a forum for

all sides of an issue to be discussed in an atmosphere of fairness and respect. He was always willing to consider factors and viewpoints that might be contrary to his own position.

He always made sure that everyone had an opportunity to participate and express their own ideas. He brought to the Board a healthy level of skepticism about the limitations of science, as this has a bearing on weighing what can be determined about the radiological exposures among workers in a nuclear weapons complex.

Sometimes his skepticism slipped sideways a little into mischievous humor. For example, he was quite dubious at first as to what actually went on at one of the nuclear weapons facilities out West, named Wah Chang. Why are we considering radiation exposures at a dry cleaners, he asked the Board's Federal Official.

Jim's humor and humanity also served as an amusing antidote to the political and administrative strictures of the life in government and public policy.

Despite six years as a Board Member and nine years as Board Chair, he never quite managed to get either his government identity smart card or his government computer to work.

So Dr. Melius, Jim, the Advisory Board on Radiation and Worker Health bids you farewell. We will greatly miss you at our meetings, but if you do find a way to listen in, be sure to press *6 on your phone and put it on mute.

Do you want to do the moment of silence now? Okay.

(Applause.)

Member Ziemer: And that hand is for Jim. But let's stand together for a moment of silence in the memory of Dr. James Melius.

(Moment of silence.)

Mr. Katz: Okay. And as we're getting ready for the next presentation, Stu, do you have a mic up there or we still have this snafu?

(Simultaneous speaking.)

Member Lemen: Ted.

Mr. Katz: Right, okay. I'm sorry, Dr. Lemen, Dick?

Member Lemen: I just wanted to point out to the Board that I gave this to Jim's family at the memorial service and summarized it and read it at the memorial service. So his family has got a copy of this.

Mr. Katz: Right. So, Dr. Lemen was just saying, the volume is a little bit low in the room at the moment, but that Dr. Lemen was a participant, he's one of Dr. Melius' oldest colleagues and friends.

And he is a Member of this Board, of course, and he presented this commemoration of Dr. Melius at the memorial for Dr. Melius that was held at Mount Sinai a couple weeks ago. And we thank you for that, Dick.

Member Lemen: And the second part is his family has a copy of it. I made sure I gave them a good copy.

Mr. Katz: Thanks. Thanks, Dick. Before we go on, we're about to start the NIOSH program update, but let me just also note, I said I had something to say about serving as acting as Chair of the Department and Director of NIOSH.

Dr. Howard has asked me to serve as Acting Chair so that we can keep our work moving forward in the interim because, as I think most of you understand, the President has to designate a new Chair for the Board. That's solely the President's prerogative.

So to understand a little bit about how that will work, I'm serving as Acting Chair, I will not be speaking to motions, I will not be voting on motions either.

So I continue, essentially, the administrative role, but I have, asked and Dr. Ziemer has graciously agreed, that he would handle the parliamentary role for when we have action items that require the Board's votes. So he will handle those and there are only two of those at this meeting today.

Okay, so with no further ado, we have our program update from Stu Hinnefeld.

NIOSH Program Update

Mr. Hinnefeld: Okay. Can you, okay, you can hear me now. Okay. Well, thanks, Ted. Thank you for Members of the Board. I'm back for my normal brief update from the program.

I don't have a terribly large set of news updates this time. We have not actually participated in an outreach activity since the last Board Meeting in December. But we have two that are imminent or one is imminent, one is next week in Ames, Iowa. That's in conjunction with the most recent extension of the SEC Class at Ames. The Board recommended that, I believe, two meetings ago.

And then, in May, we and the other federal agencies and our Ombudsman who are involved in EEOICPA are presenting another authorized representative workshop this time in Kennewick. We did one of these in December, just prior to our last, the last Board Meeting.

We did one of these in Tampa in December and it's part of our essentially labors plan to conduct these essentially around the country so authorized reps can have at least a little more convenient trip to it. That will be, like I said, somewhere and that's in mid-May.

I put on the slides your budget. I always feel like I should talk about the budget a little bit and I always feel like I don't know what to say about the budget because it's not very fixed. There is now a budget bill that has been passed for this year, so we're not

operating on a continuing resolution, I believe it was called an Omnibus Bill.

That leaves our funding intact, and we didn't receive any bump up or cut in the bill, but there is a wrinkle that I've not actually been able to sort out. I've asked the top money person at NIOSH who's asked the Office of Financial Resources at CDC and no one knows yet whether this budget removes the sequester that has been applied to our budget since, 2011.

Every year the budget that has been passed for us has listed one number, but automatically a sequester, about a ten percent reduction, was applied every year. So we actually got ten percent less money than what the budget line was because of the application of that sequester.

Now, there's been discussion that this latest budget bill for 2018 removed the sequester, at least from many accounts, maybe not from all. I don't know. And so, I've been trying to find out if it removed the sequester from our account or not. And that's what I can't find out.

I was hoping to know by today, but last word I heard was we probably won't know until the CDC gets what's actually called its budget ceiling and that won't happen for a couple more weeks. So, in a couple more weeks, and the only impact is this would be, would actually be increased money for this year. It wouldn't be cut, it would be increase money above what we've had the last several years.

So, that's all I know about the budget. And if you read the newspapers you hear, you also know that there is talk about a rescission by the White House which, who knows what that would be. So every time I feel like I want to say something about the budget, I know less and less about what the budget would be.

So, if there is a rescission from the White House, you don't know what accounts, we have no idea what

accounts it might target or anything like that. So that would then be a rescission, it would be a budget cut for '18.

Okay. I believe that concludes my news. If anyone has any questions, I'll try to answer them, but I've already told you everything I don't know about the budget.

(Laughter.)

Mr. Hinnefeld: Okay. I'll run very briefly through the statistics. These are the statistics we normally present. These are total cases, you can see we're closing in on 50,000 total cases since the start of the program.

And if you take out the administratively closed cases, which we think are done, I mean they can be reopened if the claimant decides to reopen them or reinstate it, but we think we're done with the administrative closed ones, and we have about 1,200. That's been pretty constant for quite a while.

And here are the ones that were submitted. Most of them were submitted through dose reconstruction and then several, and then a couple of categories were pulled claims also that DOL called, asked for those claims back, many of those because they were added to the SEC after the claim was submitted and already sent to us.

In those 1,200-and-some-odd are active cases, this is also a pretty constant number, somewhere around 200 to a little over 200 pretty much every time.

We completed a draft dose reconstruction and sent it to claimant for them to, you know, and then we'll talk to them about it and see if they have any questions, see if we left anything out that they think should be in there. So, realistically, we have about 1,000 cases in our inbox and that's been pretty constant for quite a while.

We still get roughly, almost 200 new claims a month and plus another 40 or so that are returned to us, usually because a person got an additional cancer and so the Department of Labor would turn it back to us for rework. So, I mean, we're still getting over 200 a month, really, of claims we have to do.

Here's our, probability of causation for the claims we have sent back with dose reconstruction. Here's how they break out in terms of being greater than 50 percent PoC, or less than 50 percent PoC. Usually that's been around 28 percent, I think it's still about 28 percent successful claims through dose reconstruction.

And the AWE records request, which I always report on is quite good. We have very few that are over 60 days, which is what we kind of consider the date that we're going to send them by. So their response has been very prompt.

And here's summary of proof 20,000 claims that I have been presenting for a while now, in terms of the ones that have been returned, pulled for SEC or pulled for other issues, in terms of the totality of the claims. Some of those numbers were deleted.

Of the claims that are not back at DOL, the bulk of them are administratively closed, meaning that the claimant opted out of the process and did not send back the OCAS-1 form and so we didn't finish, we didn't do a final dose reconstruction. So the claimant opts out sometimes after receiving a draft dose reconstruction.

We have 14, well we have essentially 42 claims that are with us. And those break out, 14 of those are with the Claimants, those were all DOL returns meaning we had done the dose reconstruction once, DOL had returned it to us, probably because of an additional cancer or because they had discovered additional employment. And then there are 28 dose reconstructions we're working on, almost all those are returns.

The one that is considered an initial is a case that was administratively closed for many years and then the Claimant passed away and new survivors picked up the claim and reinstated the claim. So after it had been administratively closed for many years the claim was reinstated by a new survivor.

And so, since we had never sent a final claim, a final dose reconstruction to DOL, that still appears in our system as an initial claim. But it was closed for many years. And then there were some of those early claims numbers, some early claims DOL sent us by mistake, and so they just deleted those claim numbers and called those back.

Okay, that's my presentation of the statistics. Are there any questions about that or anything else?

(Off-microphone comment.)

Mr. Katz: Excuse me, the questions are just for Board Members. Yes, at this point. There is a public comment session at the end of the day. And certainly you can speak to the officials here when they come down from the podium too, if you want to speak to them personally. Board Members on the line, any questions for Stu?

(No audible response.)

Mr. Katz: Okay then. I think next up is DOL and I think they're on by phone, as well.

Chris Crawford, are you on the line?

Mr. Crawford: Can you hear me, Ted?

Mr. Katz: Yes, but faintly. I think we need more volume. Hold on one sec. Okay, why don't you keep talking, Chris, so we can see if--

Mr. Crawford: Sure.

Mr. Katz: -- the volume's okay.

DOL Program Update

Mr. Crawford: I am not so far away this time. You should have better volume. How are we doing?

Mr. Katz: Keep speaking, Chris, please.

Mr. Crawford: All right. Stu has agreed to, as usual, run the slides for us, which we appreciate very much. And how are we doing now, Ted?

Mr. Katz: It's adequate. It's a little bit faint. It's borderline. I don't know, are you talking into a speaker phone?

Mr. Crawford: No, I'm talking into a handset. I do have a second handset, I'm just going to switch between them for a moment to see if that helps.

Mr. Katz: Sure, thanks.

Mr. Crawford: Ted, I'm now on a new handset. Does that help?

Mr. Katz: I think that's better. That's better. Thank you, Chris. Go right ahead.

Mr. Crawford: All right. Stu, we probably have the cover slide up at this point.

Mr. Hinnefeld: Yes, yes, I do.

Department of Labor Report

Mr. Crawford: Great, thanks. Let's go on to slide 2. My name is Chris Crawford, even though it shows Frank, from the Department of Labor.

Now slide 2, we see that Part B compensation paid is now at 6.4 billion. Part E compensation is at 4.3 billion. And we've also paid four billion in medical bills for a total compensation and bills paid of 14.7 billion. And we have so far, by our records, 199,316 cases filed.

Next slide. These slides are always a little hard to

reconcile mentally, but we see here what cases have been accepted or declined with a final decision and, in this case, accepted. We have 10,514 accepted dose reconstruction cases representing 1.56 billion in compensation. We also have 26,065 accepted SEC cases representing 3.9 billion in compensation.

There's a smaller group of cases accepted based on SEC status and also having a PoC, Probability of Causation, of greater than 50 percent. There's 1,021 such cases representing 153.2 million in compensation. And then for total, we have all of the accepted SEC dose reconstruction cases and combined cases, 37,600 cases, representing 5.6 billion in compensation.

Next slide, Stu. The status and location of NIOSH referrals, our numbers always differ somewhat from those of NIOSH, but we're also looking at slightly different periods. We have a record of 49,777 cases referred to NIOSH for dose reconstruction.

Of those, 47,672 cases were returned to DOL from NIOSH, 41,342 of those cases had a dose reconstruction done, 6,330 cases were withdrawn from NIOSH with no dose reconstruction for various reasons, including SEC establishment. We show about 1,805 cases currently at NIOSH. Again, I think the dates covered are different than NIOSH's dates.

Next slide, please. Here we have Part B cases with a dose reconstruction and a final decision. We have 33,068 such cases with both of dose reconstruction and a final decision. The final approvals are 11,572 and the final denials 21,496. So we're approving roughly 35 percent and denying 65 percent with a dose reconstruction.

Next slide, please. Here we have Part B cases filed in percentages. I'll start with NIOSH. Thirty-five percent of the cases have been sent to NIOSH, plus we had another 12 percent of SEC cases referred to NIOSH. Those are people who are looking, have multiple cancers typically and are looking for medical benefits

for the non-SEC cancers.

We also have 15 percent of SEC cases that are never sent to NIOSH. We have a small category, RECA cases, nine percent. And then we have a large category of 29 percent other. And as the slide notes in smaller print, many of those cases are for beryllium sensitivity, chronic beryllium disease, chronic silicosis.

Next slide, please. Now here we have Part B cases with a final decision, but this includes not only dose reconstruction, but all final decisions for Part B, including SEC cases. We have 98,729 cases with a final decision under Part B of which 51,841 were approved, which would be 53 percent of the overall. And 46,888 were denied, or 47 percent of the overall cases with a final decision.

Next slide, please. Here we have the top four work sites for Q1 2018, that is between October '17 and December 31st, '17. Hanford, Savannah River Site, Y-12 plant, Nevada Test Site. These are our usuals.

Next slide, please. And here we have our monthly percentage of new cases contrasting the DOE cases with the AWE cases. We see that we have 94 percent DOE cases and six percent AWE cases. So AWE cases have declined somewhat over the past years, but their holding steady for the last two now. Well, I should say, last two quarters.

Next slide, please. Today there'll be a discussion about the Site Profile for the Weldon Spring plant. And for that site we have currently 1,169 cases, Part B and Part E, of which NIOSH has done a DR on 241 cases.

We've had 569 final decisions, this is marked Part B, with 196 approvals for Part B, and then for Part E, we have 160 approvals. The total compensation and medical bills paid come to $45.7 million through March 18th.

Next slide, please. The program does outreach events, which are basically events that take place, for the most part, near work sites from a nuclear weapons program. And this is repeated information from slide to slide so I'll go through this a little bit more quickly. The medical benefits program is going full swing and we've been hiring new personnel, I know.

And then we have the -- next slide, please -- the Joint Outreach Task Group with the Members as you see form the DOL program, DEEOIC, also from Department of Energy, also the DOE Former Worker Metal Screening Program, NIOSH, the Ombudsman to NIOSH for the EEOICPA program, Part B, that's Denise Brock. And also DOL's Office of The Ombudsman for EEOICPA and Malcolm Nelson. We have monthly conference calls and conduct town hall meetings.

Now looking back on the last quarter, we have -- for the next slide, Stu -- we have the most recent outreach events. The last one was March 20th and 21st at Bridgeton, Missouri with 30 in attendance and four claims taken. It was a quarterly medical conference call on February 6th and 7th with 98 in attendance.

We had a workshop at Jacksonville, Florida, it was for authorized representatives. That was December 6th and 7th of 2017, with 21 attending. Before that, we had a Santa Fe, New Mexico joint outreach and TRC, I have to look that one up myself, in Santa Fe, New Mexico, November 15th with 80 attending and five claims taken at the outreach event.

Before that, actually in the last quarter of '17, but I don't think we have time to include it in our last slide presentation, we had a quarterly medical call on September 20th with 26 in attendance. And then on September 19th, I guess that was a continued quarterly medical conference call, with 24 in attendance.

Next slide, please. The next scheduled outreach event is April 17th, a Town Hall meeting at Ames, Iowa.

Next slide, please. And the next such event is an authorized representative workshop at Kennewick, Washington, on May 15th and 16th this year.

Now, I have no information beyond that. We've had some budgetary close calls and uncertainty so that may be part of the reason for that. I'm sure there will be more outreach meetings as we go along. Are there any further questions?

(No audible response.)

Mr. Katz: I don't see any questions in the room. Any questions for Board Members on the line?

Member Field: No questions.

Mr. Katz: Okay then. Thank you very much, Chris, we appreciate it.

Mr. Crawford: Thanks, Ted.

Mr. Katz: And next up we have Greg Lewis from the Department of Energy. Welcome, Greg.

Department of Energy Report

Mr. Lewis: Oh, okay. You're making me multi-task. Hopefully, I can handle this. Good morning, everyone. I'm Greg Lewis with the Department of Energy, Office of Worker Screening and Compensation Support. I'm going to be giving you the program update for DOE.

First, I want to thank the Board for going on the tour yesterday. We at DOE always like it when you folks do take a tour of the DOE site. We know that, you know, you do a lot of research into these sites and seeing it live, seeing it firsthand, is helpful to do your work. And we know the workers appreciate it when you are on site and able see some of what they see

every day.

(Pause)

Mr. Katz: There we go.

Mr. Lewis: I've been known to do that, hit too many buttons, got a little frantic there. Let's see. All right, so I'm going to go through our program update. Our core mandate is to work on behalf of the claimants to ensure that all available worker and facility records get to DOL, NIOSH and the Advisory Board.

We basically do three things at DOE. We respond to individual claims, so if someone files a claim in DOL, refers it over to NIOSH. They're going to both send a request to DOE for that individual's records.

We also work with both DOL and NIOSH to provide large scale site characterization-type records such as Special Exposure Cohort research projects. And then we also work with both agencies to do research into facility coverage. That's mostly for the smaller AWE sites, you know, when we find new information that indicate that either years should be added or taken away from the coverage.

For the individual records request, we do about 18,000 a year split between the different types of requests. So employment verifications, the NIOSH radiological information, and then what we call a DAR, the Department of Labor's request for all worker records. So, it's medical, industrial hygiene and HR, that kind of thing.

Workers, particularly in the Oak Ridge area, of course, but all over the complex, workers often worked at multiple sites or for different contractors or in different jobs. They might have moved around or moved up or moved into different job categories.

When we're pulling individual records, we don't go to one location. It's not like we go to one file cabinet and pull and individual's file and that's it. We have to

go to multiple departments on site, multiple sites, we have to go to site archives.

The records can be in different formats, so it can be paper records, electronic database records, microfilm, microfiche, punch cards, you know, we can get into all sorts of different media over the years. So we do have to go to a number of different locations, typically for a worker's record. And we find all of those, get them all into one unified format and scan and then send back to the requested agency, be it DOL or NIOSH.

I'll do a little bit of statistics from last year, so these are FY17 numbers, so October of '16 though September of '17. So these are slightly out of date, but, you know, we won't have the new numbers for another six months or so for FY18, so these are FY17 numbers. We responded to 18,522 records request for over 25 different DOE sites.

We just updated this for FY17 so the last presentation I did for the last Board Meeting I think I had our FY16 numbers up for these statistics.

And if you were to go back and look, these numbers all changed slightly, but I think it was maybe between five or, at most, ten pages for each of these.

So we're essentially pretty consistent in what we've been providing this year versus last year in terms of numbers. The average number of pages for employment verification was 21. The average number of pages for a NIOSH request is 46. The average number of pages for a DAR is 158. And then the overall average number of pages is 225.

That's a bit misleading because typically the DAR is also going to have much of what is in the NIOSH request and the DAR may also have much of what's in the employment verification because the employment verification is HR records. The NIOSH request is, you know, radiation control records, dosimetry, that kind of thing. And those are also

included in the DAR.

So that 225 is probably a little bit misleading. The average total number of unique pages is going to be somewhere between 158 and 225 and it may, you know, be closer to the 158 end. But our statistic just counts the number of pages that are provided in the three different kinds.

So in terms of our under 60 day numbers in FY 2017, we had an 87 percent on time response rate. That was actually a little bit lower than in previous years. We've been up around 95 percent for most of the, you know, the five or so years before that.

Last year we struggled a little bit due to budgetary concerns with the continuing resolution, gave us a little bit of trouble but, you know, we've run into that every year.

But then when the continuing resolution ended, if I remember correctly, somewhere around May or June, they were different than in previous years, our money came out in one month increments. So it was kind of go, stop, go, stop.

And with our operation because we're responding to 18,000, you know, these records requests are coming in every week from DOL and NIOSH, it's a little bit like an assembly line and when we have to start up and shut down, and start up and shut down, it really gives us fits. So we did have a little bit more trouble this year and our number did drop to about 87 percent instead 95.

Through the first six months or so of FY18, we're back up around that 95 percent response rate. And as you saw from Stu's numbers, we're doing fairly well right now, we believe. So we'll see what the '18 numbers end up being, but we believe they're going to be much better than '17.

Then our second responsibility under EEOICPA, as I outlined earlier, is the large scale records projects.

So the Department of Labor Site Exposure Matrix or the NIOSH Special Exposure Cohort projects, you know, both agencies have to do a quite a bit of research to pull all that information together.

We support that, we work with the different sites to identify the records they need, pull the records, let the research teams come in, look at what they need, identify what they want copies of and then do whatever type of review we need to release it to them, whether that's classification or review for public release or any kind of markings we need to do on the documents.

And here's a list of some of the sites that we're working on now, some are more active than others. And then I mentioned document reviews. So, you know, because of the nature of the information that they're looking at, sometimes we do have to review some of that for classification or official use only or PII, the different types of classification.

So at headquarters, and I'll specify this is Headquarters only, all NIOSH Final Reports come to Headquarters for review before getting posted online and distributed to the public. The average turnaround time for those documents, about eight working days. In some cases, we've done a day or two when needed.

And I will say that that's for those reports, when they're pulling large number of documents sites during the research projects. It could be hundreds of documents or, you know, documents that are thousands of pages long or hundreds of pages long. That can take longer.

We work with the requesting agency to come up with a reasonable timeframe based on their needs and our staffing and our ability. So that's always a challenge, but we work very hard to try to make sure we're not holding up their work.

And then the third thing that we do, as I outlined

earlier, is facility research. We host a database for over 300 facilities covered under EEOICPA.

We get requests from folks, you know, fairly routinely to look into these sites and see if our designation is incorrect or needs to be adjusted in any way. And we try to do the best we can to find documents.

With some of those AWEs it can be a challenge because they operated during the '40s, '50s and '60s, but we try to find the best information that we can and make the right decision.

Outreach, both Chris and Stu mentioned that. We continue to participate in the JOTG, Joint Outreach Task Group, events. We participated in the first authorized representative workshop in Jacksonville and will be doing the same at the meeting in Richland, Washington, in May.

And then the other program that my office funds and supports is the Former Worker Medical Screening Program. And I always make mention, for those of you in the audience that may be a former worker or know former workers in the area or out of the area, the Former Worker Medical Screening Program provides free medical screens. We make sure that we can find a place that's close to your residence, you don't have to travel too far.

The principal investigators for these programs are trained Occupational Medical Physicians who are very familiar with DOE work and hazards that you may have encountered at a DOE site. So, they're going to have a little bit more knowledge, a little bit different knowledge than your typical personal physician. So I would encourage you to look into that program.

And if you or someone you know might be eligible for a screening, please, you know, you can find more information on it here on our website and there's also a brochure.

If you're in the audience, you can always talk to me

later in the day. And this information will be posted on the Board's website, you can also find it on the DOE website. So with that, are there any questions?

(Off-microphone comment.)

Mr. Katz: The questions are just for Board Members.

(Off-microphone comment.)

Mr. Katz: The questions are just for Board Members. Any questions on the line? For people in the audience, if you have questions of Greg, you can ask him after he comes down.

(Simultaneous speaking.)

Mr. Lewis: Yes. I'll be here all day and I'll be happy to talk to you about whatever questions you may have.

Mr. Katz: Oh, there's -- David? Dave.

Member Kotelchuck: On your Slide 7, Greg, I wondered if the last number, overall average number of pages, needs either an explanation. I'm not sure it's terribly meaningful, it's just the sum of the other three categories it appears.

Mr. Lewis: Right.

Member Kotelchuck: And I do think that it needs some clarification or perhaps deletion, I'm not sure it adds much. You might check it out.

Mr. Lewis: Well, I mean, I kind of explain, you know, you're absolutely right. It is a sum of the three previous categories. So in total, that is the number of pages that we provide.

It's an accurate number, that is the number of pages that we provide, in total, on average. But because it can be somewhat duplicative, we don't really know exactly how many pages are duplicated on any given, for any given claimant.

So again, the total number of unique pages provided is somewhere between 158 and 225, we don't know exactly where that is. And I think that's a little bit tough to explain on the chart.

Member Kotelchuck: But, if I may, I mean, it seems like the overall average number of pages would be the number of pages for a request that involves employment verification, NIOSH requests and DAR, which you may or may not get. Is my understanding correct?

Mr. Lewis: Oh, you saying because I'm adding averages?

Member Kotelchuck: Yes. Normally you get a request for an employment verification, you may get one.

Mr. Lewis: Oh, no. I would say for the vast -- for a large percentage of individuals, we get all three. We typically, we almost always get, I mean, probably 90, I don't want to say 90, 95 plus percentage of the time at least we will get an employment verification and DAR. We almost always get both of those.

And, in fact, I think the only reason the Department of Labor asks for them separately is because they know we can return the employment verification, because it's a smaller request, faster than the DAR. So then they can at least have some idea of the employment before they go forward.

And then, you know, NIOSH would probably, between NIOSH and DOL they would be able to tell you what percentage get referred to NIOSH for dose reconstruction. But it's a fairly significant percentage.

Member Kotelchuck: Well, that clarifies it. So you usually get all three, and you might get all three and you might get --

Mr. Lewis: Two to three, for sure.

Member Kotelchuck: Yes. You might indicate that

overall average for the three or whatever.

Mr. Lewis: Yes, yes. I'll look at, I could probably describe that a little bit better. Yes, I agree.

Member Kotelchuck: Thanks.

Mr. Katz: Okay. If we don't have any questions from Board Members on the line, then I think that takes care of it. And, Greg, thank you very much.

Member Field: Ted, this is Bill, I've having a hard time hearing speakers and the Board Members when they ask questions.

Mr. Katz: I think it's, Dave wasn't speaking right into his mike. I think that's the trouble.

Member Field: That was it?

Mr. Katz: Yes, but thank you Bill. Just a reminder to all Board Members, you have to speak right into your mic if you want the public on the phone to be able to hear you, as well as your fellow Board Members.

Member Kotelchuck: I did hold my finger down the whole time.

Mr. Katz: No, I saw your finger was down, but you were facing this way which is a problem.

It's difficult, I know. That's why you have to hold the button down. It's intended to encourage you to get close to the mic.

So our next session is on Weldon Spring and, as I noted earlier in the meeting, I'm going to ask Dr. Ziemer to serve as parliamentarian for this session because this is a session for which we'll have a Board vote.

Before we go there, we have to determine who is actually presenting. Dr. Lemen, are you still on the line?

Member Lemen: I am.

Mr. Katz: Super. Okay. So, Dr. Lemen will present. Dr. Lemon, Stu will handle the slides and, let's see, he has them up. So we're ready when you are and you sound very clear, Dick, so go right ahead.

Weldon Spring Site Profile Review

Member Lemen: Okay. To start out, the Working Group met in February and, as you see, the Working Group is myself, Bill Field, and Paul Ziemer.

At the Weldon Springs plant is a 220 acre site near St. Louis. It processed a uranium compounds between '57 and '66. And the plant was in standby between '67 and '85.

And as you see a remediation period between 1985 and 2002 was set up to remove all radioactive materials and components from off-site disposal. They were buried and entombed in low-level waste on site with concrete and rock cover. Presently, a wild life preserve is being monitored.

Some of the highlights of the Weldon Spring Site Profile activity include the Site Profile, ORAUT-1, 2, 3, 4 and 5, which was issued in 2005. SC&A, excuse me, initially had a Site Profile Review issued in February of 2010. And, again, there were 28 findings and nine observations.

I don't know if you're having trouble hearing me, but I get a lot of feedback.

Mr. Katz: No, you're very clear, Dick.

Member Lemen: Okay. I'll go on, but I still get a lot of feedback anyhow. Eight Working Group meetings were held between 2010 and 2012. And there were many revisions to the Site Profile documents through September of 2017. At the Advisory Board Meeting on the 22nd of 2017, we discussed the Weldon Spring site, and SC&A was assigned to the task to review

the current TBDs.

Let's go through the findings. We'll start with one through three. Finding 1, lack of personnel contamination and egress monitoring. This will be addressed on an individual basis using the DCAS-TIB-13, and this was closed by the Working Group on May the 9th in 2011.

Finding 2, inadequate information concerning worker's status and exposures for 1967 through 1984. And this will be addressed on an individual basis. To date, no such cases have arisen. The Working Group closed this on May the 9th, 2011.

Finding 3, individual exposures versus average exposures. Concerns of enriched uranium, recycled uranium, et cetera, were addressed in other findings and resolved and they were closed out by the Working Group on February 1st, 2018.

Finding 4, recycled uranium not adequately recognized in the TBDs. TBDs revised to include the recycled uranium and associated radionuclides and correct dates of usage. And this was closed out by the Working Group in our February meeting this year.

Finding 5, accident/incidents documentation not sufficiently addressed. This was discussed and clarified in September 13th of 2011. And the Working Group, on meeting on February the 1st, closed this finding out.

Let's see. Finding 6, inconsistence and frequency of X-ray exams.

Finding 7, photofluorography exams not adequately addressed.

And Finding 8, the lumbar spine exams not addressed. I think Ron Buchanan will have more to say about these if there are any questions.

Finding 9, the use of the ICRP-34 instead of ICRP-74.

And resolution of these findings, all four of these findings, were resolved by use of ORAUT-OTIB-6 and also, 79.

Appropriate revisions were made to TBD-3 the 1st of January, Revision 1 on January 30th, 2014. And all these Findings, 6 thorough 9, were closed out in our February 1st, 2018 meeting.

Finding 14, stated uranium, beryllium, radium, led ratio, --

Member Lemen: Dick, Dick, you missed, you skipped a slide. You should be on Finding 10.

Member Lemen: I did?

Mr. Katz: Yes, you should be on Finding 10.

Member Lemen: It's kind of hard to do it remotely from here, but I'll try.

Finding 10, lack of atmospheric monitoring data for operational period.

Finding 11 was insufficient data for unmonitored worker's internal environmental dose.

Finding 12, lack of validation from maximum environmental dose.

And Finding 13, the TBD lacks sufficient effluent data prior to 1967. The resolution for these Findings 10 through 13 were that all four of these findings were resolved by revisions in TBD-4, Revision 01 of May 17, 2013, which added data for assigning environmental intakes with accompanying text for those reconstruction. All four findings were closed by our Working Group on February 1st of this year.

Finding 14 stated uranium, thorium, radium led ratio should be used with caution. And as you see, after we looked at the revisions of the TBD, we closed this finding out on February 1st, 2018.

The next Finding, February Finding of the 15, natural thorium-232 not always negligible. And we, as you see after looking at the revised TBDs, we closed this out on February the 1st in our meeting this year.

Finding 16, the use of external environmental dose from protracted Fernald estimated data. Again, looking at TBD-4, we used the Weldon Spring data instead of the Fernald data to resolve this issue and we closed it out in February of this year.

Finding 17, the episodic release. This issue was discussed in the September 13th, 2011, Working Group meeting. NIOSH then provided information and clarification to resolve this issue, which enabled us to close it out on February the 1st, 2018.

Finding 18, incomplete access of uranium decay products using TBD-5, which provided data to resolve this issue. We were able to close this out in our February Working Group meeting.

Finding 19, incomplete assessment of radon exposure. NIOSH changed to end or model with no ventilation with maximum process model intake. This was discussed in 2012 by the Working Group and the equilibrium factor of the 0.5 was a concern.

Sequentially, though, NIOSH increased it to a factor of 0.7 in order to be conservative. And, thus, the Working Group closed this out in February at our meeting this year.

Finding 20, different solubility classes listed for the same element. NIOSH stated that the most claimant favorable solution, solubility type, would be used. This was discussed in our Working Group meeting on January 25th of 2011 and was revised text in the TBD-5 on May the 21st, 2013.

Finding 21, missed data and coworker data not adequately addressed. The issue was discussed, resolved and closed at the May 9th, 2011, Working Group meeting.

Finding 22, the cost center codes may not be reliable for dose reconstruction. NIOSH stated at the January 25th, 2011, Working Group meeting that the cost center code would not be used for dose reconstruction. This issue was resolved and closed in January of 2011 at our Working Group meeting.

And Finding 23, negative in-vivo results do not necessarily indicate lack of thorium uptake. NIOSH stated at the January 25th, 2011, Working Group meeting that these results would not be used for dose reconstruction. This issued was resolved and closed at the January, 2011, Working Group meeting.

Finding 24, enriched uranium, let's see, enriched uranium not sufficiently addressed. The use of the one percent enriched uranium has since been documented in the SRDB and TBD-5, and it uses the enriched uranium of one percent.

Therefore, the issue has been resolved. NIOSH recently increased the concentration from .783 to .973 picocuries per microgram. Therefore, a PER is in process. The Working Group closed this out in February of 2018.

Finding 25, shallow and extremity doses not sufficiently characterized. The revised TBD-6 of February 2013 added Section 6.3.11, which discusses geometric factors and references. And as a result, we were able to close this out on 2000, in February of this year.

Finding 26, the badging policy was not consistent. This issue was addressed and detailed on Page 17 of NIOSH's November the 9th, 2011 replied to the Weldon Spring Site Profile SEC issues and followed by revised text in the TBD-6 of February 6, 2013. The Working Group was able to close this out in our February meeting.

Finding 27, lack of sufficient coworker data developed for external dose. With TBD-6 of February 6, 2013, and later revised Table 6 and 7 and added Table 6

and 8 to resolve the issue. And the Working Group closed this out in February of 2018.

Finding 28, the lack of documentation and detail for neutron doses. This was issued on September 13th, 2007 to the Working Group and the SC&A evaluated results and other DOE sites, N/P values and found that the .1 was reasonable. Therefore, our Working Group closed this out in February of this year.

Any questions on the findings at this point?

(No audible response.)

Member Ziemer: And, Dick, we'll have opportunity after you finish the whole section here for additional questions and maybe hear from Ron Buchanan. But why don't you proceed with the observations and we'll complete this.

Member Lemen: Observation 1, lack of coverage of off-site activities. Resolution, exposures occurring off-site are not covered. So, as a result, we were able to resolve this in our February meeting this year.

Observation 2, TBD-3, Equation 3-1. Symbols and equation may be incorrect. Resolution, NIOSH removed Equation 3-1 from Revision 01 in January of 2013 enabling the Working Group to resolve this issue.

Observation 3, application of environmental doses. Clarity needed with wording of when to assign environmental dose. The resolution was that TBD-4 of May 2013 provides correct wording. So this was able to resolve this Observation 3 by the Working Group in February.

Observation 4, special uranium curie. The SC&A had questions concerning the equation. As a Resolution, SC&A analyzed this issue in view of the different TBDs and the associated wording and agrees with NIOSH and finds the observation resolved allowing the Working Group to resolve this issue.

Observation 5, corrections to text of TBD-4. Unit and working typos and the resolution to this was TBD-4 of May 2013 corrected the typos allowing the Working Group to resolve this.

Observation 6, years of thorium use. TBD-5 needed clarification for years of use of thorium. And resolution to this was that details of thorium exposure had been addressed in other resolved Weldon Spring Site Profile findings. And the Working Group was able to resolve this then in our February meeting.

Observation 7 had three points and this changes in the text for TBD-5. First, the second paragraph on Page 10 seems out of place. Our resolution does not affect dose reconstruction. Therefore, we were able to resolve it.

Point 2, incorrect reference on Page 12. The resolution was corrected text in TBD-5 of May 2013 enabled us to resolve this issue. And thirdly, there appears to be an incorrect statement concerning the MAC hour on Page 36 of TBD-5. The resolution was different method used in TBD-5 of May of 2013, therefore, no longer applicable. So, we were able to resolve this in 2018.

Observation 8 changes in the text of TBD-6 at two points. Table 6-6 contains incorrect symbol for gamma. Resolved. TBD-6 in the February 2013 corrected this issue therefore allowing us to resolve this in our last meeting.

Point 2, Table 6-6 is not clear when referring to associated figures. Our resolution was this does not affect the dose reconstruction so we were able to resolve this issue.

Observation 9, missing data in the TBD-6. Two points, Table 6-2 contains some blanks were historical recorded dose practices. Our resolution, the dose does not affect the dose reconstruction so, therefore, we resolved this in our February meeting.

Point 2, Table 6-16, the data dose does not provide information for all years it concerns. Our resolution, missing data used LLD values will be used for the dose reconstruction. This does not affect dose reconstruction, therefore, we resolved this issue at our last meeting.

In summary, all 28 findings have been addressed, resolved and closed by the Working Group in our February the 1st meeting this year. The BRS Findings for Weldon Spring have been updated.

All nine observations have been addressed and resolved by our Working Group, again, in our February meeting. The BRS Observations for Weldon Spring have been updated.

So with that, I will turn it over, I guess, back to you Paul since you're the acting monitor or do you want to go directly to Ron Buchanan to have his presentation?

Member Ziemer: Well before we have Ron talk to us, let's see if there's any immediate questions right here. I think Josie has one, so let's go ahead. Josie.

Member Beach: I was just curious if the Work Group did any dose reconstruction, sample dose reconstructions on this?

Member Lemen: The answer to that, I think I no.

Mr. Katz: We do that with SECs. Right? This is a Site Profile review. Right?

Member Ziemer: So --

Member Lemen: Did you hear my answer?

Member Ziemer: Yes, Dr. Lemen has basically summarized eight years of Work Group work in 30 minutes. And I know in 30 minutes you don't have a feel for the excitement that this Work Group has felt for eight years, but it really is there.

And a lot of that is a result of Ron Buchanan and SC&A which had a lot of Findings here to start with and they've been resolved. And you see that some of those resolutions go back and they're just now being reported.

Ron, do you have additional things to add at this moment? Well, let me point out before you say anything, Ron, Board Members, you all have available and this information is also on the website and I think a lot of it's in the back.

The current revisions of the Weldon Spring Site Profile, which includes all of the sections, the site description, occupational medical doses, environmental does, internal doses, external doses. Board Members have all of that back-up material.

We also have the findings matrix and the observations matrix. We have two matrices that explain actually in more detail the resolution of these findings and the matrices.

Dr. Lemen summarized them in a couple sentences, but more detail and, hopefully, Board Members, you've had a chance to look at that because I think where were going today is to indicate whether we agree that all the findings or observations have been closed appropriately.

So, let's see if there's additional questions, but, Ron, how about comments first? Ron, are you on the line?

Dr. Buchanan: Yes. This is Ron Buchanan, SC&A. Can you hear me okay?

Member Ziemer: Yes. Speak close to your phone.

Dr. Buchanan: Okay, can you hear me?

Member Ziemer: So you're as loud as you -- use your outdoor voice, as it were.

Dr. Buchanan: Yes, can you hear me okay?

Member Lemen: Yes.

Member Ziemer: You're good.

Dr. Buchanan: Okay. Yes, this is Ron Buchanan with SC&A and we've been working on the Weldon Spring Site for eight to ten years now. So some of this goes way back. Some of it goes back before some of the OTIBs and such were out and before any of the revisions were out to the Site Profile.

And we have made several visits to the site and we've interviewed the workers and we've worked with NIOSH. And working on this site, the resolutions, one thing that changed was that it got its material from Fernald. So when Fernald changed, well then this site changed.

So, it's been a work in progress for the last eight years or so. And so some of these things have been ironed out by other venues and some of them we've worked out at the site itself.

And so I feel that the Work Group, and I would like to thank them for their work and NIOSH's input into it and working with SC&A and three of us I think came to satisfactory resolution on these concerns.

And I think that Dr. Lemen did a good job of presenting it today. And I don't have any further comments, but I would like to thank the groups involved and feel that they have any questions and such have been resolved.

Member Lemen: I would just like to say thank you, Ron, for all the work you've done on this. It has been extremely beneficial to resolving these issues and we appreciate SC&A as a constant help when we have issues to help us deal with them.

And I would apologize for going through this so fast, but there's a lot of data and, as Ted said, we have provided other information that you can go back and look at. But as far as the Board or the Working Group

is concerned, I think we feel that we resolved all the issues and are ready to put this to rest at this time.

Member Ziemer: So let me now ask if there are additional questions on any of the Findings or questions for clarification?

(No audible response.)

Member Ziemer: If there are not, although the Work Group didn't specifically present a motion, I think a motion would be in order for the Board to accept the, basically the, I'm going to call it recommendations of the Work Group, to close all of the issues and observations and findings.

Member Munn: Second, if necessary.

Member Ziemer: Wanda has made such a motion, is there a second?

(No audible response.)

Member Ziemer: Dave has made a second.

Member Anderson: I'll second it.

Member Ziemer: Okay, Dr. Lemen wishes to second it. Oh, that was Dr. Anderson. Okay.

Member Lemen: That was Dr. Anderson. I know we look alike and talk alike, but he made the second.

Member Ziemer: I should have recognized that. So, we have the motion before us. It would be appropriate to ask if there's any additional questions or comments, discussion on the motion to approve?

(No audible response.)

Member Ziemer: There appear to be none. We can do this by voice votes since it's not a recommendation on a site, on an SEC. All in favor of this motion will say aye.

(Chorus of ayes.)

Member Ziemer: Any opposed.

(No audible response.)

Member Ziemer: Abstentions?

(No audible response.)

Member Ziemer: So ordered. We turn it back to you, Mr. Federal Official.

Mr. Katz: So thank you, Paul. Is this mic working? Okay.

Member Lemen: We hear you.

Mr. Katz: Okay, great, thanks. It's 10:30 now and so the next session is on procedure reviews, which Paul will also serve as parliamentarian for. But we have a break in between and I think we probably will need some extra time for the procedure reviews.

So why don't we just take a break now instead of waiting until 11. And if you could all be back, so 15 minutes, if you could all be back at 10:45 and we'll start the next session and that extra time will probably come in handy, 10:50.

Member Lemen: Ted?

Mr. Katz: Yes.

Member Lemen: You know that I have to leave at this time so I won't be there either.

Mr. Katz: That's fine. Thank you. Thank you very much for being able to make this session. So 10:50, let's say 10:50, I've been corrected.

Member Lemen: Thank you all. Bye, bye.

(Whereupon, the above-entitled matter went off the record at 10:34 a.m. and resumed at 10:54 a.m.)

Mr. Katz: Okay, well, I don't think we have Dr. Anderson yet, but I think we can get going. We still

have our quorum.

And let me just note the agenda shows three procedures that the Board will be reviewing, sort of similar to the Weldon Springs, and Dr. Ziemer will be doing the parliamentarian role for this.

But before we get to that, at the last Board meeting in December, we dealt with another procedure, and Dr. Neton from NIOSH will address that.

We had some questions from Dr. Richardson, I think primarily, during that session in December, and Dr. Neton followed up on those matters. So we want to bring that to you first, before we get into the new procedures. Thanks.

Dr. Neton: Here we go. All right, thanks, Ted.

As Ted mentioned, at the last Board meeting, there was a -- Wanda presented this presentation on OTIB-20. The Procedures Work Group or Subcommittee undertook their review of that procedure a long time ago, like it was 2007. I mean that was when this all sort of came down. And the procedure is the use of coworker dosimetry data for external dose assignment. And I was asked by the Board to address a couple questions that came up by David Richardson, and these specifically related to closure of Findings 4 -- or no, Finding 5 and Finding 6.

Just a little bit about the review. Way back when in 2007, SC&A reviews didn't contain findings, per se. They had narratives to discuss the issues, but there was no sort of dialogue that rolled up into a finding that you can point to.

So to accommodate the way we currently do business, SC&A went back and extracted, they gleaned from those narratives what appeared to be findings, statements that you could identify as a finding. But in doing that, you sort of lose the context because there's not like a roll-up going to the finding.

With that as a prelude, I'll just go over these two findings. One, Finding 5 is SC&A considers the 50th percentile constant as one that was -- scientific basis and not claimant favorable. And 6, although it's a different finding, actually when I researched it, there's a 50-page transcript just on these two findings. They discuss this issue at depth back in -- when they reviewed this, way back when. And the second finding is there are multiple elements describing the guidance and use of the TIB that require dose reconstructors to make subjective decisions.

In reality, that all kind of boiled down to the same issue, which is the use of the 50th or 95th percentile of the external dosimetry coworker model. It was felt that the dosimetry -- there was too much burden placed on the dosimetrist, the dose reconstructor, to determine whether a person really merited the 50th or 95th percentile. And in reviewing the transcript of the discussion, what it came down to was the 50th percentile is really only used for people who typically had administrative assignments but could have entered the controlled areas of the plant, were not actively involved in work activities as such.

And so in the discussion, it came out that the -- what the dose reconstructor would look at would be the job title, the CATI, if there was any information on what the person actually did at the site, and any relevant information that might be in the Site Profile. And given that, a decision could be made as to whether it was environmental exposure, the 50th percentile, or the 95th percentile would be applied to these workers. And it was thought that the 50th percentile would be a reasonable upper limit for a worker who casually entered -- not casually -- occasionally entered work areas. It would be a bounding estimate. If anything, it would be a plausible upper bound, I would say, is the way it was treated.

Together with that, it was also discussed that these dose reconstructions undergo multiple reviews. A

decision is not made by just a single dose reconstructor. There is an ORAU peer review that is done on those as well. And then NIOSH also reviews every dose reconstruction that goes out.

It was also discussed was there any evidence that NIOSH had inappropriately applied this 50th percentile. And the discussion centered around well we do dose reconstruction reviews. Has anybody seen any evidence that there has been inappropriate assignment of the percentiles? No one could recall, as such, but the Procedures Subcommittee took it upon themselves to say well, we'll pay attention to that, and as the dose reconstruction reviews go on, we'll see if anything of merit comes of that.

I'm trying to think of what else I had gleaned from those transcripts. I think that's essentially it.

It was the general agreement among the Procedures Subcommittee that they could think of no better way to accommodate this, other than just to look at it down the line and see if it's being applied appropriately. And that's been done, I'm sure. This 50th percentile has been in play for, basically, the duration of this program. So it's nothing new.

So that's my brief summary of what occurred there. I'd be happy to answer any questions, if I could.

Member Richardson: Could I ask just one question? The procedure that you described, as I understood it, was that the -- one could restate it this way. The operating procedure is to use the 95th percentile. There are exceptional situations in which a lower percentile is used, and that's the 50th.

Now the question is, when one diverges from the typical operating procedure to a lower default situation, that's where you would like -- if that is the practice, that's where that would really be flagged and highlighted. We're diverging from the typical to -- because I believe you said the 95th percentile is what you're using, except for these cases of let's say

clerical workers who only occasionally would go into.

So it would seem like that would be highlighted. The claimant would understand that a different than typical assumption is being made and here's the rationale why.

Dr. Neton: I'm not sure that's the way it actually works in practice. I think a decision is made based on the CATI and the job title of the claim, not -- I think we would be claimant favorable and default to the 95th percentile. If there was any doubt at all, we certainly would do that. But I wouldn't characterize it as the default is the 95th percentile.

I say we have these options. There is three options. There is administrative dose, which was sparingly used for people, administrative people who clearly would not have entered the controlled area and may have stated as such in their CATI. But once you get the administrative personnel who you can't really tell, then that would be the default to the 50th percentile.

The 95th percentile is reserved for people who actually do hands-on work or appear to do hands-on work in radiation areas on a regular basis, operators, trades people, those types of folks, and whose coworkers were --

Ms. Lin: Hard to hear.

Dr. Neton: I'm sorry. So that's the way it works in practice.

Member Richardson: Okay, then I didn't understand the description that you described. But --

Dr. Neton: Okay, maybe I --

Member Richardson: No, I see where you're going. You think there's three categories. I was trying to simplify it so somebody would understand when there was a divergence. And I had understood that the, let's say the frequency distribution of these

assumptions was that there was a mass at one point and there were a few cases in which the other assumption was made.

Dr. Neton: No, I have the procedure with me, and that's not the way that reads. The general approach of applying coworker -- I'm reading from the procedure -- is to assign either the 50th or 95th percentile with the intent -- assigned doses represent but do not underestimate the doses that would be assigned had the employee been monitored.

So it's pretty clear that the option is there at the beginning to use the 50th or 95th.

Ms. Lin: Dr. Neton, could you speak right into the microphone?

Dr. Neton: Okay, yes.

You know that would of course then be based on the job title, CATI, and any other information.

For instance at one site I think we found out -- you know, there are some sites where people who had what may have been administrative sounding titles actually were more exposed than we thought, and in those cases, we would have used the 95th percentile.

Member Ziemer: Dave, are you okay on that? I think what he's saying is that it's not automatically the 95th by default, unless you can prove otherwise. I think they make the selection to start with, it sounds like. I believe that's the case, they determine which it should be at the front end.

Member Lockey: I guess it wasn't clear to me. When do you go to 50th percentile?

Dr. Neton: For people who have job titles that appear to be administrative in nature but we could not determine that they -- and that they may have entered intermittently controlled areas or radiation areas where radioactive material was handled or, you

know, processed.

Member Kotelchuck: Dave Kotelchuck. Why not do that? Why not make that clarification? I realize the procedures are written, you're clear about that. But for eventually explaining to the claimants, it seems to me that some kind of clarification of where, apparently, the large majority of cases are decided, would be helpful.

Dr. Neton: Well, that would be in the dose reconstruction itself. The report, is that what you're speaking about?

Member Kotelchuck: Uh-huh.

Dr. Neton: Yes, I'm not exactly clear what language is in there right now. I think we do have an explanation in there that the coworker model was used and it was the 50th percentile but I don't know that we go to great lengths to explain the process behind that decision. We could certainly look at that.

Member Kotelchuck: It seems to me that the more that we can explain to the claimant after decisions are made, the better. And I think it would be worth a look.

Dr. Neton: Okay, yeah.

Member Ziemer: Now we have one, two, three, four TBDs that -- well, actually three TBDs and an OVER that we're going to be looking at. This particular one, most of it goes back to 20 -- the actual work by the Work -- it's not a Work Group, it's a Subcommittee in this case, goes back quite a few years.

But, Wanda, are you going to have additional comments on this TBD-20 or is this --

Dr. Neton: No, this was just clarification of questions that were raised. And I don't think the Board took any action on these findings, closure of these findings.

Member Ziemer: No, the Board did not. The Subcommittee closed the findings in 2012 on this particular one. So there's not been official Board action.

The document that the Board Members have includes all the findings, and they were all closed way back then. But there was clarification asked for this particular one for clarity, although it had been closed, I believe.

But do you have any additional comments on this one, Wanda?

Member Munn: No, I really do not. We just felt it was appropriate for Dr. Neton to be giving some response to the concerns that Dr. Richardson expressed at the time. But we have, as a Subcommittee, resolved all of the issues involved.

Member Ziemer: So what would be appropriate at this time would be a motion to close OTIB-20 -- it technically is 0020 -- ORAUT-OTIB-0020, Rev. 3. Is there a motion?

Oh, wait. I'm sorry. Brad had a comment first. Sorry, Brad.

Member Clawson: I just wanted to speak for a minute because of what David is talking about and also Mr. Kotelchuck. As a Dose Reconstruction Work Group, we have looked into this closer, and we have found some where they did not follow the CATI information, which changed things a little bit.

And so we are looking at this as a more in-depth process but also, too, as a dose reconstructor makes these decisions, we're trying to get them to why, kind of a more informational so that when we go through this, we'll understand why they did this and why they did not.

Plus also, it goes back to the importance of the CATI interview and so forth.

Member Ziemer: And the reviewers will have that information as they review it, so that they know the basis of that decision, which is important.

Member Clawson: Yes.

Member Ziemer: So now I will entertain a motion to approve this OTIB.

Member Munn: Mr. Chair, I'm prepared to move that we consider that now.

Member Ziemer: Wanda Munn has moved that we approve the closing of all the findings on this OTIB. Is there a second?

Member Beach: I'll second.

Member Ziemer: Okay, that was a pretty noisy second, but we'll accept it.

Any further comments or discussion?

(No audible response.)

Member Ziemer: If not, those in favor say aye.

(Chorus of aye.)

Member Ziemer: Those opposed, no.

(No audible response.)

Member Ziemer: Are there any abstentions?

(No audible response.)

Member Ziemer: Okay, as they say ayes above the noes.

Member Anderson: Aye is yes.

Member Ziemer: Okay, Andy, we heard that aye --

Member Anderson: Okay, thank you.

Member Ziemer: -- in some form.

Member Anderson: I'll go back on mute here.

Member Ziemer: Okay, thank you.

The motion carries.

Now Wanda is going to proceed, and I think the documents are also available to all of you. Are they all back on the table, too?

If those seated before the Board here, if you have need for having personal copies of all of these, there are copies on the back table.

Member Kotelchuck: Excuse me, which issue -- which OTIB are we starting with?

Member Munn: We'll start with 17.

Member Ziemer: I think we're on OTIB-17.

Member Kotelchuck: Thank you.

Procedure Reviews: OTIB-17, OVER-9, OTIB-34

Member Munn: Yes. And I thought, while Stu is bringing up the material here, I am going to rely on him to change it for me.

I need to let you know, as my enraptured audience, that I am coming out of a week of rather extensive laryngitis, which has been a terrible problem for me. The folks around me don't seem to mind, but, nevertheless, you may -- I'm not at all sure how well the vocal cords are going to hold out. I'm not really and truly this husky, normally, but we will do the best we can to see what we can get through here.

As you all know, the Subcommittee for reviewing procedures has been active since the inception of the Board's activities and, among the things that we've done most recently that we felt were applicable to what we're attempting to do in Oak Ridge today included OTIB-17, which is the Interpretation of Dosimetry for Assignment of Shallow Doses.

As you are undoubtedly aware, many of these things arise as a result of activities but turn out to be applicable quite often across the site. So we're trying to tie these all together for you, the things that might be most pertinent to what you're going to hear the rest of the day.

This is guidance for assigning shallow doses to the skin, testes, and breast from non-penetrating radiation.

We have a great deal of information on these slides, and I'm going to try not to just read them back to you because you do have them in hard copy, if you would like to read them. But we like to, in cases of this sort, particularly, have slides that portray a fairly consistent view and a fairly detailed view of what we covered, simply because if people are going to use this as a reference in later years, we'd like them to have complete information on it.

We had Revision 1 issued back in 2005 and we had our first report from SC&A fairly soon after that in June of '06. They had 15 findings that went into our Board Review System, and those are the ones that we addressed throughout our activities with this particular OTIB.

We all worked on resolutions for it for the next couple of years. We wound up with 14 findings closed and one in abeyance.

I'll read the findings verbatim. It is suggested that the dose reconstructor check whether the site was reporting dose due to electrons or photons and whether the dosimetry system had been calibrated for that type of radiation.

SC&A wanted the OTIB to provide additional guidance on how to interpret film badge data because the beta versus low-energy photon exposure -- there are several different types of doses that are calculated here. The shallow dose for this type of beta is the one that is being under analysis at this

moment.

NIOSH responded to that with the indication that OTIB is to be used together with the Site Profile. The Site Profile hopefully contains a significant amount of material that is necessary for interpretation of what the dose reconstructors must do. And it is one of those things that can only be done on a case-by-case basis. You can give general guidance but when the rubber hits the road, we have to take into consideration the specific conditions of that claim.

In 2007, we found that NIOSH's response was acceptable, SC&A agreed, and we closed the finding.

Finding 2, the protective clothing used for each case was known in the majority of cases. Clothing-specific transmission factors should be used.

NIOSH said that there is language in the OTIB, which there was, that allows the dose reconstructor to choose which of those factors was going to be applicable and whether that was going to require a maximizing, minimizing, or realistic data of the beta dose that was being looked at the moment.

Both parties agreed that this was appropriate, and we closed the finding on October -- at our October 2nd meeting in 2007.

Finding 3, it is SC&A's opinion that individual monitoring for beta particles only works on a yes/no basis.

That position was disagreed with by both OCAS and ORAU. Talked about the geometry issues that are discussed in the OTIB under a different exposure geometry heading and we discussed the dose reconstruction reports on a case-by-case basis because that's the way we have to look at them.

SC&A's main concern was the potential for deposition of hot particles, which as you know, is a hot topic in this particular venue always. On a worker's skin if it's

not -- or if it's localized and an undetected beta exposure.

NIOSH responded that whether such exposures might be occurring is determined primarily on the frisking data for hot particles, as people come out of the zones where they work, and the knowledge of what conditions were like in that specific facility for that particular claimant.

SC&A recommended that Finding 3 go ahead and be closed because OTIB-17, although they had some concerns with it technically, can't be improved much further than it already is. The work that could be done was done with respect to the verbiage and the presentation method.

So here was SC&A's suggestion. When the cancer site is on the hands, lower arm, or face, consider workplace monitoring data. When the cancer is on the thorax, use individual monitoring data. When the cancer site is on the lower legs or feet, you must consider both.

We closed that finding based on the assumptions that we had discussed and both parties being satisfied with addressing this further under overarching issues, which is the special corner in which we place issues that spread across more than one or two sites of the complex.

Finding 4, it is possible to state definitely where the cancer site is but not where the contamination was.

And the discussion that we just went through in the preceding on pretty much covered that. We thought about every aspect of it that we could during the discussion.

Finding 5, a skin dose due to hot particle exposure will not be detected because of the localized nature of the exposure.

Of course this is very much like the previous finding,

which we closed along with Finding 3.

Finding 6, if dosimetry recorded detection of -- a limit of detection, then this value should be used as the basis for the missed dose calculation.

We had a subsequent White Paper prepared by SC&A on this particular OTIB, and it appears that the two agencies agree. Here is the verbiage. If it is known that the film badge dosimeter overstated the dose from low-energy photons and if it can be further ascertained that the limit of detection was expressed in terms of this overstated dose, rather than the corrected dose, then we agree that it's appropriate to supply a correction factor to the limit of detection in assigning a missed dose from low-energy photons.

So with that agreement on December 11th in 2007, we closed the finding.

Finding 7, it is not claimant favorable to consider that an employee had 4 millimeters of clothing thickness.

NIOSH took the position that, depending upon the location of the organ of concern, the 4-millimeter assumption had been made for pants and undergarments -- not a lab coat, which is more directly applicable in most cases that we encounter.

That was agreeable to SC&A, reasonable, and we closed the finding.

Finding 8, attachment A provides a correction factor for the breast, penis, and testicle using a source that was modeled as a 12 centimeter square infinitely thin disc source located two centimeters away from the skin. For the breast area, the film dosimeter would give a reasonable dose estimate. If the source was near the testicles, the film dosimeter would not measure anything.

So of course, these observations stimulated a great deal of discussion about the other documents that we had that addressed these issues in one way or

another. The geometry of badge placement is not something limited to this discussion only.

NIOSH relies on quality assurance and training to ensure that everything that can be possibly addressed and documents are correctly used when individual doses are being calculated.

That response was accepted and we closed the issue in 2007.

Tables A-1 and A-2 list correction factors for non-penetrating doses based on radionuclide. In nearly all real cases, it is not possible to state the radionuclides that are responsible for the beta dose was Finding 9.

NIOSH pointed out that the benchmark correction factors for a range of beta energies. We have Site Profile documents which typically provide additional information that will help the dose reconstructor determine for himself or herself whether the proper energy range is going to be used.

In addition, this particular document, this OTIB, provides guidance with respect to all of the uranium daughter products, which is most helpful, I'm sure, from the dose reconstructor's point of view.

The agency and the contractor agreed in that matter, and we, again, closed that finding.

Finding 10, for low-energy beta, the dosimeters were likely incapable of furnishing accurate doses.

As was pointed out, however, that the dose reconstruction staff would, of course, been considering that information before they began. The purpose of the OTIB is to provide generalized information known by all and sundry, including, most certainly, the dose reconstruction folks that they use all the resources at their disposal.

If necessary, the hierarchy of data sources listed in IG-001, that is one of our basic instructional

documents and PROC-0006, which is shown in a table in this OTIB as well, includes the use of source term modeling.

That was an acceptable response. We closed the finding.

Finding 11, it is not clear why the two tables providing examples of skin dose assignments on pages 21 and 24 give the recommendation from 30-250 keV for missed dose to the skin and zero for an OW reading and zero S reading.

Determining energy ranges for radiation types, in this case, are chosen because it is in fact the most claimant-favorable over and above the potential of assigning it as an electron dose.

Because it was claimant-favorable and the differences are known, it was an acceptable response, and we closed the finding.

Finding 12, the logical order of the information in Chapter 3, General Approach, could be improved.

And I think most of us who looked at it had a tendency to agree that that was, in fact, the case, and NIOSH agreed with it. They identified the need to revise it in the future and they did -- will. It is in abeyance awaiting exactly that. When the next revision is issued, that will occur.

Finding 13, the OTIB does not identify any cases where a possible -- Probability of Causation can be determined early in the investigation.

There is a different procedure, PROC-0006, which we mentioned earlier, that needs to be used in order to do this kind of triage in assessing whether or not a claim is likely for a high Probability of Causation.

If you're going to consider the use of 17 in the overall context, you have to be aware that this is a very important decision in making it. It does give guidance

on the topic of high and low PoC. That potential is shown on a specific page, page 6 in several items.

Once that was observed a little more closely, we agreed with that response, and the Subcommittee closed the finding.

Number 14, the OTIB is not claimant-favorable in instances of unknown parameters that affect dose estimates. Ordinarily, the dosimeter location has no relationship to skin dose at the point of cancer incidence.

This was a thing on which there was no quick and easy agreement. Geometry issues are discussed in this OTIB and in specific OTIBs talking about geometry placement of your badge in relationship to the placement of cancer.

And the OTIB does make the recommendation of a dose conversion factor of 1 to accommodate potential inaccuracies that are caused by exposure geometry. So it's not an unknown, and it's not a matter which is addressed lightly. It is a primary concern for the DR.

The OTIB is claimant-favorable regarding the dose correction factors as well as the level of detection, attenuation, and radiation. So that's a very careful consideration.

And that was certainly an agreeable response. The Subcommittee closed the finding.

15, the OTIB does not employ scientifically valid protocols for reconstruction of doses regarding (a) assignment of non-penetration dose; (b) assumption of 4-millimeter clothing thickness; and (c) treatment of hot particles.

There was a disagreement with that position, and we had considerable discussion of SC&A's concerns.

The guidance is given in order to assign the non-

penetrating dose as electrons or low-energy photons -- as you will recall, we've already taken a look at that -- as necessary to complete a valid dose reconstruction using IREP. Dose is often given as OW and S or shallow and deep, not as beta and gamma.

Since the organ that was being under consideration in this particular section of the OTIB was the penis, the four-millimeter assumption was made for pants and an undergarment, which seems fairly obvious, not a lab coat, but you could add that, if you choose, but it's highly unlikely. That type of clothing is less common than the pants and underpants.

Non-uniform dose can be considered by the dose reconstructor using guidance in not only this OTIB but lots of other things that are available to them, including VARSKIN and guidance from Site Profile documents that are talking about hot particle exposures.

We agreed and closed the finding.

It was a long and very thorough review of the document itself and of the potential that it had to address.

Any questions?

Member Ziemer: Wanda, before we go to questions, since overarching values came up in this one as well, would it be helpful to go ahead and do the Overarching Issues 9 and then take the questions?

Member Munn: I, personally, would think that would be the best process because these overarching issues are not small things. They are issues that need in-depth consideration and for which our technical folks have to spend a great deal of effort zeroing in on exactly what the root causes of the issues are and how to address them.

So yes, I would prefer to do overarching issue as well.

Member Ziemer: Okay, so why don't you go ahead with that? For the Board Members, it's another separate document, and you can pull that up, and we'll do that. And Stu can pull it up there, and then we can include those together.

This will be Overarching Issues 9 on skin exposure.

Member Munn: And I'm going to try to avoid coughing by trying to speak over Louise's very nicely offered cough drop. So prepare your ears for what you are likely to hear or not hear.

The first concern with this overarching issues paper addresses is the concern related to NIOSH's dose model for chronic deposition of fine particles on bare skin.

The concern that was expressed by NIOSH -- I mean by SC&A to NIOSH involves a derived dose of 16 millirem a year to bare skin. It seems to be based from their position on unsupported and unrealistic assumptions, which included daily skin contamination for each of the 250 workdays per year that only persist for eight hours; an implication that after an eight-hour shift, each skin contamination is removed completely by a standard daily shower; and the assumption that only bare skin is subject to contamination and the radiation exposure that is likely to result from that.

NIOSH talked about its approach for addressing this particular issue, fine particle deposition, except that the assumptions regarding the ease with which uranium could be removed from skin and clothing.

This turned out to be more of a sticky issue than we had assumed. It is, of course, a fairly common occurrence and one that was going to recur. And so NIOSH spent some additional research time attempting to assure that they had covered all the known bases in that regard.

The did a White Paper that assessed all of the

literature for quantitatively and qualitatively supporting the removal of 100 percent of uranium by soap and water wash, which, as you probably know, is accepted, common, and in most cases entirely satisfactory process that is used widely across the complex.

After reviewing that paper in-depth, we both found that the conclusions were acceptable, and we were able to close that concern.

The second concern was related to how IREP derives Probability of Causation and its relevance to how dose is assigned. Specifically, this involved the relationship between a derived dose and how IREP uses it to derive a PoC, given that the skin dose only occurs through a very small area.

The IREP issue was not an easy one either. We addressed it repeatedly, over the years of 2013 and 2014, and we had a number of teleconferences, several of which were almost entirely on this issue.

NIOSH provided an explanation of the relationship between derived dose and IREP. They identified that specific guidance was given for dealing with non-uniform exposure to the skin, and it's been incorporated in the OTIB that we just talked about.

They consulted with SENES to confirm that that OTIB's guidance was appropriate and adequate. And we found that to be a quite adequate response. We closed the concern.

The third concern related to NIOSH's dose model for large uranium flakes on the skin. The same basic questions that we looked at earlier but for deriving the dose from large uranium flakes was discussed again in those 2013, and 2014 and later in 2016 teleconferences.

SC&A recommended using the OTIB that we just looked at, where the skin exposure under a hypothetical flake is averaged over the entire surface

area of the body, which is about as claimant-friendly as you could get I believe.

That was accepted by the Subcommittee, and we closed Concern 3.

Now, questions?

Member Ziemer: I have one question, Wanda, not specifically on the actions here, but could you remind us on the Board -- what's the proper name for our big matrix -- the Board Review System, where we show a finding closed, do we distinguish between when the Subcommittee has closed it versus the full Board?

Mr. Katz: No, we don't. We don't.

Member Munn: No, we do not.

Member Ziemer: That was my thought. And it seems to me that at some point, we need to be able to designate or identify which of those closed findings in the Board -- oh, Ted's got an answer.

Mr. Katz: No, I mean I absolutely agree. I think that's an oversight. I don't believe we've been doing that, although it is possible it was occurring but I don't think so.

In any event, we can follow-up after this meeting because there have been many other procedures, too, that are in the Board Review System and they probably end with indicating that the Subcommittee closed them or the Work Group, but not necessarily that the Board did. And I think that's a good point.

Member Ziemer: Yes, and my point was so here's a group of things that I thought were all done with five years ago and we're just now acting on them as a full Board. And so -- and I had in the back of my mind that the Board may have even authorized the Subcommittee to be the final closure on those, but it's far enough back and I'm at the age where I don't

remember that far back.

Mr. Katz: Yes, actually the Subcommittee isn't in a position to be authorized for that.

Member Ziemer: Well, that's helpful. Then we will find a way to designate in the documents themselves that when it is closed by the Subcommittee versus the full Board that we --

Member Munn: We can certainly talk about that at our next Subcommittee meeting --

Member Ziemer: Right.

Member Munn: -- and give NIOSH that charge because it would be a nice thing to add.

But I do have to point out that during the period of time we were discussing these things, especially as an overarching issue, the Board, itself, had this as a topic on more than one occasion.

So it isn't as though the Board was not kept briefed on our processes. We were moving through them.

Member Ziemer: Oh, yes, that is certainly very true. This is not a surprise to the Board. The overarching issues have come up under a number of other issues as well.

Member Munn: Yes, indeed.

Member Ziemer: Very good.

So we can do two things here. One is to separate these two vote-wise, but to open the floor for a discussion on either of these two documents, if there are questions.

Dr. Kotelchuck.

Member Kotelchuck: On Concern 1 on overarching, NIOSH did a study to say that removal of -- supported removal of uranium by washing with soap

and water. But in Item 2, it said is 100 percent removed by a standard daily shower. Is that -- is there any data to show that there is in fact a standard daily shower winter and summer?

Member Munn: I believe that the term daily shower incorporated the soap and water process.

Member Kotelchuck: No, the question is I'm not sure people, all people do a standard daily shower and at different times of year, in winter, whether people do that. And I assume, in large facilities, people have to take a shower at the end of the work day. That's required I'm sure in some. On the other hand, for the AWE facilities, I'm not sure.

I just wondered if there is data to say that that -- there's no question that it's removed if you do the standard daily shower. The question is, is there a standard daily shower? Is there evidence for that?

It's a little awkward. It's an awkward but, on the other hand, I'm not at all sure that everybody does a standard daily shower 12 months a year.

Member Munn: I'm at a loss to identify how we could possibly assure from every claimant that we have that has worked in an exposure area, that they -- I would think, and this is just a personal comment, certainly the radiation workers that I know personally want to shower when they come out of a zone, regardless of what the weather is.

Member Kotelchuck: Well I wondered whether there is data on this. And it is awkward. Obviously, we'll never know if people take a daily shower. I mean what are they going to do, fill out a form?

But if there is data on -- and it may relate to different facilities. As I say, some facilities, obviously, folks take a shower. It's required, and they do. I'm not worried about that.

But if we're really trying to figure out what the

chronic -- the effect of the chronic deposition, it would help in my mind if there was some supporting data about that.

Member Ziemer: Several years ago, NIOSH did a White Paper for the Subcommittee on this issue. I don't recall the details but maybe -- Josie, do you recall that?

Member Beach: Well, I don't recall that particularly, but I do work in a rad facility. OSHA requires showers to be available. They do not, however, require people to take showers. So it is up to the individual.

Member Ziemer: But I thought -- I don't know if Jim Neton is still here.

Jim, didn't we have -- we had some data which formed a basis for a final decision on this particular issue, actually.

Dr. Neton: Yes -- testing.

I reviewed the literature and specifically, we were talking about time periods back in the 1950s. And in the facilities that we looked at, showers were required at that time. Now, I don't know that it was -- we didn't investigate all facilities but this was in the 1950s when uranium was being rolled and that sort of thing. And I found three papers relevant in the 1950s, in that era, that looked at the efficacy of showering and removal of the uranium.

And I don't think you're questioning that but there was some interesting studies. One was they made a -- they took some lanthanum-140 and mixed it with dirt of various particle sizes and rubbed it onto the arms of 45 volunteer workers and then used various treatments to try to remove it, one of which just used basic soap and water and it pretty quantitatively removed the contamination that was rubbed on their forearm. So we felt pretty comfortable that that was true from showering.

But related to your question about how do we know that everyone took a daily shower, we really didn't look at that in tremendous detail. But it was our experience that many of these facilities that we were familiar with, showering was part of their activity, especially when you're involved in these sort of messy operations, rolling and that sort of thing.

Member Kotelchuck: Well I mean I do appreciate what you're saying but, in fact, even to say, as you did appropriately, that these are studies in the '50s, when there was a lot more activity in the radiation field, we're now talking about almost 70 years later.

It might be worth taking a look at -- not the efficacy of the soap and water. No question about that, but the frequency with which people, just to sample perhaps a few facilities and find out, what is the frequency with which people really do take showers.

Member Ziemer: One related question would be whether or not showers are required in those cases where they actually detect activity through the portals when they're checking out or whatever their scan methods. It's one thing to say that everybody should shower every day, but it's another thing to say do those for whom we actually know got contaminated shower or if it's localized, wash their hands or whatever it is.

Certainly in my experience, if we detected something on somebody's skin, you didn't tell them to go home and wash. You took care of it right away.

Member Kotelchuck: Yes, good point.

Member Ziemer: But nonetheless, at some point, and I'm not sure how you would necessarily follow up, I'm not sure we want a big study on how frequently DOE people shower, but the point is, in the record, I don't know whether you have hesitation on closing this issue, but at least it's worth discussing, perhaps.

David you have --

Member Richardson: Well just first to close that out, I think Dr. Kotelchuck's observation was that currently the assumption is 100 percent showering with 100 percent efficacy, which gets back just to the basic question of that.

Just a clarification also on this first point, there's a distinction here between bare skin and covered skin. Is that correct?

I mean so there's -- because the other situation in some industrial settings is that when you have contamination on your clothing, as you take that clothing off in the workplace, the contamination gets onto your skin, at which point that distinction between covered and uncovered becomes a little more murky for me. And then if you say the person, it's questionable whether they took a shower when they left, then there's actually more skin that's been exposed. I mean that happens in other industries, certainly.

Could I ask one about, to work backwards just with these overarching concerns? Could you help me understand? Concern 3 you said is the same basic question as described in Concern 1.

Concern 1 is what we've just been discussing about the efficacy of washing. Is that what you were talking about with Concern 3?

Member Munn: I think I was referring to the difference between small and large flakes.

Member Richardson: Because I was thinking that the issue was more about averaging over surface area, which I took to be Concern 2.

Member Munn: Joan, do you have any comment?

Kathy, are you with us?

Member Ziemer: Is Kathy Behling on the phone?

Member Munn: Kathy?

Ms. Behling: Yes, this is Kathy Behling. I'm on the phone.

Member Munn: Hey, good.

Ms. Behling: You're correct. It is a combination of Concern 1 and Concern 2. But you are correct, Concern 2 does come into play for the large uranium flakes, also, and averaging over the entire surface. And that was, ultimately, addressed in OTIB-17.

Member Richardson: And that -- so could you -- because I wanted to understand, it was stated that it was, that this issue of how IREP is going to handle this was resolved, but it wasn't -- we weren't told how it was resolved.

What is IREP -- how is this averaging being resolved by IREP?

Member Ziemer: I think you're asking Kathy but --

Ms. Behling: I'm still here. I have to go into IREP and -- I'm sorry -- OTIB-17 to recall how they go about doing this. And perhaps Dr. Neton can also help me here.

Member Ziemer: Yes, Dr. Neton is approaching the mic here.

Dr. Neton: There were some fundamental questions about how we would address various exposures, skin contamination scenarios of bare skin, not on the clothing.

And one issue was if you have a small particle, a small contamination area, how does that relate to risk, given that the risk models for skin exposure were based on a uniform exposure to the whole body, the Hiroshima/Nagasaki survivors.

And the answer to that was that it is true that the risk would be smaller because you have a smaller area of skin exposed but at least the way SENES or now Oak Ridge Center for Risk Analysis explained it to us is

the baseline risk would also be lower. So they sort of cancel out each other.

So you can use the same excess relative risk per sievert for a small area as a large area. And that's how we handle it. That's how we were doing it anyways.

The other issue was if the contamination was not near where the skin cancer occurred and we knew that, then we would assign no dose -- no dose to that part of the skin.

Member Richardson: So maybe we could just start with --

Dr. Neton: There is a third scenario, though, which is if you don't know where the contamination occurred, then IREP -- this is not an IREP issue. It is an input into IREP issue. We assign a distribution, it's a log-normal distribution that accounts for the various possible scenarios of how large the area could have been contaminated as such. And I don't recall the exact parameters of that log-normal distribution right now, but it's in TIB-17, and if Kathy has it, she could probably --

Ms. Behling: I'm sorry, you were breaking up. I can't hear everything that was being said.

Dr. Neton: Oh, I'm sorry. Well, I was talking about how NIOSH or how we input into IREP the situation where we don't know where the skin contamination occurred. And I think there is a log-normal distribution in that procedure.

Ms. Behling: Yes -- excuse me. Yes, there is. The smaller the area of skin that is impacted, it starts with a GSD then of 6 and goes up to 14 for what they would consider a single hot particle exposure. So it is a log-normal distribution with a geometric standard deviation between 6 and 14, based on the area of skin that they feel is impacted.

Dr. Neton: You'd have to read the procedure. I have not read the procedure in a while but it's described in there. I don't know, Kathy, if we want to go through and read the whole thing, but there's a description in there why that's a valid approach, and that was vetted through this review process. And I'm at a loss right now to explain exactly how that works.

Member Richardson: But the basic issue is that we could imagine skinning an adult human and laying out a sheet of skin and it's got some defined area. And we could average the dose over that entire sheet, or we could look at subsets of that skin.

And one part of that subset, which isn't too large, is the bare skin. And you can help me, but I assume that is the face, the neck, the hands.

Dr. Neton: Yes, this is all related to bare skin we're talking about here, not --

Member Richardson: Well, but the issue of when we get to IREP is that now we're working on a model which, as you said, assumes whole body exposure, that whole sheet. And the suggestion was we could average over that because the baseline probability of the occurrence of skin cancers is also uniform over the whole sheet.

But I would ask somebody with experience, do skin cancers occur uniformly over the body or do they tend also to occur on the bare skin? Do we see the instances of skin cancer more often on the face, the neck, the hands than we do some of the covered flesh?

Dr. Neton: Yes, I don't know the answer to that.

Member Richardson: And I mean I guess the other part for the claimant is we're not blind to where the claimant's cancer occurred. Some of those cancers occurred on the bare skin and some of them occurred elsewhere.

And so we don't have to start from ignorance. We could start from --

Dr. Neton: This procedure deals specifically with a known skin contamination value, whether we know exactly where the skin contamination was measured or not.

Member Richardson: I was working the other way. We know where the cancer occurred or not.

Dr. Neton: Well, yes, that's what I'm saying. So if we know where the cancer occurred, and we have a survey that shows that the skin was contaminated at that location, then this is when we would assign the dose.

If the skin cancer occurred on the hand and the contamination occurred on the neck, we would assign zero dose to that skin cancer.

Member Richardson: One of the scenarios for this calculation of what the largest bare skin dose would be, for example, was just assuming some daily dust exposure, which is washed off 100 percent at the end of each day, and it assigns a dose to the bare skin.

And one of the questions with the implementation of IREP is do we take that estimate of the bare skin dose and then average it over the entire sheet of human skin or do we use a larger dose which is not averaged over the sheet.

As I understood that and it's the same thing with the flake --

Dr. Neton: No, we assign the dose as calculated to that area of the skin without any modifications.

Member Richardson: So this part here about averaging over the entire surface area of the body is a red herring.

Dr. Neton: No, I think I need to go back -- maybe I'll report out on this again. I need to go back and review

that distribution that takes this into account. It's a log-normal distribution, and I'm at a loss right now to explain it, but I can certainly get back to you on that.

Member Ziemer: And you would only use that scenario if you didn't know -- if you had a skin cancer but didn't know where a contamination occurred.

Dr. Neton: That's correct.

Member Ziemer: Then you would do that averaging. Otherwise, it's right at the cancer, has a specific dose --

Dr. Neton: Right.

Member Ziemer: -- or it's zero if the contamination is known to be elsewhere. So there's three scenarios.

Dr. Neton: Correct.

Member Richardson: No, Paul, but I was working the other way. We know that a skin cancer --

Member Ziemer: We know where the cancer is, yes.

Member Richardson: -- occurred on the bare skin. We don't know where the contamination occurred, but we're generating a bare skin estimate and then averaging it over the entire body.

And is that claimant-favorable or not is my question. One could estimate just the dose that went to the bare skin --

Dr. Neton: But I think that is one piece of this log-normal distribution. It could be either distributed over the whole body or it could be a little piece directly under the thing. And that's what is accounted for in this distribution.

Member Richardson: I see that, I mean, under -- but the question is why would we use a distribution when we --

Dr. Neton: Because we don't know. All we have is a value. We know there was maybe 5,000 dpm per 100 square centimeters. Where? We have no idea. And so we have to have some accommodation to account for the unknown nature of where the contamination occurred. Was it over the tumor? Was it not over the tumor? How large an area?

Member Richardson: And again, we could imagine that sheet and we could partition it into smaller and smaller pieces. The very smallest section of that sheet would be the site location of the tumor. A larger set but not still the whole sheet would be the bare skin. And the largest set would be the entire body, the entire surface of the body.

Dr. Neton: Yes, and that's basically what this log-normal distribution accounts for.

I mean if Kathy could maybe read the paragraph or I could report out, I don't know that we --

Member Ziemer: Well what I'm wondering here, this may, particularly on the overarching document, we may want to postpone action on that until we can clarify this. We could certainly do that.

Dr. Neton: I might ask is someone from NIOSH on the phone or ORAU? I think Tim Taulbee may be on the phone and/or Matt Smith. And if they have any better insight into how this log-normal distribution is generated, they could help at this point.

Dr. Taulbee: This is Tim Taulbee. I'm on the phone, but no, Jim, I don't have anything to add at this time about that log-normal distribution. I, like you, need to go back and reread all the assumptions associated with it. Sorry.

Maybe Matt Smith is on the phone. I'm not sure.

Member Ziemer: Well let me just suggest to the Board that a possible route here would be to defer action on the overarching issue document, and

there's only the three concerns, and to take action on the OTIB with the possible exception of that part of the OTIB that also is related to this document. I think it was just one item. I forget which one it is.

Now, Loretta.

Member Valerio: So my question is on Finding number 12 of the OTIB, it appears that NIOSH, SC&A, and the Committee are all in agreeance with it, but the revision has been in abeyance since 2007. That's an awfully long time. So I'm wondering if there's any indication of when that will be revised.

Dr. Neton: Yes, this procedure is currently undergoing revision for other items and I made sure that this would be incorporated into that revision that's being worked on right now.

Ms. Lin: Loretta, can you please speak into the microphone?

Member Ziemer: Oh, were you asking about Jim Neton's remarks?

Ms. Lin: No, asking about Loretta's remarks.

Member Ziemer: Okay, Loretta, if you wanted to repeat that again.

Member Valerio: So my question was on the time frame for the revision of the OTIB-17.

Member Ziemer: Now what would be needed here, if you wish to pursue this in the manner I described, would be two things. One would be a motion -- well actually we don't need a motion to postpone. We don't have a motion to act at the moment.

So lacking a motion to act on OTIB -- or on OVER-9, Overarching 9, we could let it -- although, I think it would be helpful to have an action item where we instruct NIOSH, perhaps, to provide the information to the Board and then put this on the agenda again.

So perhaps a motion to that effect. I don't know if you want to use my words or some better ones. Does someone wish to make such a motion?

David is --

Member Richardson: I will.

Member Ziemer: Okay. Did I word that motion, though, in the proper way for you, David?

Member Richardson: Far better than I would have done.

Member Ziemer: Yeah, right.

Member Kotelchuck: And I'll second it.

Member Ziemer: And it's seconded.

So that motion is to defer action on Overaching-9 and to request that NIOSH provide further detail on the -- I think it's on the IREP methodology and related information to help us resolve the issue raised by David's question.

Are you ready for a vote on that motion?

All in favor, aye.

(Chorus of aye.)

Member Ziemer: On the phone lines, any ayes?

(Chorus of aye.)

Member Ziemer: Okay, good. I think we have all ayes.

Any noes?

(No audible response.)

Member Ziemer: Motion carries.

Now back to OTIB-17. What is your pleasure on that?

For clarity, help us remember which finding referred to OVER-9? Which finding was that?

Member Beach: I think it's 3.

Member Munn: Let us get it back up for you.

Member Ziemer: Is it 3? Yes, Finding 3 recommends that it be closed. Well, let's see. No.

Oh, yes, number 3 does refer, at the bottom of the page to Overarching-9 --

Member Kotelchuck: 4 and 5 both mention.

Member Ziemer: Okay, 3, 4, and 5 also refer to that then. Is that correct?

I think what we may be looking for will be a motion to agree to the closure of Findings 1, 2, and then 6 through 15.

Mr. Katz: Why don't you just defer it all?

Member Ziemer: We could defer it all.

Member Richardson: While we're here, could I ask a question about Finding 7?

Member Ziemer: Yes. Yes, go ahead.

Member Richardson: So Finding 7 relates to the assumption of four millimeters of clothing. And I understood it to be -- or maybe it's a question about how that's operationalized or what that means in terms of the shielding from four millimeters of clothing and what assumptions are implicit in that.

Member Ziemer: I suspect we may have to get Dr. Neton to address that as well.

Member Richardson: I can just give you a preview while he's coming up of what my question is. Is it that it's -- we've said one part of that clothing are the underpants.

And is the assumption that the worker is wearing an impermeable, non-absorbent underpant, or is there -- is it possible, that given the fabric --

Dr. Neton: I don't know the answer to that question. I'd have to go back and research it. These things were done 11 years ago. And I thought I prepared adequately for this, but apparently, the level of depth at which --

Dr. Taulbee: Dr. Richardson, could you repeat that question, please?

Member Richardson: Sometimes when you incorporate clothing as an additional barrier, you view it -- there's various ways of implementing it. And one of them is that you assume it's impermeable or nonporous. And for the underpants, that would seem a stretch. I think they are designed to breathe.

Member Ziemer: A stretch so to speak.

Dr. Taulbee: I don't believe that's the case. The thicknesses were derived from the standpoint based upon the guidance within VARSKIN and clothing thicknesses. And so there was some compounding going on.

The whole issue was regarding the exposure to the testes --

Member Richardson: Right, but I believe, and somebody knows this far better than I do, that the recommendation with that VARSKIN algorithm was actually the best situation would be to measure inside the clothing. I mean that this issue of permeability was an important assumption in VARSKIN and one which is not clear.

And so if you're assuming like an impermeable work suit, that's one thing, but if we're saying half the thickness is underpants, then we may want to look at what the embedded assumption is, for example, in that VARSKIN, where this has been discussed before.

Member Ziemer: Okay, we're going to need a follow-up on that, too.

So at this point, since there are several items in OTIB-17 that need follow-up, perhaps our best bet would be to defer action on the whole document until we have further clarification.

And, Josie, do you have an additional comment or question?

Member Beach: I just wanted to point out that 15, Finding 15 would also be included in that, in 17 -- not to miss 15.

Member Ziemer: Oh, Finding 15. Yes, correct. Thank you.

So we're going to ask for a motion to defer action on OTIB-17.

Mr. Katz: We don't have a motion.

Member Ziemer: I'm asking for a motion on OTIB-17 to defer.

Mr. Katz: We don't have a motion to go forward.

Member Ziemer: No, we don't have a motion to go forward, but we need some action to be done, as we did on the Overarching 9.

Member Beach: I will be happy to make that motion.

Member Ziemer: I'm not certain what the follow-up is on this, however. I'm not sure what your motion covers follow-up wise, Josie. We've identified the items here.

Member Beach: Right. Just a report from NIOSH, is what I was assuming, clarifying those items in question.

Member Ziemer: Jim or Stu, are we sort of semi-clear on what's needed here? Okay.

Member Clawson: I second.

Member Ziemer: We're not only semi-clear, we're completely clear. Correct?

Mr. Katz: Brad seconded.

Member Ziemer: Brad seconded.

So the motion will be to defer action and to report back the clarification matters for those findings that deal with the skin dose and the undershorts and other garments.

Member Munn: So we're deferring --

Member Ziemer: Wanda?

Member Munn: So we're deferring? I'm not sure I understand.

Member Ziemer: I think we are deferring all of the action on --

Member Munn: We're deferring everything until we check on the underwear.

Mr. Katz: There were more items than that but anyway, we're --

Member Ziemer: There's a number of items here that have related parts of the skin dose issue. I think we've identified at least four of these, at this point.

And, Phil, did you have additional comment?

Member Schofield: I was just going to say that I don't think this one could be addressed because my experience has been that there is a wide variation in the weight of protective clothing, coveralls, underwear, tee shirts, whatever you wore. Sometimes they were very light. In the early days, they were all cotton. Then later on we went to coveralls -- cover the other coveralls.

So I don't know how they're going to formulate that.

It's going to be a hard one for them.

Member Ziemer: Well, we'll see what information we gather, and we'll have claimant-favorable underwear.

No Duluth Trading underwear.

Are you ready to vote then on the motion? Do you remember what it is? Okay.

All in favor aye.

(Chorus of aye.)

Member Ziemer: On the phone?

(Chorus of aye.)

Member Ziemer: Thank you.

Any noes?

(No audible response.)

Member Ziemer: The motion carries.

We're ready with OTIB-34 -- or are we ready?

Mr. Katz: We're actually out of time.

Member Ziemer: We're out of time.

Mr. Katz: Which is fine. I suspected that we might not get through all the agenda items, which is fine. We can also carry that agenda item, the last procedure forward to the next meeting.

But it's 12:15 now. In the session after lunch -- lunch break goes to 1:45 -- it's very important that we start on time because we have a lot to cover in that hour. It's going to be tough, again there, to make it within time. So let's try to break on time.

But thank you -- thanks, Board Members, for these questions because this is an important part of approving these procedures is getting clarification

about these matters at the Board level.

So we are breaking, out of session until -- what did I say -- 1:45. And again, Board Members, please be seated and ready at 1:45 for the next presentation. Thank you.

(Whereupon, the above-entitled matter went off the record at 12:18 p.m. and resumed at 1:45 p.m.)

Dose and Dose-Rate Effectiveness for Low-LET Radiation

Mr. Katz: While we are waiting, let me just check on the line and see do we have back Dr. Anderson and Dr. Field?

Bill, are you on the line, Bill? And Henry, Andy?

(No audible response.)

Mr. Katz: Okay well, we have a quorum in any event. We don't have Dr. Anderson or Dr. Field on at the moment. That's okay. And I don't think we have Dr. Lemen on either.

But, David, this is your session to lead.

Member Richardson: Well, thank you. So there is a Working Group on Scientific Issues and, for quite a long time now, we've been working through this topic of what's called dose and dose-rate effectiveness factors. A large report has been prepared that was commissioned by NIOSH. The group has gone through that report briefly. And also NIOSH solicited a number of external peer review comments on it, which have been circulated, and the Board has had an opportunity to circulate those and get to them.

But today what we're going to do is have a presentation on this topic. And just to orient people, we currently, we use the IREP system for relating dose to the risk of cancer for a claimant. Embedded within this computer system, which does a calculation, is an assumption about what the risk is

per unit dose. And there's a set of risk coefficients which have been derived from studies of the Japanese survivors of the atomic bombings of the Hiroshima and Nagasaki. And for solid cancers, there's pretty much a straight line, which is drawn between on the x-axis, how much radiation exposure someone received and, on the y-axis, the risk or the probability that they got cancer.

This factor here, this dose and dose-response effectiveness factor for solid cancers is a number that they're going to divide that slope by when they start talking about lower doses and the typical doses that workers were receiving.

So we have assumptions that we use right now that are embedded. There's one set of assumptions for all cancers other than breast and thyroid, which is basically dividing that slope by two. So if it increases at a 45-degree angle, as risk -- as dose goes up, the risk goes up. It's going to be 22.5 degrees as an angle for that reduced slope at lower doses.

The exception is for breast cancer and thyroid cancer, where it's being divided more by a factor of 1.5 instead of roughly a factor of 2.0.

These were subjective derived correction coefficients that came from Charles Land, who was at the NCI at the time. And my own reading of this is somewhat that this different slope factor for breast and thyroid versus the other solid cancers partly reflects Charles' subjective view of the world and his particular interests in breast cancer and thyroid cancer.

What NIOSH has done is now commissioned a report which is looking back at those assumptions that go all the way back to the start of this program about what risk per unit dose we should be using for making these decisions.

And I'm going to pass now over to Dave Kocher, who is going to talk about this report.

Dr. Kocher: So as David just said, we looked at this one parameter that's in the IREP program and we want to develop a probability distribution of this parameter. The idea of the probability distribution is to develop a distribution of possibly true values of this parameter. We're not interested in an uncertainty in the mean or anything else. We just kind of want to know the range and sort of what's the probability in-between that range.

But more generally, our interest was to develop a DDREF distribution that would be generally suitable for use in any modern-day cancer risk assessment that attempts to fully account for uncertainty.

As David just said, DDREF is basically an adjustment factor that's used in estimating cancer risks from low-LET radiation at low acute doses or low dose rates. And in our report and in the draft copy of a paper for health physics that I believe you have received, we do go into what constitutes a low dose and a low dose rate but I'm not going to talk about that today.

The basic idea of a DDREF, it is an assumption that the risk per unit dose, the risk per gray at low doses or low dose rates may differ from the risk at higher acute doses, which is observed in the Japanese atomic bomb survivors. The A-bomb survivors are still the gold standard in cancer risk assessment today.

DDREF is defined as the ration of the risk per unit dose at high acute doses to the risk per unit dose at low doses or low dose rates. This definition is arbitrary and I think it was done with the belief that DDREF would be greater than one. So they would like to have a nice number greater than one.

As David also said, this correction factor, this adjustment factor is used whenever a linear dose-response for a cancer is assumed that risk is a linear function of dose, alpha is the coefficient, D is the dose. But when you use a DDREF, it means that this coefficient may depend on dose or dose rate. That's

sort of what's implicit in here.

And the reason we like linear dose-responses, as David said, is that for all solid cancers and for most individual solid cancers, the dose-response in the A-bomb survivors appears to be basically linear up to a fairly high dose, 2-3 gray.

Well, where did DDREF come from? I think it was invented about 40 years ago and it had certain arguments behind it. The main argument was that even though these dose-responses might be linear, that the true dose-response was really linear and quadratic in form. Okay -- that there was this quadratic term so the dose-response would curve upward. And I'll show you a picture of that in a moment.

So one assumption was that it may appear to be linear but it really was linear-quadratic underneath. And the other assumption was if you wanted to estimate the risk at low dose rates, it was determined by the linear term only. Only this term would occur when you were down in chronic exposure situations.

It turns out that the experimental basis for this linear-quadratic model was all artifacts. It had been proven later that these linear-quadratic dose-responses that they saw in cells, that was an artifact. And David Richardson was important in showing that the linear-quadratic dose-response for all leukemias in the A-bomb survivors was also an artifact. But this model lives on and people are still using it. But there's not a firm basis for its assumption. There's no doubt about that.

So here's a little picture that kind of -- and David tried to illustrate with his arms what's going on but this is basically what he said. Imagine we have four data points up here. And this is in the range where you really do see a response at a given dose. There is no doubt about that it's elevated. And for solid cancers, you can fit this dose-response with a nice linear curve that just goes a straight line down to zero. And the

slope of that curve is the risk per unit dose. And that risk per unit dose is independent of dose. The slope is the same everywhere.

But if the true underlying dose-response is linear-quadratic in form, like this solid line right here, it starts out with a small slope, increases, and then it rolls over here when you're doing a lot of cell-killing. If the true dose-response really is this, then the slope of this curve at low doses is this curve down here. It's a much lower slope.

So the idea is that DDREF is basically the ratio of this slope to this slope. In this cartoon, it's a number greater than one. But this is the basic idea behind the linear-quadratic model being the true dose-response.

When you have a linear-quadratic dose-response, the risk per gray, which is alpha plus beta D, it increases with increasing dose and DDREF is greater than one. And a DDREF is incorporated implicitly in this model and it depends on dose. The DDREF is 1 plus the ration of the beta coefficient to the alpha coefficient times the dose. And that is a dose-dependent quantity.

And this beta over alpha is referred to as the curvature parameter. The higher the value of beta over alpha, the more distinct curvature you get in this linear-quadratic dose-response.

But since this linear-quadratic model doesn't have a firm basis, other kinds of dose-responses are not ruled out. One of particular interest is the dose-response possibly super-linear, where the risk per dose at low doses and low dose rates is higher than at high acute doses, in which case, DDREF is less than one. And the question of whether DDREF can actually be less than one is of some controversy but it's not ruled out by anything that I'm aware of.

You have to distinguish, in this business, between solid cancers and leukemias. And again, David had a lot to do with this.

For solid cancers, you basically have linear dose-responses most of the time, adjusted by a possible DDREF. You don't know what it is but it's possibly adjusted by this factor. But it's clear that the dose-response for leukemias combined in the A-bomb survivors is not linear. It is highly curve-linear. It looks like a linear-quadratic model with this dose-dependent DDREF in it.

And this linear-quadratic model is an artifact because all leukemias consist of basically three different kinds of leukemias. The dose-response for none of those is linear-quadratic but, when you put it all together, it looks LQ. And that means that you can't use these dose-responses to inform a DDREF for solid cancers. It has nothing to do with solid cancers. Leukemias are just different. So you have to separate the two.

And so we're worried about a possible DDREF for solid cancers. Well, why do you we use it? This kind of reiteration. Okay, you get nice linear fits to dose-responses in the LSS cohort but that doesn't necessarily mean that it fits the data below limits of detection, which are typically about 0.1 to 0.2 gray. There may be small non-linearities that are concealed in there and they usually try to tease them out.

The other possibility is that the linear fits to the LLS may not describe the risk per unit dose at low dose rates, which is what you're interested in for your worker populations. So this is kind of why we need to use this parameter.

A DDREF really consists of two distinct concepts and I'm going to emphasize this throughout. The first we refer to as a low-dose effectiveness factor, LDEF. And this is basically the effect of dose from acute exposure on the risk per gray. As the dose from acute exposure goes down, does the risk per gray change?

And you analyze possible nonlinearities in the dose-response from acute exposure and almost always it's done using linear-quadratic models fitted to data in the LLS cohort for all solid cancers combined.

So you attempt to tease out that there's some actual curvature, even though it looks linear and the response per unit dose is different at low acute doses.

The other concept is called a dose-rate effectiveness factor, DREF. It is concerned with the effect of dose rate on the risk per gray. When you go from acute exposure to a chronic exposure, what's the change in the risk per gray, if any?

And you, generally speaking, estimate this. You have some data in worker populations where you estimate risk to those workers and you compare those risks with comparable risks in the atomic bomb survivors, which is high acute doses. And you take the ratio of those two, a DREF is the risk per gray and the LSS at acute exposure divided by the risk per gray from chronic exposure in workers or members of the public.

Uncertainty is extremely important. IREP is all about uncertainty. Modern-day cancer risk assessment tools are all about uncertainty.

The goal of all of these programs is to obtain some kind of subjective confidence interval. These are not statistical confidence intervals that have any statistical rigor. They are subjective. There is always judgment involved.

These confidence intervals, in our view, are supposed to represent -- they represent uncertainty in estimated risks and we refer to this as state of knowledge. And I'll say this several times. It's a fuzzy concept. It took me a while to get used to it but state of knowledge does not mean statistical uncertainties from model fits the data.

And there are several analyses I have shown that the uncertainty in DDREF can be a very important source of uncertainty in estimating risks of solid cancers at low doses or low dose rates.

So to characterize the probability distribution of

DDREF as best we can is extremely important for purposes of this compensation program and any other application where you are looking at uncertainties and estimated risks.

David mentioned the two probability distributions that are in IREP at the present time. These are what we call discrete probability distributions. Probability is assigned to discrete numbers. This is not a continuous function.

The one on the left is for all cancers other than breast and thyroid. It's set actually at about 1.8 or so. The 90 percent confidence interval goes from one to three. And breast and thyroid has a slightly lower value. It's central value is about 1.3, somewhere in there.

And again, as David -- it's true that this was basically a wet your finger and put it in the air and see what you come up with. There wasn't any kind of formal analysis behind this. This was Charles Land abetted by Owen and others at our company about what this might look like.

But this is what's in IREP at the present time and this is a fairly uncertain quantity. You know it can range from 0.5 to 4.0. Remember, anything less than one means that the risk per unit dose is considered to be higher at low doses and low dose rates than it is in the atomic bomb survivors at high acute doses.

Anybody that gets in this business -- this is an important slide for the panel. Anybody that gets into this business confronts two basic issues. Issue 1, what studies are relevant in developing at DDREF distribution for solid cancers? What are you going to choose? What data are you going to use? Are you going to use epidemiologic studies only or are you going to include this wealth of data on cells and animal systems, laboratory animal systems?

And if you include radiobiologic data, you have to answer the question can these data really be used to

quantify or inform the uncertainty in DDREF in humans. We sort of believe that the answer to that question is pretty much no. You've got to show me that this is really relevant to quantifying uncertainty. They demonstrate, no doubt, that there is an effective dose and dose rate but to actually adjust some numbers, that's a stretch, in our view.

So even if you decide that you're going to use epidemiologic studies only, which ones are going to choose? There's a bunch of them out there.

The second major issue is you're going to have each value that you choose is a distribution of some kind. It has uncertainty. And the question is, how are you going to combine those all different probability distributions of DDREFs that you have gleaned from the literature? How are you going to combine them? What weights are going to be given to them?

And we have done this differently from everybody else. So heads up about that.

So the basic idea of our study was to develop what we call a state-of-knowledge probability distribution of this parameter using data from epidemiologic studies only.

Our study is unique in the fact that we used four different data sets. We have low dose effectiveness factors for incidence and mortality from all solid cancers and we have dose-rate effectiveness factors for incidence and mortality for all solid cancers. Any other analysis of the literature includes only a subset of these data sets. We are the first one, to my knowledge, to use all four.

We also looked at data for specific solid cancers but we didn't use it in our analysis. We don't think it really informs anything that you don't get out of this.

And this distribution -- IREP doesn't calculate risks of all solid cancers combined. It calculates risks of specific solid cancers. And our intent would be that

this distribution would apply to those cancers whenever linear dose-response is assumed. And that's an assumption.

We talked about the linear-quadratic model before. And you can actually use the linear-quadratic model in two different ways to estimate a low dose effectiveness factor in cases of acute exposure. The one that I showed you before is this take the ration of R sub-H over R sub-L. And I showed it before, it's 1 plus the quadratic coefficient divided by the linear coefficient times the dose. And by convention, by convention only, it is evaluated a dose of 1 gray.

So in this approach, the LDEF is just 1 plus beta over alpha. Again, beta over alpha is this curvature parameter.

The other way to do this is the one that I showed in the cartoon before, where you take the ratio of two linear slopes. The numerator is the coefficient to the linear fit to the dose-response and the denominator is the coefficient of the linear term in the linear-quadratic fit. Those are the two straight lines that I showed in the previous cartoon. You don't get the same answer. You get sort of the same answer but you don't get the same answer. It's just a different model for how to do this.

Okay, I'm going to describe qualitatively and then I'll show you some data here pretty soon. What studies did we use in our analysis to come up with a probability distribution of DDREF at the end of the day? And again, we used four data sets.

The first data set was data on low dose effectiveness factors from acute exposure for solid cancer incidence and solid cancer mortality. For solid cancer incidence, everything is based on DS02 dosimetry, for those of you who have been keeping score about that business. One estimate came from the study in 2007 for the Radiation Effects Research Foundation. These are the experts at Hiroshima that have studied this problem since 1950. They came up -- Dale

Preston published a single estimate of an LDEF and the BEIR VII Report from 2006 came up with two estimates, using the two different methods of LDEF that I showed you on the previous slide.

For solid cancer mortality in the LLS cohort, we actually have six different estimates. We get two estimates from a paper by Mark Little about ten years ago. This was done for the United Nations Scientific Committee on the Effects of Atomic Radiation. So this is an authoritative analysis. His approach was to use two different risk models, rather than the two different methods of applying a linear-quadratic model. He used an excess relative rate model, ERR, and an excess absolute rate model, EAR.

And the most recent paper from RERF on solid cancer mortality, you can tease out four different estimates of LDEF from that: the two different ways of evaluating linear-quadratic model that you showed you before; and the other dimension here, the other two come from the fact that this was evaluated over two different dose ranges in the dose-response. And amazingly enough, he got very different answers, depending upon the dose rate that was analyzed. And I'll show you that in a second. So we had, basically, three data points up here and we have six data points down here.

This is just an illustration of kind of what these data look like. This is the solid cancer incidence dose-response from the BEIR VII report. Dose on this axis, excess relative rate really on this axis. And the solid curve is a nice linear fit and it basically fits the data pretty nicely.

What they tried to tease out is there any improvement in using a linear-quadratic fit. And the fit that they thought was best was this middle one, when the curvature parameter was 0.3, which means an LDEF of 1.3. And that's this curve in the middle.

And then they did one for a higher curvature that they thought gave a poorer fit. So their preferred

best estimate for LDEF was 1.3, based on this.

But you know to the naked eye, it is basically close to linear. We are trying to tease out a pretty small effect here.

Well, we worked on this project for years. We finally reached a point in spring of 2017 when we said enough; no more papers. We're not going to consider anything else. And as sure as tomorrow's sunrise, here comes a flood of new papers. It was absolutely predictable.

RERF has updated the dosimetry system. It's now DS02R1 and the paper is redoing the A-bomb survivor data with this new dosimetry system are starting to come out. We haven't accounted for any of this but I hope to talk about it at the end what the implications are for our work.

The first paper on solid cancer incidence by Grant, not only did it include a revised dosimetry for the survivors but a longer follow-up. The follow-up was extended from 2003 to 2009, I think, was the cutoff point. Anyway, a longer follow-up compared to the 2007 paper that we used from Preston.

Filed shortly thereafter is another paper on solid cancer mortality by Harry Cullings, et al. This was a little different. He updated the dosimetry but he did not look at a longer follow-up to the cohort. So this is basically redoing the same data that we used in the 2012 analysis with a new set of dose estimates for the survivors. But we didn't account for any of this but I'll try to show you what the potential implications are.

Okay, so now moving on to the second component of a DDREF, which is this dose-rate effectiveness factor and recall that you estimate by comparing risks in some population of workers or the public that receive chronic or protected exposures with risks in the A-bomb survivors from the high acute exposure.

For solid cancer incidence, we used two different studies; one U.K. workers from Muirhead. The second was the Techa River cohort. This is a population -- this is members of the general public that live downstream from the Mayak production facility in Russia and they got zapped. This is an important cohort because it is a member -- a cohort of the public of all ages.

Now when you do this, of course, you have to pick a comparable risk in the LSS cohort and I've indicated where we got them. We got this one from a literature and this one we calculated from the BEIR VII model. But one of the challenges is you have to match this risk in the LSS cohort by age at exposure, attained age, and male fraction with the distributions in these other cohorts and that's not a trivial job.

Solid cancer mortality, we used three studies to estimate DREFs for that. The paper by Muirhead included mortality as well as incidence. So we used it. The second was David Richardson's INWORKS study that I presume you've heard about something in the past. It's a pooled study of workers in three countries. And Techa River also has a study of solid cancer mortality.

So we had two DREFs incidence and three DREFs for mortality.

Now I mentioned there are many challenges in doing these DREFs so I think you kind of have to take the results with a grain of salt, with a healthy dose of skepticism.

To select a particular age at exposure and attained age in the LLS cohort that matches the age distributions in these workers or public populations is not easy. Oftentimes, these exposures of workers, especially, you have neutrons and alpha particles that can complicate matters. Any of these groups could have non-uniform exposures from internal beta emitters. This really complicates your dose-response analysis and it's difficult to know how to do this.

Sometimes you have exposures to lower energy x-rays. These workers all got x-rays on a routine basis to see if they had lung cancer. Some workers got treated with beta particle exposures. These things probably have an increased biological effectiveness. How are you going to account for that?

Risk transfer between populations of different nationalities. You're comparing risk in A-bomb survivors in the Japanese population with risks basically in Western populations. And it's not a given that the risks are the same because of differences in the baseline rates.

This is probably an unimportant problem for all solid cancers combined but it's not -- I would say it's not a zero effect.

These are challenges that are difficult to meet.

Well, as in the case of the LDEFs, there were a whole bunch of studies of workers and members of the public that we did not use in our analysis and I kind of wanted to outline those here.

The first study we did not use at all was the famous 15-country study by Elizabeth Cardis that was done at -- let's see, this is International Agency for Research on Cancer I think is what that stands for. And this is a famous study. They pulled data from workers in 15 countries and they came up with a positive dose-response. My, that looks nice. The problem was, this positive dose-response was due entirely to an estimated risk in a sub-population of a Canadian cohort that is now believed to be totally invalid.

So when you take the Canadian cohort out and you're left with 14 countries, still 14 out of 15, that's still pretty good. The dose-response was non-significant. And furthermore, the dose-response was non-significant in workers in each of the 14 countries and some of those dose-responses had undefined lower bounds. So we, basically, parsed all this out.

Two recent studies we did not consider, a study about Mayak workers that I'm going to talk about a little bit later, and Chernobyl emergency workers. Our basic beef with those is reliability of dosimetry. There is a new dosimetry system for Mayak workers that we're still awaiting and the Chernobyl emergency workers have always had concerns about accuracies of their dose estimates.

And this is controversial. We basically omitted any other study in workers that had a statistically non-significant dose-response. Why? Because it's uninformative about uncertainty in DDREF. We are interested especially in the lower bound of a DDREF, the values that are going down kind of close to zero, maybe. But when you start getting negative numbers, you are in La -- La Land. These are basically -- in our view, these are basically uninformative estimates. That's controversial. Not everybody agrees with that.

We are dealing with -- we want to deal with probability distributions. We wanted to find a functional form of the probability distribution of each of these input LDEFs and DREFs but we have to make those up because the epidemiologists don't give you probability distributions. What they give you is a central value and a confidence interval.

While we assumed that all the central values, the parameters that they gave us, these are what are called maximum likelihood estimates. I think that is a good assumption. No problem with that.

And we fitted these reported maximum likelihood estimates and confidence intervals with Weibull distributions. We put the mode of the Weibull distributions, the MLE, and defined the bounds of the Weibull distribution by these confidence limits.

Weibull distributions are really handy. They are extremely flexible. And we needed this because some of these probability distributions in these parameters are highly skewed. The MLE is way close to one

confidence limit and one way far away from another confidence limit. You can't describe that by normal distributions or lognormal distributions or anything like that. You need something that's flexible and Weibull fits the bill.

So what we come up with at the end of the day are 50th percentiles, median values, and 90 percent CIs of these different quantities.

I don't expect you to look at this for very long but this is basically the data that we used. From here up to the top is the data for all solid cancers that we did include in our analysis.

This solid line here, one, that's a DDREF of one. That basically means no effect. The risk per unit dose is the same under any condition. Going to the right is DDREF greater than one, which means the effect is reduced at low doses and low dose rates. Less than one means it's increased. DDREF less than one means an increase in the risk per unit dose.

The open figures are the incidence data. So here's your three LDEFs from the atomic bomb survivors. Here's our two DREFs from the worker studies. And here's our six DREFs for mortality.

And notice in the Ozasa analysis, there is one set for a dose range of 0-2 gray that gives these really high uncertainties and pretty high central values. This is a 50th percentile of 3.2. This was a highly skewed distribution. His MLE is down here at 1.8. That is not a lognormal distribution by any means.

But if you just increase the dose range slightly, this is a kerma of 0-4 gray. So this is a colon dose, maybe going up to about 3-3.2 gray, something like that. But the answer is changed really tremendously, depending upon the dose range that you chose to do the analysis.

And here is our dose-rate effectiveness factors based on the worker in Techa River studies. And you notice

right away that the greatest weight to the values less than one all comes from these studies of dose-rate effectiveness factors.

Part of the reason, I think, is that when you assume a linear-quadratic model in the LLS cohort, you are kind of biasing yourself toward a curvature greater than one.

Be that as it may, it is clear that the lower values are basically less than one or basically your dose-rate effectiveness factors, based on studies in workers and the public.

I just showed the organ-specific data down here. We didn't use any of this. Most of us, the old DS86 dosimetry -- the only value that I think is relevant today is this one estimate for thyroid cancer from Veiga's paper in 2016.

The skin numbers are not relevant because this is not a linear dose response. This is a hockey stick dose response. Basically, piece-wise linear with different slopes and different ranges of dose.

So this is really important and I'm sorry that it will be confusing.

Initially, we are different from everybody else in the way we chose the studies that we used in our analysis. And so we have developed probability distributions of all those parameters that I have shown. The way we combined these distributions is different from what other people have used and we think there is justification for this, even though epidemiologists look at me and say go away, you twit, you don't know what you're talking about.

Our whole approach to combining these different estimates is based on a concept called multi-model inference. It is basically model averaging. And this is a scheme -- it is a fairly new idea. It was first discussed in an UNSCEAR report in 2012. The basic idea in model averaging or multi-model inference is

this: that each distribution of LDEF or DREF that we come up with is a distinct model. It is a distinctly different model of representing a DDREF. It is these different distributions. They do not represent repeated measurements of the same quantity. They are distinctly different models. And this is the new concept that I think we're the first people to try this in this arena.

The other thing that is different is how do we weight these different distributions? Well model -- yes, how do we weight them? We didn't assign our weights based on statistical uncertainties and the model fits to the data. We did it based on subjective judgment about the weights that should be given to each study to represent their relevance to estimating a DDREF. The relevance is different from statistical uncertainty. These weights account for the quality -- we can account for the quality of the underlying studies.

This a very -- you're sitting there going this is a very squishy concept. It doesn't have any bedrock. That is true but I'm going to show you that it's really, really easy. It's really, really easy. And I'm also going to show you later that, no matter what you do, judgment is involved. And we're just admitting our judgments right up front.

The essential feature of this multi-model inference model averaging, you have a bunch of confidence intervals of the different estimates that you're going to combine. Some of them are narrow. Some of them are wide.

When you do multi-model inference or model averaging, the confidence interval of your answer is always wider than the narrowest distribution of the input distributions. And similarly, it's always narrower than the widest one. You're averaging. The confidence interval in its width well be somewhere in the middle. Very simple concept. And that's an essential feature of this model. It's always wider.

So here's where we part company from everybody

else -- not everybody else. There are three papers in the literature that have done this method called inverse-variance weighting.

What this is about is instead of weighting each estimate by some kind of subjective squishy judgment about relevance and quality of the study, you just weight it by the statistical uncertainty. The variance is a measure of statistical uncertainty. And you weigh each one by one over the variance, the reciprocal of the variance. So if you have a very small uncertainty, that estimate gets a huge weight and if you have a large uncertainty, that estimate gets a very small weight.

So this is based on an assumption that all your uncertainties are purely random and that all these different distributions or measurements are the same thing. It's a very attractive way because it's a defined mathematical prescription for how to do this that everybody can understand.

What it produces is what we call a deflation of uncertainty. When you do this inverse-variance weighting based on statistical uncertainties only and assume they're all measuring the same thing, you get an uncertainty that is smaller than the uncertainty in the smallest input distribution that you put into the calculation, a deflation of uncertainty.

And this is the kind of thing you're used to from your college statistics classes, where you're doing random variability and that kind of thing. When you see that somebody has done a meta-analysis of epidemiologic studies, this is exactly what they're doing. That's a buzz word for this inverse-variance weighting but ours is different.

So, we have this squishy subjective weighting quality of studies baloney, you know no bedrock. It's really not that hard.

How did we combine our low dose effectiveness factors for solid cancer incidence? We have estimates

from two expert groups, RERF and the National Academy of Sciences. They get equal weight. They both know what they're talking about. They get slightly different answers but so what? You give them equal weight. That's really easy. Now the BEIR VII report came up with two estimates so we give each of those 25 percent weight.

They add to 100. So you just make a judgment. Both of these groups know what they're talking about. They just used different models, some different assumptions but the outcome is equally valid.

The same thing with the low dose effectiveness factor for solid cancer mortality. We have two expert groups, UNSCEAR up here, RERF down here. They get equal weight. They both know what they're talking about. They used different models. That's a matter of judgment. We say their judgment is equally valid.

Now we have two estimates from Little. We give each of those 25 percent weight.

Now, in the Ozasa LSS, the RERF analysis, we gave slightly higher weight to the lower dose range values than we did to the higher dose range values and this was only because Ozasa preferred an LDEF based on the narrower dose range. That was his preference. I think if I had to do it over again I'd reverse, to be honest with you.

Okay, how did we combine the estimates of DREF, the dose-rate effectiveness factors? We had two studies. Here we gave a much higher weight to the U.K. worker studies than we did to the Techa River cohort.

We felt we had to include the Techa River cohort because it's the only public cohort I'm aware of in which risks of all solid cancers combined have been estimated, surprisingly enough. The lower weight of only 20 percent reflects the concerns about uncertainties in estimated doses. None of these

people were monitored, obviously. The dose estimates are all based on modeling. There is a lot of uncertainty about it but we felt we had to include this to represent our state of knowledge, sort of the global what does the waterfront look like overall but we give it a low weight because the outcome may be less reliable than say a worker study.

In the solid cancer mortality, we had three studies to combine. Again, we gave a low weight to the Techa River cohort because of dosimetry issues. And this was probably something that we could reconsider for sure.

We gave equal weight to the Muirhead study and to David Richardson's INWORKS study. Now the problem here is that the data from U.K. workers that David Richardson included is exactly the same data as in this paper up here. So we've kind of double-counted this study. In effect, we've given a weight of like 50 to 60 percent to the Muirhead study and 30 to 40 percent to the other two populations in David's study. But these are the kind of judgments that you have to make that people can argue about until the cows come home.

Okay, so at this point, we have four distributions. We have a low dose effectiveness factor for solid cancer incidence, based on LLS data. We have a low dose effectiveness factor for solid cancer mortality and we have DREFs for the two endpoints.

We have four distributions. So how are we going to combine those? Well, the first judgment we made is we're going to give a relative weight of two-to-one to incidence over mortality. We're going to give the incidence-based distributions twice the weight of the mortality-based distributions. Why is this? Again, this is a judgment.

I think people today consider that the incidence data and the atomic bomb survivors really is the gold standard. One obvious reason for this is that IREP calculates incidence. It's not the least bit interested

in mortality.

But there are problems with mortality data in the LLS that don't arise in the incidence data. Disease ascertainment is a problem. Sometimes you know the cause of death is reported in such a way that you don't really know that it was a cancer. The other problem is that mortality risk clearly depends on the level and intensity of medical care; whereas, incidence does not. So for a variety of reasons, we give a higher weight by two-to-one to incidence versus mortality.

So now we're down to distributions. We have an LDEF for incidence and mortality combined and a DREF for incidence and mortality combined. Well, we give them equal weight. We feel like in order to encompass the state of knowledge of what we know, both of these approaches to estimating a DDREF are equally valid. The data may not be so good in each one but the approaches themselves are equally valid.

So the result of all that, you do this in a Monte Carlo setting with a crystal ball and you all are probably familiar with this kind of thing. But you end up with a distribution that has some tails. So we truncated the distribution we got. We eliminated any value less than 0.2 and any value greater than 20. We just felt that there's no credible evidence of any kind that the true DDREF would lie outside this very broad range.

Well, we eliminated very few numbers, only about 1.3 percent and removed them mostly at the low end.

So the answer that we came up with after doing all these machinations, we have a median value of 1.3, this is the 50th percentile, a 90 percent subjective confidence interval between about 0.5 and 3.6. The 95 percent CI is broader. And just to kind of give you a sense of what this means, this distribution assigns a probability of 27 percent, more than one chance in four that the true value lies -- is less than one, that the effect is greater, that effective radiation is greater at low doses and low dose rates than it is in the

atomic bomb survivors, and about 17 percent probability that it's greater than two. Two, of course, is the magic number in radiation protection today.

And again, it's a squishy concept but we are absolutely serious about it. This distribution is intended to represent our state of knowledge of DDREF. It's not any kind of statistical distribution. It is not necessarily what you could get if you could do a repeated measurement over and over again to get the true value. It's our state of knowledge.

As part of this study, we did a couple of comparisons with other estimates that had been in the literature. One was the BEIR VII report. Their 50th percentile was 1.5. I mentioned earlier that their maximum likelihood estimate was 1.3 but their distribution is lognormal with a median value of 1.5. This is basically an LDEF for solid cancer incidence only. So this is only kind of one-fourth of the kind of data that we used.

Peter Jacob, back in 2009, did a meta-analysis of a bunch of studies in workers and the public. His main result was obtained by combining seven studies on solid cancer mortality and he got a DREF with a central value less than one and a fairly tight confidence bound.

And another value for solid cancer incidence, this is not his main result, a central value of about one, fairly narrow confidence bound.

So this is a picture of kind of the way things look like. This is our data, again, up here at the top, our incidence data, mortality data, and the LDEF and the DREF. And below the line, the red is the result from our report. And here's Jacob's values and here's BEIR VII down here.

Now, I've been doing this for too long but I have got to tell you when I kind of stood back and looked at this, when I looked at our line down here and I looked at this data up here, I said that passes the eye test.

That passes the eye test. This doesn't but they only did one data set so you can't fault them for that. But this kind is a representation of this stuff up here, this kind of passes the eye test to me.

I wanted to talk about this solid cancer mortality study in the LSS, where the low dose effectiveness factor depended very much -- let me go back. Here, again, in a narrow dose range you've got this high value, a large uncertainty. And if you went out to the full dose range, you got a value of nearly one with a small uncertainty. This is kind of surprising.

And basically what Ozasa found this curve L is the linear fit to the dose-response over the entire dose range. LQ is the linear-quadratic dose fit to the dose-response over the entire dose range and it's virtually indistinguishable from the linear. LDEF is basically one. But if you restricted the fit of the linear-quadratic model from 0-2 gray, he got a fairly substantial curvature.

So really the question is, if you're going to estimate your risk per unit dose based on this curve up here over the full dose range, are you going to apply a DDREF based on a limited dose range or the full dose range? I think you apply this one but Ozasa thought this was the right one.

This is us just being cute. We're talking about distributions, probabilities, all kinds of things. If you want to look at a single estimate in a distribution that best represents what's going on, it's the arithmetic mean. The arithmetic mean is the expectation value of all the values in a distribution. It's the single most meaningful measure of central tendency.

So if you want to estimate the arithmetic mean of a risk at low doses and low dose rates, you might think well that's just one over -- that would be proportional to one over the arithmetic mean of DDREF. No, it's proportional to the reciprocal of the harmonic mean. This is a concept I was not that familiar with. If you want to punish yourself, you can stare at that

equation. That's what it is.

But the point is that the harmonic mean is less than the arithmetic mean.

In our distribution, the harmonic mean is only 1.1, which means that our DDREF suggests that the reduction in average risks at low acute doses or low dose rates is only about 10 percent. Big whoop.

If you took the reciprocal of the arithmetic mean, you would get a reduction of about 40 percent but that's not the correct interpretation. It's the reciprocal of the harmonic mean that determines the arithmetic mean of the risk.

So do I have time to talk about the data that we didn't include? So let me go through this with some -- I know I put you all in La La Land.

These recent estimates that came down from the RERF, I'm going to show you MLEs and confidence intervals. For solid cancer incidence, this is the estimate that we used, the new paper by Grant, new dosimetry. Now, he only evaluated the curvature over the full dose range. He didn't do 0-2 gray to the colon. But basically his LDEF is the same and it's very close to one. So there's not really much change here.

Now here for solid cancer mortality in the LSS, here's the old Ozasa estimate. This is his preferred number. And you can see what I meant by this distribution being highly skewed. The MLE butts right up against the lower bound and is way far away from the upper bound. That's a funky distribution.

But this is his preferred value and when Cullings did it with DS02R1 dosimetry, he got basically the same central value. The uncertainty about double. The more you know, the worse it gets. This is life. This happens all the time. The more you know the worse it gets.

But he, again, found no significant curvature at the

higher dose range. So if you did this over the full dose range, you would basically get an LDEF of one.

The real kind of new thing in the Grant paper on solid cancer incidence was the fact that LDEF may depend on sex. It appeared to be different in males than in females. A definite 2.3, that's a fairly high number for males; essentially 1.0 in females. Whether this is significant, it remains to be seen.

Well, if you look at the Cullings analysis for solid cancer mortality, there is no sex dependence over the same dose range. There is no sex dependence at 0-2 gray to the colon in the mortality data, even though you still get a higher curvature.

If you go back and relook at the old 2012 data over the 0-4 gray kerma, nothing. But if you look at his data at 0-2 gray, he did see a big effect but it went away when you changed the dosimetry. So this is all a mystery.

In a personal communication, we asked Eric Grant what's going on here. And he sent us an email, a very nice email saying he's looking at data for specific solid cancers and he's not seeing anything yet. So the upstate returns are not in on this question of whether LDEF depends on sex.

So there are a number of issues with this recent data. They are not definitive. What we have done is not definitive. Nobody has done anything definitive. It's all information.

This dependence of LDEF for mortality on the dose range is very puzzling. It's not clear what to do about it. We think that you should use the same dose range to estimate LDEF in the risk per gray. That's the only thing that makes sense to us.

Now this effect on dose range appears to be small for solid cancer incidence. It's not been explicitly studied but the comparison with the Grant paper and the Preston paper indicates effect of dose range, if any,

is probably small.

The other question is are LDEFs in males and females significantly different and are they different for solid cancer incidence versus mortality? It's hard to believe that this is really true.

I'm going to spend a minute talking about another study that came out in 2017 after our work was completed. The ICRP has a big Task Group that's looking at all issues of DREF. And one of their members, Roy Shore, published a paper recently looking at dose-rate effectiveness factors. And he looked at 19 studies of mortality, three studies of incidence, and he did this inverse-variance weighting that I talked about before.

His answer, when he included all 19 studies of mortality, he got a median value of 2.8, pretty high, with a range indicated here. If he included the incidence data, even a little higher. You know the probability that the value is less than two is very low in this distribution.

But here's one of the problems with the inverse-variance method. The Mayak worker study had, by far, the smallest variance of any of the 22 studies. That one study alone contributed 91 percent of the weight to this answer. It contributed 80 percent of the weight to this answer. In fact, most of these studies contributed, basically, zero weight. So this is an issue.

If you took out the Mayak worker study, you get something that's kind of comparable to us because we didn't include Mayak workers. His value changed drastically. Instead of 2.8 for the central value, it's down to about 0.9 and the confidence interval gets way lower. Same thing for mortality plus incidence. Our value is here and, of course, we include low dose effectiveness factors, which are not in this analysis.

But this one paper drove the whole thing. So Roy Shore, in his wisdom, and he's way smarter than I

am, said I'm not going to recommend a value. Here's just a bunch of different values based on a different set of assumptions. You do with it what you want. That's smart.

He had another set of numbers where he restricted his studies with a mean dose less than 100 milligray. That excluded the Mayak workers. That was a fairly high-dose cohort. Again, he got numbers kind of like what we got, these really high values including the Mayak worker study were not there.

Well, I've been critical of this so-called meta-analysis approach. Let me just briefly summarize what our concerns are.

The approach is objective in the sense that it is a prescribed mathematical formalism that is understandable and everybody can do it but there are assumptions behind it. You make judgments when you do this.

Judgment 1 is that each estimate of these things that you're combining represents a repeated measurement of the same quantity with the same instrument. Your risk estimate in German uranium millers has exactly the same meaning as your risk estimate in Japanese nuclear power plant workers. Sorry, I'm not buying that dog.

Even more important, this method assumes that every estimate that you're combining is totally free of bias. There is no systematic error in any of these risk estimates in workers of the LSS cohort. I would say good luck with that. Or the biases cancel out with no uncertainty. Good luck with that, again.

These assumptions, in our view, are not met and they result in confidence intervals that are too narrow to represent our state of knowledge.

After I gave this presentation in Charlotte about five months ago, an epidemiologist came up to me and said this is the way we do it, end of story.

Let me make some concluding remarks here. I hope I -- if you get nothing out of this, any way of estimating DDREF and its uncertainty always involves important subjective judgments. There is no right way. There's no objective way to do this. That's a flight of fancy.

You make judgments about the data to be included. You make judgments about how you are going to combine these different estimates. It's always there.

Our approach of subjective weighting based on relevance and this approach of model averaging, it differs from the more familiar inverse-variance weighting used in meta-analysis.

I want to make this point. Our analysis and every other analysis is a work in progress. It is a snapshot in time. The Upstate returns are not in yet. We hope we've contributed something to the dialogue.

I think it is clear that over time there is an increasing tendency toward a central estimate of DDREF of about one. ICRP is very unhappy about this, let me assure you about that. But we are not in the radiation protection business here.

There are lots of unresolved issues, even with the LSS data, this dependence on sex, different LDEFs for incidence and mortality, is that real? Dependence of LDEF on the dose range analyzed is an issue.

I summarized before that there are many important challenges in estimating DREFs, that I don't think any analysis, including ours has really overcome completely. And these uncertainties really matter.

To summarize our analysis again, our analysis is unique because we have four different data sets, low dose effectiveness factors and dose-rate effectiveness factors for the two different endpoints. Also unique is our approach to weighting the different estimates and using model averaging to combine them.

And our belief is that you have to do both of these things to come up with a distribution that represents a state of knowledge. And distributions of DDREF only don't represent the state of knowledge because you haven't accounted for this and vice-versa.

And again we believe that basing an answer on a statistical uncertainty is only -- does not really fully represent what we know, especially what we don't know.

Now some of you know that we've put out a report of this. This is the website. We finally refer to this report as the mighty doorstop.

I'm done. Thank you.

Mr. Katz: Thank you. So I think we have -- I mean it's squishy. We have LaVon next and then we have a break. We have a little bit of elbow room here but I wouldn't think we could use more than five minutes or five or ten minutes at most.

And just a note for everybody. I mean this is really to welcome everybody to the subject, the point of this session today. NIOSH has not come out yet with what it proposes to do with this work so we are awaiting that for real Board dialogue.

But with that said, then, David.

Member Richardson: Thank you, Ted, I was going to make a similar point, which the intention of the presentation today was for the Science Working Group to bring to the Board sort of the topic that we're dealing with. And thank you very much, David, for getting us oriented to it, to understanding sort of the history of one of these assumptions that goes into the IREP program that we've inherited and are using at this point, and to understand the report that you produced for NIOSH about an updated, again, proposed subjective distribution. And I think you've done a very good job of adding both documentation and clarity for the rationale for what a distribution

would look like and how it's informed by different threads of evidence.

Dr. Kocher: I should say that a paper, a journal article describing our work in kind of summary form is scheduled to appear in Health Physics Journal in the June issue. So you don't have to read the mighty doorstop.

Mr. Katz: The Board actually already has that paper.

Dr. Kocher: Yes, I know. Okay. But I just wanted to let you know that it is going to be published soon.

And we'd be glad to answer questions from the Board at any time.

Member Richardson: So Ted, either we could stop there or if there's comments at this point.

Mr. Katz: Yes, I would just say if there is anything immediate someone to gets off their tongue about this at this point, that's super. You can do that for about five minutes but, otherwise, we'll carry on from there.

Member Beach: Ted, just a question for NIOSH. Is there any timeline for when they're going to come out with something on this?

Mr. Katz: I think -- I had spoke to Jim about this before the meeting. And I believe we'll have something well before the August Board meeting. So this will certainly be on the table again in August and you'll have the advantage of NIOSH being able to give some opinions about where to go with this.

David?

Member Kotelchuck: The presentation and the work is extremely interesting and intellectually challenging. How and whether it will ever be relevant to the task of this Board, I am certainly not sure. But we have to learn what we can learn and understand as best we can what we can learn.

Dr. Kocher: Our view is that NIOSH needs to do something about the DDREF and IREP. Our position would be that this one of many things that should be resolved when the entire Code is updated. To put Band-Aids on this thing at this point in time doesn't make a lot of sense to us. We would like to see this kind of thing judged and taken into account when new risk models are put into the code, that kind of thing, new data on biological effectiveness, all that kind of stuff.

And I would reiterate that ours is a work in progress. It's not the answer.

Member Richardson: Yes, I think we could separate issues of implementation from -- as far as the Science Work Group goes, we are sort of reflecting on the state of evidence, reflecting on what assumptions we have, and the input -- providing input on the report that NIOSH has given us.

Mr. Katz: Any questions from our Board Members on the phone?

Okay, then. Thank you very much.

Member Anderson: Hold on. Hey, wait. It's Andy.

Mr. Katz: Oh, go ahead, Andy.

Member Anderson: This is more a question for NIOSH. So what's next steps or what is going on NIOSH.

Mr. Katz: So I've addressed that, Andy, already I think. But NIOSH is still digesting this and they will be coming out with a report of some sort to the Work Group suggesting how they would -- where they would go from here.

So we'll get that and we'll get that sometime well enough before the August Board meeting.

Member Anderson: No, I was more wondering is NIOSH putting together external advisory group or

are they going to be --

Mr. Katz: No, Andy. No. I mean this has already been peer reviewed.

Member Anderson: Okay.

Mr. Katz: So we don't need that but really the Board is the next step to consider what NIOSH will propose at that point.

Member Anderson: Okay, thank you.

Member Richardson: Just to follow-up on that, NIOSH got, in my opinion, got some really high-quality external review on this report already and that's been circulated to the Working Group. So we have those to digest.

Member Anderson: Okay.

Member Richardson: And then, as was mentioned, there's been a paper that has been peer reviewed as well.

Mr. Katz: Okay, then, move on. Carry on.

SEC Petitions Status Update

Mr. Rutherford: Okay, thanks, Ted. I'm LaVon Rutherford. I'm going to do the Special Exposure Cohort update. We do this update every Advisory Board meeting. It gives the Board a chance to prepare for Work Group meetings and future Board meetings.

I'm going to talk about petitions in qualification, under evaluation, currently under Board review, and potential 83.14s.

Okay, to date we've had 246 petitions. We actually have no petitions in the qualification process at this time. We have three petitions that are under evaluation. And we have nine reports with the Advisory Board.

Sandia National Lab, this is a petition under evaluation, SEC-188, it addresses the remaining years of an initial petition. We had hoped to present this evaluation at this Board meeting, however, we did not get data in time from Sandia.

Right now, we're currently scheduled to have the report out the end of July. I think we've got enough information to complete that. We are still waiting for some things but I think we'll be okay.

Lawrence Livermore Nationals Labs, another addendum that addresses years 1990 to 2014. It's all employees and we do expect to have that report out in November.

De Soto is a new petition we received not long ago. It is under the 180 days. Currently, we are on schedule to have that report completed in July and do the presentation at the August Board meeting.

So you could expect Sandia and De Soto at the August Board meeting, as well as some additional work I'll discuss.

Under Advisory Board review, we have the Hanford petition. We're still working on resolving the issues of whether the prime contractors' bioassay program was meeting commitments.

Savannah River Site, I think Brad will update during the Work Group session where we stand there.

Los Alamos National Lab, we recently did some additional interviews, SC&A, Josie, the Board, and myself. And we also are working on a White Paper response to SC&A's review of our addendum. We expect that report out at the end of the month and for a future Work Group meeting.

Idaho National Labs with the Advisory Board still looking at the proposed Class Definition.

Argonne West, I think we have a paper that is in

internal review right now. It will be discussed maybe during the Work Group sessions.

Area IV Santa Susanna, we are still working to resolve a couple of issues that were raised by SC&A.

Metals and Controls, we actually went back and did interviews with the Board back at this site. We have developed a new subsurface model. We expect that report on that model to be out sometime within the next week or so, in support of a May Work Group meeting.

We anticipate also presenting a revised Evaluation Report on Metals and Controls at the August Board meeting as well.

So, we have nine petitions that are with the Advisory Board. I went through each one of those.

And the only potential 83.14 we have on our plate right now is still the early years at LANL, which was a Z Division and have actually been changed to Sandia Albuquerque and that is 1945 to 1948.

We have not petitions or not litmus claims to move that one forward. At this time, Department of Labor is still processing those claims under LANL.

That's all I've got.

Mr. Katz: Thank you, Bomber.

And do we have questions from any of the Board Members or on the line?

Okay, much thanks, Bomber.

Okay, we are about at our break. And then we have probably a good bit to do on our Board Work Session and then Oak Ridge Facilities update after that.

So, please try to be ready on time, 3:15. Thanks.

(Whereupon, the above-entitled matter went off the

record at 2:59 p.m. and resumed at 3:15 p.m.)

Board Work Session

Mr. Katz: So, let me check on the line. Do I have Bill Field back and Henry Anderson back?

Member Field: Yes, I'm on for a little bit, but my wireless may be getting a little low. We're down to one bar, so --

Mr. Katz: Oh, dear, okay. Okay. Well, we'll try to make it before that blips out.

And, Henry Anderson, are you on?

(No response.)

Mr. Katz: Perhaps you're on mute, Andy.

(No response.)

Mr. Katz: Okay. Well, let's move on.

Board work session. We have a number of matters to get through, including the Work Group reports. But let me -- I think it's very important I get some scheduling done first quickly, if we can do that first thing.

So, the first matter is location for the next meeting. For Board Members, in your notes I gave you actually the wrong dates, of course, by a day. It's actually August 22nd-23rd that is our August Board meeting, not 23rd-24th, as I had it.

And it's sounding -- from what we've heard today -- like it might be quite a full -- a pretty full two-day Board meeting. So, plan on that.

What we have -- so we have the dates. What we need is a location for that. And I'm not sure we can settle the location now, but I want to raise the possible locations and get your thoughts about those at this point, and I'll communicate with you by email a little

closer -- probably a month down the road or so, to firm up exactly what our location is. And that's probably as long as we can wait, but we have some uncertainties and it would be nice to get those resolved before we settle on a location.

Ms. Lin: Ted, can you repeat the dates for the upcoming Board meeting?

Mr. Katz: Yes. So, we're speaking of the next face-to-face Board meeting, not the teleconference. And that's August 22nd to 23rd.

Was that Jenny Lin?

Ms. Lin: Yes.

Mr. Katz: Yes, okay.

Ms. Lin: Thank you.

Mr. Katz: Yes, sure. You're welcome.

So, locations -- and this is based on where we have new SECs to present as well as important work to resolve on SECs. That looks like it may be ready for resolution at a Board meeting, and I have four locations for you to think about.

One, we've never been there, but Metals and Controls. That's a possibility. We haven't been there. There's some use in being there. That should be ready for discussion in front of the public.

Second, where -- we've been there several times recently, but we do have an SEC to complete there, Sandia. Now there's some work going on, and it should be -- as Bomber said, it should be ready at that point, but let's see how that goes.

De Soto is a third. As he talked about, they have a presentation for that -- for a new SEC on that. That should be ready.

And the fourth is INL. We have a couple of things

relevant there. One, we have an SEC class recommendation still standing there. And I believe most of the work related to the Board's consideration of that is completed. So, there needs to be another Work Group meeting. SC&A may be still doing a little bit of work related to that, but, by August, we should be ready on that to resolve that. Or I'm hopeful of that.

And we also have at the same time possibly -- likely I think, but not certain -- an 83-14 on the burial grounds there, so a separate SEC matter. So, there's actually quite a lot that would be of interest relevant to the folks at INL.

So, those four locations. I haven't given consideration to other locations at this point because there's already quite a lot of options on our plate, but I'm happy for Board Members' thoughts about these. And then, like I said, we'll resolve this in about a month as to where we'll go.

Member Ziemer: Can you remind us where Metals and Controls is located?

Mr. Katz: I'm sorry?

Member Ziemer: Can you remind us where Metals and Controls is?

Mr. Katz: That's in Massachusetts.

Member Ziemer: Okay.

Mr. Katz: Yes.

Member Ziemer: Is it Boston?

Mr. Katz: Attleboro. No, it's not Boston, but it's actually closer, I think to -- what's the city below, the state below -- Rhode Island. Providence.

Mr. Rutherford: Yes, but, Ted, Burial Grounds will not be ready because there's some workers' interviews that are scheduled the first week of June. So, I do

not expect that to be ready.

Mr. Katz: Okay. Well, that's good to know.

And then is there utility -- will there be utility in getting input at the Board meeting for Burial Grounds?

Mr. Rutherford: I think the worker interviews are already set up. So, I don't --

Mr. Katz: All right. All right. Thanks. That's helpful.

Josie?

Member Beach: I'll just vote for Metals and Controls now, simply because we haven't been there. We had quite a bit of petitioners that were very active at the last meeting, when the first report came out.

Mr. Katz: Thanks, Josie. Other thoughts?

Right, that's California. That's LA area. Sandia is New Mexico. Yes.

So, other thoughts from Board Members about these sites or another?

(No response.)

Mr. Katz: All right, then. So, the one place --the ardent request I've heard is Josie's for Metals and Controls in Massachusetts. So, that's a good possibility. Like I said, I'll communicate with you all by email as we go along with these.

Anything else?

(No response.)

Mr. Katz: Okay. Okay. Moving on, then, scheduling. We have to schedule -- this is for next year, but, believe it or not, this is time to do those.

We need a teleconference February of next year, and the approximate right timeframe is the week of

February 24th. So, if you can look at your calendars for that? That's a teleconference again. We usually do it in the middle of the week, but it doesn't have to be in the middle of the week.

So, that would be -- if we do the typical Wednesday, that's the 26th of February. Any conflicts there? Or, the 27th, okay. That's next year? Okay. Yes, the 27th -- I was corrected -- is Wednesday. Yes, that's the usual.

Is that good with everybody? It sounds like it. I haven't heard any objections. Okay. Let's settle that. So, February 27th, next year, teleconference.

And then, for a meeting, the approximate right timeframe is the week of April 15th, you know, give or take a week or two. It's better to add than to subtract on that.

First of all, how are we doing? I know Josie has a conflict. She'll be away. But the week of April 15th, how is that for others? Usually -- I mean, our first preference is Wednesday-Thursday probably. Well, you have to get them done by April 15th already. So -- yes, so you'll be okay with that, I hope? Right, well it is that week, and it wouldn't be the April 15th anyway. Anyway, the Wednesday-Thursday -- whatever numbers those are, 17-18 of April next year. Any problems with those dates?

(No response.)

Mr. Katz: Going once. Going twice. Sold. All right. Okay. So, April 17-18, 2019.

Okay, thank you. That was quick.

All right. Let's go to Work Group/Subcommittee reports. And we can just run these alphabetically. Some of these -- a lot of these will be very quick because there hasn't been work in the interim.

Ames?

Member Kotelchuck: Nothing.

Mr. Katz: Right. Argonne-East, Brad?

Member Clawson: We've got a little bit of an update. They've been working on some of the issues that they've been coming across. I had one paper that's come out on there from NIOSH. And we're just slowly working.

Mr. Katz: Thanks, Brad.

Blockson, Wanda?

Member Munn: We have nothing scheduled. We do anticipate meeting sometime in the next -- probably a month or so from now. We have new material to take a look at, but we haven't scheduled yet. So, you'll be hearing from us probably in the next couple of weeks --

Mr. Katz: Right.

Member Munn: -- with respect to a time certain.

Mr. Katz: Thank you. That sounds good.

Brookhaven, Josie?

Member Beach: No change. Just waiting for the external -- I believe it's the external TBD that's due in September.

Mr. Katz: Right. Carborundum is Gen. There's no update there. Okay.

The next is the Dose Reconstructions Review Methods. Dr. Melius was Chair of that. And that's going to wait, and there's been no action since the last meeting on that.

The next is Fernald. Brad?

Member Clawson: We've still got some outstanding issues. I believe there's some responses from SC&A. Is that correct, John?

Mr. Katz: Wait. They can't hear you. You're not at a microphone John.

Mr. Stiver: At our last Work Group meeting we had some concerns about one of the issues, which was the recycled uranium default values for the '61-to-'72 timeframe. And we have prepared some preliminary numbers on that, but we didn't really have time to complete that memo. So, we need to get that finished up.

And, let's see, I think there was also the issue NIOSH had for looking into air sampling data. I think that's what it was. Yes, excuse me, yes, the raffinates. This will be the uranium poor and the uranium poor raffinates. And I believe that was about it, wasn't it? Yes.

Mr. Katz: Okay. So, yes, moving on from there -- thank you.

Grand Junction, Bill?

(No response.)

Mr. Katz: Bill Field was down to one bar when we heard from him last on his internet connection or his battery; I'm not sure which.

Grand Junction, there hasn't been any action, I can tell you that. So, we can move from there.

Hanford is another one. Dr. Melius was Chair of that. Brad's been on that Work Group a long time. I can, more or less, tell you I think the materials for that -- there's been a lot of work over a lot of time, and that work has been all organized well in terms of the issues that are needing to be resolved and the status of those. That was all done some time ago. So, I think we're probably pretty close to ready to a Work Group meeting to address all of that and get up-to-speed.

And then there is an SEC at Hanford still, and there's still some work to sort it out, as to finish that out. But

it's largely finished out, the SEC matters at Hanford. I think there's a small window still to be addressed. Is that correct, Brad?

Member Clawson: Yes, that's correct. We also had a new NIOSH person come on, and they've kind of had to get up-to-speed and go on from there.

Mr. Katz: Right, a new NIOSH staff person lead for Hanford.

So, we could see a Work Group meeting, I think, before August on Hanford, and we'll have a new Chair, too, for that Work Group.

INL -- we already heard from LaVon about INL matters.

Phil, is there anything you want to add?

Member Schofield: Yes. We're going to need a Work Group meeting before August.

Mr. Katz: Oh, absolutely, that makes sense. Okay, Work Group meeting there.

Lawrence Berkeley, Dr. Ziemer?

Member Ziemer: No action.

Mr. Katz: All right. And then, LANL, Josie?

Member Beach: So, you heard from LaVon we're expecting a paper talking about the post-1995 cutoff period, answering SC&A's memo. So, we expect that by the end of April.

And then, the Work Group, some of us did go out and do some interviews in March. We heard from a group of workers, the County workers that aren't consistently being represented for dose reconstruction. And so, we interviewed several of them.

LaVon might be able to add to this, but we're going -

- giving information to Denise, trying to sort out how that's going to be affected for those later years also.

Mr. Rutherford: Yes, I mean, it's a Labor issue. What we're trying to do is to provide the information that we get to Labor.

And also, I've gotten Denise onboard, and she's looking into the claims that have been accepted that were Los Alamos County workers and trying to understand what -- she's going to talk with the claims examiner to understand why some were accepted and some weren't.

We're also providing the interviews. Once we have finalized the interviews, we're going to provide those to Labor as well, and we'll go from there.

Member Beach: Thank you.

Mr. Katz: Thanks, LaVon and Josie.

Metals and Controls, we've heard from from Josie, and we have a Work Group meeting scheduled for --

Member Beach: May 3rd.

Mr. Katz: -- May 3rd. And then, we expect that to be on the agenda for August, and maybe we'll be out there.

Mound, Josie again.

Member Beach: Nothing to report there.

Mr. Katz: All right. And Nevada Test Site, Brad?

Member Clawson: There's nothing to report right there from the last time.

Mr. Katz: I think we -- SC&A should be about wrapping up, right? Or are we waiting on -- yes, are we waiting on something from DCAS as well? Okay. All right. Very good. So, we could have an NTS Work Group meeting then coming up.

Member Beach: Ted, sorry, I did forget. We are waiting for the external, which is due in September of 2018 for Mound.

Mr. Katz: Ah, okay. 2018, you said? Okay, very good.

ORNL, Gen?

Although we're going to be hearing extensively --

Member Roessler: You're stealing my line.

(Laughter.)

Mr. Katz: Go ahead.

Member Roessler: I was going to say, we have been hearing for some time, a number of meetings, that we would soon have an update. And in less than an hour, we're going to get that update.

Mr. Katz: Sorry about that, Gen, and thank you.

Pacific Proving Grounds, that's Jim Lockey.

Member Lockey: I mean, all the findings and observations are closed. We're waiting for NIOSH to look at that 95-percent confidence rule in relationship to the dosimetry. And that will be done by the end of this month, I understand.

Mr. Katz: Right. So, that is another Work Group meeting coming up. That will be another Work Group meeting coming up.

Member Lockey: We can probably handle that by phone.

Mr. Katz: Yes, absolutely.

Member Lockey: Yes, right.

Mr. Katz: Yes, yes, a teleconference.

Okay, Portsmouth, Paducah, K-25, Phil?

Member Schofield: Nothing.

Mr. Katz: Rocky Flats?

Member Kotelchuck: Nothing new.

LaVon, though, you have been looking over some of the materials at LANL.

Mr. Katz: Thank you, Dave.

And Sandia we've already heard about.

Santa Susana Field Laboratory, Phil?

Member Schofield: With the new stuff coming out in De Soto and stuff, I don't know if we'll be ready to have one before August or not. And they kind of tie together, De Soto, and Santa Susana; there's a lot of intermesh between people there.

Mr. Katz: Well, NIOSH, do we have a sense for when -- aren't we producing some work for Santa Susana?

Dr. Hughes: So, yes, NIOSH -- it was the Work Group, some smaller reports on the issues that were remaining from the last Work Group meeting. I'm not sure if it's going to be with the Work Group before August. The effort has been slowed down a little bit because of other upcoming efforts, such as the De Soto SEC evaluation, which is on a tighter schedule at the moment. So, it's just we had to kind of re-shuffle a little bit.

Mr. Katz: Thank you. Thank you, Lara and Phil.

Okay, let me just repeat that for her. For Santa Susana Field Laboratory, there is some work to be done by the NIOSH program. That's underway. It has been a little bit delayed because of the De Soto SEC petition, which is under a more rigorous timeframe. So, the same people working on both of those issues, so -- both of those facilities. So, that won't necessarily be ready before the August meeting, for our Work Group meeting.

Savannah River Site?

Member Clawson: We've been doing quite a bit with it. We've still got a -- we're still trying to work on coworker data. And as everybody remembers, we had -- Tim had found a bunch more documentation. We're trying to cover a certain area that we're trying to place. He's getting ready -- from the email that I got on Monday, that he's coming to us with a sampling plan for the 850 boxes, I guess, that they found. So, we're proceeding forward.

But I do have some issues from Savannah River of some items that we've kind of stepped over, the thorium. Can we task SC&A with that, to be able to finish up those reports?

Mr. Katz: We can. There are several reports there that Joe had indicated where really they could move forward on and that were relevant for the SEC petition. And absolutely.

Member Clawson: Okay. So, John, you've got -- you sent me that list. And also, we need to -- we kind of put those on the back burner -- we need to bring those up.

Mr. Katz: Thank you, Brad. That's good.

Science Issues, we heard from from Dr. Richardson. I don't think there's anything else to add. No? Thank you.

SEC Issues Work Group, that also was chaired by Dr. Melius. That Work Group has some work to do, but it's not pressing and I would prefer to wait until we have a Chair there before moving forward.

The Subcommittee on Dose Reconstruction, Dave?

Member Kotelchuck: Well, we started on the -- at our last meeting in March on the blind cases for Set 24. And at our next meeting, which is on July 24th, we're going to finish up the blinds for that set. And we're

working actively on Sets 19 through 21. It's a little bit of a time span between our last meeting and our next one, but a lot of us are tied up in June and July. So, we can't meet until late July.

Mr. Katz: All right. Thanks, Dave.

And I will also add, in the meantime, SC&A is also working through a new set of dose reconstruction reviews to add to the work.

The Subcommittee on Procedure Reviews, Wanda just reported extensively out on some completed items, but, Wanda, do you have more to add about work ahead?

Member Munn: I am sorry, I was so busy with my cacophony over here that I'm not even sure where we are. Are we on Procedures?

Mr. Katz: We're on Procedures, yes.

Member Munn: We're on Procedures?

(Laughter.)

Member Munn: We have a few, but we do not have enough for us to schedule another meeting at this time. So, I have no activity since my last meeting, and we are uncertain yet of exactly when we're going to be scheduling. It will probably be before the August meeting, but not in the immediately foreseeable future.

Mr. Katz: Yes, that makes sense. Thank you, Wanda.

TBD-6000 Work Group?

Member Ziemer: The TBD-6000 Work Group has had no activity since our last meeting.

Mr. Katz: And I don't know if Andy -- Dr. Anderson is on the line, but the Uranium Refining AWEs Work Group.

(No response.)

Mr. Katz: Okay. I can tell you. There are some items for that Work Group and it probably will be having a Work Group meeting somewhere between now and August. There's some work that's ready to be discussed.

Okay. So, the next one is the Use of Surrogate Data. That's Dr. Melius. It does have one small item to address, but, again, that Work Group will need a Chair.

Weldon Spring, we heard them report out on the last of their work, and we know about the follow-up that's going to come on that.

And that's the list. So, that's it for the Work Groups and the Subcommittees.

So, finally, what we have is public comments from the December Board meeting to run through. Let's see how we're doing on time here.

Okay, I need to pull up those comments. One sec.

All right, then, I will run down these comments for everyone. And, please, Board Members, stop me wherever you would if you have questions. And I'll try to go through these fairly quickly.

Okay. We had several comments on Sandia. And those were all responded to in real time by Dr. Melius. So, those are taken care of.

Let's see. Sorry, my computer is stopping on me.

Okay. We have a Los Alamos comment, and this has to do with the petitioner at Los Alamos being concerned about the use of a White Paper in dose reconstruction. And NIOSH has gotten back to the petitioner on that matter. NIOSH isn't intending to use that White Paper in the way that the petitioner was concerned about. So, I think that sounds appropriate.

Okay. We had comments about CLL, and particularly about CLL being included on the list of specified cancers. And I addressed that, and I communicated with the Board about that matter as well. They're well familiar and agreed with the matter there, which is the specified cancers are set by statute, and they will only be changed by statute as a result. And I've communicated with the party who raised the issue as well.

Member Ziemer: A question, Ted, on that one.

Mr. Katz: Yes.

Member Ziemer: Is that information from that individual -- has that been sent forward to anyone in CDC or HHS that might have a role in updating the legislation?

Mr. Katz: Well, there isn't -- I mean, again, that's not an HHS issue. That's a legislative issue. And it's -- no, there's not going to be lobbying by -- at any point in the HHS structure on the legislation.

Member Ziemer: I'm not suggesting we lobby on it.

Mr. Katz: Yes, I know. I mean -- but yes. So, no, that hasn't gone forward beyond NIOSH to HHS, that matter.

Okay. And then, we have a comment on the Savannah River Site -- which LaVon has responded to -- related to the critical mass lab about characterization of waste. And LaVon basically explained that that matter had been thoroughly vetted already -- which is true -- by the Board.

Okay. There's a comment about Ames Lab, about the discussion we had in the December Board meeting about Ames. And this is a standard thing. The Board Members often ask about the number of claimants at a specific SEC site and, in particular, who might be included in a class. The Board is often interested in what the scope of that class might be.

And the commenter was commenting that the number is not -- shouldn't be relevant to the evaluation of an SEC petition. And it -- the number of claimants that could come with a class is not relevant for evaluating -- it doesn't affect how we evaluate those petitions. But it is relevant for the Board to know because the Board has to set priorities in how it does its work. It may have a class of 500 and a class of 2,000 -- or what have you -- and a class of 10. And so it has to -- in terms of priorities of what comes first, it has to move the items that have a bigger impact, generally speaking. Of course, there are lots of other factors that matter too, how long something has been waiting, and so on. But it's not an irrelevant matter, and it's also just a matter of interest as to what kind of impact is the Board potentially having here, although it doesn't change how any SEC Class is evaluated.

Then, let's see, we have several comments about -- well, we have comments provided to someone's concern that NIOSH changes its dose reconstruction methodology without going through a regulatory notice and comment. And the person commenting is -- believes that that's not allowable, that it requires rulemaking, but this program was designed specifically to allow us to update our methods without having to go through rulemaking. You can imagine how that might work to update our dose reconstruction methodology.

Okay. We had questions about Sandia, what we were awaiting. Those were responded to in real time by LaVon. The question was about what documents were we awaiting to move on with the SEC. Anyway, that was covered.

Let's see. Okay. We have a question regarding General Steel about the PER-80 and SC&A's review. SC&A has that review underway. It should be completed fairly soon, I think.

Okay. We have several questions. We have questions

related to Dow, Illinois, and Rocky Flats, a part about magnesium-thorium shipments potentially. And LaVon has responded to those. That all looks appropriate, and about the number of boxes of records were captured also been responded to.

Okay. For Santa Susana, we have a number of questions about americium and thorium, the reconstructability of those; about proving work location for people in Area IV; about Boeing's behavior related to claims and claiming, and verifying employment -- okay, about americium and thorium locations and about log records. All these, a whole series of questions, Lara Hughes has responded to these in March. These all look appropriate.

And that's it for public comments. Do I have any questions?

(No response.)

Mr. Katz: Okay, then, so we don't have any correspondence to discuss. That takes us up to the Oak Ridge facilities update, which begins at 4:15.

So, it's 3:54. So, you have another short break, a comfort break. Let's be ready, though, at 4:15, and we'll go into the Oak Ridge facility update and, then, follow with the public comment right away after that.

Thank you.

(Whereupon, the above-entitled matter went off the record at 3:53 p.m. and resumed at 4:16 p.m.)

Oak Ridge Facilities Update

Mr. Katz: Okay. Now we have an update on the Oak Ridge facilities, covering them all, by Dr. Lara Hughes. We will follow that by a public comment session. I'll have some brief remarks to make for the public before the public comment session. That will go really quickly. So, folks from the public, please hang in there and be ready following Lara's session.

Thanks.

Dr. Hughes: Thank you, Ted and the Board.

Can you hear me okay? Okay.

This is the Oak Ridge facilities update. I'm going to try to update you on the status of all Oak Ridge facilities -- there are eight covered facilities -- in less than 45 minutes.

The currently active sites that I'm the lead for are ORNL and Y-12. There is some SEC-related work going on, and the work is -- currently the NIOSH contract overall person that's working both efforts is Joe Guido, and he has done a very good job at pulling a lot of information together. I would just like to acknowledge their contribution to all of the ORNL and Y-12-related information that is presented.

So, the current Oak Ridge ER facilities, let's start with ORNL/X-10. It is covered from 1943 through present. There's currently an SEC from 1943 through the middle of 1955, and there are a little over 3,600 claims as of mid-March.

Y-12, also covered from the early '40s to the present, there's also an SEC from the beginning of nuclear operations through the end of 1957, and there are over 6,000 NOCTS claims in the NIOSH claims database currently.

K-25 is also covered from 1943. The operational period ended in 1987, and there is a remediation period from 1988 through the present. The SEC period is from '43 through February 1st, '92. This was a congressionally established SEC. There are close to 4,000 claims at NIOSH for K-25.

CEW is Clinton Engineer Works. It's a covered site from 1943 through 1949, and there's an SEC period for that period. There are 64 claims at NIOSH.

The Oak Ridge Institute for Science and Education is

covered from 1946 through the present, and there is an SEC from May 15, 1950 through December 31st, '63. There are 101 claims at NIOSH.

I will get a little bit more into detail on the SEC status of those sites.

Oak Ridge Hospital is covered from 1943 through 1959, and it is an SEC from May 15, 1950 through December 31st, 1959. There are 51 claims.

Okay. Oak Ridge Hospital, there are 26 claims at NIOSH at the moment.

OSTI is covered from 1957 through the present, and there is currently no SEC period. There are 51 claims at NIOSH.

And lastly, S-50, the Thermal Diffusion Plant, covered from 1944 through 1951, and is also an SEC period for its entire operational period. And there are 43 claims at NOCTS.

This is a map of the Clinton Engineer Works from the early 1940s. On it, you can see the entire Oak Ridge area that is covered under -- CEW is the outline that is presented here. And within this area you can see listed Y-12, X-10, K-25, S-50, as well as the City of Oak Ridge that is listed in the upper right corner. And in the City of Oak Ridge are several covered sites located, such as Oak Ridge Hospital, OSTI, and ORISE.

So, back to Clinton Engineer Works. That is a covered site that is essentially what I just showed you. Everything inside the fence is a 59,000-acre federal government area. This is a covered site. When we did an SEC evaluation, we determined that the exposure potential was limited to a warehouse area near the Elza Gate.

Now the Clinton Engineer Works is essentially everything in Oak Ridge but the plant. So, there isn't a lot of nuclear material or radiological operations

going on. However, there was this storage area near the gate that was a collection of warehouses where they stored uranium ores and residues in barrels and that were handled there. So, this is the area that was added to the SEC -- or that was what caused the SEC evaluation. This evaluation was done in 2012, and the infeasibility is internal and external exposure to uranium-bearing ores.

K-25, the Oak Ridge Gaseous Diffusion Plant, did uranium-235 enrichment, processing, and recycling. The SEC is congressionally established.

The Oak Ridge Institute for Science and Education, ORISE, is a scientific research institute operated by ORAU. This was evaluated for an SEC, the ORINS Cancer Research Hospital. The evaluation percent was presented to the Board in 2006, and the infeasibility here is the internal dose from nuclear medicine handling. They developed -- they used the ORNL-produced isotopes to treat cancer and various other ailments at this hospital in Oak Ridge.

Oak Ridge Community Hospital is also a covered site. It is also an SEC. This was evaluated in 2009. And the infeasibility is the same as for the ORINS Cancer Research Hospital, internal/external exposure from nuclear medicine operations. These two facilities were essentially attached to each other. So, the ORINS Cancer Research Hospital used the Oak Ridge Hospital facilities such as kitchen, the morgue -- not the laundry, but various other facilities.

The Office of Scientific and Technical Information, OSTI, is a federal repository for DOE technical reports. There is no SEC Class. There was a petition submitted, but it did not qualify for evaluation. And this is the facility that was not associated with radiological work.

The Oak Ridge Liquid Thermal Diffusion Plant also was another version of the uranium enrichment facility. It was adjacent to K-25. It was shut down after the war and later did some work on nuclear

energy for the propulsion of aircraft. There was an evaluation presented to the Board in 2006, and it has an infeasibility of internal/external exposure to uranium and other unknown radionuclides.

So, that leads us to the current effort. Oak Ridge National Laboratory, as I mentioned, currently is an SEC through the middle of 1955, and the infeasibility is based on internal exposure to uranium, mixed fission products, and thorium.

Y-12 also has currently an SEC ending in December 1957, and the infeasibility is based on internal exposure to thorium and cyclotron-produced radionuclides. Ongoing work has identified a potential infeasibility to reconstruct doses from plutonium-241 from calutron operations at Y-12. This was an ORNL effort at Y-12. So, there is a certain amount of overlap between the sites. And at Y-12, we are also working on evaluation of thorium exposures from thorium operations that started in the 1950s.

So, let's go back to SEC 189, the ORNL, the current -- or the evaluation that established the current ORNL Class. This is the summary slide or the summary table from this Evaluation Report. As you can see, so the top row is the year. And on the very left column, you have the internal sources. So, we identified the periods where there is no internal data available for uranium, thorium, and fission products. You can see that the infeasibility period ends in the middle of 1955. That's why the current SEC ends in 1955. And at the bottom you see the yellow section of the table. It says, "Reserved for joint ORNL, X-10, and Y-12 for evaluation." And that is what we just last week presented to the Work Group in the form of ORAU Report 90.

Now this is listed for a time period from 1943 through 1955. But, since we already have an established SEC Class from the middle of 1955, we start from there. We start in the middle of 1955 and go on after that.

So, a little bit to ORNL history. The photograph is the

graphite reactor from a while back, I suppose. Those of you who went to the tour got to see it yesterday, which I thought was really cool. So, that was the graphite reactor that was used for -- that was a pilot plant used for initial plutonium production. After the war, ORNL supported the civilian nuclear power program development, different reactor configurations. They did nuclear fuel reprocessing, research and development that involved various methods of dissolving irradiated fuel and separating out the plutonium and uranium.

And another large part of ORNL history is the isotope production. They produced and sold radioisotopes for research and medical uses. Some of those were produced in the reactors. Some were produced at Y-12 using calutrons. And there were numerous facilities doing separation, packing and shipping of those radioisotopes.

This photograph is a -- I think it's dated from the 1940s, but it shows some workers removing some medical isotopes on this little cart from one of the reactor ports.

Additional ORNL history -- ORNL has just such a long history and so many different things they do, it's very difficult to give a brief overview. They are involved in fusion energy programs, development of renewable energy methods, fossil energy program, basic physical sciences research, biomedical and environmental programs, waste management, space and defense technologies, artificial intelligence, parallel computing, and education.

This is an aerial view of the ORNL campus. It seems to be fairly modern-day. I don't have a date for it.

So, let's go back. To value the -- what we call exotic radionuclides, that is the radionuclides that are produced in the isotope production program.

Ms. Lin: Dr. Hughes, hi. I'm sorry to interrupt, but the microphone really is not coming through. So is

there any way that you can make sure that you're speaking directly into the microphone or get another one?

Dr. Hughes: Okay. I am right in front of the microphone. I can try to speak up a little bit.

Ms. Lin: Yes, this is perfect.

Dr. Hughes: Okay.

Ms. Lin: You're coming in loud and clear.

Dr. Hughes: All right. So on the left, this graphic is a schematic of the ORNL Isotope Production Division. There's X-10 and Y-12 involved. So the production part of this endeavor is at X-10 in the form of the graphite reactor and at Y-12 in the form of cyclotron calutrons.

Then on each side you have labs that do the chemical separations. And the end use is either onsite or offsite. You can see all these arrows going in between. So you have certain things that are produced at Y-12. They're separated at ORNL. They might have been used onsite or offsite. There's a fairly large overlap between the two sites for this program.

This graphic on the right is a cutout of an early ORNL map. The circled area, at the top the circle is the graphite reactor. At the oval, what's called the isotope circle, is a collection of smaller facilities that were used for chemical separation of the isotopes. And the reason they had several smaller buildings, they tried to keep things separate because you don't want any cross-contamination between those isotopes that you're selling.

As for the isotope production at Y-12, that was done in the beta calutrons. Those calutrons were initially used for uranium separation. They were not used for that anymore because that effort had shifted to K-25. So they used some of the beta calutrons for

plutonium separation starting in 1952. The separations were done in glove boxes in Building 92043. And they used eight of those calutrons for various isotope separations starting in 1952, not '62.

So to evaluate the -- whether those exotic -- if there is a dose reconstruction infeasibility from exotic radionuclides, we started looking at the ORNL bioassay data. We have a database from ORNL that has over 100,000 results in it from the period of 1949 through 1988. Almost 95,000 results from 7,500 individuals are available from the period for 1955 through 1988. There are 62 different analytes as well as a Code 000 for nonstandard methods.

We know that this database is incomplete, but we also know it's not inaccurate. So we know not everything is in there, but it has a large number of the bioassay records in it, and it's a good source to look for the various methods and what's available. We know that gross beta is missing from 1955 through 1959.

We also have NOCTS bioassay data, over 20,000 results from 1955 through 1988. This bioassay data has been extracted and tabulated for a potential coworker approach. And so a comparison of those two leads to a sample ratio average of 1.13. What that means is, for any given worker, we compared all available worker data. And it turns out that the NOCTS bioassay is a little more complete. So we already knew that the ORNL bioassay database is somewhat incomplete, but there's only a few samples missing.

There's also in vivo data from ORNL, whole body counts for gamma emitters. That program started in 1960 and saw a slow ramp-up and program optimization. We think that routine operations started in 1963, such as baseline and recurring counts of potentially exposed persons. And they ended up with a system capacity of over 100 persons per month.

They had a selection criteria that are presented in the report on who got to have a bioassay or an in vivo count. This was determined by area health physics. So they did baseline, termination, quarterly, and semiannual counts.

So after doing a tabulation overview of the available bioassay data, we do a radioisotope inventory list. We look at isotope shipping and sales reports, all the operational and technical report series, logbooks, ORNL and Y-12 related holdings in the SRDB. There are currently over 15,000 documents.

And then what we did, we developed a table, and that is Table 6.3 in ORAU Report 90. That was presented to the Work Group last week. We ended up coming with a table, an inventory list of 213 radioisotopes. This does not include service irradiations. That means that we do not include -- there might have been other entities that brought radioisotopes to ORNL for irradiation and, then they took them back. They were not separated out on the site. So that's not included.

This table could not fit into this presentation. It essentially starts with, you know, hydrogen ends with fermium-257, and then the number of years in which this radionuclide was produced.

So after that, we compare annual production history of those 213 nuclides to the available bioassay methods for each year. We look at the characteristic radionuclide emissions, such as type and energy; the analytical method sensitivity. We did not reconcile the quantity of radionuclide with the frequency of monitoring method. This means we did not look at how much was produced per year and how many data-points do we have in the bioassay database. We also assumed that, once an adequate method was indicated, it was assumed to be available in the following years, whether or not we see any data available in the bioassay database. A gap is defined as no monitoring results for other years of interest.

So we come up with this table. This is also, again,

this is an excerpt. This is a very large table spanning several pages.

At the top row, you have the years, 1955 onwards. At the very left column, you have the radionuclide. So the column -- each individual cell is color-coded. Green means the radionuclide was present, and the bioassay method is available, and we have sample results available. Yellow means the nuclide is present, a bioassay method is present, but we do not have any samples recorded in the database. N means this radionuclide was not present in the specified year. And red means the radionuclide is present, but no method was identified, and further analysis is needed.

So we did this for all 213 radionuclides on the inventory. So 34 radionuclides were identified to need additional research. Six of those are iodine radioisotopes for which we suggested a dose reconstruction method that I will talk to in just a minute. The remaining 28 have short half-lives; 22, less than a year and decay mostly by electron capture and isomeric transition.

So in order to assess the dosimetric significance of those, we estimated an intake of 10 to the minus 5 of the listed inventory quantity for each. I'll try to explain that a little more simply. We assumed that any given person that would handle this could potentially inhale this fraction of the inventory. And then we calculated the 50-year committed organ dose to the highest organ from this radionuclide. We also compared this to the action levels of workplace monitoring and postulated that dosimetrically significant intakes were not likely.

This is what this table looks like. These are the 28 radionuclides and the specified organ. ET stands for the extrathoracic region. BS stands for bone surface. As you can see, the doses are fairly small, relatively speaking.

So next, addressing the ORNL iodine production.

Iodine was produced for commercial applications since 1946. Since 1958, this was done through separation from reactor fuel. The production years, 1946 through 1964. The quantity of production ranged from 1.3 to 3,600 curies per year.

There was limited personnel monitoring data during that time. They did some thyroid monitoring from 1944 through 1954. In addition to that, workplace controls were available. The separations area was 3,000 -- 3026D, and 3028, but exposure is possible wherever reactor fuel was processed. They started whole body counting for iodine in 1961.

Looking at the available thyroid count data for chronic and acute exposures at ORNL, we developed this graph. The black line indicates the chronic 95th percentile data, developed from data from 1943 to 1957. And this was done to address the gap starting in 1957 until the early 1960s. As you can see, whereas the acute doses are fairly high in the 1940s, the chronic 95th percentile can be used to bound doses for the later period from the mid-1950s on. This intake, this 95th percentile intake, from the 1943 to 1957 data, is 5.4 times 10 to the 5th picocuries per day. And it is suggested as a dose reconstruction method to assign this intake to unmonitored workers from 1955 to the onset of full body counting for iodine.

Okay. That was the current effort for ORNL. This is basically the contents of Report 90.

So let's switch over to Y-12, a little bit of the history. Typically, we talk about different eras of the Y-12 history. So the first period from 1943 to 1946, the focus was on uranium isotope separation using calutrons. The second era, from 1947 to 1992, manufacturing of Cold War nuclear weapon components, produce and testing key components of nuclear weapons, stockpiling highly enriched uranium, and technology development for new weapons designs. The third era, post-1992, consisted

of multiple new missions such as storing highly enriched uranium, continued weapons parts production on a smaller scale, D&D, and environmental and waste management.

Our current focus is on the thorium operations at Y-12. The thorium processing operations that are of concern for this effort started in the early 1960s. There was an arc-melting process of thorium electrodes. The metal from these meltings was press-rolled and machined. Radium and its progeny are volatilized during this process.

Process controls, air sampling, and in vivo counting were available. The detailed process information is classified.

Currently, we are researching the end date of this thorium processing information, and we're looking at the in vivo and air data for dose reconstruction.

This is an aerial photograph of the Y-12 campus. I think it's a little older.

So the issues we're looking at with Y-12 concerning the in vivo and air data. The in vivo data, the thorium results that we have for the in vivo are reported in units of milligram of thorium. In order to use this for dose reconstruction, we need calibration and count/channel data to assess intakes from these in vivo results. There's an issue with the thorium chain disequilibrium and whether or not inhaled thorium would have actually been picked up by the in vivo count.

As for the air data, we have general air, breathing zone, and operational data available. The majority is general air data. The Y-12 thorium air sample database has some issues with data pedigree and completeness. And the breathing zone data are not sufficient for intake, to develop an intake approach for all years.

So the path forward for ORNL and Y-12, we have not

identified an obvious internal DR infeasibility from exotic radionuclides. However, the evaluation of that is sure to continue. The ORAU Report 90 was delivered to the ORNL Work Group, and I'm sure it will be discussed in detail in a Work Group meeting.

We're looking at a potential plutonium-241 infeasibility. This is an ORNL effort that was done at Y-12. So we assumed there's an SEC evaluation for Y-12 moving forward. Since SECs are determined by site, not by operator, it would be an SEC for Y-12.

And we'll continue to look into the thorium DR feasibility. We'll continue with data capture to collect more information on thorium operations, and any potential thorium infeasibility would be an SEC issue.

And that's it. Questions?

Mr. Katz: Thank you. Thank you, Lara. That was a very rich presentation for the amount of time you had to work with.

Questions from Members here in the room? Gen?

Member Roessler: Mine is a comment. The report that Lara talked about that some of us got this week looks pretty formidable. It's very long, but I know the Work Group will read it, and I recommend everybody else reads it. It's very well-organized, and it's very well-written. So it certainly isn't as bad as it looks. Plus, most of it is tables. So I recommend you take a look at it.

Mr. Katz: Thanks, Gen.

Josie?

Member Beach: I just have a question. Is there a Work Group scheduled? I know you're probably going to report for Oak Ridge. Is there one coming up?

Member Roessler: No.

Mr. Katz: David?

Member Richardson: Thank you very much. I liked and appreciated the approach that you've taken with making this radioisotope inventory list, but I had a question about it.

My understanding, if I heard what you said correctly, was that the list was enumerated from sources such as isotope shipping and sales reports. I guess the clarification I'm looking for is, is this list intended to be a subset of those to which workers may be exposed? That is, those isotopes which were intentionally produced, those which are a product, as opposed to other isotopes which, when you begin working with reactor fuel, may occur, but were not the targets intended to be generated, and which would not appear on a shipping inventory list?

Dr. Hughes: No, it's my understanding that we looked at logbooks, and it's not solely shipping and production, but it's anything, separation from the fission product facility. So not necessarily only commercial radionuclides.

Member Richardson: So now the list would include those which were intentionally produced or those which were monitored for? And is there still a set of things which one might be exposed to which would not have been routinely monitored? I know that some of the things, which maybe on the bioassay program just have names like fission products.

Dr. Hughes: Yes, I'm not sure. I mean, this should cover most of it. So this is the produced, everything that was produced for this program as well as any other information that was available in logbooks or the various series of ORNL reports. This is in addition to the previously evaluated material that addressed mixed fission products, thorium, and uranium, and plutonium.

Mr. Katz: Other questions? Any questions from Board Members on the phone?

Oh, I'm sorry. Josie?

Member Beach: I don't see that report. Did that get sent out to the whole Board or just to the Work Group?

Dr. Hughes: It's also available on the NIOSH website now, yes.

Member Beach: And then is that something that has to be tasked for SC&A to report on that or is that too far ahead?

Mr. Katz: No, I -- well, I could just go ahead and say it. I mean, SC&A should be looking at that report, too, and I think they would have received it because they would have had their -- whoever is the lead person for SC&A would have received it.

I don't know, who is your lead? But, anyway, yes, they can go forward, SC&A, with reviewing that, if they haven't already.

Okay. So any other questions?

(No response.)

Public Comment

Mr. Katz: All right then. It's a little bit ahead of public comment session, but we're going to go into it. We'll perhaps still be at it, we'll certainly still be at it once the official public comment time, we hit that.

So let me, first, make a few remarks. Well, let me just see if we have any. Yes, we have some people who aren't necessarily familiar with our procedures about public comments. So let me give you that first.

Everything that you say in a public comment is recorded. Whether you know it or not, the Board's proceedings are transcribed verbatim, and then they're all published on the NIOSH website. So if you make public comments, everything you say will be reported there and attributed to you.

The one exception is if you discuss other parties other

than yourself and you give private information about them, that information may be redacted because we protect the privacy of everyone else who's talked about. We don't necessarily know that they have given permission for their information to be given in a public sphere. So we do that under the Privacy Act to protect their privacy. So that takes care of what you need to understand about that.

We will begin with people who have public comments related to the sites here, and then we'll go from there to public comments about other sites and to people on the phone, although if we have people from the facilities here on the phone, we'll take those comments, too, before dealing with other sites.

So the first person I have, I believe, for this facility is Phillip Branson, who I believe has comments related to or worked at K-25. Is Phillip in the room?

(No response.)

Mr. Katz: Okay. And then I'm not entirely clear. We have a [identifying information redacted]. I don't know; is this related to -- oh, that's right, you talked to me earlier. Thanks.

I don't have any in the room, then, otherwise addressing the local facilities. But do I have anyone on the phone from these facilities here who has public comment?

Ms. Colley: Yes.

Mr. Katz: Okay. Would you please identify yourself? And then you can proceed.

Ms. Colley: Yes. My name is Vina Colley. I'm President of Portsmouth/Piketon Residents for Environmental Safety and Security.

Mr. Katz: I'm sorry. I'm sorry to interrupt, but, one, it was hard to understand even your name, and then, I don't know if you need to speak closer to your mic,

but it's hard. You're hard to understand.

Ms. Colley: Is this any better?

Mr. Katz: That's much better. Thank you very much. Can you tell me your name again?

Ms. Colley: Okay. Vina, V-I-N-A, Colley, C-O-L-L-E-Y.

Mr. Katz: Thank you. Perfect. Go ahead.

Ms. Colley: And I'm President of a group called PRESS, Portsmouth/Piketon Residents for Environmental Safety and Security, and I co-chair National Nuclear Workers for Justice. And I'm a co-member of Nuclear Whistleblower Alliance. I am from the Portsmouth Gaseous Diffusion Plant.

First off, we would like to invite you to hold one of your meetings here in Portsmouth, Ohio. We are the home of the Portsmouth Gaseous Diffusion Plant, one of the largest facilities in the world who enriched highly enriched uranium. We down-blended uranium from Russia. The contamination of plutonium is widespread. We are one of the facilities that broke the story in 1999 about plutonium being at the Portsmouth Gaseous Diffusion Plant and the Paducah Gaseous Diffusion Plant in Paducah, Kentucky.

My question is, we started out being one of the first special cohort sites, and for some reason, we seem to be left out of a lot of the process of these meetings. And we're not -- the workers here are still having tons of trouble trying to get through the NIOSH process and the dose reconstruction. We don't understand why. We don't know why they keep getting turned down, and we don't know why this facility, Portsmouth and Paducah, has been ignored.

We did highly enriched uranium. We also have had plutonium at the facility that was downgraded. And we've had it at the facility since 1953. We have 30-some-thousand depleted uranium sitting out in the

yard in the open that's giving off neutron exposures for anyone who walks around those cylinders.

And then I'm wondering why NIOSH, because a lot of these studies have all been inconclusive by design, and I am wondering how they have been able to come up with these studies when they're not talking to us, the workers, and what we really worked in. I know that our union (telephonic interference) of chemicals, the buildings, and they worked hours and hours and hours, and somehow everything got lost off of the process.

So being a sick worker myself, I've been fighting these issues since the late '80s. I am concerned about the special cohort sites, us being one of the first ones, and then still having to fight for our illnesses.

There is also a petition that [identifying information redacted] and myself worked on from the Hanford site. And it was one of the first petitions filed, and it had a number 00011. That petition somehow or another dropped through the cracks.

And I'm also aware that NIOSH has been used against the workers in court in litigation for the Department of Energy, and they fought against us. So I'm really concerned about how data is being put together, and when they don't have data, the government said they (telephonic interference) should get compensated, but we're still here. I'm still here fighting for compensation for consequential illnesses.

And they claim that they even had more exposures for neuropathy, and so far, I was told that I had more exposures and they were going to reevaluate me, but I haven't got that conclusion yet. But I do have another coworker that they opened up his case, and they turned him down, said he didn't have enough exposures.

So I'm really, really concerned about what is going

on. Why are these workers having such a hard time fighting? I mean, we're all dying. They're dying, and their survivors are getting paid, and they laid -- they sent this since, what, 2002. It's 2018 now. Why are we still having to do re-dose?

So I guess that's my question. I'm just boggled about how we've been treated.

Mr. Katz: Thank you for that. Let me just quickly touch on some of what you said, though, if it's helpful.

The Board does have a Work Group that's actually dealing with your site. The Work Group was quite active a while ago. It's been a while. They're waiting for some additional work to be done by staff before they're ready to discuss it in Work Group meetings. But there is a Work Group.

And by all means, that's one good venue, I think, for you and other members there. If you have comments about how the dose reconstructions are being done or questions about what data is available and what isn't available, et cetera, next time we have a Work Group meeting -- these are noticed on the NIOSH website. But attending one of those, and you don't have to attend in person; those are mostly done by teleconference anyway. You can join by teleconference, and you or other people there can bring up comments. We usually have an opportunity for public members to comment. So that's one venue for you getting yourselves heard about concerns you might have with respect to how dose reconstructions are done.

And you can also go on the NIOSH website and look at the contact at NIOSH. You can both speak to NIOSH staff that are responsible for the dose reconstruction methods for your facility, and there is also, for individual claims where people are having trouble -- I don't know to the extent they've been taking advantage of this, but there's a NIOSH Ombudsman. Her name is Ms. Denise Brock, and

she's very good. She's very good at dealing with all sorts of issues related to how the dose reconstructions are being done and getting misunderstandings sorted out, and so on. So I encourage you to use her, and her contact information is also on the NIOSH website.

So I hope those things are helpful to you. And thanks for your comment. We appreciate that.

Ms. Colley: I'd really appreciate if you would consider coming to our site with one of your meetings and put us down on your agenda.

Mr. Katz: Thanks. So we'll keep that in mind. Thank you.

Ms. Colley: I thank you.

Mr. Katz: Okay. Let's then, I don't -- do we have any folks from these Oak Ridge facilities on the phone who have comments about the Oak Ridge facilities?

(No response.)

Mr. Katz: Okay. Then let me go down the list of people here in the room who have comments.

I have John Sadler, related to Fernald. Please do go to a mic. Otherwise, we can't record you.

By all means, you know, there's a chair right there. Dr. Lockey is not using it, if that's comfortable.

Mr. Sadler: I'll be okay if I can hold onto something.

Mr. Katz: Okay. So then that mic is great.

Mr. Sadler: Here is stuff I need you to pass out to everybody on the Board.

Mr. Katz: Well, let's pass this out afterwards because they're not going to be able to read it and listen to you at the same time. But we'll pass this out after the fact.

Yes, there's a button right underneath the mic, and you have to hold it. You have to keep it down. You have to hold it down for it to work.

And, please, we have about five minutes. Thanks.

Mr. Sadler: My name is John Sadler. I'm from Fernald. And I passed out some things to the Board there to go into the record.

I appreciate the opportunity to speak and, hopefully, bring new topics to light that you may have never heard of or been aware of.

The Board may remember me from the Santa Fe meeting in August. I was the guy who said, if it wasn't for the nuclear workers in the country, we would all be speaking Russian or German.

I'm presenting some documents to the Board, and I recommend the books Behind the Fog, At Work in the Fields of the Bomb, and The Plutonium Files, and a research paper from Dr. Patricia Cianciolo, a professor at Northern Michigan University.

The paper is about the difficulties in navigating the claims process. She was involved with doing a claim for her father who worked at Fernald for some years, from '52 to '89, and it took her three years to do it, and he fell into an SEC and had to do dose reconstruction.

I'm also including a letter from Dr. Melius. He came up to me after the meeting in Santa Fe and told me not to get discouraged and keep on trying. He said decisions are turned around all the time. This was after the no vote on the Petition 46 to extend SEC years for Fernald to 1989.

And it's my hope that the Board will be more informed for your decisionmaking in support of all the nuclear workers in our country, in support of the intent of Executive Order 13179, recognizing the sacrifices made for our country and that the workers

deserve support to minimize the administrative burden on workers and their families.

You have a handout of uranium stack discharges by decade that happened at Fernald. This is a listing of what plants onsite were contaminating the environment and to what degree.

U3O8 is also called black oxide. When it gets into your lungs, it doesn't dissolve and is never coming out except on an autopsy.

During production years onsite, we would be breathing whatever was in the air, including black oxide, plutonium, thorium, technetium, neptunium, beryllium, and whatever other deadly and harmful elements were coming out of the dust collectors, and at what levels expressed in parts per billion.

I'll be one to donate my body to the government, so they can reclaim the black oxide in my lungs and whatever elements they could find useful. Some of us in this country are just a walking uranium mine, and some of the workers can't walk because they have passed into the phase of not being able to because they have become incapacitated by their sacrificial sickness, and many are gone.

There is strong reason to believe that the Fernald nuclear site, along with many others in the country, were part of the government's offensive radiological weapons program that secretly used workers and surrounding residents as experimental subjects.

In support of this reasoning, the sites being part of this program would contaminate the site and surrounding community. In personally hearing managers in Plant 5 and 9 tell workers not to shut down dust collectors because of major dust leaks, because we need to continue production and that we would shut down at our next holiday, which was often a month away, I thought that answer didn't make any sense at the time, since the whole countryside was being dumped on. And after finding out about the

offensive radiological weapons program going on all over America, plus England and Canada, then it made perfect sense.

If checking on all the other sites in the country, you will find they all contaminated the environment in similar ways as Fernald, and some were doing a lot worse, such as Hanford. This weapons program lasted from the early 1950s into 1990. A GAO report came out in 1993 started mentioning about this program, the offensive radiological weapons program.

Secretary of Energy Hazel O'Leary stated in 1994 that the government continues to sponsor radiation experiments involving human subjects, but added that no tests in the 1990s were conducted in secret or without consent. And the person in charge of this program was General Leslie Groves, the same person that ran the Manhattan Project. He had run that program with the utmost secrecy, and it was expected that he could do the same with the offensive radiological weapons program.

Many other notable elites in the radiation sciences were also part of this secret project, to include Robert Oppenheimer. This group's title was the Radiological Weapons Experimentation Group. The Atomic Energy Commission was in charge of operating this project until 1977, when the Department of Energy took over.

And this refers to Fernald. The company was contaminating the environment purposely, and then say, we're protecting the workers at Fernald by way of monthly readings of the TLD badges. The company was either purposely protecting the workers or they were purposely not protecting the workers and the residents. The sad conclusion is they were not.

All the discharges from the dust collectors was a known health danger, and yet it went on for years. Public comments by management about health and safety at the plant had no way of accomplishing

whatever their intended goal was. Nothing will hurt you at Fernald unless it falls on your head, and you can eat a teaspoon of what we process every day and it won't hurt you. All of those statements point to an uncaring and pointed disregard for the safety and health of workers at Fernald and the surrounding communities.

And with the government's high priority for the offensive radiological weapons program, there would have been no reason for Fernald and other sites not to participate. The government would have all the players in place and the logistics in place for an effective program. And all they would have to say is go.

All of the happenings of the past at Fernald causes me to wonder if this offensive radiological weapons program has some life left in it and what it would look like now. With all the government's efforts and money poured into this program, it would be hard believe that they would have given up without a final and effective offensive weapons product.

The sad and ironic part of all this narrative is that all of the taxpaying public were unknowingly bankrolling this program to be used as guinea pigs. What negative effects this would have on the nation's health is an unanswered and ongoing question. We were even making sick and killing off the nuclear workers we depended on to defend our country.

And there's a lot to be said for oversight to be a large part of how we operate our government. Most people working on the Manhattan Project didn't know what they were involved in until the bombs were dropped. The Vice President didn't know anything about the Manhattan Project until after the President died.

In 1945, the AEC put a limit on plutonium at 1 microgram, 1 millionth of a gram, and they labeled it tolerable. And we operated on that in this country for over 22 years, and after 1977, DOE changes that amount as lethal. And how many workers and

residents were lethaled?

In regards to the 5 rem per year dose, which I just found out was different from Stu a little while ago, that the rest of the world is 2, but the United States is still 5.

And a lady that's in a book, At Work in the Fields of the Bomb, [identifying information redacted], said 5 rems should be divided by 50 to get .1 rem a year. The physicists on the Manhattan Project set the limit, declared themselves the experts on safe limits, and we still use that limit today. It was set in 1951. Have we learned nothing in 67 years?

The ICRP, International Commission on Radiological Protection, was not set up as a professional society. It was set up as a secret club, a self-perpetuating committee right out of the military, never had a public health expert on it, no one in epidemiology on it, never anyone who would challenge the risk estimates. As of 1987, when At Work in the Fields of the Bomb came out, the Commission had only put out three publications, and all the people on the Commission were physicists.

And on page 151, At Work in the Fields of the Bomb, [identifying information redacted], a world authority on the health hazards of low-level radiation, relates that a key finding is that the lower the dose, the more cancer risk per unit dose. It does not make it safer to deliver radiation slowly and, in fact, it makes it more dangerous.

[identifying information redacted] from Rocky Flats died of a brain tumor at 32. In the final litigation on June 4th, 1987, the Colorado Court of Appeals ruled that [identifying information redacted] death was caused by on-the-job exposure to permissible levels of radiation. Rocky Flats did not appeal that ruling. Another guy from there named [identifying information redacted], he had the same findings in 1990.

There's a group called the Transuranium Registry, headquartered in the State of Washington. It's an arm of the government to collect cadavers for radiation contaminated studies. Someone from there came to the site to give a presentation and offered workers $500 for them to sign a release to give their bodies to the government after they died.

And this happened before I started working there in 1982. The partner I worked with was there and asked what body parts they were interested in, and the presenter said both arms and both kidneys.

And the government uses this --

Mr. Katz: Mr. Sadler, you need to wrap up, please.

Mr. Sadler: I've got about a few seconds.

The government uses the Social Security retrieval process to get to workers that have died and to claim the bodies quickly.

After information came to light with the publication of Behind the Fog, three centers from the areas talked about were outraged and planned to further investigate the offensive radiological weapons program. One of the documents presented to the Board is a newspaper article that was in my local paper a few months back. After reading the article and the book Behind the Fog, the disconnects started connecting.

Mr. Katz: You need to speak into the mic, please.

Mr. Sadler: This is the first page of the Energy Employees Act, 35 pages long. Right down at the bottom where you see the highlighted areas, it said, furthermore, studies indicate that 98 percent of radiation-induced cancers within the nuclear weapons complex have occurred at dose levels below existing maximum safe thresholds, 5 rem.

Mr. Katz: Thank you, Mr. Sadler.

Okay. Next we have Susan Adkisson.

Ms. Adkisson: Thank you. My name is Susan Adkisson. I'm the Regional Director of Cold War Patriots here in Oak Ridge.

We just wanted to say that Cold War Patriots was deeply saddened when we learned of the loss of Dr. James Melius passing. He was a dedicated and long-serving public servant not only to the stakeholders of this program, but to other workers in similar situations, such as those in the 9/11 first responders.

In appreciation, Cold War Patriots made a donation in Dr. Melius's name to the New York Committee for Occupational Safety and Health.

Dr. Melius will be missed by many.

Mr. Katz: Thank you very much, Ms. Adkisson.

Next we have Terry Barrie.

Ms. Barrie: Good evening. My name is Terry Barrie, and I'm with the Alliance of Nuclear Worker Advocacy Groups.

When I first started typing the draft of my public comments, I surprised myself and started automatically typing, good evening, Dr. Melius. I have always admired Dr. Melius. And while I did not always agree with his decisions, I know he carefully considered every aspect of the issue. I will miss his gentle humor, especially when he teased Stu or LaVon. ANWAG offers our condolences to Dr. Melius's family, friends, and especially to all of you here who worked so closely with him for years.

I am thankful that this Board can continue work until a Chair is appointed, unlike the situation with the Department of Labor Advisory Board. It's important that your work continue uninterrupted. The SECs that have been being debated for like 3, 5, 10 years would fall through the cracks if you weren't here to resolve

them.

And now on to Rocky Flats, I'd like to give you an update on the petitioners' work on this issue. You know that NIOSH has reviewed 40 boxes down at Los Alamos, and they did find certain documents that are of interest to them, none of which were associated with the magnesium-thorium alloy.

I was disappointed, though, that they were only directed really to look for that specific issue, the magnesium-thorium, because in the thousands of records -- and I understand there's like maybe 1600 boxes still of documents at Los Alamos that should be reviewed -- for one reason or another, probably resources and finances, they won't be able to take a look at them.

So the petitioners understood that. So we decided, okay, well, we'll make arrangements to go down and take a look, and Los Alamos said, no, we can't do that. So we're resorting to filing FOIA requests for documents from the indices of the 40 boxes. So that's where that stands right now.

It's very important that we resolve this. I mean, I honestly feel that there is one document in there that will allow SEC status for Rocky Flats.

And the last thing I would like to address is the issue of CLL. Dr. Ziemer had asked Ted about whether CDC or HHS can contact Congress or make Congress aware of this issue. And it dawned on me that Secretary Richardson did the exact same thing in order to get the EEOICPA legislated.

So I would like to ask Secretary Azar, I believe his name is, to reconsider and go to Congress and open a discussion about CLL and changing the legislation to let CLL be a covered, a specified cancer.

And that's all I have, and thank you very much.

Mr. Katz: Thank you, Terry.

That's it for the list in the room, but do I have other people on the line who want to comment?

Mr. Giron: Yes. My name is Eloi Giron from Sandia National Lab.

Mr. Katz: Hi. So before you start, I don't know whether you're on a speaker phone. You're very hard to hear.

Mr. Giron: Yes. Sorry about that.

Mr. Katz: That's much better. Thank you.

Mr. Giron: Can you hear me better? Okay. I had you on the speaker phone because I had a couple of people in here.

Mr. Katz: It's okay. Would you repeat your name, and then go ahead with your comments? Thanks.

Mr. Giron: Okay. My name is Eloi Giron. Chairman and Members of the Board, my name is Eloi Giron. I'm a member --

Mr. Katz: I'm sorry. I'm sorry, can you --

Mr. Giron: I'm an employee of Sandia National --

Mr. Katz: Excuse me. Just go ahead and spell out your name because it's still hard to decipher.

Mr. Giron: Okay.

Mr. Katz: Thanks.

Mr. Giron: The first name is Eloi, E-L-O-I; last name, Giron, G-I-R-O-N.

Mr. Katz: Thank you. That's perfect. Go ahead.

Mr. Giron: Okay. Thank you, Chairman and Members of the Board, for listening to me today. I'm an employee of Sandia National Labs. I'm a security police officer.

At this time, I'm addressing SEC 188. I addressed this Board in December 2016 in Santa Fe and 2017 in Albuquerque. At those times, I brought up where and how we worked around SNM post 835.

At this time, I would like to be clear that nothing changed on the day-to-day operations on how we worked around SNM post 835 to prior to 835. It's been a few years, and a few of us, a group of us met with Sam Glover in a classified setting here at Sandia Labs. And we were able to ask questions directed at him on how we worked and where we worked in front of Sandia National Labs safety personnel. None of the information that we gave to Sam Glover was challenged to be wrong.

I'm asking for an update on this. I asked this in December. The Board had told me -- I know there's been, you know, changes in the Board. I mean, things have happened now. And what I'm asking for is an update, and I asked in December. The response I received from the Board was the Board is waiting for information that Sandia was supposed to give.

Shortly after that, we had another one of our employees go before you guys, the Board, at the public input, and asked what information in writing from the committee are you waiting for from Sandia. The Board said, I think they referred it back to LaVon Rutherford, and he responded by saying that they're waiting for dosimetry. The question again at that time was, what type of dosimetry and what timeframe did Sandia request -- what was the timeframe that your Board requested this from Sandia and what type of dosimetry was LaVon Rutherford, what kind are they waiting for.

I know you guys are busy. I mean, we're just waiting patiently here and asking for these updates. But now it is mid-April 2018, and since our last meeting, there are four new cases of SNL employees that I know of, just me, with cancer. Three of them are Stage 4, and one of them has just passed. And all four of them are

qualifying cancers under the program.

I would like to just find out again what the status is, if you received the information, or where are we at?

Thank you, Chairman.

Mr. Katz: Bomber, do you want to just give, remind -- we discussed this earlier, but you probably weren't on the line when we did. So LaVon is going to come up and just repeat what he said earlier.

Mr. Rutherford: Yes, this is LaVon Rutherford.

We have received most of the information from Sandia. We have gone back and forth with them on a couple of things, some discrepancies that we noted. But we fully intend to have the Evaluation Report completed at the end of July and presentation at the August Advisory Board meeting.

Mr. Katz: Thank you. Thank you, LaVon.

Mr. Giron: Chairman?

Mr. Katz: Yes? Do you have something else?

(No response.)

Mr. Katz: Okay. Well, thank you for your comment.

Mr. Giron: Sorry about that. I was able to hear your response. I was not able to hear LaVon Rutherford's at all. It was coming in broken.

Mr. Katz: Okay. Well, let me reiterate, basically, what LaVon said is they have had success receiving records that you've been discussing, and they are proceeding to work on that. They should be pretty far along a little early into the summer, and this should be ready for discussion by the Board at its August Board meeting.

So I think we thank everyone for pushing on this, and we have made good progress at this point. We will

expect this to get addressed then in August.

Okay. Do I have any other --

Mr. Giron: Okay.

Mr. Katz: Any other public commenters on the line who want to speak to us?

Ms. Hand: Yes. Yes.

Mr. Katz: So would you please identify yourself and then proceed?

Ms. Hand: My name is Donna Hand.

And I would like to make a public comment regarding the overall process because the -- and today's meeting, Dr. Neton says, I think the decisions are made on the CATI and job title. It should never be done on the job title. Even the statute says it's in the performance of duty. So even an administrator, a secretary could be assigned to the reactor and everything. So she would get more than just the administration.

And the 50 percentile was told that it was just for administration people. That's not the case. Whenever we file for another cancer, they automatically use the 50th percentile. The statute requires the 99th percentile. So you're only using the 95th percentile.

The methods and guidelines are in the regulations. What you're doing is a misapplication of the methods and guidelines to apply those. And to reduce it down to the 50th percentile, that's not what the law stated, nor the regulations.

And it is the duty of the Board to make sure that the dose reconstruction is scientifically valid. Back in December the 12th, 2017, I asked the Board to determine if there's a scientific validation of the metal tritide dose, and also, is it sufficient of data for the internal dose. The Board never responded. They sent it to Stu Hinnefeld.

That's great that Stu Hinnefeld responded. However, he does not have that authority. That authority is addressed and put into the statute for the Board to determine, not for Stu Hinnefeld or NIOSH to determine.

And the methodology is already into the law. So the Advisory Board, as well as the NIOSH, must comply within the parameters of the law.

As far as Pinellas group goes, we've been denied again on an SEC because it didn't qualify. Qualification is a policy. Policy is not binding. The statute and the regulations are binding. And the regulations, 42 CFR 83, we met that.

In fact, on March the 3rd, 2016, Peter Darnell did a response to Matrix Issue No. 6, which was the decontamination and decommissioning period, stating, we don't have those records. It's not there. And we're not going to look any more. But, yet, we were denied.

So if you don't have the data of the decontamination and decommissioning era, but, yet, you're saying we don't qualify, you're not having an equal application of the law.

And, again, I would request that the Advisory Board respond to my December 12th letter regarding the metal tritide dose, specifically at Pinellas, because you did not know which metal tritide was used when.

And also in that March 16th letter, Peter Darnell acknowledged that there were aged tritide uranium, uranium oxide, and uranium aluminum samples that was there in that information regarding Pinellas.

So the dose reconstruction for the external dose and internal dose was revised and renewed in 2016 for the internal dose and December of 2017 for the external dose. That's after you denied the SEC, but you still didn't add into those issues.

And, again, neither one of these have been approved by the Working Group, and definitely from the very first one until this recent one, have never been approved by the Board to be scientifically valid. So the Board has never done any of the Technical Basis Documents for Pinellas Plant saying that they were, yes, scientifically valid and voted on those. So they are still open, but, yet, you're denying us our SEC when there's not the information.

And the law demands and requires that you, that this program is to provide timely, uniform, and adequate compensation. When you're waiting even for your new Technical Basis Document 0017, you say, well, when we add on, we'll put in this new information. No, you should do it now because that's not timely then. If you wait, keep on waiting and waiting, that's not a timely decision, nor is it timely to be used.

And as the other people have stated, these people are dying, and it's not fair to them, whenever this program started in 2000. 2001, it was amended. 2002, examples were going on, and the Board was up and ready. 2006, the Board started voting on certain things. So it's been over 10 years. So this is -- it's not in a timely -- so all I'm asking is that you follow the law and the regulations as implemented, and be fair and adequate to all of the sites, and to have equal application of the law to all the sites.

And, again, I would like to have an answer to my December 12th, 2017 letter.

Thank you.

Mr. Katz: Thank you, Ms. Hand.

I will just address the letter question because, in fact, the letter that was written by Stu was carefully reviewed by all the Members of the Board and concurred with by all the Members of the Board. So, that is, in fact, addressing the Board's view on the matter, not just the program's.

But thank you for your comments.

Do we have any other public commenters on the line?

Mr. Giron: Chairman? This is Eloi Giron again from Albuquerque, Sandia Labs.

Mr. Katz: Yes?

Mr. Giron: I want to be clear on this. When you responded to me saying that Sandia has provided some information, the question in December from [identifying information redacted], he had two questions. Have they, Sandia, are they providing all information or just portions of this, of his questions?

Mr. Katz: Okay. Well, this is not really the forum to get into nitty-gritty details about what exactly they're providing, and so on.

Mr. Giron: Okay.

Mr. Katz: But the general message is just that they're receiving the records that they require to address the SEC petition, and we will be considering that petition in August. I think those are the critical points.

Mr. Giron: Okay. Because the question that was posed in the December meeting, when Peter would ask those two questions, the Board or somebody on the Board was supposed to get back to him with answers to those two questions. And I met with Pete Irwin earlier, and he said he has received nothing since then.

Mr. Katz: Right. Well, the program would be communicating with you folks, not an individual from the Board. And I believe LaVon has been doing that. And if there needs to be more communication between LaVon and the questioners, by all means, get back in touch with him. There's plenty of time between now and then. Thanks.

Mr. Giron: Thank you, Chairman. Members of the Board, thank you.

Mr. Katz: Sure. You're welcome. Thanks for raising the issue.

Any other public commenters on the line?

Ms. Carroll: Yes, this is Stephanie Carroll.

Mr. Katz: I'm sorry, this is?

Ms. Carroll: Can you hear? Can you hear me okay?

Mr. Katz: Oh, yes, yes, there you go. Thanks.

Ms. Carroll: Hi. Stephanie Carroll. I'm an authorized rep here in Denver, Colorado.

And I would like to make a comment on the vote to deny the extension of the SEC for Rocky Flats. Prior to the vote, I had submitted via online submission a Manual of Good Practices at Uranium Facilities draft. And it was written by Bryce Rich, Stuart Hinnefeld, Clayton Lagerquist, Gary Mansfield, Leo Munson, and Edgar Wagner.

And that document did not show up online, nor did the Rocky Flats -- well, nor did the Board actually review the record prior to the vote. So I just wanted to make that be known, that there were two documents, actually, that were never reviewed before the vote was put through to deny the SEC for Rocky Flats.

And that's all I have for you today.

Mr. Katz: Thank you, Stephanie.

Ms. Carroll: Thank you.

Mr. Katz: Do we have any other members of the public with comments?

(No response.)

Mr. Katz: Going once. Going twice.

All right. Thank you, everybody, for a productive

Board meeting. We really appreciate it. All the public participation, we really appreciate it.

Ms. Colley: I would like to make another comment if I can.

Mr. Katz: And at this point we are adjourned.

(Whereupon, the above-entitled matter went off the record at 5:34 p.m. and resumed at 5:35 p.m.)

Ms. Colley: Hello? Hello? Can you hear me?

Mr. Katz: Hello.

Ms. Colley: Hello?

Mr. Katz: Hello. Is there someone trying to speak to us?

Ms. Colley: Yes, I said I'd like to make another small comment. This is Vina Colley.

Mr. Katz: Okay. Hold on a second because we already adjourned. And so there's a lot of noise in the room. And one second.

Ms. Colley: Okay. That's okay.

Mr. Katz: Hold one moment.

Everyone in the room, can we -- I know we tried to adjourn. I think there's another public commenter who wants to make comments. Can we, please, everyone, can we be quiet in here, so that we can hear the individual?

Sorry about that. So go ahead. Would you please identify yourself and go ahead?

Ms. Colley: Yes. This is Vina Colley.

And I just want to comment that I did --

Mr. Katz: Wait. Hold on one second.

Please, everyone in the room, please, we're trying to hear from someone who's calling in.

Okay. Go ahead again. This is Bonnie Clay?

Ms. Colley: Vina Colley.

Mr. Katz: Vina Colley.

Ms. Colley: From Portsmouth.

Mr. Katz: Okay. Go ahead.

Ms. Colley: I just wanted to make a comment that I did testify on behalf of the human experimentation, and I met many of the people that the government experimented on. And I was personally invited to Secretary Hazel O'Leary's Whistleblower Conference in '92 or '94; I'm not really sure right now because I don't have my papers here.

What's going on right now with the workers and the way they're letting them die, and keep re-dosing them, is a criminal act. All the workers that I worked with who started this process by getting it out to the public in the '80s have passed away.

[identifying information redacted] was 42. He died of a brain tumor. [identifying information redacted is still sick. [identifying information redacted] is sick. There's so many of us workers that started this process and they've all passed away.

And it seems like the government is just waiting for us all to pass away, where they continue to have meetings and try to figure out this dose reconstruction. It's just corrupted, and it's a criminal act against us workers who are already sick and have been experimented on by the government all these years.

And that's all I have to say for now.

Mr. Katz: Thank you for your comment.

And with that now, we will re-adjourn and remain adjourned, and thank you again, everybody.

(Whereupon, at 5:37 p.m., the meeting in the above-entitled matter went off the record.)